Menhaden Juvenile Abundance Index Update
November 2011

Fishery-Independent Data – juvenile abundance index

Data collected from seine surveys conducted within several states along the east coast of the U.S. were used to develop indices of relative abundance for juvenile menhaden. The primary objective of these seine surveys is to measure the recruitment strength of species other than menhaden, that is, the underlying sampling protocols were designed to target juvenile striped bass, alosines, or other fishes and species complexes. Although menhaden are a bycatch species in these surveys, the seine catch-per-haul data represent the best available information for the construction of a menhaden juvenile abundance index (JAI).

The calculation of the menhaden JAI was based on data from the following state seine surveys:

- North Carolina alosine seine survey (1972-2010)
- Virginia striped bass seine survey (1967-1973, 1980-2010)
- Maryland striped bass seine survey (1959-2010)
- Connecticut seine survey (1987-2010)
- New Jersey seine survey (1980-2010)
- New York seine survey (1986-2010)
- Rhode Island seine survey (1988-2010)

State seine surveys

The North Carolina Alosine seine survey (Program 100S) has operated continuously from 1972-present in the Albemarle Sound and surrounding estuarine areas. The survey targets juvenile alosine fishes and sampling is conducted monthly from June through October.

The Virginia striped bass seine survey was conducted from 1967-1973 and 1980-present. The survey targets juvenile striped bass following a fixed station design, with most sampling occurring monthly from July through September and occasional collections in October and November. In 1986 the bag seine dimensions were changed from 2 m x 30.5 m x 6.4 mm to the "Maryland" style seine with the dimensions 1.2 m x 30.5 m x 6.4 mm. Rivers sampled in the southern Chesapeake Bay system include the James, Mattaponi, Pamunkey, Rappahannock, and York rivers.

The Maryland striped bass seine survey targets juvenile striped bass and has operated continuously from 1954-present. Survey stations are fixed and sampled in July, August, and September with a beach seine of dimensions 1.2 m x 30.5 m x 6.4 mm. Twenty-two permanent stations within the northern Chesapeake Bay system are sampled with two replicate hauls at each station in four regions: Choptank River, Head of Bay, Nanticoke River, and Potomac River.

The New Jersey striped bass seine survey targets juvenile striped bass and has operated continuously in the Delaware River from 1980-present. The sampling scheme has been modified over the years but the core survey area, sampling locations, and field time frame (June-November) have remained consistent. The current sampling protocol, which was established in 1998, consists of 32 fixed stations sampled twice a month from June through November within three distinct habitats: Area 1 – brackish tidal water; Area 2 – brackish to fresh tidal water; Area 3 – tidal freshwater. A beach seine with dimensions 1.8 m x 30.5 m x 6.4 mm is used for sampling. For the menhaden juvenile index calculation, data from Area 3 were omitted due to the rare occurrences of menhaden in tidal freshwater.

The Connecticut River seine survey targets juvenile alosines in the Connecticut River and has continuously operated from 1987-present. Sampling occurs weekly from July through October with a beach seine of dimensions 2.44 m x 15.2 m x 0.5 cm. Approximately 56 hauls are taken annually from four sites in the lower River located at Deep River, Essex, Glastonbury, and mouth of the Salmon River.

The Rhode Island seine survey targets a variety of fishes in Narragansett Bay and has operated continuously from 1988-present. The survey began with 15 stations in 1988 increasing by one station in each year of 1990, 1993, and 1995, for a total of 18 fixed stations. All 18 fixed stations are sampled in each month from June through October using a beach seine with dimensions 3.05 m x 61 m with mesh size running from 0.635 cm in the wings to 0.476 cm in the bunt.

The New York seine survey targets a variety of fishes in western Long Island Sound and has operated continuously from 1984-present. Sampling occurs with a 61 m beach seine primarily from May through October within three areas: Jamaica Bay, Little Neck Bay, and Manhasset Bay.

Potential biases

Because of the schooling nature of Atlantic menhaden combined with the fact that these seine surveys were originally designed to measure the abundance of other species, it is possible that the menhaden catch data are not truly representative abundance.

Biological Sampling

Length data (in mm) were available for the seine surveys conducted by North Carolina, Virginia, Maryland, and New Jersey; little or no length data are available for the seine surveys conducted by Connecticut, and Rhode Island.

Aging Methods

For state seine surveys (North Carolina, Virginia, Maryland, New Jersey, and New York) with length data, catch-per-haul data were adjusted based on the convention cut-off sizes by month for juvenile menhaden adopted by the Atlantic menhaden Technical Committee in March 2003. Juvenile length cutoffs were defined as: June 1-June 30, 110 mm FL; July 1-August 15, 125 mm FL; and August 16-November 30, 150 mm FL.

Coastwide Index

A coastwide index of juvenile menhaden abundance was developed by combining the state-specific seine data into a single dataset. As noted in the most recent menhaden stock assessment, examination of the raw catch-per-haul data for each state indicated that each data set contained a high proportion of zero catches, or alternatively, a low proportion of hauls where at least one juvenile menhaden was captured (ASMFC 2010). Zero catches can arise for many reasons, and it was reasoned that the use of an active sampling gear combined with the schooling nature of menhaden was the likely cause (Maunder and Punt 2004). Although a variety of strategies can be used to deal with zero catches, in the most recent stock assessment a delta approach was adopted where the probability of obtaining a zero catch and the catch rate, given that the catch is non-zero, were modeled separately (Maunder and Punt 2004). The general form of a delta model is:

$$\Pr(Y = y) = \begin{cases} w & y = 0 \\ (1 - w)\, f(y) & \text{otherwise} \end{cases}$$

Based on analyses described in the most recent assessment report, the probability of obtaining a zero observation was modeled using the binomial distribution and the distribution used to model the non-zero catches was assumed to be lognormal (ASMFC 2010). The delta-lognormal GLM used to develop the coastwide juvenile relative abundance index included *year*, *month*, and *state* as fixed factors. All statistical analyses were conducted using the software package R, version 2.11.0 (R Development Core Team, 2010).

State-Specific Indices

Indices of relative menhaden juvenile abundance were also developed for each state separately. A delta-lognormal GLM that included *year* and *month* as fixed factors was fitted to the state-specific data.

The index trends from the late 1990s through the mid 2000s are generally variable but higher in more northerly states when compared to the more southerly states (Figure 2). The 2009 and 2010 index years are either roughly the same or lower than previous years for all states except Virginia. The Virginia index values for those years are the highest when compared to the previous 15 years.

Results

The trend of the coastwide index is generally low during the 1960s, high from the mid 1970s to mid 1980s, and low to moderate from the mid 1980s to the present (Figure 1). Over the past 20 years, noteworthy strong year-classes occurred in 1999 and 2005.

The state-specific index trends from the late 1990s through the mid 2000s are generally variable but higher in more northerly states when compared to the more southerly states (Figure 2). The 2009 and 2010 index years are either roughly the same or lower than previous years for all states except Virginia.

Correlation analysis indicates strong correlation ($r > 0.65$) between the coastwide index and the four most southern state indices (NC, VA, MD, NJ). In comparison, NY, CT, and RI had Pearson correlation coefficients of 0.35 or less. Although recruitment from all areas is important, the strong influence of the southern state indices on the coastwide index corresponds well with the general understanding that the Chesapeake Bay region is the epicenter of menhaden recruitment (J. Smith, personal communication).

The Virginia index values for 2009 and 2010 are the highest values in nearly two decades for that survey. Strong recruitment in this region in recent years is corroborated by an increase in the percentage of age-1 individuals in the Chesapeake Bay harvest.

Literature Cited

ASMFC. 2010. Atlantic Menhaden Stock Assessment and Review Panel Reports. Stock assessment report 10-02 of the Atlantic States Marine Fisheries Commission. Washington DC. 326p.

Maunder, M.N. and A.E. Punt. 2004. Standardizing catch and effort data: a review of recent approaches. Fisheries Research 70:141-159.

R Development Core Team. 2010. R: A Language and Environment For Statistical Computing. Vienna: R Foundation for Statistical Computing.

Figure 1. Coastwide juvenile abundance index (black line) based on the delta-lognormal GLM with fixed factors *year*, *month*, and *state* fitted to seine catch-per-haul data for 1959-2010 from all states combined. Coefficients of variations (CV; grey line) were calculated from jackknifed derived SEs.

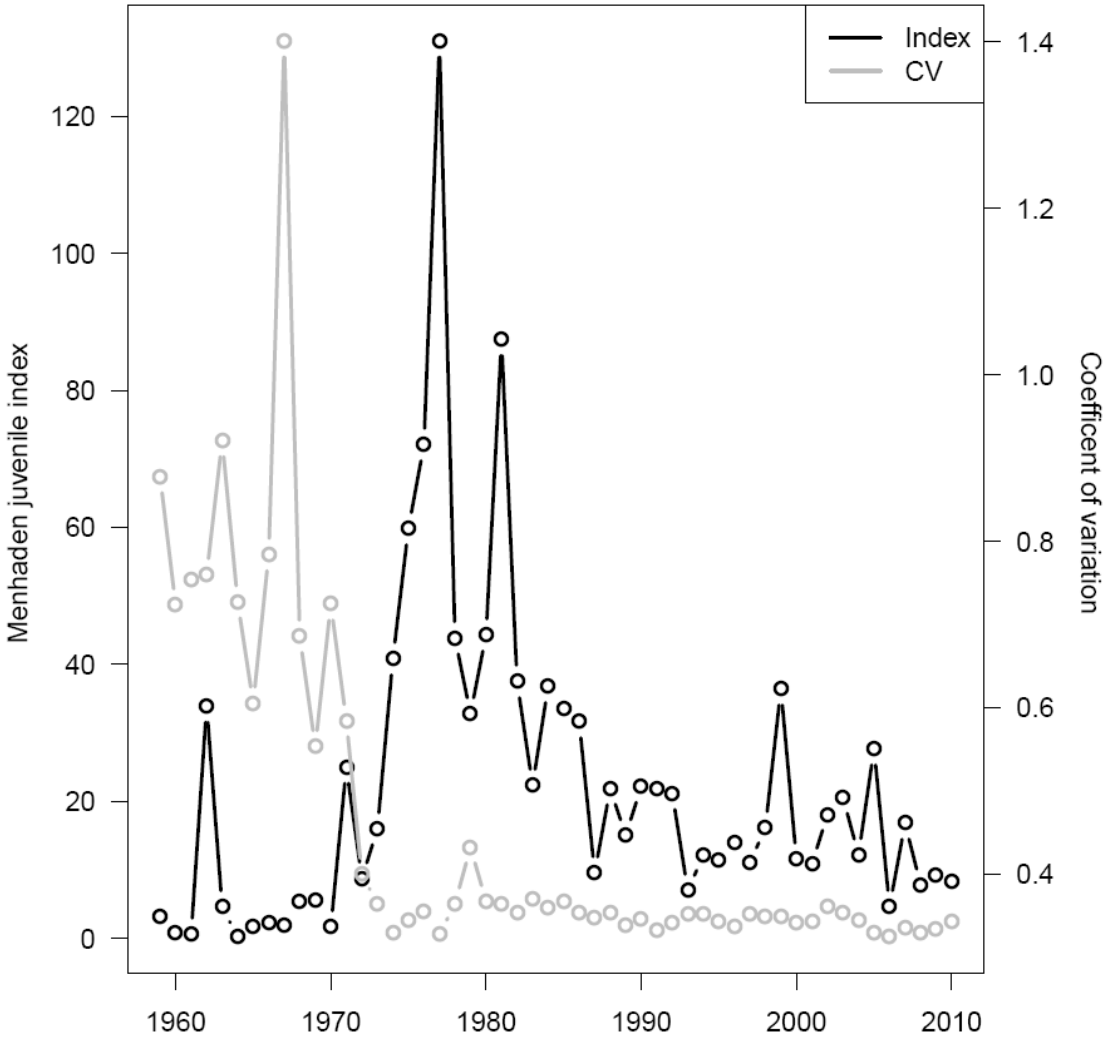
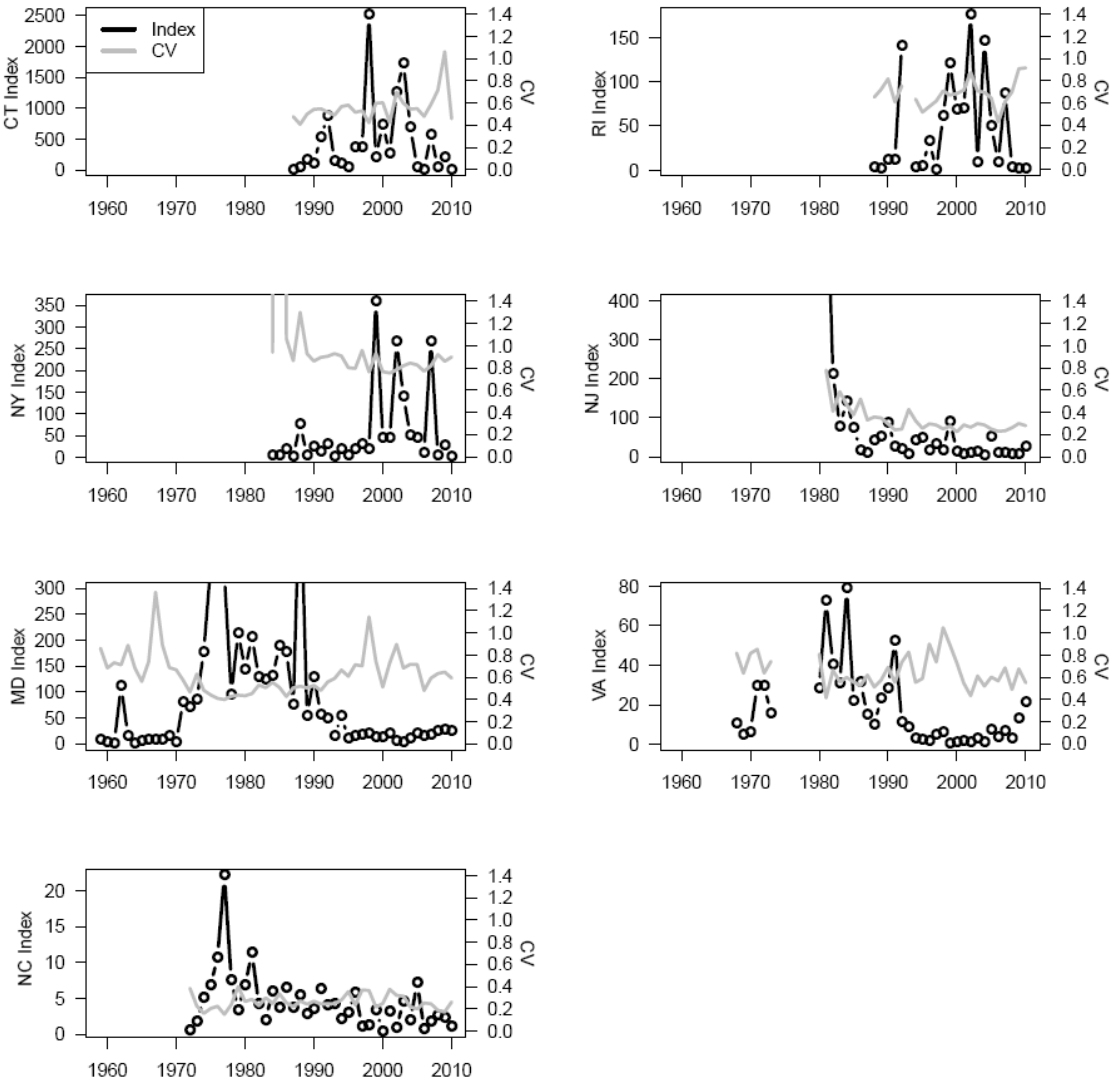


Figure 2. State-specific juvenile abundance indices (black line) based on the delta-lognormal GLM with fixed factors *year* and *month* fitted to seine catch-per-haul data. Coefficients of variations (CV; grey line) were calculated from jackknifed derived SEs.



Atlantic States Marine Fisheries Commission

1050 N. Highland Street • Suite 200A-N • Arlington, VA 22201
703.842.0740 • 703.842.0741 (fax) • www.asmfc.org

MEMORANDUM

October 28, 2011

To: Atlantic Menhaden Management Board
From: Atlantic Menhaden Advisory Panel
RE: Advisory Panel Report to the Board on draft Addendum V

The Advisory Panel met on October 25, 2011 in Baltimore, MD to make recommendation to the Board on Draft Addendum V. Panel members in attendance represented the conservation community, commercial harvesters (for bait and reduction), bait dealers, and recreational fishermen. The following is a summary of the meeting.

Attendees

Advisory Panel Members

Bill Windley (MD), Chair
Ron Lukens (VA)
Jimmy Kellum (VA)
Brian Tarbox (ME)
Jeff Kaelin (NJ)
Ed Cherry (NJ)
Don Swanson (NH)
Jennie Bichrest (ME)
Ken Hinman (VA)
Donald Smith (RI)

ASMFC Staff

Toni Kerns

Public

Mike Waine
Shaun Gehan
Ross Kellum
Candy Thomson

Draft Addendum V

2.2.3.4 Ecological Role Section

The AP recommends that the ecological roles section of Amendment 1 be expanded to include more, context for the cause of mycobacteriosis, information regarding the ecological services of menhaden (e.g., predator prey relationships), and detail of the MSVPA X use in the current stock assessment (used to develop M estimates) and future stock assessments. These additions are recommended to be included in the next management document.

3.0 Social and Economic Impacts Section

The AP recommends that the Board add long term economic and social impacts, in addition to the short term to the next management document.

2.3.1 Reference points

Some AP members feel that changes to the reference points should not be made until the updated stock assessment is released in 2012.

Others feel that waiting for the next assessment is not necessary because the reference points are management targets and limits, and are independent of the results of an updated stock assessment.

Threshold

The AP had a split opinion on the threshold. Some favored status quo, while others favored a F15% MSP threshold.

The group agrees that there should be a level of protection for spawners. However, some feel they are already getting adequate protection while others feel that the level of protection for spawners should be increased.

Target

Some AP members feel that the fishery should be managed to the fishing mortality target, while others feel it should be managed towards the target, as to minimize the probability of approaching the threshold. The target is a buffer to accommodate for uncertainty in the assessment and the fishery.

Some members of the AP favor a F40% MSP target, some members favor a F15% MSP (Note that F15% MSP is outside of the range of options proposed in the document).

Comments leading to this recommendation,

- Some members favor a F40% MSP because they feel that this would be the greatest opportunity to bring menhaden back to their waters that was seen in the 1970-1980s. Some noted that a F30% MSP could be acceptable. It is important to leave fish in the waters for their ecological services including forage.
- Some AP members favor a F15% MSP target because they feel this level of spawning potential will keep the stock abundance (fecundity) at the target levels. Although this is less than what is in the document, it is acceptable as MSP is a new fishing mortality reference point being proposed for this stock.
- An AP member added that it acceptable that the Atlantic herring fishery is managed at an MSY level that is similar to a 10-15% MSP according to a conversation with a scientist on the Atlantic herring TC.
- Industry has funded an independent survey conducted by the University of New England. Preliminary results show that are adult menhaden north of New Jersey. The assessment assumes that fish do not occur outside the fishery area. They now have evidence with their independent survey they the spawning adults do occur outside the fishery zones.
- The intent of the target is to satisfy the ecological role of menhaden as forage for predatory species that other fisheries heavily rely on. This is not an interim action because the Board has been discussing this for a long period and the MSVPA will take time to develop and use for management purposes.
- The 20%MSP target option is the same as status quo.
- Environmental factors may be influencing where menhaden are migrating.
- Some AP members stated they are not seeing menhaden in northern waters like they used to see.

2.3.2.1 Recreational Fishery Management Measures

The AP supports status quo because the recreational fishery is insignificant when compared to the commercial fishery. The only viable measures are bag and size limits but they would be very difficult to enforce.

2.3.2.2 Commercial Fishery Management Measures

Most of the group recommend that an amendment must be considered for the suite of commercial management measures being considered in Addendum V, not a follow-up addendum.

The AP recommended that all the measures proposed in the commercial fishery management tools section of draft Addendum V be explored in a future management document. The AP stated that the Board is prematurely asking for direction on management tools, and the AP should be asked for recommendations on how to manage the fishery after the Board has made a decision on reference points, but before a second document is approved for public comment.

General comments and suggestions regarding draft Addendum V:

- What percentage of the total stock does the existing fishing mortality reference point protect?
- A lot of people are referring to the vast overfishing in the time series, but that has nothing to do with the current status. The most important time series to look at when considering if overfishing is occurring is the most recent years.
- Why are early landings being grouped in bait catch if those landings were going to the reduction industry?
- Peer review recommendation of alternative reference points came when overfishing was not occurring. The peer review recommended alternative reference points to protect more SSB.
- The PDT recommendations for this document say that they can't discern that there is a stock recruitment relationship; it's not that there is no relationship. Spawning stock may take more advantage of favorable environment if more spawners are left in the water.
- How many ASMFC fisheries are actually managed at the target?

AP Leadership Changes

Jule Wheatly recently passed away and there was a need to elect a Chair and Vice Chair.

Bill Windley was elected as Chair, and Jeff Kaelin was elected as Vice Chair.