

Atlantic Menhaden Research Planning

Prepared by

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Submitted on

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2 Executive Summary

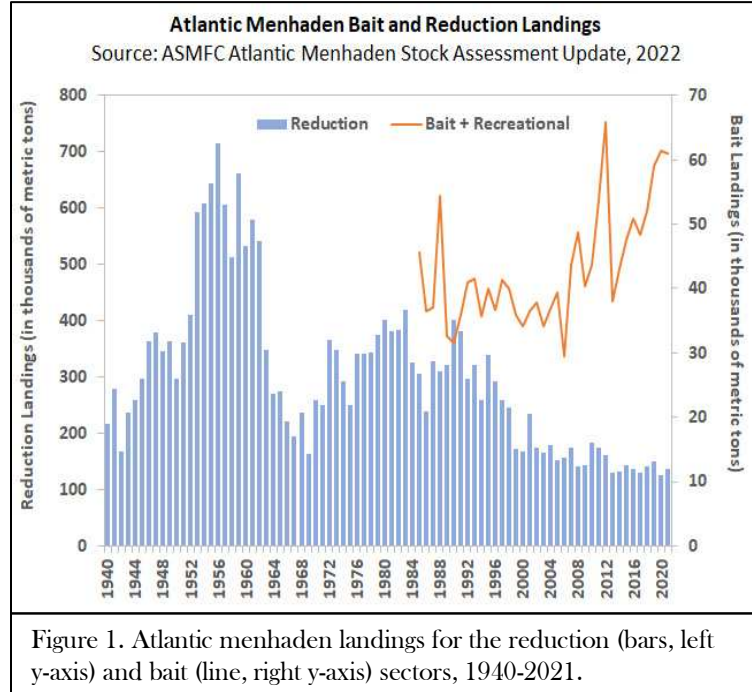
Forage fishes play a critical role in marine food webs. These small and medium-sized species are a key food source for many larger fishes, marine mammals, and seabirds, thereby transferring energy from plankton to larger consumers. Historically, fisheries management decisions were aimed at maximizing yields while maintaining biological sustainability, and this philosophy was often applied without considering the ecology and economics of managed resources. Over the past two decades, however, this management philosophy has evolved to become conceptually more holistic, and in some cases, tactically rooted in ecosystem principles. In the mid-Atlantic and Chesapeake Bay region, the Atlantic menhaden is an ecologically important forage fish that has supported the largest fishery by volume on the Atlantic coast for over a century. Fueled by advancements in ecosystem-based fisheries science and management, the stock status of Atlantic menhaden and the potential ecosystem effects of high-volume fishery removals have been more critically evaluated in recent years, particularly in Chesapeake Bay. Although Atlantic menhaden science has been growing and evolving for decades, the available information focused specifically on fish that seasonally inhabit the bay is limited and many unresolved questions remain. For several years, environmentalists, conservation groups, and recreational anglers have expressed concern to elected officials, policy makers, and fisheries scientists about the health of Chesapeake Bay, and in particular, the impacts of Atlantic menhaden commercial fishing on the bay ecosystem. In response to these concerns, the Virginia General Assembly passed legislation during the 2023 session that directs the Virginia Institute of Marine Science (VIMS) to develop a plan for studying Atlantic menhaden in the waters of the Commonwealth. To achieve the legislative objectives, VIMS led a 1.5-day workshop that brought together a diverse group of stakeholders with varied perspectives on issues related to Atlantic menhaden. These stakeholders were asked to work collaboratively toward identifying and prioritizing research topics that address uncertainties and knowledge gaps pertaining to the ecology, fishery impacts, and economic importance of Atlantic menhaden. The workshop was highly successful and consensus among participants supported nine extremely relevant research recommendations. This report summarizes the rationale, methodology, appropriate research agencies, collaborative stakeholders, timelines, and costs associated with these research recommendations. Workshop participants also unanimously agreed that addressing these research topics would greatly enhance the information available to fishery managers charged with formulating robust harvest policies that acknowledge the ecological role of Atlantic menhaden in the Commonwealth and beyond.

3 Introduction

3.1 Background

Atlantic menhaden is a schooling pelagic fish distributed from Nova Scotia, Canada to Florida. Although maximum age has been estimated to be 10 years, fish older than age-6 are rarely observed. Reproduction occurs in the coastal ocean over a protracted timeframe (approximately Sep-Apr) and larvae are transported by tides and currents to estuarine nursery areas. Chesapeake Bay is believed to be the most important nursery for Atlantic menhaden along the US east coast, and studies have shown peak ingress of larvae into the bay occurs during winter months. Juveniles spend their first spring and summer in estuarine nurseries along the coast, and with the onset of fall, these fish migrate to coastal and ocean habitats in preparation for overwintering. Subadult and adult fish undergo extensive seasonal migrations and inhabit both estuarine and nearshore areas along the coast. Movements are age/size dependent such that older/bigger fish migrate farther distances. Atlantic menhaden use specialized gill rakers to filter seawater and feed on plankton; juveniles consume both phytoplankton and zooplankton while adults feed almost exclusively on zooplankton. A wide variety of species rely on Atlantic menhaden as a key prey resource, including many commercially and recreationally important finfishes like striped bass and bluefish, marine mammals such as bottlenose dolphin and humpback whale, and piscivorous seabirds like osprey, brown pelican, and bald eagle. As a result, Atlantic menhaden are a critical component of estuarine and coastal ocean ecosystems.

In addition to their ecological importance, Atlantic menhaden support the largest commercial fishery by volume (weight), on the US east coast. The majority of landings are taken by the purse seine reduction sector where fish are processed into fish meal and oil. In the 1950s, between 22 and 25 reduction factories operated along the US east coast from Maine to Florida, and during that time, reduction landings peaked at over 700,000 metric tons (mt; Figure 1). However, processing capacity in the reduction sector has systematically decreased over time such that only a single facility located in Reedville, Virginia is currently operational. As a result, reduction landings have been less than 200,000 mt since the early 2000s. Atlantic menhaden are also harvested by the comparatively smaller scale, coastwide, mixed gear bait sector for use in other commercial and



recreational fisheries. Due to decreased availability of other bait species such as Atlantic herring, bait landings of Atlantic menhaden have increased in recent years and presently comprise approximately 25% of the total coastwide landings. Collectively, these fisheries provide appreciable economic benefits for coastal communities in Virginia, particularly those in the Northern Neck.

Since Atlantic menhaden is a coastal species that inhabits nearshore areas extending across state boundaries, the Atlantic States Marine Fisheries Commission (ASMFC) holds authority for coastwide fisheries management. The ASMFC acts as a deliberative body and coordinates policy and sustainable stewardship of fisheries resources among the 15 Atlantic coast states. However, within the state waters of the Commonwealth, the Virginia Marine Resources Commission (VMRC) has management authority and can enact regulations provided they maintain compliance with the ASMFC Atlantic menhaden fishery management plan (FMP).

In 1981, the ASMFC established the first Atlantic menhaden FMP, and over the 20 years that followed, management regulations were modest with no annual quota levels or harvest caps. However, coincident with a national movement to consider ecosystem principles more formally in fisheries management, the ASFMC modified the FMP in 2001 to explicitly recognize the ecological importance of Atlantic menhaden. This new philosophy stimulated broader thinking about Atlantic menhaden as a key forage species and the potential impacts of fishery removals on ecosystem processes. Although landings during the 2000s were significantly lower than historic levels, the proportion from Chesapeake Bay had increased due to the concentration of purse seine fishing in the mid-Atlantic resulting from closure of surrounding reduction facilities. Concurrently, striped bass in the bay were showing signs of poor condition and skin lesions from the outbreak of mycobacteriosis, which is a subacute to chronic disease with reported prevalence levels greater than 60%. Taken together, managers and stakeholders began to express concern about ‘localized depletion’, or more specifically that reduction fishery removals in the bay were driving the local Atlantic menhaden abundance below the level necessary to maintain its role as a forage species. In response to these concerns, the ASMFC implemented a harvest cap on the reduction sector in Chesapeake Bay that limited removals to 109,020 mt, which was the average of the 2001-2005 reduction landings from the bay. The cap was a precautionary measure designed to limit expansion of reduction fishing in an ecologically important region. In 2012, the ASFMC established a coastwide total landings quota of 170,800 mt and lowered the bay cap for the reduction sector to 87,216 mt. Since that time, the coastwide quota has fluctuated modestly based on the results of stock assessments and ecological modeling activities, but in 2018, the bay cap was further reduced to 51,000 mt, which was again based on average reduction landings from the bay over the previous 5-year period.

Stock assessments designed to provide stock status information for Atlantic menhaden have been routinely conducted since the early 2000s, and results have predominantly indicated that the coastwide population is healthy. Notably, the 2019 and 2022 multispecies ecological assessments designed to account for Atlantic menhaden’s role as a forage fish both indicated that the coastwide

stock was not overfished and was not experiencing overfishing. Despite these favorable determinations, recreational and environmental stakeholders continue to express concern over the health of Chesapeake Bay and the adequacy of Atlantic menhaden abundance to fulfill its ecological role within the estuary. This concern motivated stakeholders to lobby the Governor's Office during fall 2022, and members of the General Assembly during the 2023 legislative session for more conservative Atlantic menhaden regulations. One outcome of those lobbying efforts was Senate Bill 1388, which is an Act that directs the Virginia Institute of Marine Science (VIMS) to develop a plan for studying the ecology, fishery impacts, and economic importance of Atlantic menhaden in the waters of the Commonwealth.

3.2 Senate Bill 1388

An Act to direct the Virginia Institute of Marine Science to develop plans for studying the ecology, fishery impacts, and economic importance of menhaden populations in the waters of the Commonwealth; report.

[S 1388]

Approved March 22, 2023

Be it enacted by the General Assembly of Virginia:

1. § 1. That the Virginia Institute of Marine Science (VIMS) shall develop plans for studying the ecology, fishery impacts, and economic importance of menhaden populations in the waters of the Commonwealth. Such plans shall (i) include anticipated methodologies, timelines, and costs; (ii) identify relevant stakeholders for participation; and (iii) state whether VIMS is the most appropriate entity to perform the study. In developing the plans, VIMS shall collaborate with and receive input from the Menhaden Management Advisory Committee established in § 28.2-208.2 of the Code of Virginia and the Atlantic Menhaden Technical Committee of the Atlantic States Marine Fisheries Commission and other relevant stakeholders.

VIMS shall, no later than September 1, 2023, provide a report on its findings to the Chairmen of the Senate Committee on Agriculture, Conservation and Natural Resources and the House Committee on Agriculture, Chesapeake and Natural Resources and the Secretary of Natural and Historic Resources.*

* Extension granted to October 1, 2023

3.3 Atlantic Menhaden Workshop

VIMS recognized that Senate Bill 1388 presented a unique opportunity to bring together stakeholders with diverse backgrounds and varying perspectives on issues surrounding Atlantic menhaden for a collaborative meeting to identify and prioritize future research topics. Accordingly, VIMS held a stakeholder workshop on August 8-9, 2023, on the campus of William & Mary in Williamsburg, Virginia. The goals of the workshop were to: 1) identify common goals ('fundamental objectives') and topic ideas around a forward-looking research agenda for studying the ecology, fishery impacts, and economic importance of Atlantic menhaden in the waters of the Commonwealth, 2) prioritize research topic ideas considering shared goals and feasibility, and 3) build greater understanding and collaboration across stakeholder groups. Approximately 20 attendees representing the reduction and bait sectors, recreational anglers, state and federal agencies, academia, the ASMFC Atlantic Menhaden Technical Committee, and an NGO participated in the workshop (Section 5). A professional facilitator from the Institute for Engagement and Negotiation, University of Virginia, guided the workshop proceedings and coordinated the discussion (Section 6). All recommendations stemming from the workshop were arrived at through a consensus building approach. Overall, the workshop was highly collaborative and productive, and what follows is a prioritized summary of Atlantic menhaden research topics identified within the themes of ecology, fishery impacts, and economic importance.

4 Research Priorities

4.1 Ecology

Research on the biology and ecology of Atlantic menhaden has been ongoing since the 1950s. Early work focused on fundamental topics such as timing and occurrence of eggs and larvae, age determination, maturity and reproduction, population size structure, and movement patterns along the coast. These studies provided valuable baseline insights and served as motivation for many subsequent research projects aimed at refining or expanding upon this historical information. Although the breadth and depth of research on Atlantic menhaden has grown considerably over time, previous research efforts did not differentiate between estuarine and coastal habitats because the home range of Atlantic menhaden spans the entire east coast. However, contraction of the reduction sector to a single processing facility in Virginia combined with increased public concern about potential fishing impacts on ecosystem processes in Chesapeake Bay have motivated many bay-centric questions. Accordingly, the following ecological research topics are proposed.

- 1) Title: Estimate the seasonal abundance of Atlantic menhaden in Chesapeake Bay
Rationale: Although the routinely conducted coastwide Atlantic menhaden stock assessment provides estimates of total population size, the underlying analytical framework is not able to resolve abundance estimation at more

refined spatial scales, such as Chesapeake Bay. This is because the goal of this modeling effort is to assess the sustainability of all reduction and bait fishing activities across the full range of Atlantic menhaden. Developing a spatially-explicit version of the coastwide modeling framework that isolates Chesapeake Bay would allow estimation of bay-specific abundance and survival over time. Annual abundance and survival estimates for the bay would allow fishery removals to be formally assessed with respect to the standing stock of Atlantic menhaden and its ability to provide ecological functions. Bay-specific estimates could then be linked to environmental variables to assess how Atlantic menhaden respond to changing physical conditions.

Methodology: Developing seasonal estimates of abundance for Atlantic menhaden in Chesapeake Bay would require a two-pronged approach. First, extant catch and effort data for the reduction and bait sectors would need to be acquired, analyzed, and introduced into an appropriate spatial population modeling framework. Second, the fisheries-dependent information would need to be supplemented with survey data collected according to a scientifically valid sampling design. Since Atlantic menhaden are very difficult to sample using traditional fish survey methods due to their surface oriented, schooling behavior, it would be necessary to implement a survey that uses novel, technologically advanced instrumentation. This could include partnering with the reduction sector to charter airplanes for aerial surveys and/or relying on ship based hydroacoustic surveys using, for example, a Simrad EK80 scientific echosounder. Survey frequency would need to be no less than twice monthly from March to November to adequately sample the seasonally changing abundance of Atlantic menhaden in Chesapeake Bay.

Collaborators: Reduction and bait sectors, recreational anglers, NGOs

Agency: Virginia Institute of Marine Science with support from the University of Maryland Center for Environmental Science

Timeline: 3 years

Cost: \$1,100,000

- 2) **Title:** Evaluate movement rates of Atlantic menhaden between the Atlantic coast and Chesapeake Bay

Rationale: In the late-1960s, the National Marine Fisheries Service initiated a large-scale Atlantic menhaden tag-recovery study. Teams of scientists from 12 coastal states tagged fish over several years. In total, over 1 million fish were injected with individually numbered ferromagnetic tags, which were then passively recovered by magnets installed in reduction fishery plants located from Maine to Florida. Historic and recent analyses of these data have provided informative, broad-scale assessments of seasonal movement patterns along the Atlantic coast. However, in addition to the age of the data, the spatial structure does not permit evaluating fine scale movements between coastal and estuarine environments. Understanding contemporary seasonal movement rates of Atlantic menhaden among coastal habitats and Chesapeake Bay would provide important insight into the residence time of fish in the estuary, which in turn, helps address the ecological benefits Atlantic menhaden provide to the bay. Additionally, linking movement rates to environmental drivers would allow identification of factors that influence occupancy of different habitats.

Methodology: Reproducing the ferromagnetic tagging study would be very challenging for several reasons: 1) the high volume of annual Atlantic menhaden landings would require tagging several hundred thousand fish to ensure a reasonable tag-recovery rate, and personnel is limited, 2) the access to ocean fish for tagging is restricted due to the reduction sector being one company with few, fully subscribed purse seine vessels, and 3) harvest of Atlantic menhaden during a purse seine trip is often a mixture of ocean and bay caught fish, which does not allow assignment of the recapture location of a tagged fish to either the coast or estuary. However, acoustic tagging technology has evolved in recent years and tag sizes have become increasingly smaller to accommodate studies of juvenile fish movement. These smaller tags hold promise for Atlantic menhaden, and pairing them with strategically positioned hydroacoustic receivers would yield information on coastal and estuarine movements and residence times.

Collaborators: Reduction and bait sectors

Agency: Virginia Institute of Marine Science

Timeline: 3 years

Cost: \$330,000

- 3) **Title:** Assess impacts of predator demand and consumption of Atlantic menhaden
- Rationale:** It is well understood that Atlantic menhaden is a key forage species for many finfishes, marine mammals, and seabirds. Some finfish and osprey diet composition data are available for Chesapeake Bay and the Atlantic coast, however, across the full spectrum of known Atlantic menhaden predators and times and areas where predator-prey interactions occur, major data gaps remain. Expanding fieldwork, data collection, and analyses aimed at quantifying consumption of Atlantic menhaden more comprehensively would aid assessment of predatory demand and impacts. Modeling work could also provide insight into how Atlantic menhaden abundance influences the demographic rates and dynamics of finfish predators and osprey populations.
- Methodology:** Extant finfish (> 50 species) and osprey diet data would serve as the basis for this analysis, however, these data would be augmented with newly collected samples from additional predators, regions, and seasons. Sample acquisition will be achieved through collaboration with recreational anglers (stomachs of landed fish) and other fish survey programs, as well as from targeted bottom trawl survey cruises offshore during winter. Information on the diet composition of marine mammals would be acquired through collaborations with academic colleagues and NGOs. Data from all sources would then be combined into a single statistical analysis designed to yield a time-series of predator consumption of Atlantic menhaden in Chesapeake Bay and beyond. Dynamic predator-prey models will be constructed for key finfish predators and osprey to explore Atlantic menhaden abundance regulates predator population dynamics.
- Collaborators:** Recreational anglers and NGOs
- Agency:** Virginia Institute of Marine Science and William & Mary
- Timeline:** 2 years
- Cost:** \$770,000

4.2 Fishery Impacts

The fish community of Chesapeake Bay is very dynamic. Residence time for most fishes inhabiting the bay is less than six months because of the extreme seasonal changes in water temperature. Species found in northern regions enter the bay during the colder months while those associated

with southern regions utilize the bay during the warmer months. Despite the rapidly changing fish community, Chesapeake Bay has a rich history of supporting diverse fisheries that target a range of species. Although this fishing history is an important cultural aspect of the Commonwealth, limited attention has been directed toward characterizing patterns and changes in fishing practices in the bay over time for both the commercial and recreational sectors. Analyses of fishing strategies can reveal information on patterns of availability of target species over time and space. Since this type of information can aid efforts to evaluate fishery impacts on natural resources, the following research topics are proposed.

1) Title: Analyze spatiotemporal patterns in Atlantic menhaden commercial fishing effort in Chesapeake Bay

Rationale: Since commercial fishers typically set gear in areas that are expected to hold fish, fishing effort data contains information about the availability of target species over time and space. In the case of Atlantic menhaden, a thorough analysis of reduction and bait fishing effort data in Chesapeake Bay would provide key information on the seasonal and spatial distribution patterns of fish, and most importantly, insight regarding potential changes in those distributional patterns. Additionally, linking fishing locations with environmental variables would also yield insight into fine scale Atlantic menhaden availability, movements, and habitat utilization.

Methodology: Quantifying long-term patterns of the Atlantic menhaden fisheries in Chesapeake Bay would require the acquisition of commercial catch and effort data at relatively fine spatial and temporal scales. These data could then be incorporated into an appropriate spatiotemporal model, which would yield insight into changes that have occurred with the fishery, as well as into possible shifts in habitat usage by Atlantic menhaden in the bay. Linking these model outputs to an array of environmental covariates could uncover potential drivers of any spatial or temporal changes observed.

Collaborators: Reduction and bait sectors

Agency: Virginia Institute of Marine Science and Virginia Marine Resources Commission

Timeline: 2 years

Cost: \$192,000

- 2) Title: Assess the possibility of localized depletion of Atlantic menhaden in Chesapeake Bay
- Rationale: A significant concern routinely voiced by stakeholders is whether Atlantic menhaden fishery removals from the bay are detrimental to the overall health of the estuary. The term ‘localized depletion’ refers to a situation where fishery removals are concentrated in a relatively small area compared to the home range of the target species, the scale of those removals exceeds the threshold required to sustain normal ecosystem processes, and replenishment of harvested biomass does not occur rapidly. In general, localized depletion is a challenging concept to address in fisheries science, particularly for highly mobile species that engage in seasonal migrations. At a minimum, four types of information are needed to address this issue for Atlantic menhaden: 1) tabulated harvest removals from Chesapeake Bay annually, 2) estimates of abundance in the bay each year, 3) annual estimates of fish residence time in the bay, and 4) yearly movement rates between the coastal Atlantic and the bay. A more comprehensive understanding of predation impacts and how Atlantic menhaden abundance affects the dynamics of predator populations would also be beneficial. Therefore, formally addressing localized depletion cannot be accomplished unless research is conducted to address topics 1-3 in the Ecology section above.
- Methodology: Addressing localized depletion would involve synthesizing the results of topics 1-3 in the Ecology section above.
- Collaborators: Reduction and bait sectors, recreational anglers, NGOs
- Agency: Virginia Institute of Marine Science
- Timeline: 2 years
- Cost: Included in costs for Fishery Impacts topic 1
- 3) Title: Quantify changes in the recreational fisheries in Chesapeake Bay
- Rationale: Chesapeake Bay supports many forms of recreation for the citizens of the Commonwealth and beyond, and recreational fishing consistently ranks as one of the most popular pastimes. Many fish species that seasonally inhabit the bay are prized targets of recreational anglers, including striped

bass, cobia, bluefish, sea trout, and summer flounder. Several of these species and others routinely targeted by anglers have strong linkages to Atlantic menhaden as forage, so it is likely that patterns in recreational fishing effort reflect information about the availability of target species, and by extension, Atlantic menhaden. Additionally, a comprehensive analysis of recreational fishing participation, effort, and success would yield indicators on the viability of this industry and its role as an economic driver for the Commonwealth.

Methodology: Data on recreational participation, effort, and harvest would be acquired from the Virginia Marine Resources Commission and the NOAA Marine Recreational Information Program. Spatiotemporal patterns in these data would be quantified following the analytical approach outlined in topic 1 of the Fishery Impacts section above.

Collaborators: Recreational anglers

Agency: Virginia Institute of Marine Science and Virginia Marine Resources Commission

Timeline: 2 years

Cost: Included in costs for Fishery Impacts topic 1

4.3 Economic Importance

Fisheries systems include both fish and people. Consequently, fisheries management should include biological, socioeconomic, and governance considerations. Historically, management policies and governance focused on biological sustainability and aimed to maximize continual harvests. Nowadays governments, NGOs, community-based organizations, and foundations are working to manage fisheries that achieve both ecological sustainability and human well-being outcomes. This transformation has been partially achieved for Atlantic menhaden in that ASMFC now uses ecological reference points that explicitly reflect the predation needs to guide the process of setting coastwide total landings quotas. While this ecosystem-approach to management philosophy represents a major step forward, lacking is comparable progress evaluating the socioeconomic impacts and tradeoffs of management policies for Atlantic menhaden. Accordingly, the following economic research topics are proposed.

- 1) **Title:** Assess the economic impacts of management decisions on Atlantic menhaden fisheries and related industries

Rationale: Fisheries management decisions are frequently based on achieving biological sustainability. However, it has been recognized that biological objectives can often be met through several different management policies, each of which vary in their socioeconomic impacts. The socioeconomic effects of competing policies are often not quantified, which hinders the evaluation of tradeoffs among management options. Atlantic menhaden fisheries support hundreds of jobs in the Commonwealth and products derived from the reduction and bait sectors are utilized by an array of businesses located in Virginia as well as throughout the U.S. and internationally. Thus, management measures implemented for Atlantic menhaden fisheries have cascading effects in local economies and beyond. Assessing these effects would allow fisheries managers to more holistically consider the tradeoffs associated with regulatory options.

Methodology: Using the results of a contemporary economic impact analysis (see topic 2 below), evaluate the economic effects of candidate management strategies on the Atlantic menhaden commercial fisheries in Chesapeake Bay, as well as the associated secondary and tertiary industries.

Collaborators: Reduction and bait sectors, recreational anglers, NGOs

Agency: Virginia Institute of Marine Science

Timeline: 3 years

Cost: \$308,000

- 2) **Title:** Conduct a contemporary assessment of the social and economic importance of Atlantic menhaden in the Chesapeake Bay region

Rationale: Socioeconomic studies of the Atlantic menhaden fisheries have been conducted in the past, and while they can serve as a baseline framework, changes in the fisheries, regulatory structure, and the economy over the last two decades have made prior work less relevant today. Additionally, previous studies have generally been narrowly defined and of limited use in assessing management tradeoffs. Developing a framework to provide updated economic impact analyses using contemporary methods has been identified as an important priority. Further, there has been expressed interest in quantifying the economic impacts and importance of these fisheries to the Northern Neck, particularly since a large portion of the reduction sector workforce comes from underserved communities.

Methodology: Standard socioeconomic data will be compiled from the reduction and bait sectors to develop an economic impact model for the Atlantic menhaden fisheries in the Chesapeake Bay region. Additionally, non-market valuation methods will be used to quantify the economic importance of Atlantic menhaden to the recreational sector.

Collaborators: Reduction and bait sectors, recreational anglers

Agency: Virginia Institute of Marine Science and Virginia Marine Resources Commission

Timeline: 2 years

Cost: Included in costs for Economic Importance topic 1

3) **Title:** Quantify the bioeconomic impact of Atlantic menhaden fishery removals from the Chesapeake Bay to those from the Atlantic coast

Rationale: Recreational and environmental stakeholders routinely advocate for a ban on purse seine fishing in Chesapeake Bay. Such a restriction would force all harvesting activities to occur in the coastal ocean which has both biological and economic consequences. Biologically, Atlantic menhaden in the bay are generally younger and thus have a lower reproductive output when compared to the older fish in the ocean. Therefore, harvesting exclusively in the ocean has the potential to reduce the reproductive capacity of the population. Economically, fishing in the ocean would incur additional costs, safety concerns, and lost fishing opportunities due to weather. Conversely, increased local availability of menhaden in Chesapeake Bay could improve recreational angler outcomes and associated value. Quantifying these bioeconomic impacts would allow fisheries managers to evaluate tradeoffs associated with the establishment of a marine protected area in Chesapeake Bay.

Methodology: Develop a spatially-explicit, bioeconomic simulation model for Atlantic menhaden in Chesapeake Bay and the coastal ocean. Results from past stock assessments and topics 1-3 in the Ecology section would inform the biological component of the model, while results from topics 1-2 in this section would guide the economic component. Once developed, the impacts of a variety of harvest policies could be quantified, including declaring the Chesapeake Bay a marine protected area.

Collaborators: Reduction and bait sectors, recreational anglers, NGOs

Agency: Virginia Institute of Marine Science

Timeline: 2 years

Cost: Included in costs for Economic Importance topic 1; highly dependent on achieving Ecology topics 1-2

5 Workshop Participants

Participant	Affiliation
Robert Latour	Virginia Institute of Marine Science
Mark Luckenbach	Virginia Institute of Marine Science
Cecilia Lewis	Virginia Institute of Marine Science
Kristina Weaver	Institute for Engagement and Negotiation, University of Virginia
Jim Gartland	Virginia Institute of Marine Science
Caroline DeVries	Virginia Institute of Marine Science
Andrew Scheld	Virginia Institute of Marine Science
Shanna Madsen	Virginia Marine Resources Commission, ASMFC Atlantic Menhaden Technical Committee member - Virginia
Amy Schueller	NOAA Beaufort Laboratory
Genevieve Nesslage	University of Maryland Center for Environmental Science
Michael Wilberg	University of Maryland Center for Environmental Science
Bryan Watts	William & Mary
Montgomery Deihl	Ocean Harvesters
Peter Himchak	Omega Protein
Ross Kellum	Kellum Maritime, LLC
Frederick Rogers	Rogers Bait Company
Bruce Vogt	NOAA Chesapeake Bay Office
Lynn Fegley	Maryland Department of Natural Resources
Alexei Sharov	Maryland Department of Natural Resources ASMFC Atlantic Menhaden Technical Committee member - Maryland
Allison Colden	Chesapeake Bay Foundation
Steve Atkinson	Virginia Saltwater Sportfishing Association

6 Workshop Agenda

Menhaden Workshop: Identifying Shared Goals for Future Research

August 8-9, 2023

Leadership Hall
Alumni House, William & Mary

Meeting Purpose

1. Identify common goals (“fundamental objectives”) and topic ideas around a forward-looking research agenda studying the ecology, fishery impacts, and economic importance of menhaden populations in the Commonwealth (S 1388)
2. Prioritize research topic ideas considering shared goals and feasibility
3. Build greater understanding and collaboration across stakeholder groups

Day 1 Agenda

9:00 – 9:30	Coffee/Networking
9:30 – 10:00	Opening Remarks and Introductions
10:00 – 11:00	Overview of Research Context
11:00 – 11:15	Break
11:15 – 11:30	Overview of Dialogue Process
11:30 – 12:30	Generate Ideas for Research Topics
12:30 – 1:30	Lunch
1:30 – 2:30	Generate Ideas for Research Topics
2:30 – 2:45	Break
2:45 – 4:15	Develop Foundational Objectives for Future Research
4:15 – 4:45	Closing Day 1

Day 2 Agenda

9:00 - 9:30	Day 2 Kickoff
9:30 - 10:00	Discussion: Considerations for Research Feasibility
10:00 - 10:45	Evaluating Research Topics
10:45 - 11:00	Break
11:00 - 11:45	Resources for Implementing Research
11:45 - 12:10	Next Steps
12:10 - 12:30	Closing the Workshop

ATLANTIC STATES MARINE FISHERIES COMMISSION

REVIEW OF THE INTERSTATE FISHERY MANAGEMENT PLAN

FOR ATLANTIC MENHADEN
(*Brevoortia tyrannus*)

2022 FISHING YEAR



Prepared by the Plan Review Team



Sustainable and Cooperative Management of Atlantic Coastal Fisheries

REVIEW OF THE ASMFC FISHERY MANAGEMENT PLAN AND STATE COMPLIANCE FOR ATLANTIC MENHADEN (*Brevoortia tyrannus*) FOR THE 2022 FISHERY

Management Summary

<u>Date of FMP:</u>	Original FMP: August 1981
<u>Amendments:</u>	Plan Revision: September 1992 Amendment 1: July 2001 Amendment 2: December 2012 Amendment 3: November 2017
<u>Management Unit:</u>	The range of Atlantic menhaden within U.S. waters of the Northwest Atlantic Ocean, from the estuaries eastward to the offshore boundary of the Exclusive Economic Zone (EEZ).
<u>States With Declared Interest:</u>	Maine – Florida, including Pennsylvania
<u>Additional Jurisdictions:</u>	Potomac River Fisheries Commission, National Marine Fisheries Service, United States Fish and Wildlife Service
<u>Active Boards/Committees:</u>	Atlantic Menhaden Management Board, Advisory Panel, Technical Committee, Stock Assessment Subcommittee, Plan Review Team, Plan Development Team, Ecological Reference Point Workgroup
<u>Stock Status:</u>	Not overfished, and overfishing is not occurring relative to the current ecological reference points (2022 Single-Species Stock Assessment Update)

I. Status of the Fishery Management Plan

Atlantic menhaden management authority is vested in the states because the vast majority of landings come from state waters. All Atlantic coast states and jurisdictions, with the exception of the District of Columbia, have declared interest in the Atlantic menhaden management program.

The first coastwide fishery management plan (FMP) for Atlantic menhaden was passed in 1981. The FMP did not recommend or require specific management actions, but provided a suite of options should they be needed. In 1992, the plan was revised to include a suite of objectives intended to improve data collection and promote awareness of the fishery and its research needs.

[Amendment 1](#), implemented in 2001, provided specific biological, ecological and socioeconomic management objectives. Addenda I and V revised the biological reference points for menhaden and specified that stock assessments are to occur every three years. Although Amendment 1 did not implement any recreational or commercial management measures, Addenda II through IV instituted a harvest cap on the reduction fishery in Chesapeake Bay. Specifically, Addendum II implemented a harvest cap for 2006-2010 fishing seasons; before its first year of implementation, Addendum III revised the cap amount to be the average landings from 2001 to 2005 (or 109,020 mt); and Addendum IV extended the provisions of Addendum III through 2013.

[Amendment 2](#), implemented in 2012, established a 170,800 metric ton (mt) total allowable catch (TAC) for the commercial fishery beginning in 2013. This TAC represented a 20% reduction from average landings between 2009 and 2011. This Amendment also used the 2009-2011 period to allocate the TAC among jurisdictions. Additionally, the Amendment established timely reporting requirements for commercial landings and required states to be accountable for their respective quotas by paying back any overages the following year. Amendment 2 also included provisions that allowed for the transfer of quota between jurisdictions and a bycatch allowance of 6,000 pounds per day for non-directed fisheries that operate after a jurisdiction's quota has been landed. Addendum 1 to Amendment 2 allows two licensed individuals to harvest up to 12,000 pounds of menhaden bycatch when working from the same vessel using stationary multi-species gear; the intent of this provision is to accommodate cooperative fishing practices that traditionally take place in Chesapeake Bay. The Amendment also reduced the Chesapeake Bay reduction fishery harvest cap by 20% to 87,216 mt.

Amendment 2 also enabled the Board to set aside 1% of the coastwide TAC for episodic events. Episodic events are times and areas where Atlantic menhaden are available in more abundance than they normally occur. Technical Addendum I to Amendment 2 established a mechanism for New England states from Maine to Connecticut¹ to use the set aside, which includes a qualifying definition of episodic events, required effort controls to scale a state's fishery to the set aside amount, and a timely reporting system to monitor the set aside. Any unused set aside quota as of October 31 is redistributed to jurisdictions on November 1 based on the Amendment 2 allocation percentages.

In 2015, the TAC was increased by 10% to 187,880 mt for the 2015 and 2016 fishing years. In 2016, the Board again increased the TAC by 6.45% to 200,000 mt for the 2017 fishing year.

Atlantic menhaden are managed under [Amendment 3](#). Approved in November 2017, the Amendment maintained the management program's single-species biological reference points until the review and adoption of menhaden-specific ecological reference points (ERPs) as part of the 2019 benchmark stock assessment process. In doing so, the Board placed development of menhaden-specific ERPs as its highest priority and supports the efforts of the ERP Workgroup to reach that goal.

¹ At its May 2016 meeting, the Board added New York as an eligible state to harvest under the set aside.

Amendment 3 also changed commercial quota allocations in order to strike an improved balance between gear types and jurisdictions. The Amendment allocated a baseline quota of 0.5% to each jurisdiction, and allocated the rest of the TAC based on average landings between 2009 and 2011. This measure provides fishing opportunities to states that had little quota under Amendment 2, while still recognizing historic landings in the fishery. States also have the option to relinquish all or part of its quota which is then redistributed to the other jurisdictions based on the 2009-2011 landings period. The Amendment also prohibits the rollover of unused quota; maintains the quota transfer process; maintains the bycatch provision (which was rebranded as the ‘incidental catch/small-scale fisheries’ (IC/SSF) provision and applicable gear types were defined) and the episodic event set aside program (EESA) for the states of Maine – New York. Finally, the Amendment reduced the Chesapeake Bay cap to 51,000 mt, recognizing the importance of the Chesapeake Bay as nursery grounds for many species by capping recent reduction landings from the Bay at current levels.

[Addendum I](#), implemented in 2023, modifies Amendment 3 by creating a three-tiered system for minimum allocations to the states, with Pennsylvania receiving 0.01%; South Carolina, Georgia, Connecticut, Delaware, North Carolina, and Florida receiving 0.25%; and the remaining states continuing to receive a minimum of 0.5%. Furthermore, the Addendum allocates the remainder of the TAC, excluding the 1% reserved for the EESA, on a state-by-state basis based on landings history of the fishery from 2018, 2019, and 2021. Regarding the IC/SSF provision, the Addendum codifies the ability for states to elect to divide their quotas into sectors, enabling individual sectors to enter into the provision at different times. Additionally, the Addendum removes purse seines as a permitted small-scale directed gear, thereby, prohibiting them from harvesting under the IC/SSF provision. Finally, the Addendum counts IC/SSF landings against the TAC and if IC/SSF landings cause the TAC to be exceeded, then the Board must take action to modify one or both of permitted gear types and trip limits under the provision.

State	Addendum 1 Allocations (%)
ME	4.80%
NH	1.19%
MA	2.12%
RI	0.81%
CT	0.33%
NY	0.84%
NJ	11.00%
PA	0.01%
DE	0.27%
MD	1.17%
PRFC	1.09%
VA	75.21%
NC	0.37%
SC	0.25%
GA	0.25%
FL	0.29%

In August 2020, the Board formally approved the use of ERPs to manage Atlantic menhaden, with Atlantic striped bass as the focal species in maintaining their population. Atlantic striped bass was chosen for the ERP definitions because it was the most sensitive predator fish species to Atlantic menhaden harvest, so an ERP target and threshold sustaining striped bass would likely provide sufficient forage for other predators under current ecosystem conditions. For the development of the ERPs, all other focal species in the model (bluefish, weakfish, spiny dogfish, and Atlantic herring) were assumed to be fished at 2017 levels.

In November 2022, the Board approved a TAC for 2023-2025 of 233,550 mt, based on the ERPs. The new TAC represents a 20% increase from the 2021-2022 TAC level. Based on projections,

the probability of exceeding the ERP fishing mortality target of 0.19 is 2% in 2023, 22% in 2024, and 28.5% in 2025.

II. Status of the Stock

In February 2020, the Board accepted the results of the [Single-Species](#) and [Ecological Reference Point \(ERP\)](#) Benchmark Stock Assessments and Peer Review Reports for management use. These assessments were peer-reviewed and approved by an independent panel of scientific experts through the 69th SouthEast, Data, Assessment and Review (SEDAR) workshop. The single-species assessment acts as a traditional stock assessment using the Beaufort Assessment Model (BAM), a statistical catch-at-age model that estimates population size-at-age and recruitment. According to the model, the stock is not overfished or experiencing overfishing relative to the current single-species reference points.

The ERP assessment evaluates the health of the stock in an ecosystem context, and indicates the fishing mortality rate (F) reference points for menhaden should be lower to account for the species' role as a forage fish². The ERP assessment uses the Northwest Atlantic Coastal Shelf Model of Intermediate Complexity for Ecosystems (NWACS-MICE) to develop Atlantic menhaden ERPs. NWACS-MICE is an ecosystem model that focuses on four key predator species (striped bass, bluefish, weakfish, and spiny dogfish) and three key prey species (Atlantic menhaden, Atlantic herring, and bay anchovy). These species were chosen because diet data indicate they are top predators of Atlantic menhaden or are key alternate prey species for those predators.

The ERP assessment indicates the F reference points for menhaden should be lower than the single-species reference points, but it also concluded that the final ERP definitions, including the appropriate harvest level for menhaden, depend on the management objectives for the ecosystem (i.e., management objectives for both Atlantic menhaden and its predators). Accordingly, instead of proposing a specific ERP definition, the assessment recommends a combination of the BAM and the NWACS-MICE models as a tool for managers to evaluate trade-offs between menhaden harvest and predator biomass.

Atlantic menhaden are now managed by menhaden-specific ERPs as indicated above. The ERP target is the maximum F on Atlantic menhaden that sustains Atlantic striped bass at their biomass target when striped bass are fished at their F target, a measure of the intensity with which the population is being fished, is used to evaluate whether the stock is experiencing overfishing. The ERP threshold is the maximum F on Atlantic menhaden that keeps Atlantic striped bass at their biomass threshold when striped bass are fished at their F target. Population fecundity, a measure of reproductive capacity, is used to evaluate whether the stock is overfished. According to the 2022 single-species stock assessment update, the 2021 estimate of fecundity was above both the ERP FEC target and threshold, and the 2021 estimate of fishing

² it should be noted, however, that the conservative TAC the Board has set for recent years is consistent with the ERP F target provided in the ERP Assessment

mortality was below the ERP F target and threshold, indicating the stock was neither overfished nor experiencing overfishing. The next ERP benchmark stock assessment and single-species assessment update are underway and scheduled to be presented to the Board in 2025.

III. Status of the Fishery

Commercial

Total commercial Atlantic menhaden landings in 2022, including directed, incidental catch, and EESA landings, are estimated at 195,387 mt (430.8 million pounds), an approximate 0.15% increase relative to 2021 (Table 1). The non-incidental catch fishery landings (directed landings plus landings under the EESA) total for 2022 is estimated at 187,231 mt (412.8 million pounds) and represents approximately 96% of the coastwide commercial TAC of 194,400 mt (428.6 million pounds). Landings from the incidental catch fishery are estimated at 8,156 mt (18 million pounds) and do not count towards the coastwide TAC in 2022.

Reduction Fishery

The 2022 harvest for reduction purposes is estimated at 134,477 mt (296 million pounds), a 2% decrease from 2021 and 1.5% below the previous 5-year average of 136,473 mt (300.9 million pounds) (Table 2; Figure 3). Omega Protein's plant in Reedville, Virginia, is the only active Atlantic menhaden reduction factory on the Atlantic coast. In 2020, the reduction plant was shut down for 3 weeks due to the COVID-19 pandemic. Anecdotal reports indicate that in addition to the pandemic, bad weather may have also contributed to lower harvest.

Bait Fishery

The coastwide bait harvest estimate for 2022 from state compliance reports, including directed, incidental catch, and EESA landings, is 60,101 mt (151.6 million pounds). This represents a 3% increase relative to 2021 and a 10% increase compared to the previous 5-year average (Table 2; Figure 3). New Jersey (35%), Virginia (26%), Maine (20%), and Massachusetts (8%) landed the four largest shares in 2022.

Incidental Catch and Small Scale Fisheries Landings

Incidental catch landings in 2022 are estimated at 8,156 mt (18 million pounds), which is a 46% increase relative to 2021 (Table 3). Maine, Massachusetts, and Virginia's non-purse seine bait fishery reported incidental catch landings (82% from purse seines and 10% from gill nets) in 2022 (Table 4). Maine accounted for 87% of total incidental fishery landings. The number of incidental catch trips (4,134) was the highest since 2015 (Table 4).

Episodic Events Set Aside Program

The 2022 EESA quota was 1,944 mt (4.29 million pounds). Maine began harvesting under the EESA program on June 21st and continued until their EESA fishery closed on June 28th. Massachusetts began harvesting under the EESA program on June 23rd and closed the fishery on July 8th. An estimated 1,992 mt (4.4 million pounds) of menhaden were landed under the EESA fishery (Table 5), which is 104,723 pounds over the set aside quota. In January 2023, Massachusetts transferred 64,000 pounds to cover a portion of the overage (see Table 7), and the remaining 40,723 pounds was deducted from the 2023 set aside.

Chesapeake Bay Reduction Fishery Cap (cap)

Amendment 3 implemented a 51,000 mt harvest cap for the reduction fishery in the Chesapeake Bay. The cap for 2022 was set once again at 51,000 mt with harvest remaining under the limit in 2021. Reported reduction landings from Chesapeake Bay in 2022 were about 50,000 mt, under the cap by approximately 1,000 mt.

Recreational

Menhaden are important bait in many recreational fisheries; some recreational fishermen use cast nets to capture menhaden or snag them with hook and line for use as bait, both dead and alive. The Marine Recreational Information Program (MRIP) estimate for Atlantic menhaden harvest (A + B1) in 2022 is 5.7 million pounds (PSE of 16.6) which is a 119% increase from 2021 (2.6 million pounds).

Additionally, it is important to note recreational harvest is not well captured by MRIP because there is not a known, identified direct harvest for menhaden, other than for bait. MRIP intercepts typically capture the landed fish from recreational trips as fishermen come to the dock or beach. However, since menhaden caught by recreational fishermen are often used as bait during their trip, they are typically not part of the catch that is seen by the surveyor completing the intercept.

Quota Transfers

There were 24 state-to-state transfers in 2022 (Table 8), an increase from 16 in 2021. Quota transfers were generally pursued to ameliorate overages. One of the purposes of the commercial allocation changes in Addendum I to Amendment 3 was to reduce the need for quota transfers, and the PRT will monitor the change in quota transfers after implementation in 2023.

IV. Status of Research and Monitoring

Commercial fisheries monitoring

Reduction fishery - The NMFS Southeast Fisheries Science Center Beaufort Laboratory in Beaufort, North Carolina, continues to monitor landings and collect biological samples from the Atlantic menhaden purse-seine reduction fishery. The Beaufort Laboratory processes and ages all reduction samples collected on the East Coast. In addition, the purse-seine reduction fishery continues to provide Captains Daily Fishing Reports (CDFRs) to the Beaufort Laboratory where NMFS personnel enter data into a database for storage and analysis.

Bait fishery - Per Amendment 3, states are required to implement a timely quota monitoring system to maintain menhaden harvest within the TAC and minimize the potential for quota overages. The Standard Atlantic Fisheries Information System (SAFIS) daily electronic dealer reporting system allows near real time data acquisition for federally permitted bait dealers in the Mid-Atlantic and Northeast. Landings by Virginia's purse-seine for-bait vessels (snapper

rigs) in Chesapeake Bay are tabulated at season's end using CDFRs maintained on each vessel during the fishing season. A bait-fishery sampling program for size and age composition has also been conducted since 1994. The Beaufort Laboratory, and some states, age the bait samples collected. See *Section VII* for more information on quota monitoring and biological sampling requirements.

Atlantic menhaden research

The following studies relevant to menhaden assessment and management have been published within the last few years:

- Anstead, K. A., K. Drew, D. Chagaris, A. M. Schueller, J. E. McNamee, A. Buchheister, G. Nesslage, J. H. Uphoff Jr., M. J. Wilberg, A. Sharov, M. J. Dean, J. Brust, M. Celestino, S. Madsen, S. Murray, M. Appelman, J. C. Ballenger, J. Brito, E. Cosby, C. Craig, C. Flora, K. Gottschall, R. J. Latour, E. Leonard, R. Mroch, J. Newhard, D. Orner, C. Swanson, J. Tinsman, E. D. Houde, T. J. Miller, and H. Townsend. 2021. The path to an ecosystem approach for forage fish management: A case study of Atlantic menhaden. *Front. Mar. Sci.* 8: 607657.
- Chagaris D., K. Drew, A. M. Schueller, M. Cieri, J. Brito, and A. Buchheister. 2020. Ecological Reference Points for Atlantic Menhaden Established Using an Ecosystem Model of Intermediate Complexity. *Front. Mar. Sci.* 7:606417.
- Deyle, E., A. M. Schueller, H. Ye, G. M. Pao, and G. Sugihara. 2018. Ecosystem-based forecasts of recruitment in two menhaden species. *Fish and Fisheries* 19(5): 769-781.
- Drew, K., M. Cieri, A. M. Schueller, A. Buchheister, D. Chagaris, G. Nesslage, J. E. McNamee, and J. H. Uphoff. 2021. Balancing Model Complexity, Data Requirements, and Management Objectives in Developing Ecological Reference Points for Atlantic Menhaden. *Front. Mar. Sci.* 8: 608059.
- Liljestrand, E.M., M.J. Wilberg, and A.M. Schueller. 2019. Estimation of movement and mortality of Atlantic menhaden during 1966-1969 using a Bayesian multi-state mark recapture model. *Fisheries Research* 210: 204-213.
- Liljestrand, E.M., M. J. Wilberg, and A. M. Schueller. 2019. Multi-state dead recovery mark-recovery model performance for estimating movement and mortality rates. *Fisheries Research* 210: 214-233.
- Lucca, B. M., and J. D. Warren. 2019. Fishery-independent observations of Atlantic menhaden abundance in the coastal waters south of New York. *Fisheries Research* 218: 229-236.
- Nesslage, G. M., and M. J. Wilberg. 2019. A performance evaluation of surplus production models with time-varying intrinsic growth in dynamic ecosystems. *Canadian Journal of Fisheries and Aquatic Sciences* 76(12): 2245-2255.
- Schueller, A.M., A. Rezek, R. M. Mroch, E. Fitzpatrick, and A. Cheripka. 2021. Comparison of ages determined by using an Eberbach projector and a microscope to read scales from Atlantic menhaden (*Brevoortia tyrannus*) and Gulf menhaden (*B. patronus*). *Fishery Bulletin* 119(1): 21-32.

Theses and Dissertations of Potential Interest:

- McNamee, J. E. 2018. A multispecies statistical catch-at-age (MSSCAA) model for a Mid-Atlantic species complex. University of Rhode Island.

V. Implementation of FMP Compliance Requirements

All states are required to submit annual compliance reports by August 1.

Quota Results

The Board set the TAC at 233,550 mt (514.9 million pounds) for 2023-2025 based on the adopted ERPs. 1% is set aside for episodic events. States may relinquish all or part of its annual quota by December 1st of the previous year. Delaware relinquished one million pounds of quota, which was redistributed to the states according to procedures outlined in Addendum I to Amendment 3 and is reflected in the 2023 Preliminary Quota in Table 7.

Table 7 also contains 2022 state-specific quotas and directed harvest. The final quotas for 2022 account for 1.2 million pounds of quota relinquished by Delaware, state-to-state transfers (Table 8), and transfers to the EESA. Based on preliminary 2022 landings, PRFC and Connecticut both had overages in part due to quota that was transferred to other states. In August 2023, Virginia transferred quota back to PRFC to account for their overage. Connecticut's overage was deducted from their 2023 quota.

Quota Monitoring

The Board approved timely quota monitoring programs for each state through implementation of Amendment 3. Monitoring programs are intended to minimize the potential for quota overages. Table 6 contains a summary of each state's approved quota monitoring system.

Menhaden purse seine and bait seine vessels (or snapper rigs) are required to submit CDFRs. Maine, New York, and Virginia fulfilled this requirement in 2022. New Jersey did not require purse seine vessels to fill out the specific CDFR but did require monthly trip level reporting on state forms that include complementary data elements to the CDFR. Rhode Island purse seine vessels must call in daily reports to RI DMF and fill out daily trip level logbooks. New Hampshire also does not require the specific CDFR, but does require daily, trip-level reporting from dealers and monthly trip-level reporting from harvesters. Massachusetts requires trip level reporting for all commercial fishermen. Menhaden purse seine fisheries do not currently operate in all other jurisdictions in the management unit.

Biological Monitoring Requirements

Amendment 3 maintains biological sampling requirements for non *de minimis* states as follows:

- One 10-fish sample (age and length) per 300 mt landed for bait purposes for Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, and Delaware; and
- One 10-fish sample (age and length) per 200 mt landed for bait purposes for Maryland, Potomac River Fisheries Commission, Virginia, and North Carolina

Table 9 provides the number of 10-fish samples required and collected for 2022. These are based on the best available 2022 total bait landings data (including directed, incidental, and EESA landings) provided to the Commission by the states. In 2022, Maine fell short of the requirement, collecting 35 of the 39 required samples. Connecticut also collects bait samples from the Long Island Sound Trawl Survey, which produced 190 age samples and 881 length samples over 190 tows.

The PRT continued to discuss whether a sufficient number of age and length samples are being collected from different commercial gear types as well as regions, and whether substituting samples from fishery-independent sources is appropriate for meeting the requirement. The Stock Assessment Subcommittee will evaluate the biological sampling as part of the 2025 single-species assessment update.

Adult CPUE Index Requirement

Amendment 3 requires that, at a minimum, each state with a pound net fishery must collect catch and effort data elements for Atlantic menhaden as follows; total pounds landed per day, number of pound nets fished per day. These are harvester trip level ACCSP data requirements. In May of 2013, the Board approved North Carolina's request to omit this information on the basis that it did not have the current reporting structure to require a quantity of gear field by harvesters or dealers. In recent years, NC DMF staff have worked to develop a proxy method to estimate effort but this approach likely would not work for developing an adult CPUE index.

De Minimis Status

To be eligible for *de minimis* status, a state's bait landings must be less than 1% of the total coastwide bait landings for the most recent two years. State(s) with a reduction fishery are not eligible for *de minimis* consideration. If granted *de minimis* status by the Board, states are exempt from implementing biological sampling as well as pound net catch and effort data reporting. The Board also previously approved a *de minimis* exemption for New Hampshire, South Carolina and Georgia from implementation of timely reporting. The states of Pennsylvania, South Carolina, Georgia, and Florida requested and qualify for *de minimis* status for the 2022 fishing season.

VI. Plan Review Team Recommendations and Notable Comments

Management Recommendations

- The PRT recommends that the *de minimis* requests from Pennsylvania, South Carolina, Georgia, and Florida, be approved.
- The PRT recommends that the Technical Committee be tasked with evaluating the biological sampling requirement to be readdressed in a future management document or stock assessment.

VII. Literature Cited

Atlantic States Marine Fisheries Commission (ASMFC). 2022. Atlantic Menhaden Stock Assessment Update. Prepared by the ASMFC Atlantic Menhaden Stock Assessment Subcommittee. 127 pp.

Southeast Data, Assessment, and Review (SEDAR). 2015. SEDAR 40 – Atlantic Menhaden Stock Assessment Report. SEDAR, North Charleston SC. 643 pp.

SEDAR. 2020. SEDAR 69 – Atlantic Menhaden Benchmark Stock Assessment Report. SEDAR, North Charleston SC. 691 pp. available online at: <http://sedarweb.org/sedar-69>

SEDAR. 2020. SEDAR 69 - Atlantic Menhaden Ecological Reference Points Stock Assessment Report. SEDAR, North Charleston SC. 560 pp. available online at: <http://sedarweb.org/sedar-69>

Table 1. Directed, bycatch, and episodic events set aside landings in 1000s of pounds for 2022 by jurisdiction. Source: 2022 ASMFC state compliance reports for Atlantic menhaden. NA = not applicable; C = confidential

State	Directed	Incidental Catch	EESA
ME	7,574	15,602	2,647
NH	4,987	-	NA
MA	8,087	595	1,743
RI	617	-	-
CT	299	-	NA
NY	1,177	-	NA
NJ	46,889	-	NA
DE	53	-	NA
MD	3,357	-	NA
PFRC	3,569	-	NA
VA	331,081	1,784	NA
NC	539	-	NA
SC	C	-	NA
GA	0	-	NA
FL	152	-	NA

Table 2. Atlantic menhaden reduction and bait landings in thousand metric tons, 1988-2022.

	Reduction Landings (1000 mt)	Bait Landings (1000 mt)
1988	278	43.8
1989	284	31.5
1990	343	28.1
1991	330	29.7
1992	270	33.8
1993	310	23.4
1994	260	25.6
1995	340	28.4
1996	293	21.7
1997	259	24.2
1998	246	38.4
1999	171	34.8
2000	167	33.5
2001	234	35.3
2002	174	36.2
2003	166	33.2
2004	183	34.0
2005	147	38.4
2006	157	27.2
2007	174	42.1
2008	141	47.6
2009	144	39.2
2010	183	42.7
2011	174	52.6
2012	161	63.7
2013	131	37.0
2014	131	41.6
2015	143	45.8
2016	137	43.1
2017	129	43.8
2018	141	50.2
2019	151	58.1
2020	125	59.6
2021	137	58.4
2022	134	60.1
Avg 2017-2021	136	54.0

Table 3. Incidental fishery landings by state in 1000s of pounds, 2013-2022. Only states that have reported incidental catch landings are listed. Average total incidental catch landings for the time series is 8.3 million pounds.

State	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
ME		-	-	506	5,374	2,995	10,751	13,605	11,771	15,602
MA								49	174	595
RI	16	99	70	40	136	-	-	-	C	-
CT	0	-	10	-	124	-	-	-	C	-
NY	0	325	769	281	807	-	-	282	310	-
NJ	0	626	241	196	-	204,240	-	20	C	-
DE	76	112	92	21	29	-	-	-	-	-
MD	2,864	2,201	1,950	996	-	-	-	-	-	-
PRFC	1,087	1,112	455	106	670	-	-	-	-	-
VA	268	2,232	2,103	326	-	110,281	-	-	-	1,784
FL	65	126	302	111	264	-	-	-	-	-
Total	4,377	6,831	5,992	2,581	7,404	3,215	10,751	13,957	12,336	16,152

Table 4. Total incidental landings (1000s of pounds), number of trips, and number of states reporting landings in the incidental catch fishery, 2013-2022.

Year	Landings (1000s of pounds)	Number of Trips	Number of states landing
2013	4,377	2,783	4
2014	6,831	5,275	8
2015	5,992	4,498	9
2016	2,581	2,222	9
2017	7,407	2,108	7
2018	3,310	1,224	3
2019	10,751	3,113	1
2020	13,957	3,565	4
2021	12,336	3,099	6
2022	16,152	4,134	2
Total	67,037	27,887	

Table 5. Episodic Events Set-Aside (EESA) fishery quota, landings, and participating states by year. *The 2018 EESA quota was reduced due to an overage in 2017. The 2018 EESA overage was paid back in full by the state of Maine. **The 2021 overage was covered by quota transfers in 2021 and 2022, and there will be no deduction for the 2022 fishing year. ^The 2022 overage was partially covered by a quota transfer and the remainder was deducted from the 2023 set aside.

Year	States Declared Participation	EESA Quota (MT)	Landed (MT)	% EESA Quota Used
2013		1,708	-	-
2014	RI	1,708	134	7.8%
2015	RI	1,879	854	45.5%
2016	ME, RI, NY	1,879	1,728	92.0%
2017	ME, RI, NY	2,000	2,129	106.5%
2018*	ME	2,031	2,103	103.6%
2019	ME	2,160	1,995	92.4%
2020	ME & MA	2,160	2,080	96.3%
2021**	ME, MA, RI	1,944	2,213	113.8%
2022^	ME, MA	1,944	1,992	102.4%

Table 6. State quota reporting timeframes in 2021. The **bold** text indicates which reporting program (dealer or harvesters) the states use to monitor its quotas. **Blue text** indicates changes from 2020.

State	Dealer Reporting	Harvester Reporting	Notes
ME	monthly	daily/weekly	Harvesters must report same day during directed and episodic event trips; harvesters report daily trips weekly for trips <6,000 lbs. Harvest reports are used for quota monitoring.
NH	daily	monthly	Exempt from timely reporting. Implemented daily, transaction level reporting for state dealers.
MA	weekly	monthly/daily	Harvesters landing greater than 6,000 lbs must report daily
RI	twice weekly	quarterly/daily	Harvesters using purse seines must report daily
CT	weekly/monthly	monthly/daily	CT operates as directed fisheries until 90% of the quota is harvested. Then operates at the 6,000 pound bycatch trip limit.
NY	Weekly	monthly	Capability to require weekly harvester reporting if needed
NJ	weekly	monthly	All menhaden sold or bartered must be done through a licensed dealer
DE	—	monthly/daily	Harvesters landing menhaden report daily using IVR
MD	monthly	monthly/daily	PN harvest is reported daily, while other harvest is reported monthly.
PRFC	—	weekly	Trip level harvester reports submitted weekly. When 70% of quota is estimated to be reached, then pound netters must call in weekly report of daily catch.
VA	—	monthly/weekly/daily	Purse seines submit weekly reports until 97% of quota, then daily reports. Monthly for all other gears until 90% of quota, then reporting every 10 days.
NC	monthly (combined reports)		Single trip ticket with dealer and harvester information submitted monthly. Larger dealers (>50,000 lbs of landings annually) can report electronically, updated daily.
SC	monthly (combined reports)		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
GA	monthly (combined reports)		Exempt from timely reporting. Single trip ticket with dealer and harvester information.
FL	monthly/weekly (combined reports)		Monthly through the FWC Marine Fisheries Trip Ticket system until 75% of quota is projected to have been met, then weekly phone calls to dealers who have been reporting menhaden landings until the directed fishery is closed.

Table 7. Results of 2022 quota accounting in pounds. The 2022 landings do not include landings from the incidental catch fishery because they do not count towards the TAC. A majority of the 2022 episodic events set aside (EESA) quota was used by Maine with the remainder used by Massachusetts. The 2023 base quotas account for the redistribution of relinquished quota by Delaware (1 million pounds) and for the implementation of Addendum I to Amendment 3, which modified the quota allocation process.

State	2022 Base Quota*	Returned Set Aside	Transfers^	Final 2022 Quota	Overages	2023 Base Quota*
ME	2,194,303		5,380,000	7,574,303		24,510,314
NH	2,121,582		3,070,000	5,191,582		6,052,530
MA	5,417,812		2,956,000	8,373,812		10,838,902
RI	2,196,719		-1,460,000	736,719		4,147,882
CT	2,188,548		-2,110,000	78,548	220,704	1,472,767
NY	2,933,580		-	2,933,580		4,298,217
NJ	46,267,280		1,850,000	48,117,280		56,172,891
PA	2,121,464		-1,300,000	821,464		50,974
DE	974,821		-870,000	104,821		375,998
MD	8,029,511		-2,500,000	5,529,511		5,947,968
PRFC	4,561,747		-1,000,000	3,561,747	7,703**	5,547,444
VA	334,781,533		4,310,000	339,091,533		384,164,855
NC	4,062,537		-2,950,000	1,112,537		1,892,146
SC	2,121,464		-2,120,000	1,464		1,274,601
GA	2,121,464		-2,000,000	121,464		1,274,352
FL	2,198,486		-1,320,000	878,486		1,490,464
Total	424,292,851			424,292,851		509,740,712

*Includes redistributed relinquished quota for that year and any overages from the previous season.

**Resolved through quota transfer from VA.

^Includes inter-state transfers and transfers to the EESA quota.

Table 8. State-to-state transfers of menhaden commercial quota for the 2022 Fishing year.

Transfer Date	ME	NH	MA	RI	CT	NY	NJ	PA	DE	MD	PRFC	VA	NC	SC	GA	FL
6/6/2022		750,000			(750,000)											
6/27/2022	2,580,000				(550,000)			(600,000)					(880,000)	(550,000)		
6/27/2022							1,850,000		(500,000)				(600,000)	(750,000)		
6/29/2022				360,000	(100,000)								(160,000)	(100,000)		
7/1/2022	480,000															(480,000)
7/7/2022												370,000		(370,000)		
7/7/2022			2,380,000		(350,000)			(400,000)					(560,000)	(350,000)	(400,000)	(320,000)
7/8/2022									(370,000)			370,000				
7/8/2022	600,000														(600,000)	
7/18/2022			500,000							(500,000)						
7/18/2022		1,000,000								(1,000,000)						
7/20/2022												1,000,000			(1,000,000)	
8/9/2022												320,000				(320,000)
8/17/2022										(500,000)		500,000				
8/17/2022	500,000									(500,000)						
9/14/2022		300,000			(300,000)											
9/16/2022		300,000						(300,000)								
9/16/2022											(1,000,000)	1,000,000				
9/22/2022	220,000		140,000	(360,000)												
9/27/2022		200,000														(200,000)
9/29/2022												750,000	(750,000)			
10/12/2022		400,000		(400,000)												
11/2/2022		120,000		(60,000)	(60,000)											
12/15/2022	1,000,000			(1,000,000)												
Total	5,380,000	3,070,000	3,020,000	(1,460,000)	(2,110,000)	-	1,850,000	(1,300,000)	(870,000)	(2,500,000)	(1,000,000)	4,310,000	(2,950,000)	(2,120,000)	(2,000,000)	(1,320,000)

Table 9. Biological monitoring results for the 2022 Atlantic menhaden bait fishery.

*Age samples are still being processed

State	#10-fish samples required	#10-fish samples collected	Age samples collected	Length samples collected	Gear/Comments
ME	39	35	350	350	31 from purse seine; 4 from gillnets
NH	8	8	80	80	Purse Seine
MA	16	17	170	170	16 purse seine; 1 rod & reel
RI	1	1	10	10	Otter Trawl' 39 additional FI samples available
CT	1	1	10	10	Long Island Sound Trawl Survey - 167 tows in 2022; collected 190 age/881 length samples
NY	2	14	141	141	cast net, seine net
NJ	65	90	*	900	Purse Seine
	6	-	*	-	Other Gears
DE	1	1	10	10	Gill net
MD	8	20	325	1,132	Pound net
PRFC	8	19	190	190	pound net
VA	6	1	10	10	Pound Net
	10	68	679	679	Gill Net
NC	1	7	71	1,236	gillnet
Total	172	282	2046	4918	

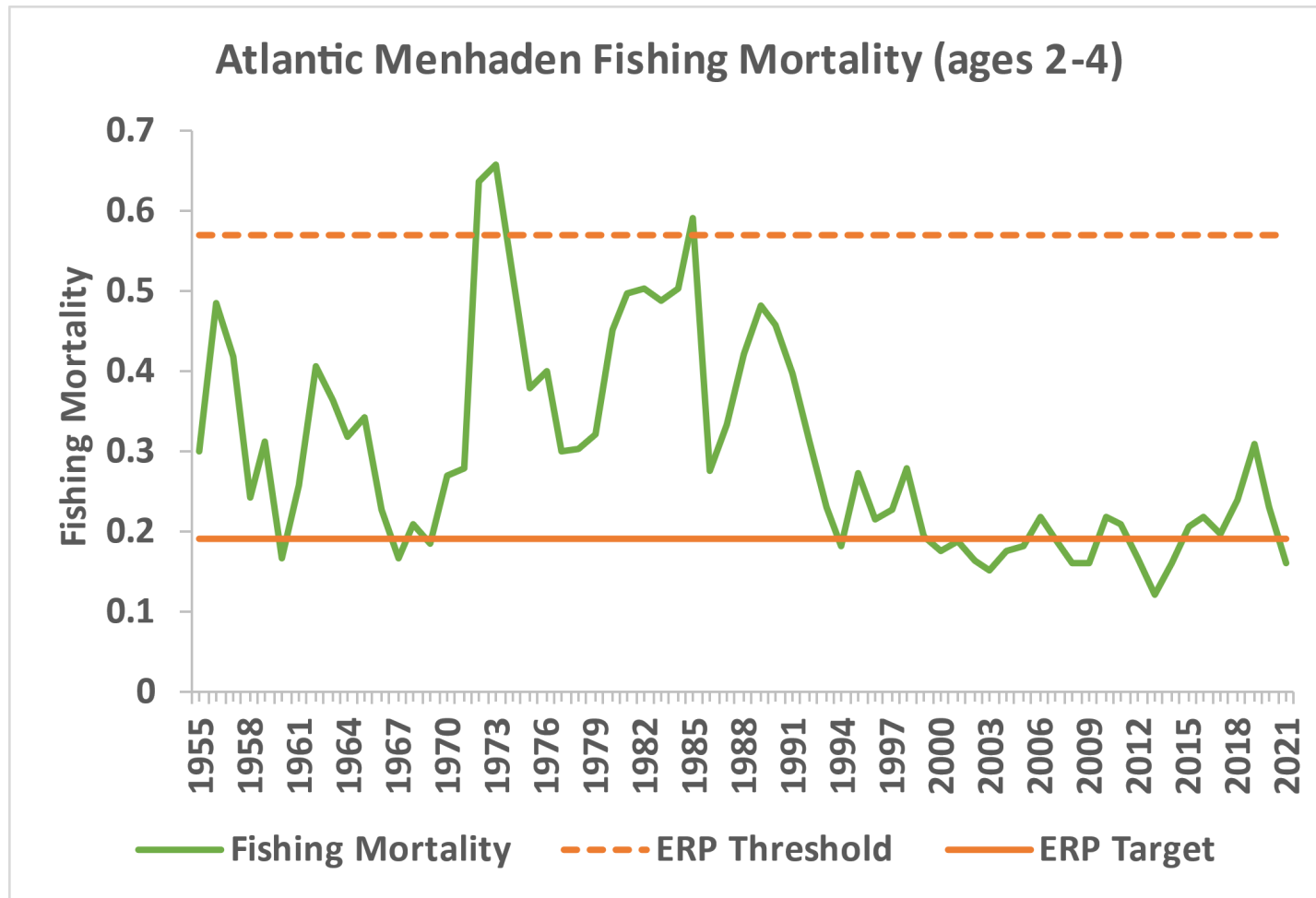


Figure 1. Fishing mortality, 1955-2021. The ERP fishing mortality reference points are $F_{\text{target}} = 0.19$ and $F_{\text{threshold}} = 0.57$. $F_{2017} = 0.16$. Source: ASMFC 2022.

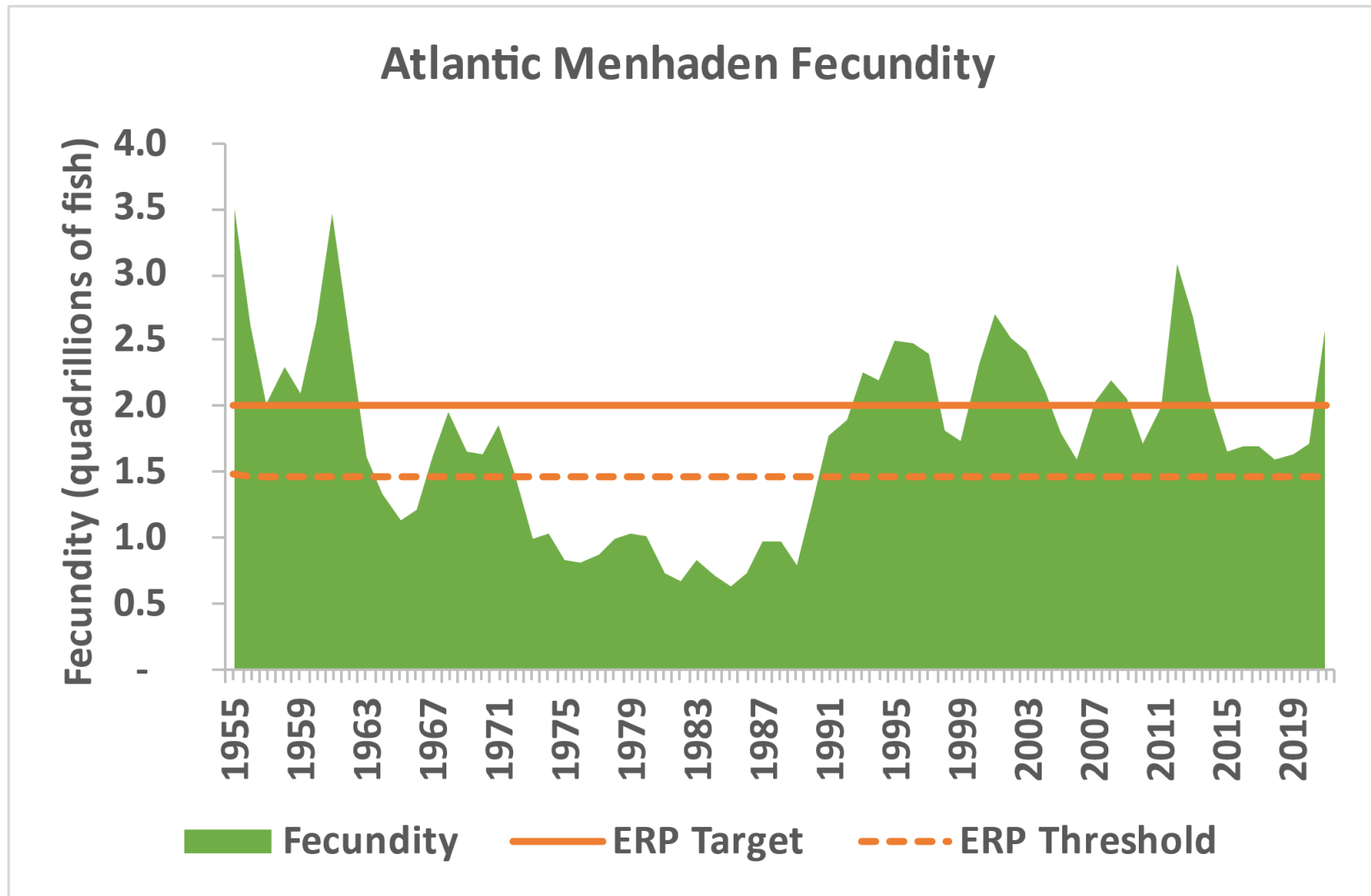


Figure 2. Atlantic menhaden fecundity, 1955-2021. The ERPs for population fecundity are $FEC_{target} = 2,003,986$ (billions of eggs), and $FEC_{threshold} = 1,492,854$ (billions of eggs). Source: ASMFC 2022.

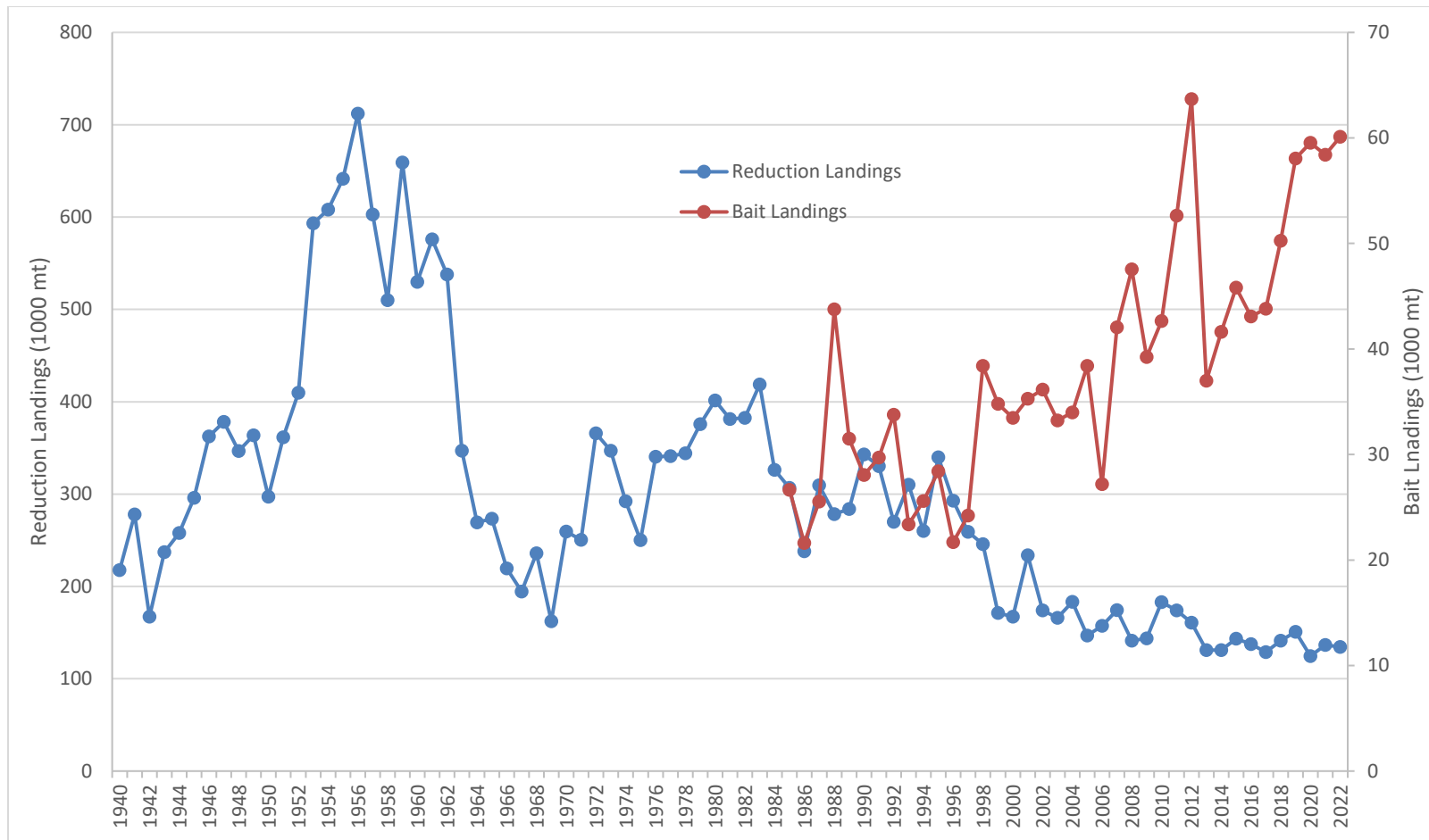


Figure 3. Landings from the reduction purse seine fishery (1940–2022) and bait fishery (1985–2022) for Atlantic menhaden. Note: there are two different scales on the y-axes.

Localized Depletion of Atlantic Menhaden in the Chesapeake Bay and Its Impact on Maryland and Virginia Fisheries



October 16, 2023

Phil Zalesak
President
SMRFO (www.smrfo.org)

Executive Summary

Although the statement that “Atlantic menhaden are not over fished and overfishing is not occurring” may apply to the Atlantic Coast, it does not apply to the Chesapeake Bay.

The latest scientific data indicates that there are insufficient Atlantic menhaden in Virginia waters during the Atlantic menhaden reduction fishing season to sustain life for fish and birds dependent on Atlantic menhaden for their survival.

This lack of menhaden is caused by the removal of 3/4 of a billion fish from the Chesapeake Bay and the waters just outside the Bay along the Atlantic Coast by the Atlantic menhaden reduction fishing industry.

The solution to this problem is to end the Atlantic menhaden reduction fishing in Virginia waters and limit reduction fishing to federal waters east of the 3 nautical mile Exclusive Economic Zone.

References:

https://asmfc.org/uploads/file/63d8390fAtlMenhadenERPAssmt_PeerReviewReports.pdf page iii
<https://www.frontiersin.org/articles/10.3389/fmars.2023.1172787/full>

**Atlantic Menhaden:
A Critical Forage Fish for Striped Bass, Bluefish, Weakfish and Osprey**



Striped Bass Mortality Rate a Function of Atlantic Menhaden Mortality Rate

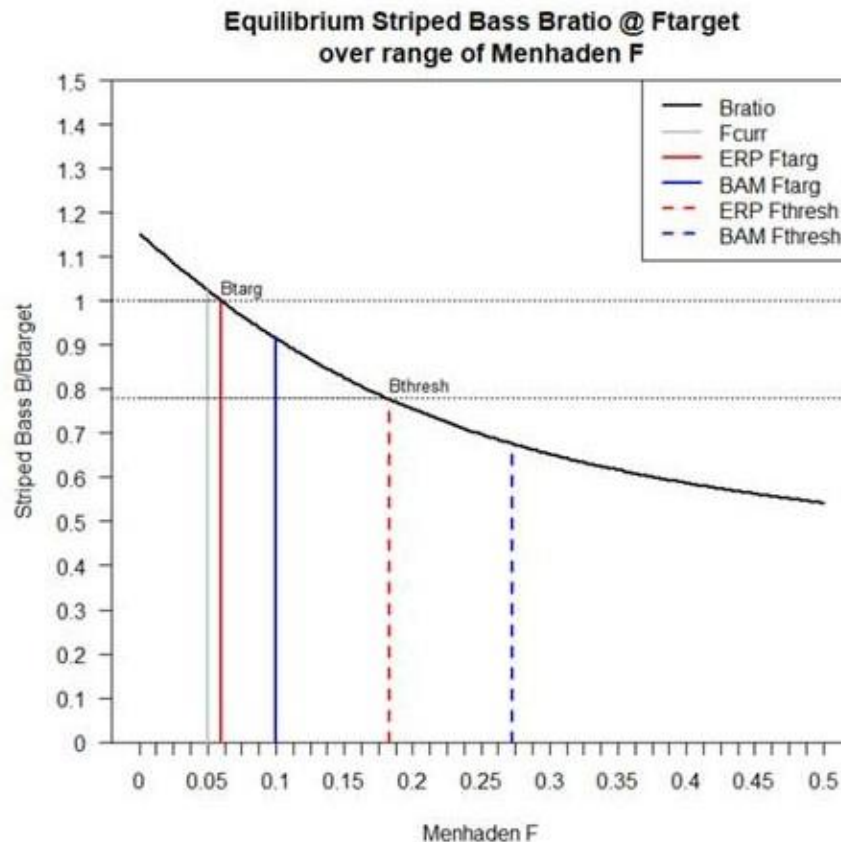


Figure 148. Terminal year biomass ratio (B/B_{TARGET}) from the NWACS-MICE model for age 6+ striped bass over a range of Atlantic menhaden F with striped bass fished at their F target. Vertical solid and dotted lines indicate the BAM single-species target and threshold F as well as the current F and the proposed ERP target and threshold F for Atlantic menhaden.

Allocation of Atlantic Menhaden Reduction Fishery in the Chesapeake Bay

	<u>Metric Tons</u>	<u># of Fish *</u>
• Prior to 2006 No quota	No quota	
• 2006 – 2014	110,400	529,104,000
• 2014 – 2018	87,236	418,088,012
• 2018 – 2023	51,000	244,423,043

* .46 pounds per fish for reduction fishery (NOAA)

<https://asmfc.org/species/atlantic-menhaden>

Atlantic Menhaden Industrial Harvesting



Atlantic Menhaden Storing and Shipping (Purse Seining for Atlantic Menhaden in Cape May NJ)



https://www.youtube.com/watch?v=ZcE_uGmz-yw

Atlantic Menhaden Purse Seine Settings

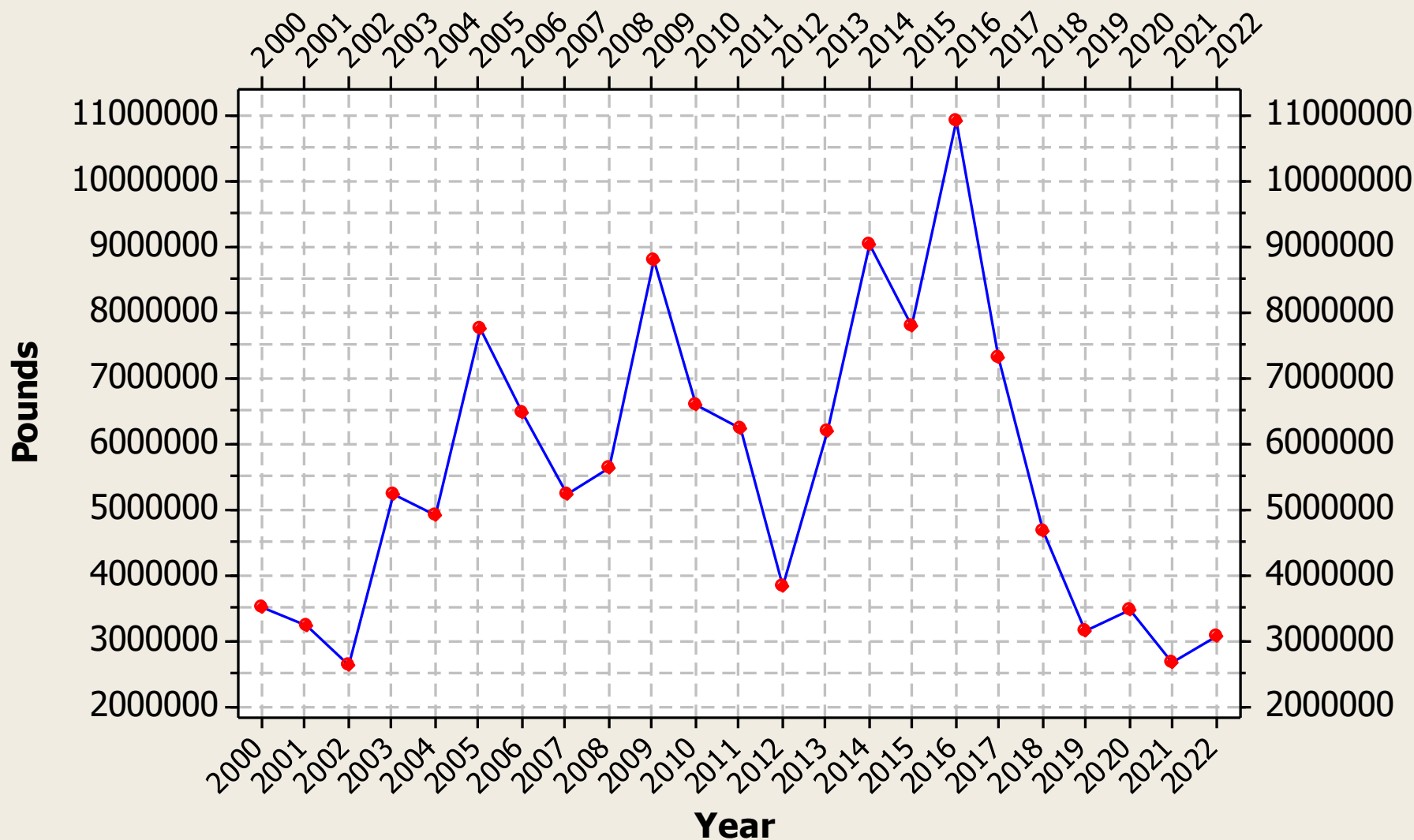
Figure 4.1.3.4.3. Locations of all purse-seine sets by Omega Protein vessels (red) and last sets of trips that were sampled for age and size composition of the catch (= port samples; green) during 2013; data are from CDFR data base.



Current Allocation of Atlantic Menhaden by State

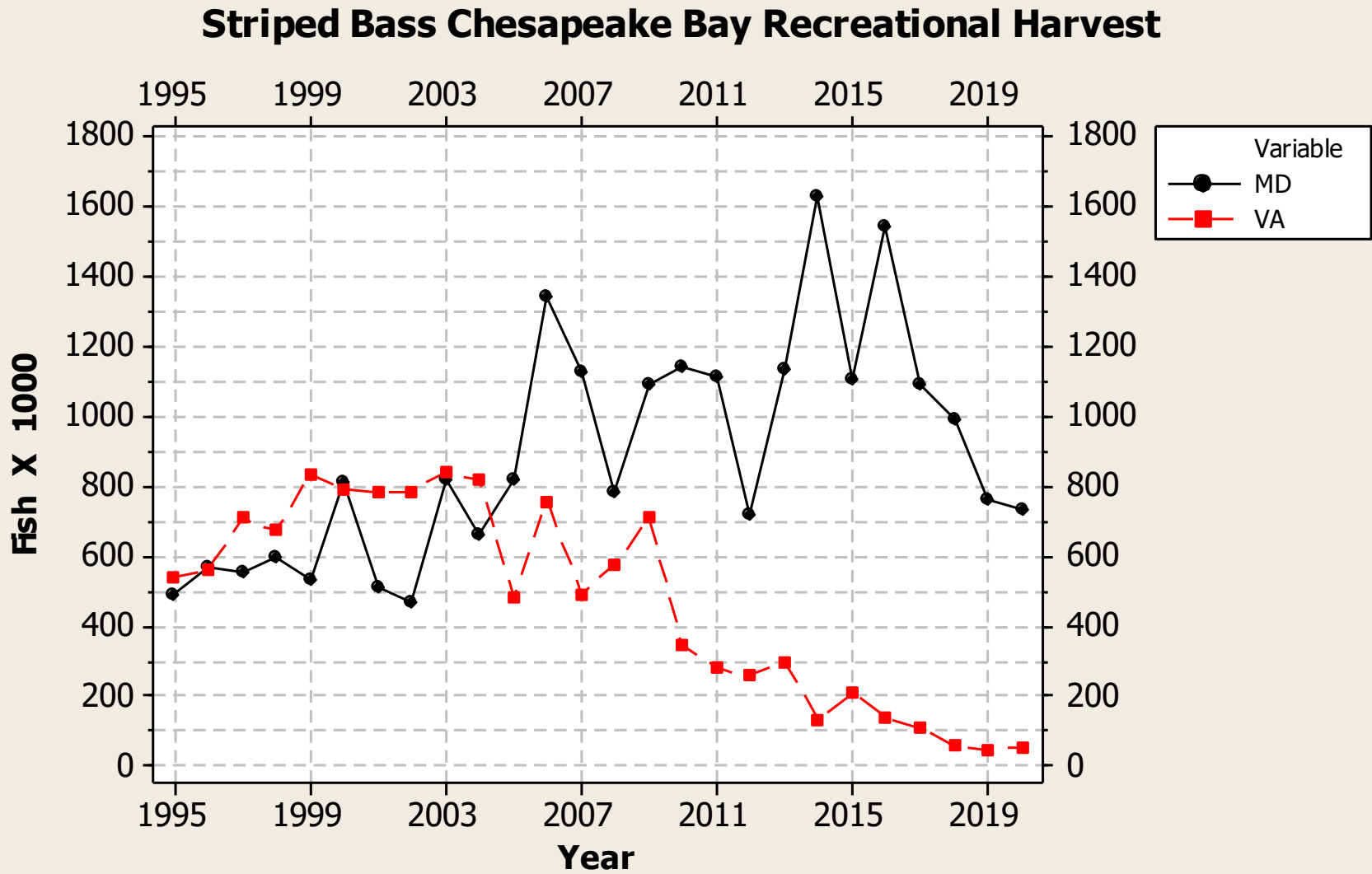
		2023 - 2024		
Allocation	Percentage	Metric Tons	Pounds	Fish*
Atlantic Coast	100.00%	233,550	514,884,330	1,119,313,761
Virginia	75.20%	175,630	387,193,016	841,723,948
Reduction Fishery	67.71%	158,137	348,628,592	757,888,243
Chesapeake Bay	21.84%	51,000	112,434,600	244,423,043
Atlantic Ocean	45.87%	107,137	236,200,420	513,479,174
Other States	24.80%	57,920	127,691,314	277,589,813
* .46 pounds per fish				

Maryland Recreational Striped Bass Harvest by Year

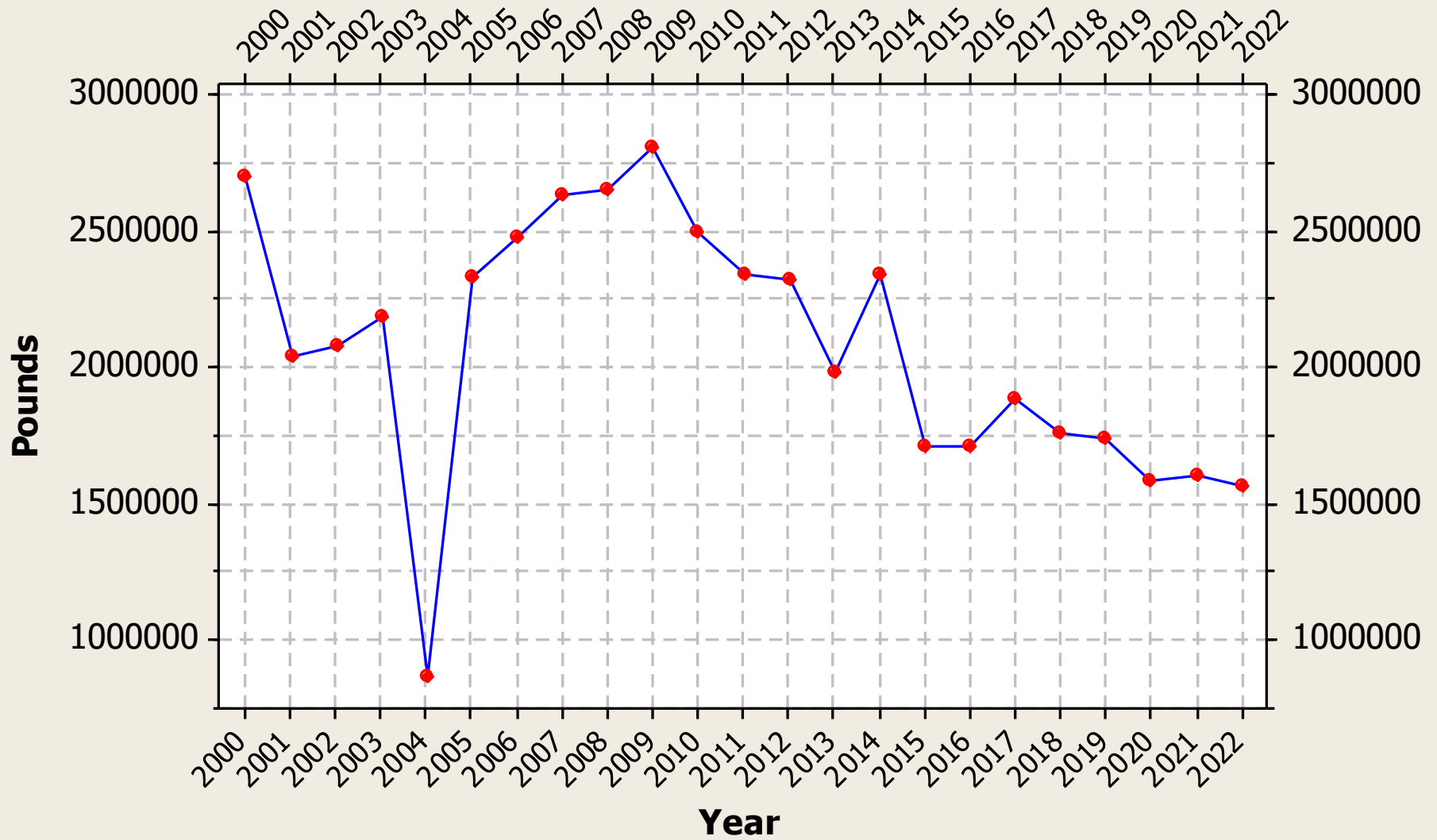


<https://www.st.nmfs.noaa.gov/st1/commercial/>

Striped Bass Chesapeake Bay Recreational Harvest Trend

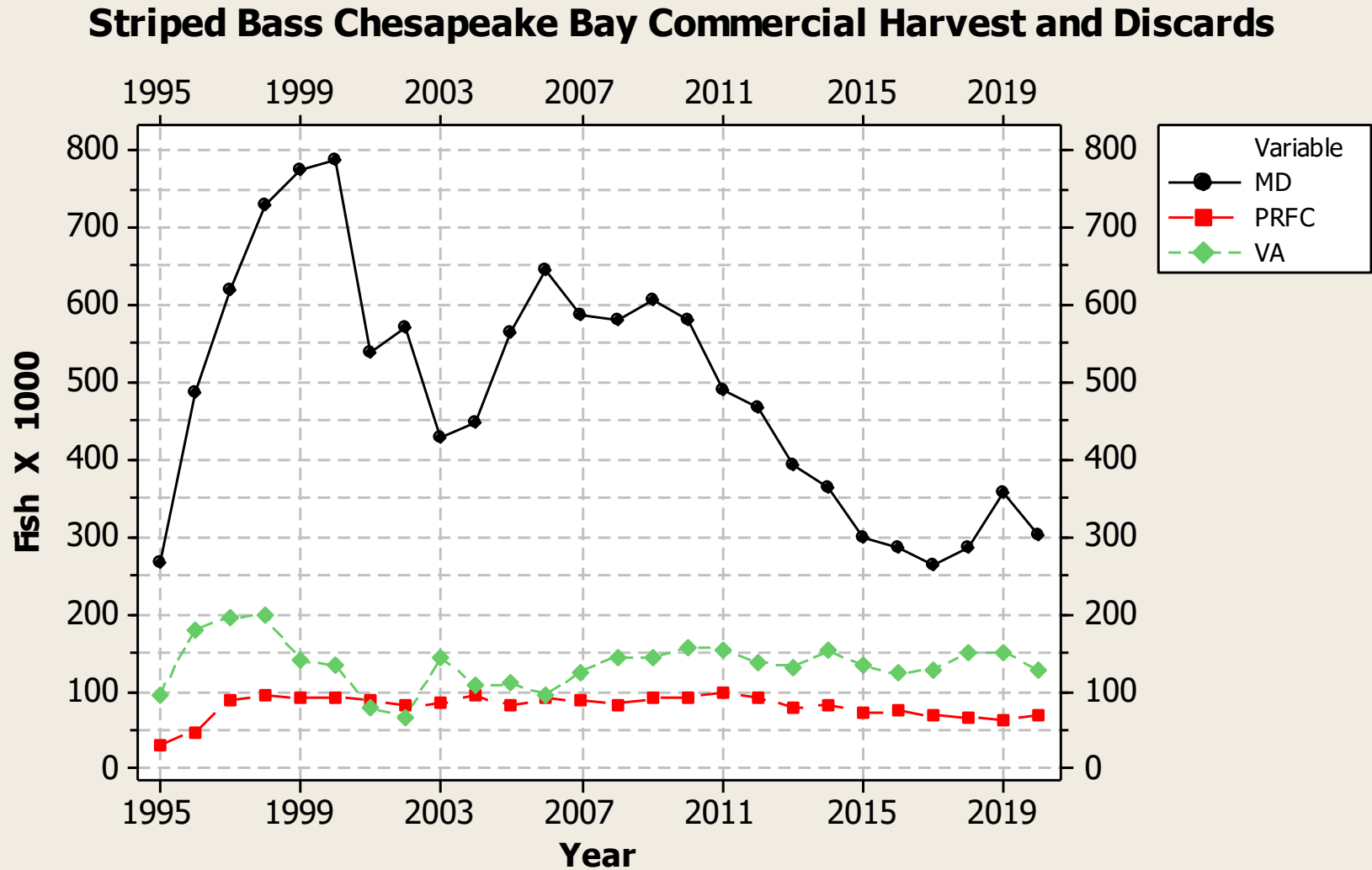


Maryland Commercial Harvest of Striped Bass By Year

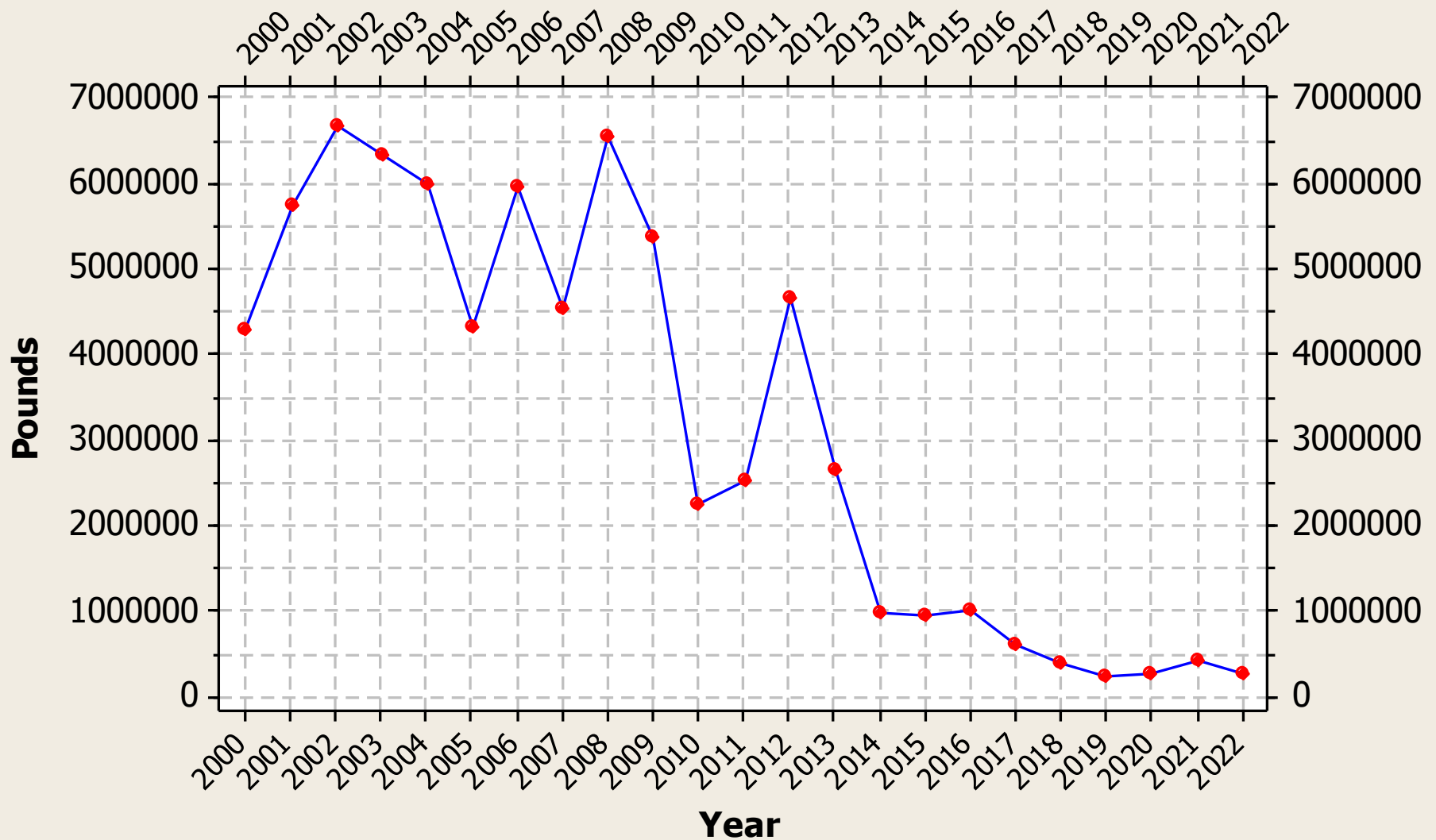


<https://www.st.nmfs.noaa.gov/st1/commercial/>

Striped Bass Chesapeake Bay Commercial Harvest and Discards Trends

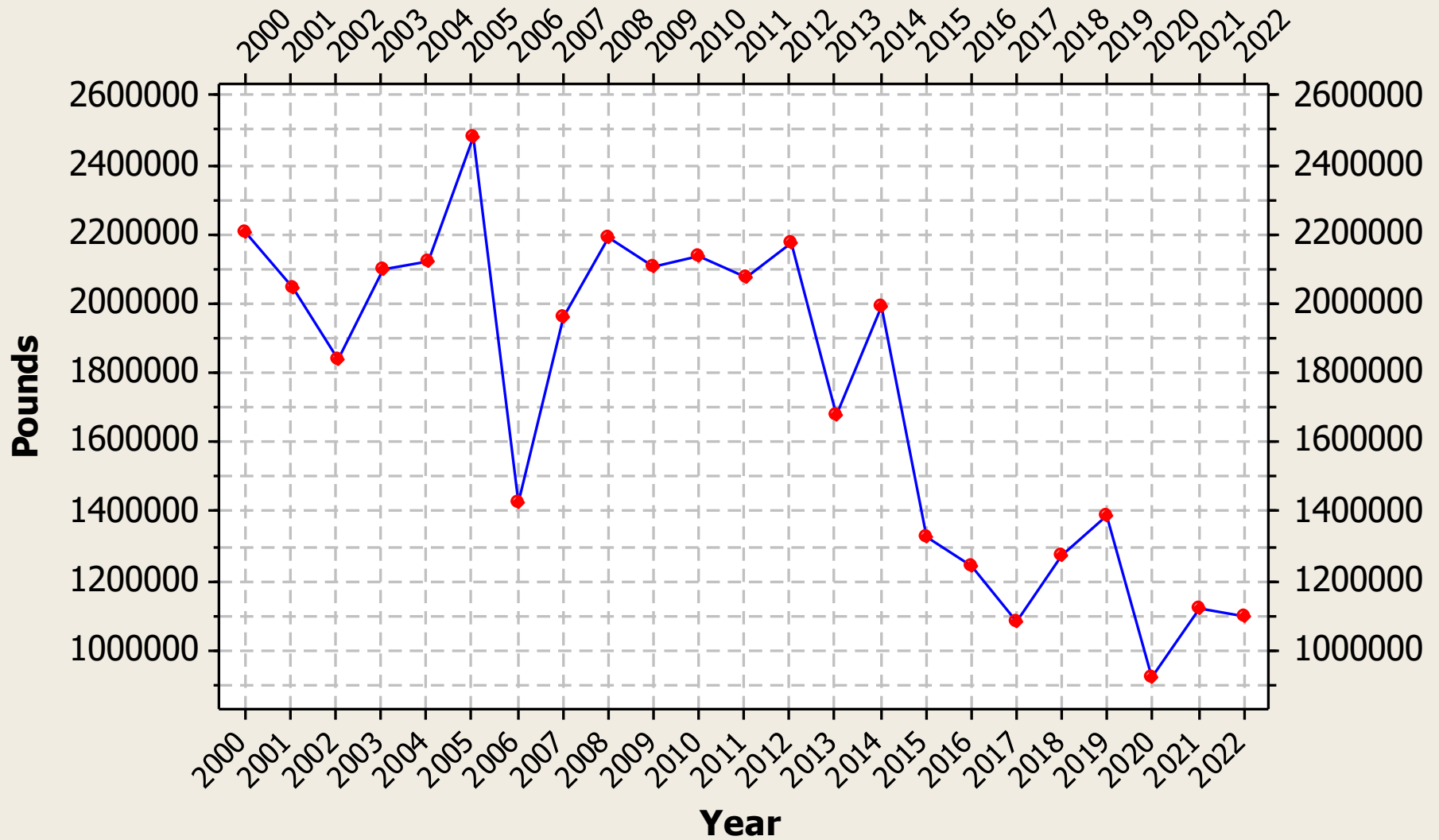


Virginia Recreational Striped Bass Harvest by Year



<https://www.st.nmfs.noaa.gov/st1/commercial/>

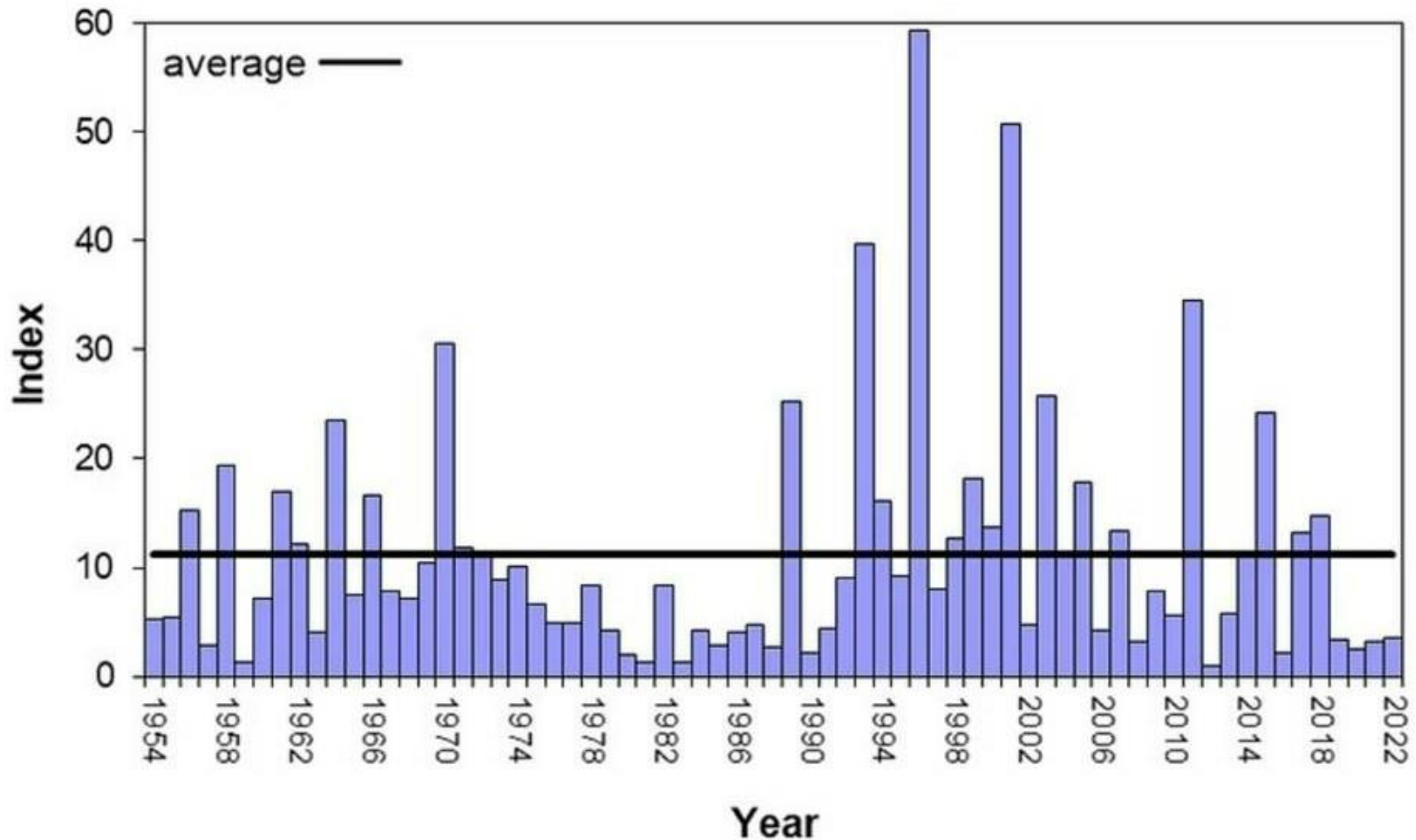
Virginia Commercial Striped Bass Harvest By Year



<https://www.st.nmfs.noaa.gov/st1/commercial/>

Maryland's Juvenile Striped Bass Index

Arithmetic Mean (AM) Catch per Haul



<https://news.maryland.gov/dnr/2022/10/20/chesapeake-bay-2022-young-of-year-survey-results-announced/>

Striped Bass Economic Impact to Maryland (2016)

Commercial GDP: \$17,109,700

Commercial Jobs 584

Recreational GPD: \$802,791,200

Recreational Jobs 10,193

Comparisons Between the Fisheries

Table MD-8. Comparison of commercial and recreational impacts: Maryland 2016

	Commercial Fishery	Recreational Fishery	Total	Commercial Fishery	Recreational Fishery	Total
Pounds landed (000s)	1,709.4	10,919.1	12628.5	14%	86%	100%
Jobs supported	584	10,193	10,777	5%	95%	100%
Income (\$000s)	\$12,569.6	\$496,859.8	\$509,429.7	2%	98%	100%
GDP (\$000s)	\$17,109.7	\$802,791.2	\$819,900.9	2%	98%	100%

Ref: The Economic Contributions of Recreational and Commercial Striped Bass Fishing, Southwick Associates, 4/12/19

Striped Bass Economic Impact to Virginia (2016)

Commercial GDP: \$12,198,100
Commercial Jobs 384

Recreational GPD: \$106,623,300
Recreational Jobs 1,444

Comparisons Between the Fisheries

Table VA-7. Comparison of commercial and recreational impacts: Virginia

	Commercial Fishery	Recreational Fishery	Total	Commercial Fishery	Recreational Fishery	Total
Pounds landed (000s)	1,333.6	1,024.4	2358.0	57%	43%	100%
Jobs supported	384	1,444	1828	21%	79%	100%
Income (\$000s)	\$9,016.0	\$67,550.7	\$76,566.7	12%	88%	100%
GDP (\$000s)	\$12,198.1	\$106,623.3	\$118,821.4	10%	90%	100%

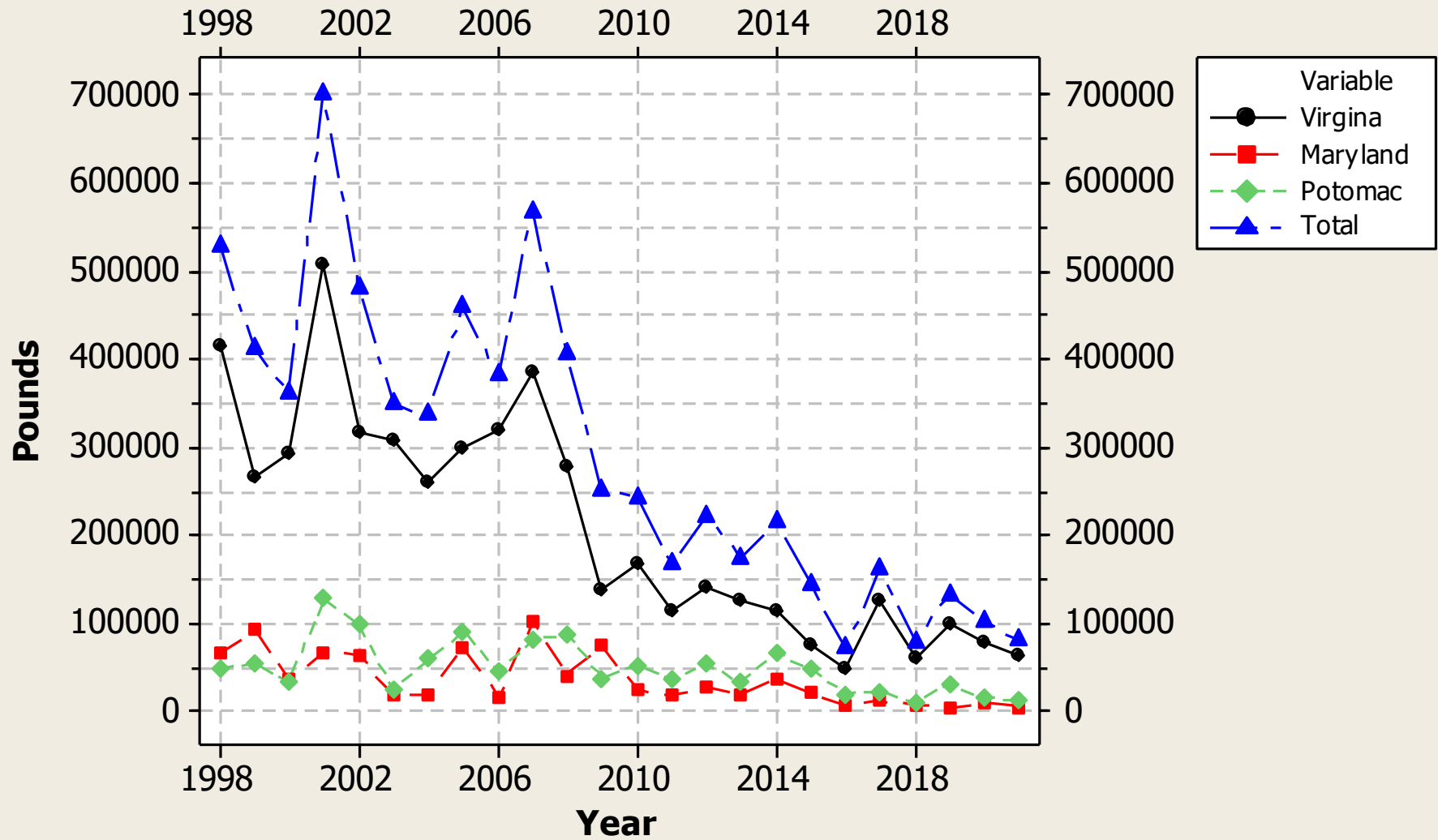
Ref: The Economic Contributions of Recreational and Commercial Striped Bass Fishing, Southwick Associates, 4/12/19

Impact of Striped Bass Related GDP on Maryland and Virginia Economies

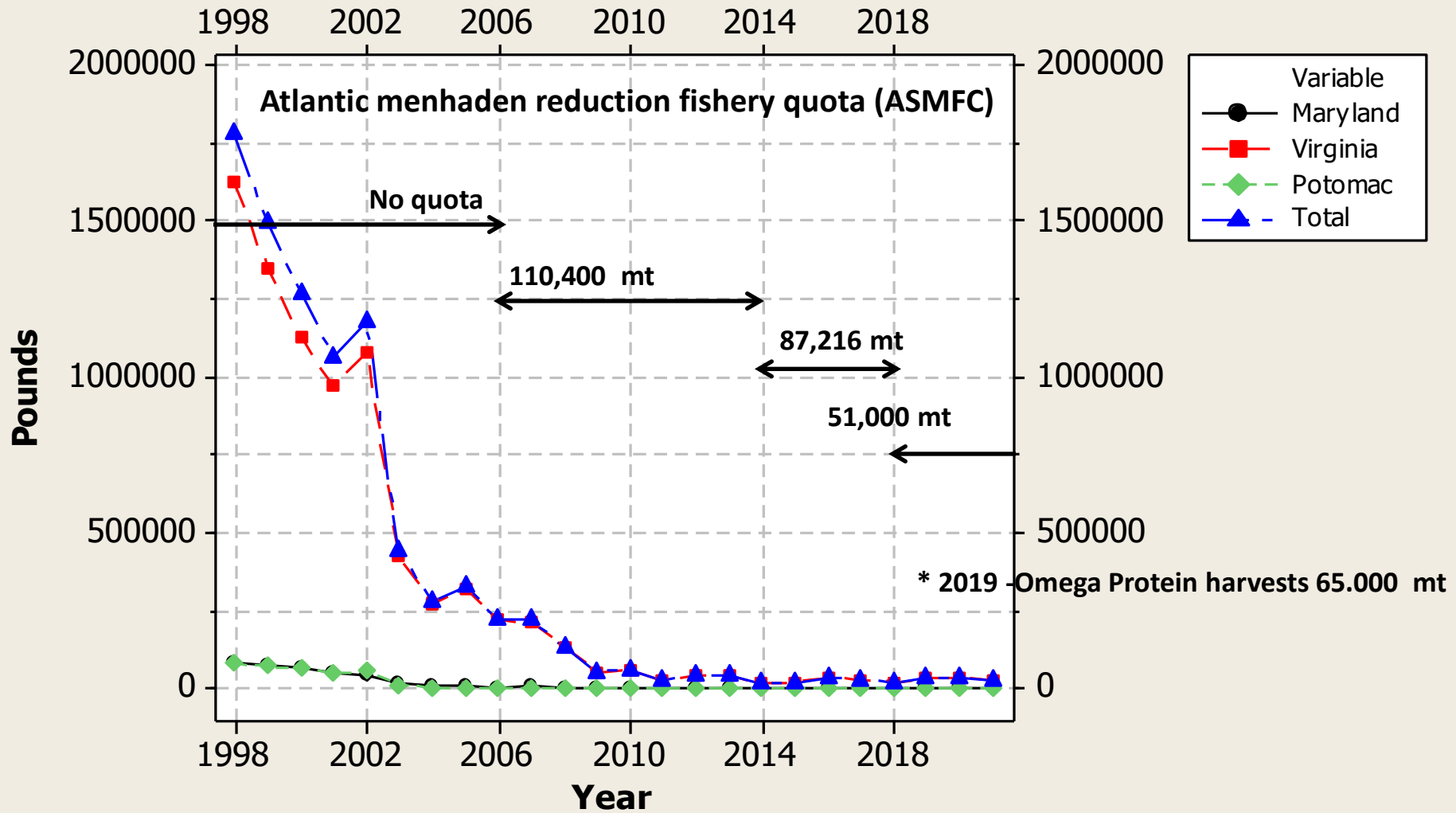
	Recreational GDP	Recreational Jobs	Commercial GDP	Commercial Jobs
Maryland	\$802,791,200	10,193	\$17,109,200	584
Virginia	\$106,623,300	1,444	\$12,198,100	384
Total	\$909,414,500	11,637	\$29,307,300	968

Ref: https://mcgraw.org/wp-content/uploads/2022/01/McGraw-Striped-Bass-Report-FINAL_compressed.pdf

Bluefish Commercial Harvest in the Chesapeake Bay



Weakfish Commercial Harvest in the Chesapeake Bay



Osprey Feeding on Atlantic Menhaden



Dr. Bryan Watts

College of William and Mary

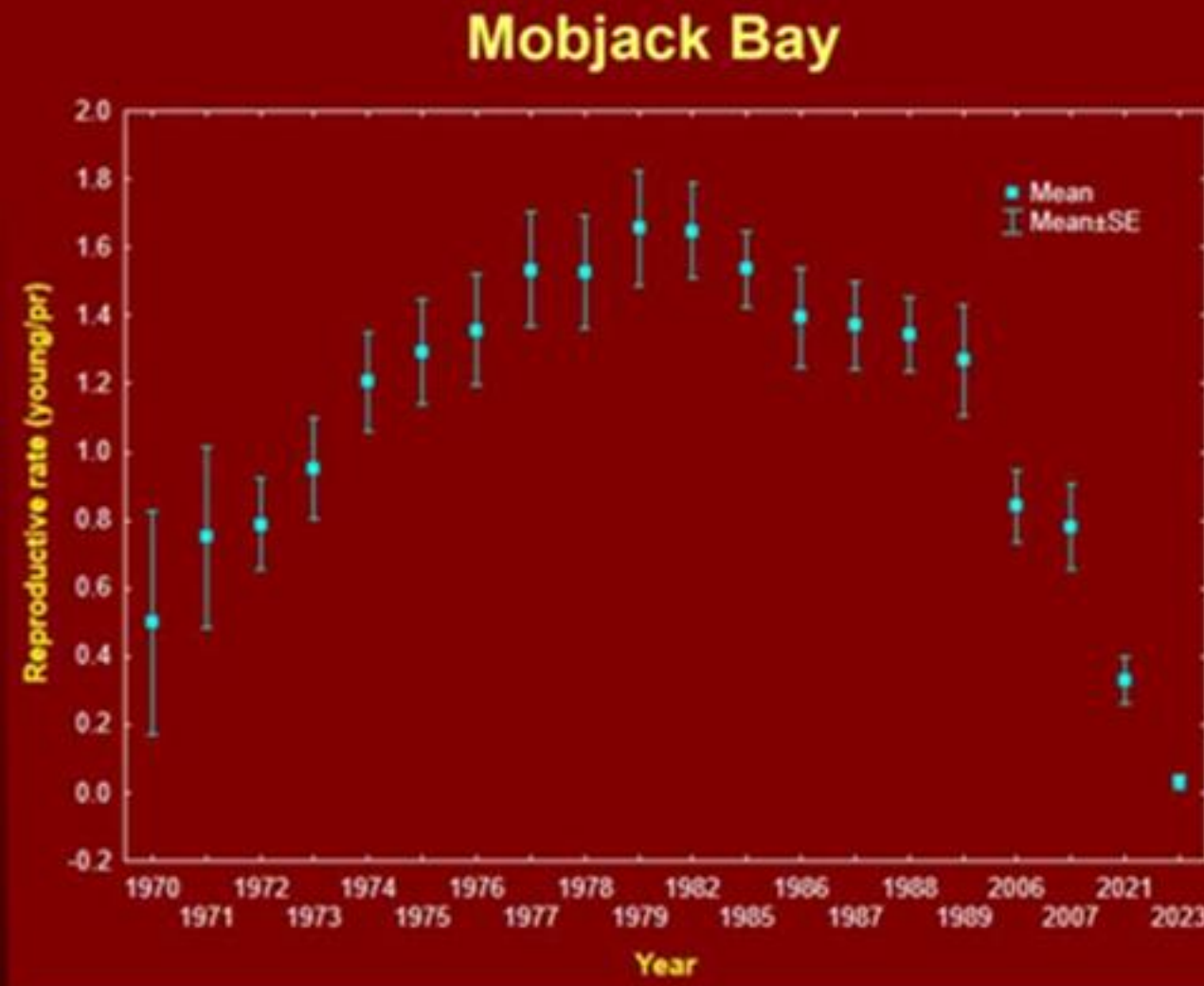
According to Dr. Bryan Watts of the College of William and Mary reductions in menhaden stocks have caused osprey reproductive productivity to decline to below DDT-era rates. This is based on 50 years of research. Dr. Watts provided sworn testimony before the Virginia Marine Resources Commission on 8/22/23. He stated the following:

“The reason we decided to finally to begin to make statements about this issue is that we had moved from several 100 chicks starving in the nests to now 1,000s of chicks starving in the nests in the lower Bay.”

He went on to state “If you look at the relationship between reproductive rates over the last 40 years and the Atlantic menhaden relative abundance index, they are directly related.”

<https://www.youtube.com/watch?v=hf58Z9SLNlg> (14:43)

Osprey Reproductive Rate (Chicks/Active Nest)



Dr. Bryan Watts, Presentation to the ERP Working Group, 10/2/23

Dr. Bryan Watts
College of William and Mary

Osprey Reproductive Rate	Chicks/Active Nest
Requirement	1.15
1970	0.50
1980	2.00
2006	0.75
2021	0.30
2023	0.10

<https://www.youtube.com/watch?v=hf58Z9SLNlg> (14:43).

Osprey Reproductive Performance Data



The CENTER for
CONSERVATION
BIOLOGY

Food Supplementation Increases Reproductive Performance of Ospreys



Introduction | Methods | Results | Discussion | Acknowledgements | Works Cited

Food Addition Group



13 of the 16 nests succeeded at 81%.

3 nests failed during the first **1.38** weeks.

Productivity rate - **1.13** young per active nest.

Control Group



5 of 15 nests succeeded at 33%.

10 nests failed during the first **2.2** weeks.

Productivity rate - **0.47** young per active nest.

Ref: Food Supplementation Increases Reproductive Performance of Ospreys in the Lower Chesapeake Bay, Michael Academia of the College of William & Mary, October 6, 2022

Impact to Osprey in the Chesapeake Bay

Food supplementation Increases Reproductive Performance of Ospreys in the Lower Chesapeake Bay, Frontiers and Marine Science - 4/23/23

“Reproductive rates within the control group were low and unsustainable suggesting that current menhaden availability is too low to support a demographically stable osprey population. Menhaden populations should be maintained at levels that will sustain a stable osprey population in which they are able to produce 1.15 young/active nest to offset mortality.”

Michael Academia and Dr. Bryan Watts

<https://www.frontiersin.org/articles/10.3389/fmars.2023.1172787/full>

The Solution

End Atlantic menhaden reduction harvesting in Virginia waters and limit industrial reduction harvesting to 3 nautical miles off the Atlantic Coastline like all of the other Atlantic States

Support for Proposed Recommendation

First, below is an excerpt from the minutes of the Maryland Department of Natural Resources Tidal and Coastal Recreational Fisheries Committee meeting of 6/29/23. This committee represents thousands of recreational fishermen across the State of Maryland:

Motion from Phil Zalesak, Second by Lenny Rudow - The Maryland Delegation to the ASMFC Atlantic Menhaden Management Board needs to put forth a motion which states: The Atlantic menhaden reduction fishery shall be limited to federal waters east of the western boundary of the Exclusive Economic Zone beginning at 3 nautical miles from the Atlantic Coast. No objections, 1 abstention. Motion passes

Second, both New York and New Jersey have greatly improved its striped bass recreational fishery due to ending Atlantic menhaden reduction fishing in their waters.

New York Experience – 3/8/21

FWD: Menhaden

From: George Scocca george@nyangler.com

To: Tom foragematters@aol.com

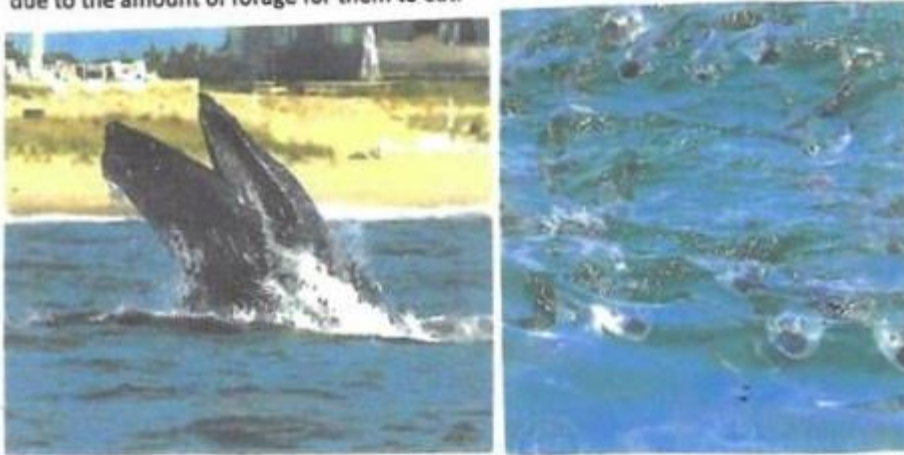
Date: Mon, March 8, 2021 7:15am

Hello Tom:

I am the person that spearheaded the bill that has kept reduction fishing out of NY waters. The changes here have been unbelievable. I can talk about it all day. My single greatest accomplishment in 35 years of fisheries management.

The availability of bunker throughout our season has seen an increase in both charter and party boats carrying anglers to get in on our great striped bass fishery. Bass stick with their food source and this has kept a healthy population of stripers in our waters. It's sparked a number of for hire boats to carry more anglers than ever before.

It has also had a profound effect on our bird population. We now have about 12 dozen nest pair eagles on long island and the osprey population is thriving. All due to the amount of forage for them to eat.



And lets not forget the importance of their filtering our waters.

Thank you.

George R. Scocca
nyangler.com

Check out my LinkedIn profile

"I am the person that spearheaded the bill that has kept reduction fishing out of NY waters . . .

The availability of bunker throughout our has seen an increase in charter and party boats carrying anglers to get in on our great striped bass fishery.

Bass stick with their food source and this has kept a healthy population of stripers in our waters. It's sparked a number of for hire boats to carry more anglers than ever before.

It has had a profound effect on our bird population. We now have about a dozen nest par eagles on long island and the osprey population is thriving."

**George Scocca
Editor, nyangler.com**

New Jersey Experience

Salt Water Sportsmen – 4/27/23

“Jersey politicians did one thing right: Getting the Omega 3 bunker boats out of state waters.

That has allowed a vast biomass of menhaden to proliferate throughout the year in Jersey waters. This draws behemoth bass into the bays, river systems and alongshore to fatten up on omnipresent adult bunker.”

<https://www.saltwatersportsman.com/howto/is-new-jersey-the-new-striped-bass-mecca/>

Backup

Allocation of Atlantic Menhaden on the Atlantic Coast

	<u>Metric Tons</u>	<u># of Fish*</u>
• 2013 and before	No Quota	No Quota
• 2014	169,092	810,391,789
• 2015 – 2016	187,880	900,435,321
• 2017	200,000	958,521,739
• 2018 – 2019	216,000	1,035,203,478
• 2020	216,000	1,035,203,487
• 2021 - 2022	194,400	931,683,130
• 2023 – 2024	233,550	1,119,313,760

* .46 pounds per fish for the reduction fishery (NOAA)

Previous Allocation of Atlantic Menhaden by State

Allocation	Percentage	2021-2022		Fish*
		Metric Tons	Pounds	
Atlantic Coast	100.00%	192,456	424,288,498	922,366,299
Virginia	78.66%	151,392	333,758,803	725,562,616
Reduction Fishery	71.11%	136,858	301,717,958	655,908,605
Chesapeake Bay	26.50%	51,000	112,434,600	244,423,043
Atlantic Ocean	44.61%	85,858	189,283,358	411,485,561
Other States	21.34%	41,064	90,529,694	196,803,683
* .46 pounds per fish				

Atlantic Menhaden Localized Depletion

Migration Pattern

“Atlantic Menhaden largely remained within the same coastal region from June to October.” 2/19/19

Intense Reduction Harvesting

Reduction harvest season begins in May in the Chesapeake Bay until the ASMFC 51,000 metric ton quota is met

References:

<https://www.sciencedirect.com/science/article/abs/pii/S0165783618302844#:~:text=Our%20objectives%20were%20to%20estimate%20movement%2C%20natural%2C%20and,and%20time-specific%20fishing%20mortality%2C%20and%20monthly%20movement.>

https://asmfc.org/uploads/file//5a4c02e1AtlanticMenhadenAmendment3_Nov2017.pdf page v

**Dr. Noah Bressman Assessment
Salisbury University**

“Virginia based menhaden fishery is overfishing the stock in and around the Chesapeake Bay, which is preventing the important forage fish from making its way into the Bay and its tributaries.”

Ref: Dr. Noah Bressman email to Secretary Jeannie Riccio, Maryland Department of Natural Resources, 10/21/2021

Ecological Impact of Localized Depletion on Of Atlantic Menhaden in the Chesapeake Bay (2019)

Key Predators

“A suite of five key predator and prey species were identified from diet data and other considerations (referred to as ERP focal species). Atlantic striped bass, bluefish, spiny dogfish, and weakfish were identified as key predator species of Atlantic menhaden” page iii

<http://www.asmfc.org/uploads/file/6436c5022019AtlMenhadenERPStockAssessmentReport.pdf>
pages iii

Chesapeake Bay Contribution to Coastal Stock (>60%) 2019

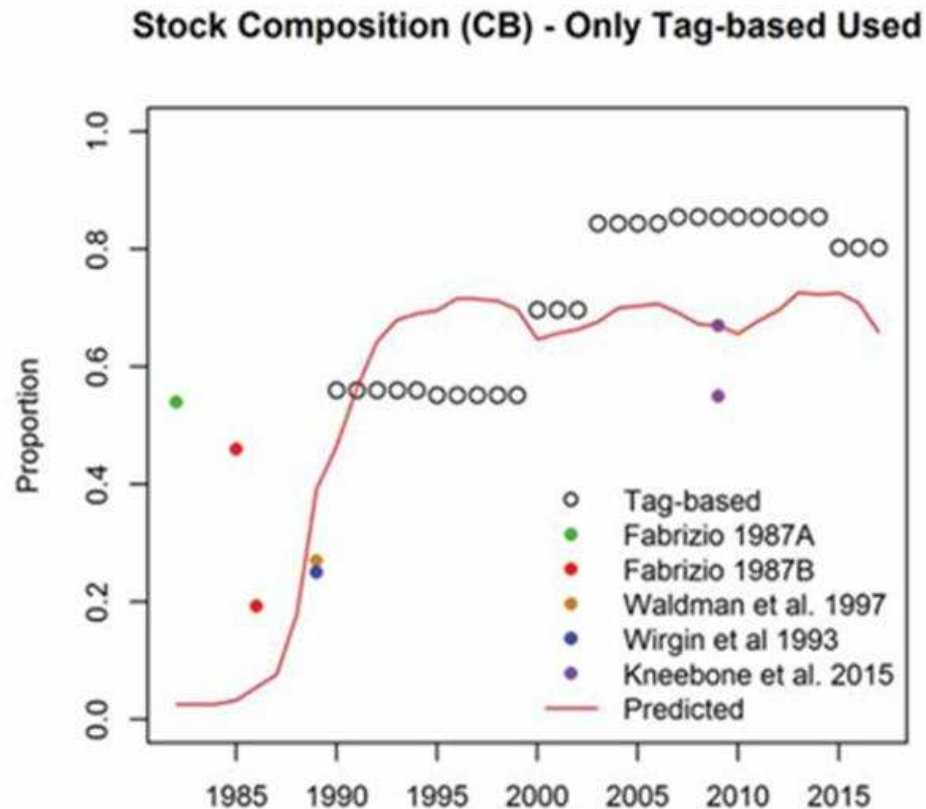


Figure B7.9. Observed versus predicted stock composition for the Chesapeake Bay stock. Literature values not used in the model fitting are indicated by the solid circles for comparison.

Atlantic Coast Economic Impact of Striped Bass (2016)

Commercial GDP: \$103,200,000

Commercial Jobs 2,664

Recreational GDP: \$7,731,600,000

Recreational Jobs 104,867

Comparisons Between the Fisheries

Table R-7. 2016 Comparison of commercial and recreational impacts: North Carolina to Maine

	Commercial Fishery	Recreational Fishery	Total	Commercial Fishery	Recreational Fishery	Total
Pounds landed (000s)	4,978.3	43,731.9	48,710.2	10%	90%	100%
Jobs supported	2,664	104,867	107,531	2%	98%	100%
Income (\$millions)	\$72.7	4,726.0	\$4,726.1	< 1%	>99%	100%
GDP (\$millions)	\$103.2	7,731.6	\$7,731.7	< 1%	>99%	100%

Ref: The Economic Contributions of Recreational and Commercial Striped Bass Fishing, Southwick Associates, 4/12/19

Latest Osprey Status

Michael Academia Email of 6/13/23:

“On June 13, Dr. Bryan and I did a boat survey of 83 nests in Mobjack Bay (Ware, North, and East Rivers). Out of the 83 nests, there were only 3 young (we don't think these nestlings will make it).

What is alarming is that the productivity rate is at 0.04 young per active nest in Mobjack Bay and could be more widespread in the higher salinity zones of Chesapeake Bay. In order for the population to be stable, the productivity rate must be 1.15 young per active nest.”

Chesapeake Bay Model - 5 to 7 Years

Table 1. Comparison of potential approaches for developing a spatially-explicit model for Atlantic menhaden.

Approach	Advice				Data Needs		Timeline***
	Single-spp. CB	Multi-spp. CB	Multi-spp. Regional Allocations	Fine-scale Spatial Dynamics	Possible w/ Existing Data	Add'l data needs	
Coastwide BAM + NWACS-MICE + supplemental Bay abundance	✓					Absolute abundance estimates in C. Bay	5-7 years
Coastwide BAM + NWACS-MICE + Bay indicators	✓*	✓*			✓		5-7 years
Coarse spatial BAM + coastwide NWACS-MICE ERPs	✓**				✓		5-7 years
Coarse spatial BAM + coarse spatial NWACS-MICE ERPs	✓**	✓**	✓		✓	Better diet data for ERP species	5-7 years.
Refined spatial BAM + NWACS-MICE ERPs	✓	✓	✓			Migration at age data for desired regions, better diet data for ERP species	10+ years
Detailed spatial BAM + detailed spatial ERPs	✓	✓	✓	✓		Finer scale data (all types) for ERP species	10+ years

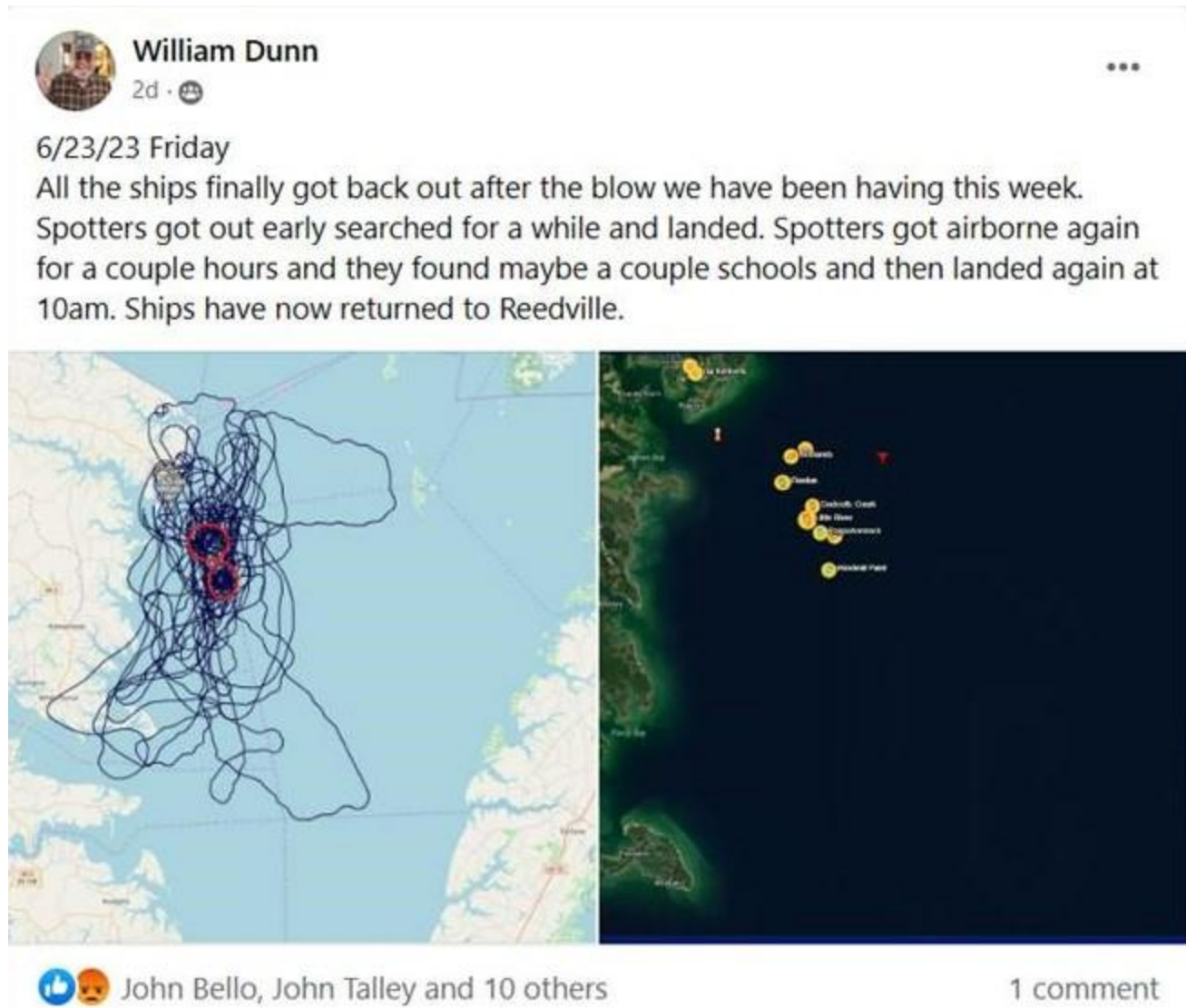
*: This approach would likely provide qualitative, not quantitative, information on Chesapeake Bay Cap

**: Existing data could provide information on MD and VA separately from the rest of the coast, but not Chesapeake Bay itself.

***: These timelines are preliminary estimates and could be revised once model development is underway.

The Latest . . .

- The Atlantic menhaden reduction harvester was having trouble locating Atlantic menhaden in the Chesapeake Bay during May and June as documented on the Facebook page: Menhaden - Little Fish, Big Deal! - <https://www.facebook.com/groups/765772041406313>



Who Supports Ending Atlantic Menhaden Reduction Fishing in the Chesapeake Bay?

MD DNR Tidal and Coastal Recreation Fisheries Committee Meeting – 6/29/23

Motion from Phil Zalesak, Second by Lenny Rudow:

“The Maryland Delegation to the ASMFC Atlantic Menhaden Management Board needs to put forth a motion which states: The Atlantic menhaden reduction fishery shall be limited to federal waters east of the western boundary of the Exclusive Economic Zone beginning at 3 nautical miles from the Atlantic Coast.

No objections, 1 abstention. Motion passes.”

Who Supports Ending Atlantic Menhaden Reduction Fishing in the Chesapeake Bay?

Maryland Legislative Sportsmen's Caucus - 10/21/21

Maryland Senate Joint Resolution 6 - 1/27/2022

Maryland Sierra Club (70,000 members)

Josh Tulkin

ShoreRivers Organization (3,500 members)

Matt Pluta

Solomons Charter Captains Association

Captain Wally Williams

Somerset County Charter Captains

Maryland Recreation Fishing Organizations

Annapolis Anglers' Club

Kevin McMenamin

Atlantic Coast Sport Fishing Association

Buddy Seigel

Frederick Saltwater Anglers

Chris Linnetty

Kent Island Fishermen

Bert Olmstead

Mid-Shore Fishing Club

Tom Wilkinson

North Bay Fishing Club

Stan Cebula

Northwest Fishing Club

Mark Kurth

Severn River Rod and Keg Club

Skip Zink

Southern MD Recreational Fishing Org

Phil Zalesak

Susquehanna Fishing Club

Jim Cappetta

Who Supports Ending Atlantic Menhaden Reduction Fishing in Virginia Waters

Steve Atkinson

- President of the Virginia Saltwater Sportsfishing Association
- SMRFO Member as of 4/7/23

Captain William Pappas

- Virginia charter captain who testified at the VMRC in December
- SMRFO Member as of 5/1/23

Michael Academia, MSc.

- The Center for Conservation Biology
- SMRFO Member as of 4/16/23

Deborah Campbell

- Property owner at Silver Beach, Virginia
- SMRFO Member as of 4/13/23

Tom Lilly

- Resident of Tyaskin, Maryland
- SMRFO Member as of 3/1/21

From: [Tom Lilly](#)
To: [Tina Berger](#); [James Boyle](#); [Spud Woodward](#); [Mel Bell](#)
Subject: [External] Fwd: Will the MD menhaden board delegates protect MD and the bay October 17th?
Date: Monday, October 9, 2023 4:50:10 PM

Tina. Please distribute to the menhaden board and policy board for the Upcoming meeting in NC. Thanks

Sent from my iPhone

Begin forwarded message:

From: Tom Lilly <foragematters@aol.com>
Date: October 9, 2023 at 2:20:04 PM EDT
To: Lynn -Dnr- <lynn.fegley@maryland.gov>, Allison Colden CBF <acolden@cbf.org>, Russel Dize <mjdize@verizon.net>, Josh Kurtz -DNR- <josh.kurtz@maryland.gov>, Hillary Falk <hfalk@cbf.org>, David Goshorn -DNR- <david.goshorn@maryland.gov>, Mel Bell <BellM@dnr.sc.gov>, Robert Beal <rbeal@asmfc.org>, James boyle <jboyle@asmfc.org>, Phil Zalesak <flypax@md.metrocast.net>, Chris Moore <cmoore@cbf.org>, Paul -Dnr- <Paul.Genovese@maryland.gov>
Cc: Tom Lilly <foragematters@aol.com>
Subject: Will the MD menhaden board delegates protect MD and the bay October 17th?

Lynn Fegley, David Goshorn Please distribute this to the delegates to the ASMFC menhaden board meeting October 17th and copy me on that. Please advise receipt of this.

Please also distribute to the TFAC for their meeting tomorrow.

Will the MD menhaden board delegates follow the goals of holistic allocation of Chesapeake menhaden based on equitable distribution to the interest groups under Amendment 3 ? There are hundreds of charter captains and tens of thousands of their clients , food fish watermen, their crews, marinas, there are 250,000 fish boat owners and the jobs they affect and in MD there are over 600 thousand salt water anglers and their children and there are over a million wildlife watchers. There are 73,000 in the MD Sierra Club and Shore Rivers. And thousands in Audubon. Every one of these people would benefit from moving the VA factory fishing into the US Atlantic. This would solve the pollution, bycatch and SAV damage and the fact about half of the menhaden caught in VA would have migrated to MD but was caught. There is no evidence a single job or ounce of quota would be lost by the factory fishing. If necessary they can add capacity to fish in the ocean and pay for it with the 57 million dollars worth of menhaden they are given each year by VA and MD

Amendment 3 requires holistic equitable allocation between the interest groups in the bay. From the poor condition of the two “indicator “ species for the level of the menhaden harvest one interest group is getting almost all of it. The striped bass and ospreys are in reproductive failure. The ERP science says over-harvesting is a primary cause.

Will you delegates raise this long delayed allocation issue for the menhaden board agenda for October 17th? Thank you. Thomas Lilly. 443 235 4465

Sent from my iPhone

From: [Tom Lilly](#)
To: [James Boyle](#); [Katie Drew](#); [Spud Woodward](#); [Mel Bell](#); [Spud Woodward](#)
Subject: [External] Material for ERP work group and staff
Date: Monday, October 2, 2023 2:58:38 PM

James and Katie please distribute this to the ERP menhaden work group and the menhaden board. Please let me know if that will or will not be done. Regards. T.

I suggest to the ERP group that one data point that needs collecting are the juvenile menhaden recruitment in MD and Va that I think have been at chronic lows for twenty years .Based on any stock-recruitment relationship and the lack of movement of the mid-Atlantic stock, this should be a holistic or quantitative indicator of an ocean stock in very poor condition. In my river ,the Wicomico ,on the eastern shore that connects to Tangier sound about 30 miles above the Virginia line 10 years ago we had schools of juvenile menhaden exiting the river in the fall by the thousands . This is what fed our juvenile striped bass , ibises and great blue herons etc. and gave anglers great fishing with small plastics on jigs starting around Oct 1st steady day by day for about six weeks on striped bass up to 18-25 inches. This time we had with friends and grandchildren was my favorite time of the year. Those schools and the fun days began declining sharply about five years ago to about a day or so last year to nothing this year. From what I hear that is happening all over the bay. Respectively, this has gone on far to tar to long. There should be an accounting here . The solutions for this problem are all known , they need to be acted on now,....Now not more years from now, do you agree ? Loosing our juvenile menhaden meant the great blue heron colony that was a part of Whitehaven culture for decades disappeared, the ibises that lined the river at low tide are all gone the river and Tangier sound are quiet and lifeless. People quit fishing- kids quit fishing.

I now know from years experience with the board that they don't listen to the people across the bay that morn the loss of these experiences and friendships that were held together by fishing adventures . I know that because they refused a menhaden board meeting at a critical time in August and are now refusing to give people an adequate time at the October meeting. That speaks volumes. I know they don't care if every blue heron and ibis left the bay and hundreds if not thousands of osprey parents have to decide which baby to feed and which to let starve until they are all gone. And I know they don't care about the hundreds of thousands of children that will never know what healthy bay fish and wildlife would mean to their way of life. I know they don't care about the hundreds of charter captains leaving a family business and the kids that will not be taking their place cause the striped bass fishing is so lousy.

But I do know one thing ,with certainty , that they will protect the factory fishing no matter how much wildlife and people are paying the price and many of them will deny their own ERP science about the cause of striped bass and osprey reproductive failures in doing so

Have a nice meeting. Hopefully this ERP group will do something to prove me wrong.Tom Lilly Whitehaven MD

Sent from my iPhone