

The Economic Importance and Value of Menhaden in The Chesapeake Bay Region: A Progress Report (February 2010)

Although funding of this project was awarded in September of 2007, the research was actually initiated in May of 2007. This project has a final completion date of 2010. This is a three-year project with approximately 28 tasks of items to be completed. Year 1 of the project required completion of 12 tasks and year 2 required completion of 11 tasks. We provide a summary/overview of our progress on each of the tasks for year 2. Despite the fact that most of the tasks required for years 1 and 2 have been completed, we have not been able to complete the economic valuation of menhaden to the region. Through field testing of the survey instrument, it was discovered that a large number of individuals were not familiar with menhaden, and some individuals were not aware of the existence of the Chesapeake Bay. This required an extensive number of modifications to the survey as well as 23 field tests before we had a satisfactory survey instrument.

Because of widespread confusion about the differences in economic impacts and economic values, we provide a brief discussion. Economic impacts indicate the changes in economic activity of an economy (e.g., changes in employment, changes in total sales, and changes in total income). As such, impacts are very useful for decision-making by managers. Economic impacts, however, are not equal to the value an individual places on a good or service. Economic value is a metric to indicate how important or valuable a market or non-market good or service is to an individual. In general, economic value is an opportunity cost, or more simply, most someone is willing to give up in other goods and services in order to obtain a good, service, or state of the world. Another metric or measure, for market goods, is the most someone would be willing to pay less what they actually pay to acquire a given good or service. In the case of non-market goods and services (e.g., menhaden in the water and not harvested), economic value equals the willingness to pay by an individual to conserve or keep menhaden from being harvested.

Year 2:

- (1) Complete development of input/output or economic impact assessments models and economic assessment of potential impacts associated with menhaden:

The input/output models have been developed for the commercial and recreational fisheries of Maryland and Virginia and respective counties. All models are based on the 2006 IMPLAN platform and updated economic information. In 2009, these models were updated to reflect more current data and commercial and recreational activities in 2008. Directed trips and angler expenditures were estimated for striped bass, seatrout, speckled trout, and bluefish, by angling mode, for Maryland and Virginia.

- (2) Complete social/economic profile of reduction fishery:

This work is ongoing. Interviews have been conducted with plant and vessel

employees and various representatives of the Reedville area. OMEGA Protein provided extremely detailed and confidential social and economic data related to plants and vessel employees, plant operations, and product sales. These more recent data were used to develop a new input/output or economic impact model for the reduction fishery.

- (3) Develop and field test appropriate survey instrument for determining the economic value of the ecosystem services of menhaden:

Development of the survey instrument (questionnaire) required 23 field tests. A draft sampling scheme was developed to field test potential respondents more representative of Maryland and Virginia. Previous surveys focused only on obtaining information from user-based or concerned stakeholders; this resulted in a strong bias against the commercial fishery. For pretesting the instrument, we surveyed 1,000 individuals from Maryland and Virginia (500 for each state) without regard to whether or not they belonged to an angling, commercial, or environmental association. The questionnaire, however, does ask the respondent to state whether or not they belong to a particular type of association. Also, the questionnaire was sent to various interested entities (e.g., angling, environmental, commercial associations, and the Atlantic States Marine Fisheries Commission) to identify problems and offer suggestions. It was not possible to incorporate all suggestions because they would introduce bias into the responses.

The survey asks one major question about valuation. While the question might appear overly simplistic, it is consistent with economic principles and accepted survey strategy for obtaining information on the value individuals place on natural resources and environmental goods and services. The survey has 19 questions, which is quite long but appropriate for determining the value of menhaden to society. The basic valuation question is as follows (I have also attached a file containing one copy of the survey for Virginia—50 % reduction and tax of \$30.0):

Now we describe an approach to reducing the harvest of the commercial menhaden reduction fishery in the Chesapeake Bay. The approach should be considered relevant to the current levels of commercial harvest of menhaden in the Bay.

To decrease the harvest of the menhaden reduction fishery in the Bay by 50 percent will require more rigorous monitoring of the catch to ensure compliance with the restriction on catch and to assess the impacts on game fish, sea bird populations and water quality. The harvest reduction could decrease the total sales of menhaden by about \$30.0 million; wages and salaries paid to fishermen and processor employees by about \$5.7 million; employment by 150 individuals; and taxes paid to Virginia by approximately \$1.7 million.

There is some chance that a reduction in allowable Bay harvest will increase the stocks of game fish; bring an increase in sea birds; and possibly improve the overall health of the Bay's ecosystem.

The program for enforcing the restriction on catch and monitoring is costly and will require additional state taxes. We estimate that a typical household would pay about **\$30** in higher state taxes each year for the next 10 years.

Suppose that this proposal is put to a referendum vote. If 50% or more of all households in Virginia and in Maryland voted for the proposal it would pass, the menhaden harvest would be decreased and you would have about **\$30 less to spend each year** for the next 10 years. If 50% or more of all households in Virginia and Maryland voted against the proposal then it would fail and commercial fishing of menhaden would remain at current levels and it would cost you nothing. If the vote were held today would you vote for or against the lower harvest of menhaden? **[Please circle your response]**

- a. for
- b. against
- c. don't know/not sure

If you would vote for the proposal please answer this question. How sure are you that you would vote for the proposal? Are you ... ? **[Please circle your response]**

- a. very sure
- b. somewhat sure
- c. not sure at all

There are three versions of the valuation question and six dollar amounts reflecting willingness to pay for different outcomes of the menhaden fishery. The basic three versions ask about the following: (1) value relative to reducing the fishery by 10 %; (2) value relative to reducing the fishery by 50 %; and (3) allowing the fishery to operate status quo. Each of the three versions has six dollar amounts relative to willingness to support a tax increase--\$10, \$20, \$30, \$50, \$75, and \$90.

In the early field tests, it was discovered that many individuals had never heard of a menhaden or knew there was a reduction fishery. Moreover, some individuals in some areas were unaware of the Chesapeake Bay. This created the problem of determining whether or not a respondent could adequately respond to questions about the value of menhaden. Subsequently, it required 23 versions of the instrument to ensure potential respondents were educated about menhaden without introducing a bias for respondents to indicate their preferences about the reduction fishery.

- (4) Develop list of stakeholders in Maryland and Virginia to survey for the purpose of determining the economic value of menhaden:

A list based on major stakeholder groups has been developed. The list includes recreational anglers, commercial watermen, processors, wholesalers, American Indian representatives, planners, politicians, community leaders, various non governmental organizations (NGOs), and other groups. Unfortunately, surveying only major stakeholders or direct users of the Bay and its resources introduces the potential for bias either for or against the reduction fishery. A more comprehensive list of potential respondents is being developed. Field tests, however, revealed problems for surveying a broader spectrum of individuals in the region: (1) several individuals indicated a preference to allow the fishery to operate at the status quo to avoid more unemployment in the region; (2) other individuals indicated a strong opposition to any tax increases, regardless of the use of tax dollars; and (3) there remained the group of individuals who simply do not care about the menhaden fishery or the Bay.

- (5) Develop stratified random sampling scheme to facilitate survey of Bay stakeholders:

Initially, we were developing a stratified random sampling scheme to survey zip codes rather than Bay stakeholders. Initial assessments, however, indicated that it would be cost prohibitive to conduct a properly stratified survey. Moreover, since the emphasis is really on obtaining information relative to Maryland and Virginia residents, and not residents by zip code or county, it was decided to survey 18,000 residents of Maryland and Virginia (9,000 for each state). Sample size will be increased relative to funds remaining in the grant/'contract. This will be conducted during the latter part of 2008.

- (6) Prepare analytical data base using survey results:

It is anticipated the survey data will be compiled by early April of 2010. All other data have been compiled into EXCEL and SPSS data bases.

- (7) Develop mathematical/statistical models for estimating the value of the ecosystem services of menhaden relating to the potential attributes (e.g., water quality, prey for fish, and pray/diet for sea birds and marine mammals):

Existing research by other individuals indicated there are no clear relationships between menhaden, water quality, and the abundance and health of other living marine resources in the Bay. We, subsequently, determined that the valuation of menhaden could not be done relative to water quality and the health and abundance of marine resources. Instead, we would have to estimate the overall value society places on menhaden. It was this reason that promulgated the need for a new survey instrument and 23 field tests to determine a final instrument. The mathematical/statistical models are specified as stated preference models, which facilitates estimation of the non-market value of menhaden.

- (8) The models will be random utility models requiring specifications consistent with multinomial logit models, and thus, the estimation algorithms will be developed:

Estimation algorithms for use by SAS and LIMDEP have been developed.

- (9) Estimate the economic valuation models and conduct sensitivity analysis

Because of problems with the survey instrument, it was not possible to estimate the economic value of menhaden in 2009. Estimation should be completed by May of 2010.

- (10) Using estimates from the economic valuation models, estimate the economic value of the ecosystem services of menhaden for the Bay region:

This will be completed in mid 2010.

**College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, VA 23062**

November 20, 2009

Dear Citizen:

A difficult issue facing Chesapeake Bay policy makers concerns the harvesting of menhaden. Menhaden is a small fish that lives part of the year in the Chesapeake Bay and is part of one coastal stock ranging from Maine to Florida. This little fish supports the largest fishery of the Chesapeake Bay. The latest stock assessment information, which is for calendar year 2006, by the Atlantic States Marine Fisheries Commission (ASMFC) indicates that Atlantic menhaden are not overfished and overfishing is not occurring on a coastwide basis. The ASMFC, however, has expressed concern that there are too few juvenile fish to support the health of the ecosystem of the Chesapeake Bay, and that localized depletion of menhaden may be occurring in the Chesapeake Bay resource. Scientific knowledge supporting these complex issues is limited.

The following questionnaire and information sheet addresses the harvesting of menhaden in the Chesapeake Bay. Please read the information and then answer the questions in the booklet. The purpose of the questionnaire is to determine public preferences for decisions about menhaden fishing when there is limited scientific information about possible effects to the ecosystem from menhaden fishing. Please provide your best responses to these questions. We give you the utmost assurance that your answers will remain anonymous.

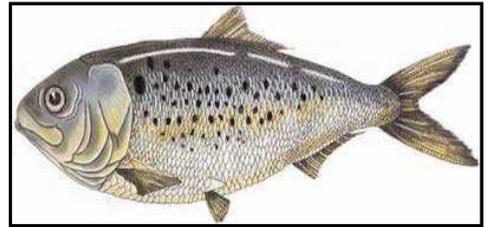
If you have any questions, please contact Jim Kirkley (804-684-7160 or by e-mail: jkirkley@vims.edu).

Sincerely,

James E. Kirkley, Ph.D.
Virginia Institute of Marine Science
School of Marine Science
1208 Greate Rd.
Gloucester Point, VA 23062
FAX: 804-684-7989

Background on the Menhaden Fishery

Menhaden is harvested for bait or processed by “reduction” into fish meal, oil, and fish solubles. These items are incorporated by various manufacturers into a wide range of products. Fish meal, for example, is used as feed for livestock, poultry, and farm-raised fish. Fish oil containing



omega-3 fatty acids is now increasingly used as a human health supplement. Menhaden is used by recreational fishermen as bait or chum, and by commercial fishermen as bait for American lobster, blue crabs, and crawfish.

Meal and oil from soybean and flaxseed could be substituted for fish meal and oil. However, they are not perfect substitutes, and they have significantly different fatty acid profiles. The protein in fish meal is especially valuable for livestock, poultry, and aquaculture feeds. The American Heart Association suggests that fish, including menhaden, is the best source of OMEGA-3 fatty acids.

Menhaden in the Bay Ecosystem

The menhaden fishery is controversial because in terms of volume of harvest, it is the largest fishery in the Chesapeake Bay. As a forage species, menhaden is a significant part of the diet of predators (e.g., striped bass, bluefish, weakfish, marine mammals, and sea birds). There is concern that the reduction catch removes the food of these predators. The ASFMC has expressed concern that there are too few juvenile fish to support the ecosystem health of the Chesapeake Bay. Various angling and environmental associations have expressed concern that the harvesting of menhaden may negatively affect the water quality of the Chesapeake Bay. The most recent research, however, indicates there is little, if any, relationship between water quality and the population of menhaden.

Menhaden and the Bay Economy

The Virginia reduction fishery is important to the economy of Northumberland County, Virginia. The fishery and related processing activities employ around 300 individuals, which is about ten percent of the Northumberland County workforce. The industry had total sales of approximately \$60.0 million in 2008. Expenditures in Virginia to support harvesting and reduction activities were about \$19 million in 2008. Harvesting and processing activities generate both state and local taxes. Gross earnings by individuals working the boats and the plant were about \$11 million in 2008. Average income for fishermen and plant workers, which includes

management, was about \$38,000, compared with average earnings of about \$27,000 per worker in the county in 2006.

How is the Menhaden Fishery Managed?

The coastal menhaden fishery is managed by each state under the direction of the Atlantic States Marine Fisheries Commission (**ASMFC**).



Historically, menhaden catches from the Bay for reduction have varied widely - from about 50,000 to 170,000 tons. This equals 10 to 75% of the coastwide landings of menhaden. In the Chesapeake Bay, purse seines are the primary gear used to harvest menhaden. Virginia is the only Atlantic coastal state with an active reduction fishery. Virginia vessels also harvest

menhaden along the North Carolina coast and in the ocean along the coasts of Maryland, Delaware, and New Jersey beyond three miles from shore. Currently, catches by the purse-seine reduction fishery from Chesapeake Bay are capped by the **ASMFC** at 109,020 tons per year for 2006-2010. Recently, the ASMFC extended the “Cap’ through 2011-2013. Since the cap was instituted, the removals by purse seiners from Chesapeake Bay have been less than this cap.

Controversy in the Menhaden Fishery

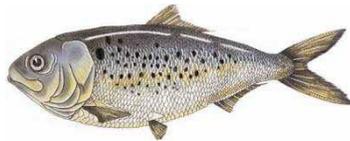
Many recreational anglers and conservation associations oppose the reduction, purse seine fishery in Virginia. They argue that it causes local stock depletion; negatively affects the populations of various predators (e.g., striped bass, seatrout, bluefish, marine mammals, and seabirds) disturbs recreational fishing; and negatively affects water quality.

The Purpose of this Survey

Good management decisions by the Atlantic States Marine Fisheries Commission require an understanding of public preferences. Many predators and sectors of the fishing industry compete for menhaden. The big question is whether further restrictions on the harvest of menhaden are a good idea. In other words “How much of the menhaden stock should be restricted from harvest?”

We hope to develop answers to these questions and others from the information that we gather from you in this survey. *Thank you for participating in this survey!*

Chesapeake Bay Menhaden: What are they worth to you?



Please answer all of the questions in this booklet, even if you have never had experience with menhaden. Then return the completed questionnaire in the enclosed, self-addressed, stamped envelope.

This survey is being conducted by:

*James E. Kirkley, Ph.D.
College of William and Mary
Virginia Institute of Marine Science
School of Marine Science
Gloucester Point, VA 23062*

The information that you provide will be kept strictly anonymous. Your name will never be placed on your booklet or associated with your answers. If you have any questions about this survey, please contact James Kirkley (e-mail: jkirkley@vims.edu; phone: 804-684-7160; FAX: 804-684-7989).

Have you ever visited the Chesapeake Bay or one of its tributaries for the main purpose of outdoor recreation or some other leisure activity?

Yes

No => please go to the next section on page 3.

What type of activities did you participate in during your visits to the Chesapeake Bay? (check all that apply)

Fishing

Hunting

Beach Going

Boating

Nature Observation

Camping

Wildlife Photography

Hiking

Bird Watching

Other

About how many trips did you make from your home to the Chesapeake Bay for the main purpose of outdoor recreation or some other leisure activity during the past 12 months?

Number of Trips => if zero (0) trips please go to the next section on page 3.

About how many of these trips were day trips where you returned to your home at the end of the day you left?

Number of Day Trips

The following questions are about commercial harvesting of menhaden for use in the reduction fishery.

How important do you think the menhaden commercial fishing industry is to the Virginia economy? Do you think it is ...? **[Please circle your response]**

- a. very important
- b. somewhat important
- c. not important at all
- d. don't know
- e. no answer

As described in the cover letter, there is concern that the harvesting of menhaden affects the levels of menhaden surviving in the Chesapeake Bay. How concerned are you about the Chesapeake Bay's menhaden population? Are you ... ? **[Please circle your response]**

- a. very concerned
- b. somewhat concerned
- c. not concerned at all
- d. don't know
- e. no answer

The cover letter also describes concerns about the impact of menhaden harvesting on game fish that eat menhaden including striped bass, bluefish and weakfish (seatrout). How concerned are you about the **impact of menhaden harvesting on** game fish populations? Are you ... ? **[Please circle your response]**

- a. very concerned
- b. somewhat concerned
- c. not concerned at all
- d. don't know
- e. No answer

The cover letter explains some concerns about the impact of menhaden harvesting on sea birds that eat menhaden. How concerned are you about the impact of menhaden harvesting on sea birds? Are you ... ? **[Please circle your response]**

- a. very concerned
- b. somewhat concerned
- c. not concerned at all
- d. don't know
- e. no answer

The cover letter explains some concerns about the impact of menhaden harvesting on water quality. The most recent research indicates there is little, if any, relationship between the water quality of the Chesapeake Bay and the menhaden resource in the Bay. Members of some angling and environmental associations, however, have expressed concerns that the harvesting of menhaden in the Bay could reduce the water quality of the Chesapeake Bay. How concerned are you about the impact of menhaden harvesting on water quality? Are you ... ? **[Please circle your response]**

- a. very concerned
- b. somewhat concerned
- c. not concerned at all
- d. don't know
- e. no answer

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Suppose that this proposal is put to a referendum vote. If 50% or more of all households in Virginia and in Maryland voted for the proposal it would pass, the menhaden harvest would be decreased and you would have about \$30 less to spend each year for the next 10 years. If 50% or more of all households in Virginia and Maryland voted against the proposal then it would fail and commercial fishing of menhaden would remain at current levels and it would cost you nothing. If the vote were held today would you vote for or against the lower harvest of menhaden? **[Please circle your response]**

- a. for
- b. against
- c. don't know/not sure

If you would vote for the proposal please answer this question. How sure are you that you would vote for the proposal? Are you ... ? **[Please circle your response]**

- a. very sure
- b. somewhat sure
- c. not sure at all

Finally, we would like to ask some questions about you and your household. These questions will help us analyze the results of this study. Your answers will be kept strictly anonymous.

How many people, including yourself, normally live in your household?

_____ People -> if one (1) person, please skip the next question,

How many of these people are under the age of 18?

_____ People under the age of 18

Are you male or female?

_____ Male

_____ Female

What is your zip code?

— — — — —

Are you currently a member of, or contribute money to, any commercial or recreational, environmental, or conservation organization or association?

_____ Yes

_____ No

Are you currently employed in commercial fisheries or a related industry?

_____ Yes

_____ No

How many years of formal schooling have you completed?

_____ Years

Some people consider the next question to be very personal. Remember that your answer will be kept strictly anonymous.

As best as you can recall, please estimate your household's annual income before taxes?

_____ Less than \$18,000

_____ Between \$18,000 and \$34,000

_____ Between \$34,000 and \$54,000

_____ Between \$54,000 and \$86,000

_____ More than \$86,000

Thank you for taking the time to complete this survey! The results of this survey will be available in 2010. You can read a summary of the results on the internet at this website: www.vims.edu.

Is there anything else you would like to tell us about your interest in the menhaden reduction fishery? If so, please use this space.