CHESAPEAKE LEGAL ALLIANCE

SMRFO

PETITION FOR RULEMAKING BY THE VIRGINIA MARINE RESOURCES COMMISSION REGARDING ATLANTIC MENHADEN, THE CHESAPEAKE BAY, AND THE REDUCTION FISHERY.

On behalf of the Chesapeake Legal Alliance and Southern Maryland Recreational Fishing Organization, along with the undersigned co-petitioners, we hereby submit a petition for rulemaking, pursuant to Va. Code Ann. § 2.2-4007, seeking the Virginia Marine Resources Commission's (VMRC) adoption of the recommendations below. We request that the recommendations be adopted and that the VMRC make specific findings in line with its statutory obligations under Va. Code Ann. § 28.2-203.

A large and growing constituency in the Commonwealth of Virginia and the wider Chesapeake Bay community demands immediate, scientifically-grounded, and enforceable regulatory action to decrease the harmful biological, ecological, and socioeconomic effects that the Atlantic menhaden reduction fishery has and may continue to have on marine ecosystems. Such action is key to the welfare of user groups at sea and on shore that rely upon robust stocks of menhaden and their predators.

While individual states and the Atlantic States Marine Fisheries Commission are considering a moratorium on fishing for striped bass (Maryland instituted one in summer 2023), among the most economically valuable fish on the Atlantic coast and one that is heavily dependent upon menhaden as prey, Virginia is doing little to protect menhaden. At a time when there have never been so many anthropogenic and environmental pressures on these and other stocks, and with mounting evidence of the risks of insufficient fishery management, we call on the Commonwealth to protect menhaden in a way that maximizes benefits for marine wildlife, the Chesapeake Bay ecosystem, and all coastal communities and economies.

Virginia law requires the menhaden fishery to be managed using conservation and management measures that protect both the fishery and the public's interest. Therefore, pursuant to VMRC's obligations and authorities under Va. Code Ann. § 28.2-201, we recommend the VMRC:

1. **Enact a moratorium in the Bay: Set a precautionary moratorium on purse seine landings by the menhaden reduction fleet within the Chesapeake Bay.**
2. **Require no less than 40% of harvest from federal waters: Set a limit of no more than 60% of current purse seine menhaden landings within Virginia waters (approximately 94,000 metric tons).**
3. **Codify a 1-mile shoreline buffer: Establish a permanent 1-nautical mile shoreline buffer along Virginia's shoreline prohibiting the use of menhaden purse seines.**
4. **Fund and implement a menhaden population study: Implement and enhance the Atlantic Menhaden Research proposal to investigate localized depletion and its impacts on the Bay (VIMS, October 1, 2023).**
5. **Establish proper industry oversight: Require increased vessel and landings monitoring and reporting to ensure compliance and reduce bycatch and impacts on Bay habitats.**

TABLE OF CONTENTS

BACKGROUND.

FORAGE FISH: CRITICAL FOOD WEB LINKS.

Forage fish such as herrings, sardines, mackerels, and menhadens are the lifeblood of ocean and estuarine ecosystems and communities, transferring the energy in plankton up the food web to form the foundations of fishing, ecotourism, and coastal economies (Essington et al., 2006). At the same time, forage fish support the largest wild capture fisheries in the world (Pauly et al., 1998). As demand for these fish increases and their populations decrease, entire ecosystems, and the people who rely upon them, experience the cascading effects of this decline. “Scientists … have identified an alarming trend in populations of large predatory fishes in the world's oceans…that up to 90% of all large predatory fish such as cod, sharks, halibut, grouper, tuna, swordfish, and marlin have been depleted” (Myers, 2003).

Forage fish like menhaden are in increasingly high demand worldwide, particularly to feed the growing finfish aquaculture industry. Aquaculture's share of the forage catch has nearly doubled since 2000 (Pauly et al., 2013).

Nearly 90% of global forage fish catch is used by so-called reduction industries that “reduce” them into meal and oil. According to data from the U.N. Food and Agriculture Organization, total world aquaculture production expanded by 609% in annual output from 1990 to 2020, with an average growth of 6.7% per year. Aquaculture now consumes nearly 70% of global fish meal and 90% of fish oil.” - (FAO, 2020; Hilborn et al., 2017; Tacon & Metian, 2008).

Overall, the science suggests that declines in forage fish populations can have significant and far-reaching impacts on both marine ecosystems and human well-being, highlighting the importance of effective management and conservation (Pauly et al., 1998; Essington et al., 2006; Pikitch et al., 2012; Hilborn et al., 2017; Cury et al., 2018; (Kaplan et al., 2013)).

Forage species like menhaden can resist the effects of sustained high harvests, but when environmental conditions, fishing effort, and predation levels change, populations may plummet rapidly and become perilously less able to recover (Jacobsen & Essington, 2018), leading to: declines in abundance, distribution, and resilience of forage populations; localized depletion of the target species and their dependent predators; food insecurity in communities dependent on wild-caught forage and their predators; reduced food availability for predators of commercial and recreational value; reduced opportunities and revenue for other dependent industries; and overall undermined ocean and estuarine ecosystem resilience (Nissar et al., 2023).

Industrial-scale forage fishing has also been linked to the release of toxic industrial wastes and other marine pollution (*e.g.*, plastics); bycatch of non-target species, such

as prized red drum & Spanish mackerel and protected species like marine mammals and turtles; and habitat destruction of nursery areas like seagrass meadows.

Some combination of these effects commonly exists in places where forage fisheries occur at scale. Worse, impacts can be additive, broadly affecting ecosystems and people who rely upon them for their livelihoods, food, recreation, culture, and other benefits known in the scientific community as “ecosystem services.”

Forage species like menhaden have never faced so many simultaneous anthropogenic, ecological, and environmental threats. The oceans continue to change due to warming waters, acidification, intensifying storms, shifting food availability, and other emerging threats like plastic pollution and contamination from personal care products and pharmaceuticals.

ATLANTIC MENHADEN.

Ecosystem and human values.

The Atlantic menhaden (*Brevoortia tyrannus*) is a forage fish vital to the Chesapeake Bay (Cuker, 2020). It not only supports the largest fishery in the Bay but also plays a crucial role in the Bay's food web by filtering plankton, recycling nutrients, and serving as prey for predator fish, marine mammals, and seabirds (Cuker, 2020).

Menhaden are famously called “the most important fish in the sea,” and over the past few decades, substantial evidence has emerged to support that claim. They play an outsized role in food webs, consuming plankton that they convert into the energy that feeds many iconic predators. Models demonstrate, too, that menhaden are not only among the most important prey items by number for many predators (Buchheister et al., 2017), but also among the most nutrient-rich. Menhaden is a prime example of why ecosystem-based fisheries management (EBFM) is necessary: there have been calls for managing the menhaden population as a key ecosystem component for decades.

Data alone can’t tell the story of the importance of menhaden: the boom-and-bust nature of their population changes are accompanied by large swings in the presence and behavior of predators and other forage species. From humpback whales gracing New York Harbor to pockets of recovered osprey populations to striped bass and tuna feeding blitzes, many people know what abundant menhaden populations can bring–and the effects of their regional and local declines. Despite the growing abundance of data and tailored management mechanisms that focus on optimizing the benefits menhaden provide:

- There is grave concern as to the efficacy of agency management;

- Annual commercial harvests by the reduction fleet often top 1 billion pounds per year, and are concentrated in the Chesapeake Bay, a key nursery to menhaden and foraging ground for many of its predators; and,
- There are concerns related to the health of the menhaden population (*e.g.*, diminished geographic distribution, average size-at-age, and age-to-maturity) and their dependent predators.

Industrial menhaden fisheries.

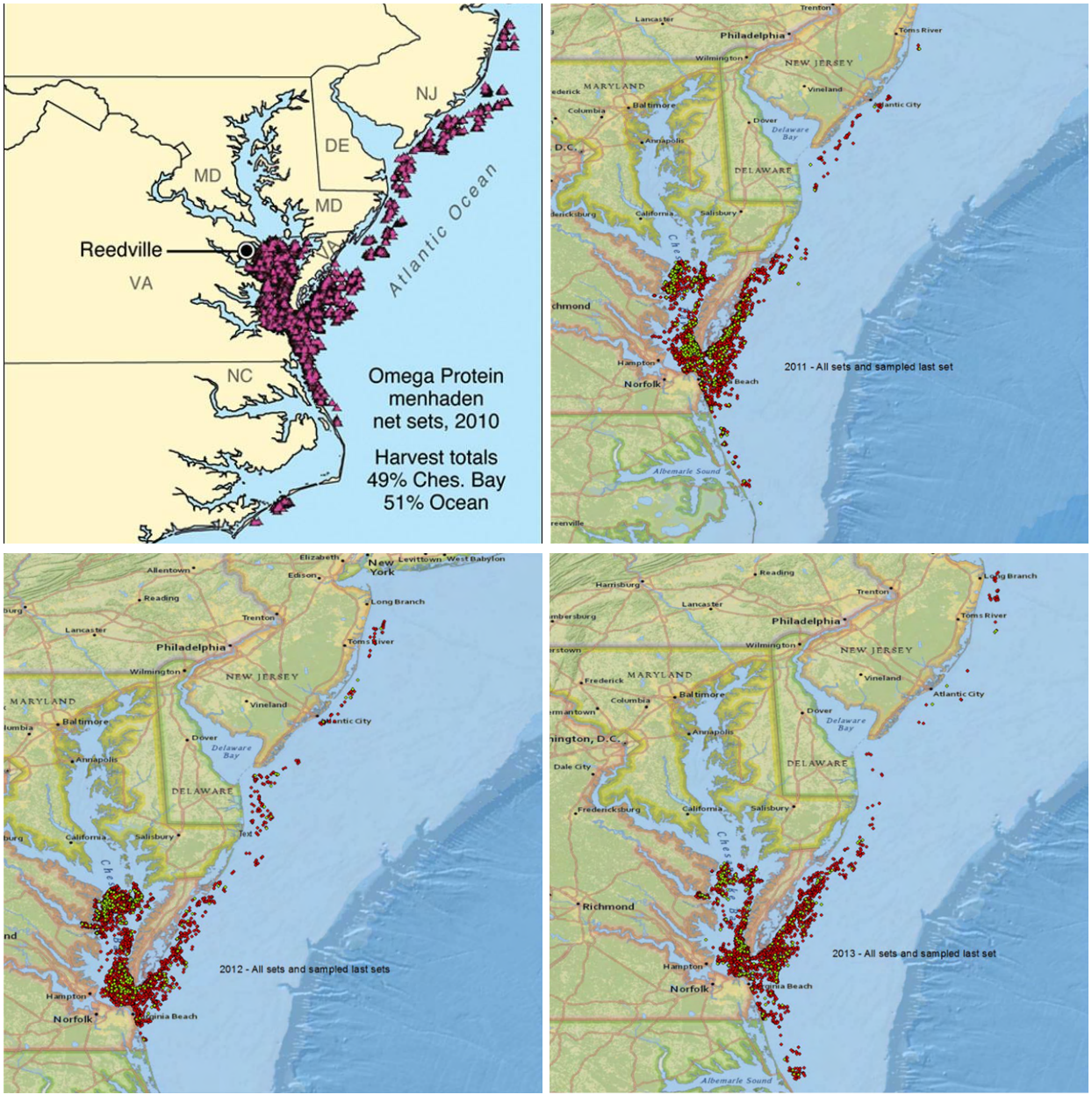
The Atlantic menhaden commercial fishery consists of a purse-seine reduction sector, which captures fish to produce fish meal and oil, and a bait sector that provides bait to support other commercial and recreational fishing. The management mechanisms in place for Atlantic menhaden are primarily governed by the Atlantic States Marine Fisheries Commission (ASMFC), with state-level authority of the 15 coastal states, NOAA Fisheries, and the U.S. Fish & Wildlife Service all coming into play on the ASMFC's Menhaden Management Board (MMB). The MMB oversees development and implementation of fishery management plans that include restrictions on catch volume and location, allocation, and more. Ongoing data collection, stock assessments, and collaboration among states play a crucial role in shaping management strategies.

Virginia is the key Atlantic state for the future of menhaden: it is where the vast majority of Atlantic menhaden are caught. Until recently, Virginia was the only Atlantic state that managed the fishery through its legislature and not its state natural resource agency, the Virginia Marine Resources Commission (§ 28.2-201. Authority of Commission to Make Regulations, Establish Licenses, and Prepare Fishery Management Plans; Accept Federal Grants; Enforcement; Penalty for Violation of Regulation, n.d.). This recent change was seen by many as a potentially substantial turning point (Bulletin, 2020; Menhaden Changes in Virginia, 2020), as it was expected to result in diligent oversight and meaningful management of the fishery, ushering in a new period of sustainability. Alas, as this petition will show, the VMRC has not yet begun to implement meaningful management efforts.

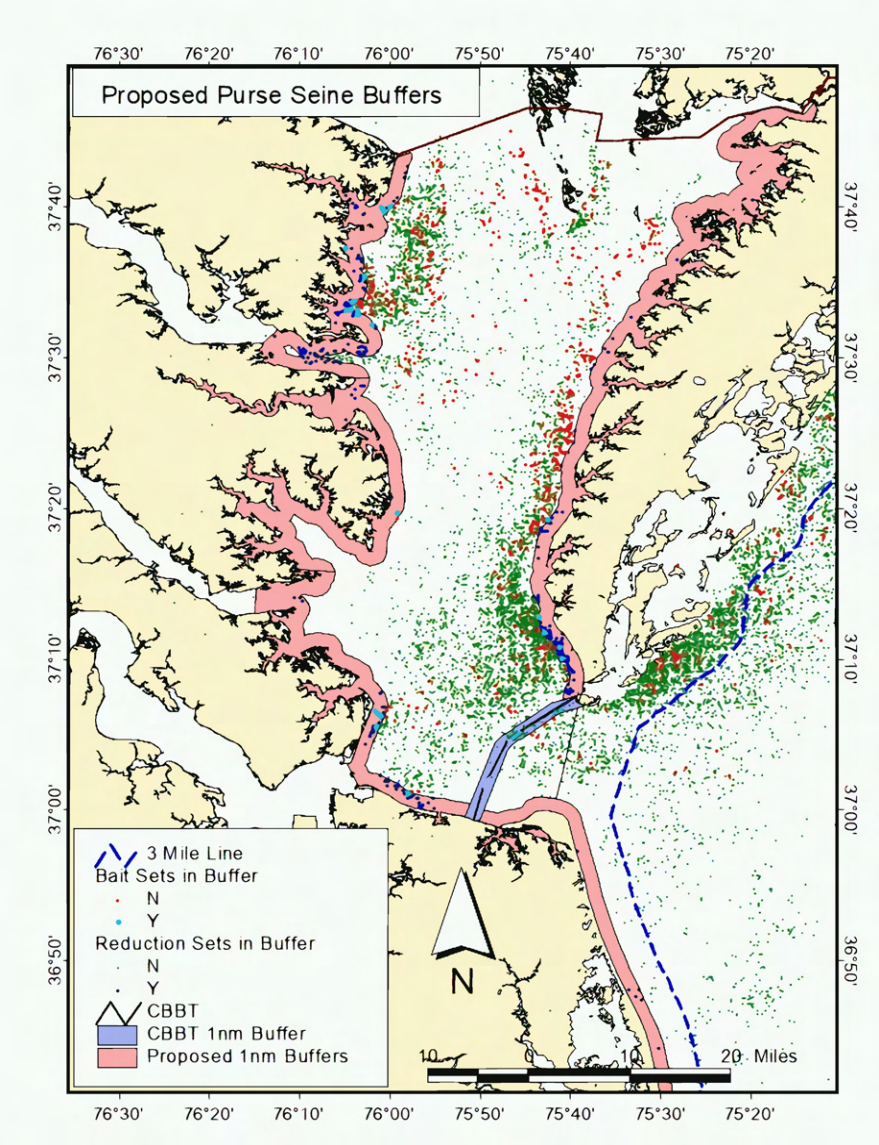
Distribution of menhaden fishing activity.

Fishing activity for menhaden coastwide occurs mostly within 3 nautical miles of the shore. Fishing is year-round, but there are concentrated peaks from May to September in Virginia and from November to January farther south. Most of the fishing by the reduction fleet takes place in the Virginia portion of Chesapeake Bay and along ocean beaches. In Chesapeake Bay, most fishing takes place in the Bay's main stem. During the summer, the reduction fleet sometimes goes as far north as just off New York Harbor. Purse-seining for reduction purposes is prohibited by state law in every Atlantic coastal state except Virginia, so purse-seine sets in the ocean are by definition more than 3 nautical miles from shore (NOAA Fisheries, 2021).

Limited spatial data are available for the fishery as public reporting of net set locations and corresponding landings amounts is not required. Based on the few available maps, there is evidence that a substantial amount of net sets and landings occur in federal waters beyond 3 nautical miles. It's worth noting that 2011 landings, as reported by NOAA Fisheries staff, were approximately equivalent between the Chesapeake Bay and the ocean. This would suggest that the fleet should be capable of adapting to reduced landings in the Bay and focus more of their effort in federal waters without losing opportunities to meet their catch limits.



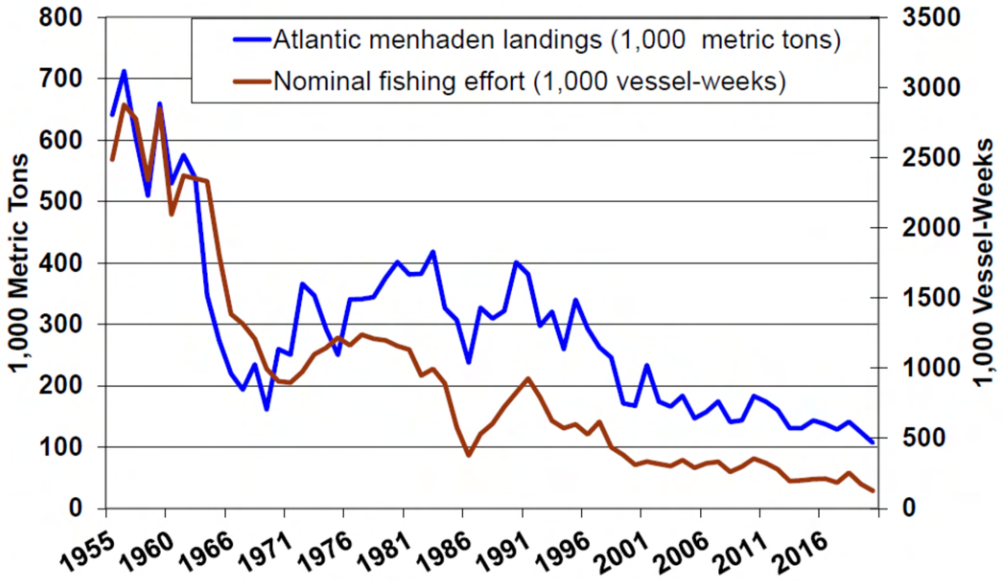
Sources: Top left: Joseph Smith, NOAA Fisheries (2011);
Top right to bottom right: Figures 4.1.3.4.1 - 4.1.3.4.3 in
(SouthEast Data, Assessment, and Review, 2015). Images cover the years 2010-2013.



Source: Figure 1 from (Virginia Marine Resources Commission, 2022)

Reduction fishery fishing practices. The reduction fishery uses purse seine nets made of nylon fiber around 1,000-1,400 feet long, with a depth of 65-90 feet and a stretched mesh size of about 1.75 inches. The net is the size of several football fields and is deployed for approximately 35-45 minutes before it is closed. The mothership vessels range from about 150-200 feet long and carry two smaller purse seine boats measuring about 40 feet long. Schools of menhaden are located by spotter planes that can cover wide swaths of the Bay and ocean in short order; the pilots direct both mothership and "purse boats" to the school. The purse boats are then deployed to encircle the schools. The net is closed around the school by a purse line; the mothership is then able to insert a large-mouthed vacuum tube into the nets to suck menhaden–and other items caught in the net–into its high-capacity hold (NOAA Fisheries, 2021).

Landings by the reduction fleet have declined substantially over time, as shown graphically below. This has occurred for a variety of reasons, including geographical contraction of the stock, which led to the closure of many reduction factories located north of the Chesapeake Bay due to a scarcity of fish (Michelson, 2022).



Source: (GlobalTRUST, 2023)

Menhaden and the Chesapeake Bay.

Although the "Chesapeake Bay is believed to be the most important nursery for Atlantic menhaden along the U.S. east coast" (VIMS, 2023) based on decades of science and on-the-water experience (see also SouthEast Data, Assessment, and Review (2015)), the structure and abundance of the Atlantic menhaden stock in the Bay are not well understood because of a lack of scientific surveys, the reduction fishery's confined geographical range (Liang et al., 2020), and the lack of publicly available reduction fishery landings and effort data. In response to public concerns, in a precautionary move, the ASMFC implemented a limit of 109,020 metric tons for the purse-seine reduction fishery in the Chesapeake Bay in 2006. Despite the ASMFC's stock assessment indicating that the coastwide stock was not overfished or experiencing overfishing, this measure was taken as a precautionary step to address ecosystem concerns (ASMFC, 2006). The cap was reduced to 87,216 metric tons in 2013 and to 51,000 metric tons in 2020.

"The 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." - Dr. Noah Bressman, Salisbury University

Signs of concern: menhaden.

Despite their reported healthy Atlantic coastwide stock status, there are numerous concerning signs evident in their population dynamics:

- Reduced menhaden size-at-age. Research by Dr. R. Eugene Turner revealed that menhaden are experiencing a reduction in body weight, length, and overall size due at least in part to fishing pressure and rising ocean temperatures, declining in body size by approximately 15% over the past 65 years. He noted that "Smaller sized fish of the same age will appear as fishing pressure increases, and fish maturation may accelerate. … The effect of the fishing, if present, can be reversed, whereas the consequences of temperature changes are permanent for now, and anticipated to increase" (Turner, 2017). A published response (Schueller et al., 2018) by NOAA and university staff called some of Turner's findings into question, but data and experience would suggest that this is a very real and concerning trend, evidenced, for example, by the disappearance of large menhaden (Smith & O'bier, 1996).
- Reduced menhaden age-at-maturity. Menhaden stock assessments (SouthEast Data, Assessment, and Review, 2015, 2020) show that menhaden are reproducing at earlier ages than ever before, which raises concerns about their reproductive capacity. Warming ocean temperatures and decades of intense fishing pressure are believed to be responsible for this shift. According to NOAA, Menhaden off the Atlantic Coast are now reaching sexual maturity at an age of 2-3 years, while previously, they did not reproduce until they had reached four years old. This development makes the species more vulnerable to overfishing, as younger, smaller fish are more likely to be caught in nets and make it more challenging for them to maintain a viable population. Plus, older fish produce vastly more spawn.
- Reduced menhaden range. Atlantic menhaden once were common in spectacular oil-slick-producing schools from northern Florida to Canada, but have contracted in distribution over time to the mid-Atlantic (Liang et al., 2020), and more recently, to southern New England and the Gulf of Maine. There have been multiple periods of coastwide population declines over time, often accompanied by closures of reduction plants and corresponding commercial fishery shifts to other sensitive forage species.

"A ban on fishing for the reduction industry could bring the population back to historic levels within a few years, given the very high reproductive capacity of menhaden and the excessive phytoplankton populations that plague the Bay. A return to super abundance of menhaden could help reduce algal concentrations as well as fuel the expansion of populations of the many species of fish, and birds, dependent on this oily fish." - (Cuker, 2020)

A key additional consideration relates to the fact that the ASMFC assumes that there is constant and complete communication (connectivity) among regional populations of Atlantic menhaden, including the Chesapeake Bay, treating the entire Atlantic coast menhaden population as a single stock (ASMFC, 2017). However, a recent published study modeling menhaden regional populations indicates that dispersion and communication among regional populations is limited, and where it does occur, is concentrated within only a few months (Liljestrand et al., 2019). Similarly, this assumption of perfect distributional ubiquity ignores the documented migration patterns of menhaden, leading to potential over- or underestimations of population dynamics. In actuality, there may be limited mixing or migration between different regions of Atlantic menhaden. In the context of the Chesapeake Bay, factors such as seasonal replenishment, age/size cohorts, and variations in menhaden distribution throughout the Bay (north/south) may play a more significant role in the population structure and movement than what is currently assumed by the ASMFC. By considering these factors more accurately, fisheries management can better account for the unique characteristics of the Chesapeake Bay's Atlantic menhaden population and improve long-term sustainability and conservation efforts.

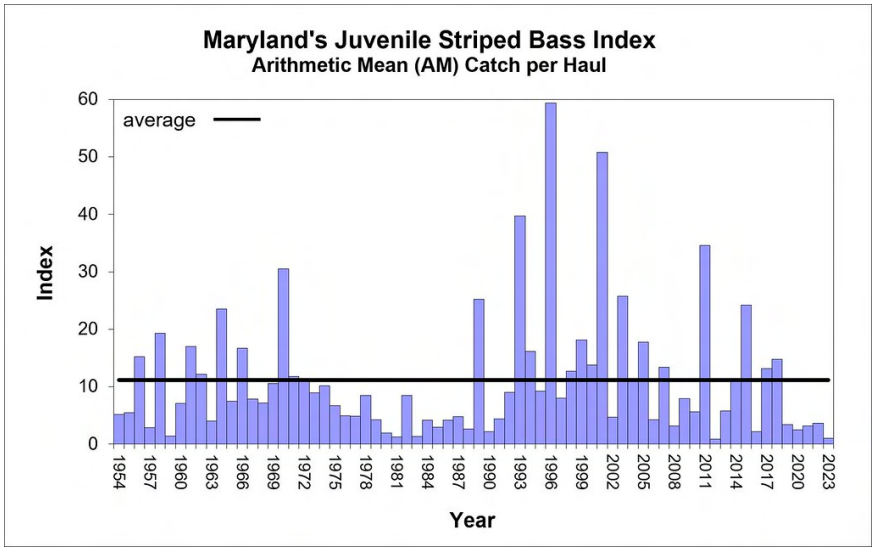
We request a response from VMRC regarding the foregoing conclusion that the menhaden fishery has and continues to experience declines within the Chesapeake Bay region, including the justification and analyses for any responsive actions or inaction.

"The number of large striped bass, I'm talking about 25-30 pounds and up, is 100% related to the amount of [menhaden] that are in the area. You are not going to find a lot of 40 pound fish hanging around unless there are [menhaden] for them to eat ... You raised the quota this year (for [menhaden]) ... and I haven't seen a pod of [menhaden] in months." - T.J. Karbowski, Charter Captain

Signs of concern: other species.

Similar concerning trends exist for other species in the Chesapeake Bay and along the Atlantic coast.

Striped bass. Inarguably among the most important fish in the Bay for the multitude of sectors of the economy that they support, striped bass populations in recent years have witnessed a concerning decline. These declines recently reached such a significant level (*Chesapeake Bay 2023 Young-of-Year Striped Bass Survey Results Announced*, n.d.) that the Maryland Department of Natural Resources submitted emergency regulations in late November 2023 to protect the species' spawning population (Maryland Department of Natural Resources, 2023b).

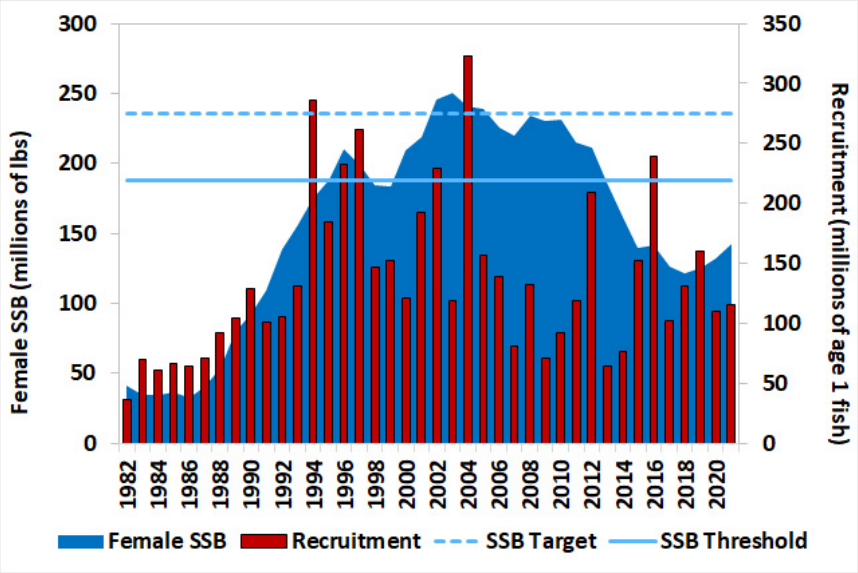


Source: (Maryland Department of Natural Resources, 2023a)

The striped bass story is similar in Virginia. Researchers at the Virginia Institute of Marine Science (VIMS) observed a poor year class of young-of-year striped bass in Chesapeake Bay tributaries in 2023, according to their ongoing long-term survey. The VIMS Juvenile Striped Bass Seine Survey recorded a mean value of 4.26 fish per seine haul, significantly lower than the historic average of 7.77 fish. This drop in annual recruitment aligns with patterns seen in the long-term monitoring program. Since the end of the striped bass fishing moratorium in 1990, single years of low recruitment in Virginia waters have occurred about every ten years, with the last instance in 2012, but multiple consecutive years of recent declines have persisted (Virginia Institute of Marine Science, 2023). This most recent finding follows coastwide declines that began in earnest in 2012.

Multiple factors have contributed to this decline, including overfishing, habitat loss, and poor water quality. The ASMFC has recognized the severity of the issue and has implemented regulations to achieve striped bass population recovery (Atlantic States Marine Fisheries Commission, 2023). Additionally, research conducted by the University of Maryland Center for Environmental Science (UMCES) suggests that climate change, specifically rising water temperatures and extreme weather, may also be impacting the survival and reproduction of striped bass (Bailey & Secor, 2016). In the past, adult striped bass would annually migrate to the Chesapeake Bay during April and May for spawning, coinciding with the abundance of zooplankton and other microscopic food sources crucial for larval striped bass survival. However, recent winters characterized by below-average snowfalls have resulted in reduced snowmelt in rivers and streams, negatively impacting the spawning environment for striped bass. Additionally, research suggests that warmer winters are causing changes in spring zooplankton production in the Chesapeake Bay, which could potentially impact the survival of juvenile striped bass and many other species.

Atlantic Striped Bass Female Spawning Stock Biomass and Recruitment
Source: Atlantic Striped Bass Stock Assessment Update, 2022



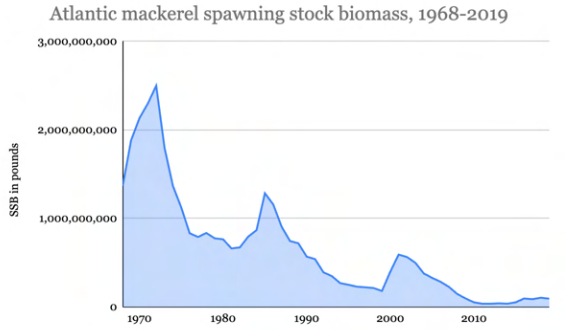
Source: (Atlantic States Marine Fisheries Commission, 2022)

- Despite these challenges, historical data indicate that under favorable environmental conditions, the striped bass population has shown the ability to rebound quickly (CBF, 2021; UMCES, 2020). Historical data reveal that favorable environmental conditions, such as abundant winter snowfalls or increased spring rainfalls, have played a role in supporting more productive juvenile striped bass classes. In 2023 in the Chesapeake Bay, not only striped bass but also other anadromous species with similar spawning behavior, like white perch, yellow perch, and herring, have witnessed below-average reproduction (Maryland Department of Natural Resources, 2023a).

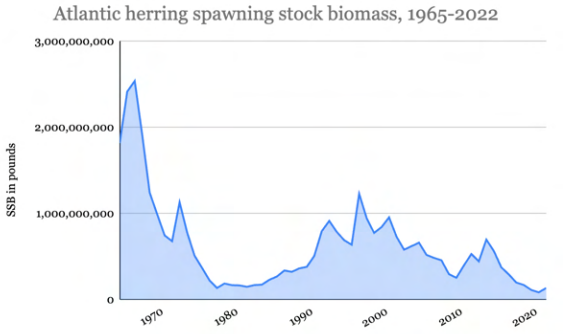
Other forage fish. Along the Atlantic coast, evidence shows that other forage fish populations have suffered steep declines, measured both by their declining population levels and harvests. Some of these species have historically been the focus of large-scale commercial fishing operations, while others have been incidentally caught as bycatch. This increased fishing pressure, combined with other ecological and environmental variables, has led to marked decreases in populations, with some species reaching historically low levels.

As a result of these declines in availability, commercial fishing companies along the Atlantic coast have turned to never-before-targeted species like chub (Mid-Atlantic Fishery Management Council, 2023), bullet, frigate mackerels (South Atlantic Fishery Management Council, Dolphin Wahoo Committee, 2018), and thread herring (Lund's Fisheries, Inc, H&L Axelsson, Inc & Axelsson Seiner, Inc Port of Cape May, NJ, 2021).

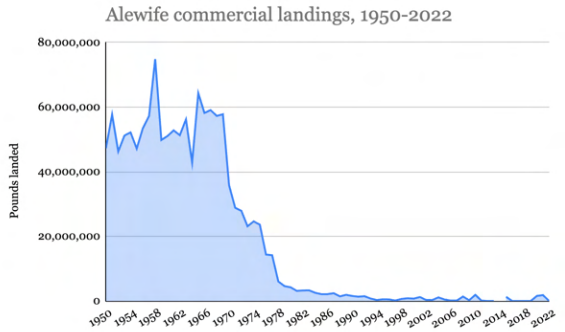
Atlantic mackerel (*Scomber scrombus*): overfished & overfishing (Source)

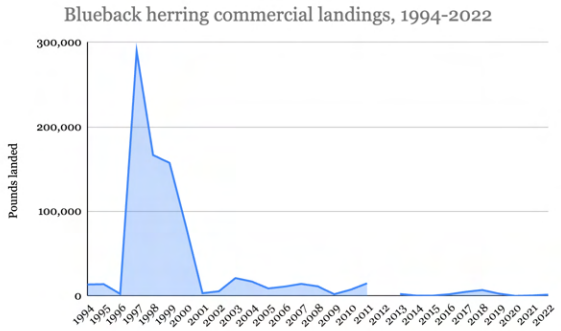


Atlantic herring (*Clupea harengus*): overfished (Source)

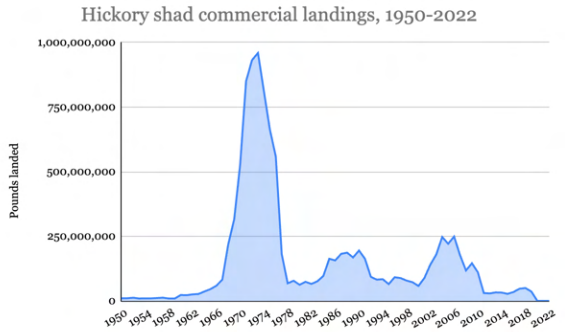


River herrings (Alewife (*Alosa pseudoharengus*) and Blueback (*Alosa aestivalis*)): Depleted at near historic lows on a coastwide basis (Source)





Shad (Hickory (*Alosa mediocris*) and American shad (*Alosa sapidissima*)): coastwide populations are depleted (Source)



"If we fail to account for the role of forage fish in the ecosystem, we can suffer very detrimental consequences. It happened with anchovies off Peru, which at one point represented 10 percent of the entire world's catch." - Dr. Ellen Pikitch, Stony Brook University

The decline of other forage fish populations has a significant interrelation with menhaden. Many economically and culturally valuable finfish predators such as striped bass, tunas, other highly migratory species, sharks, bluefish, along with marine mammals and seabirds, are capable of "prey switching." This is when they can change their primary food source(s) if it/they becomes less available. However, when multiple forage species experience a decline, predators' potential to find ample and calorically sufficient food is reduced. Consequently, the decline in diverse prey species can limit the efficacy of prey-switching.

A decline in menhaden and their critically important predator striped bass led to the first interstate catch limit on menhaden in 2006. However, this restriction only applied to the Chesapeake Bay, a key nursery for striped bass. It wasn't until 2013 that the ASMFC implemented the first-ever coastwide catch limit, effectively reducing allowed landings by 25% from the prior year. This decision resulted in significant rebounds of menhaden populations for several years. In response, many stakeholders, including fisheries scientists, conservation organizations, coastal businesses, and individuals, have urged the VMRC to follow suit to ensure sustainable menhaden populations to support wildlife, fishing, ecotourism, and coastal economies.

We request a response from VMRC regarding the foregoing conclusion that declines in the menhaden fishery has led to declines in reliant species, including the justification and analyses for any responsive actions or inaction.

Economic impacts.

"I have seen very few [menhaden] for striped bass … We're in the middle of a fall run, I operate a 36-foot charter boat … I carry 6 passengers who like to harvest and eat striped bass. I do consider my passengers to be underrepresented. They are not aware of the means to voice their opinion on striped bass. And today we have beautiful conditions, light winds, no rain finally, and my boat is sitting at the dock because I don't have any trips. There are seven other charter boats in the harbor; they don't have trips either and one party boat as well … Right in the middle of the fall run we cannot get our boat off of the dock … This has strong implications for our business. It has great impact to us as operators and owners, our mates, marinas, their mechanics, their fuel docks, local businesses, hotels, and delis." - Michael Pirri, Charter Captain

Annually between 2011 and 2018, around 700,000 anglers participated in saltwater recreational fishing in Virginia, adding $465 million to the state's economy and generating 6,504 jobs (NOAA Fisheries, 2022). The majority of the sportfishing and boating industry–over 90% of them small businesses–form the economic backbone of Virginia and Chesapeake Bay coastal communities.

Recreational fisheries, such as the striped bass fishery are crucial contributors to Virginia's economy and support a multitude of fishing-dependent businesses within the industry. Striped bass, the most significant marine recreational fishery in the U.S., generates $166 million in recreational fishing activity exclusive to Virginia. Nevertheless, the economic value of striped bass fishing in Virginia has seen a decline of more than 50% over the past ten years (Southwick Associates, 2019).

Anglers and boaters contribute substantially to conservation and habitat restoration efforts through their payments for licensing fees and excise taxes via the Sport Fish Restoration and Boating Trust Fund. In 2021, $399 million was allocated to the states for fishery conservation programs, resulting in $6.26 million specifically for conservation programs in Virginia, funded solely by the collective efforts of anglers and boaters.

By comparison, NOAA Fisheries data on commercial menhaden landings in Virginia show that revenue generated between 2011 and 2021 ranged from a high of $57 million in 2020 to a low of $25 million in 2013 (NOAA Fisheries, 2022). A study completed in 2017 shows the total economic impacts (direct, indirect, and induced) of the reduction sector using 2015 purse seine landings of 311 million pounds to be $88 million, which includes about $23 million in earnings and total employment of 528 people (which includes baseline and additional employment) (John Whitehead, 2017).

The cost to fish for menhaden varies depending on the vessel and its usage. Vessels over 70 gross tons using purse seines, which encompass all nine "mothership" vessels

utilized by the reduction fleet (GlobalTRUST, 2023), pay a maximum of $996 annually for a Virginia commercial fishing license. The smaller bait fishery vessels in the fleet, numbering around 20 purse boats under 70 gross tons, have an annual license cost capped at $249 (Virginia Register of Regulations, 2009). This adds up to a maximum of approximately $14,000 in yearly vessel license fees for the reduction fleet. For perspective, the reduction industry in Virginia harvests approximately three quarters of a billion fish, each year. The value of this public resource is many orders of magnitude greater than the fees paid by a private company.

On the other hand, an annual saltwater recreational fishing license for Virginia residents is priced at $12.50. Using conservative calculations (not considering the more expensive $25/year cost for out-of-state licenses), based on the average number of total anglers fishing in Virginia from 2011-2018 (NOAA Fisheries, 2022), the overall license fees amount to about $8.75 million.

The implications of this enormous discrepancy suggest that the Virginia public essentially subsidizes the extraction of this crucial forage fish for an industry that generates financial benefits for a foreign-owned company and precludes benefits such as fishing opportunities and cleaner water for Virginians.

We request a response from VMRC regarding the foregoing conclusion that the declines in the menhaden fishery have led to economic harm to related industries, including the justification and analyses for any responsive actions or inaction.

APPLICATION OF PRECAUTIONARY MEASURES.

"Jersey Politicians did one thing right: Getting the … [menhaden] 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 along shore to fatten up on omnipresent adult [menhaden] ." - Nick Honachefsky, Executive Producer & host of The Saltwater Underground (on why New Jersey has become the new East Coast hotspot for striped bass fishing)

Mismanagement of menhaden represents a threat to entire ecosystems. The local collapse of menhaden can have far-reaching impacts on dependent industries such as commercial and recreational fishing, affecting jobs, revenue, and livelihoods, as well as ecotourism activities that rely on healthy and diverse marine ecosystems. Decades of science and on-the-water experience reveal that it is essential to manage forage fish populations differently than predators to ensure their sustainability and preserve the integrity of marine food webs.

Precautionary approaches may be implemented in forage fishery management using any combination of scientifically supported strategies. These can be applied spatially (such as by maintaining a minimum distance from shorelines), temporally (like avoiding fishing during specific life history stages), and quantitatively (by setting catch limits that intend to offer various benefits to different users).

Spatially and temporally explicit management measures are needed to achieve optimum yield,[1] including rebuilding the resource where it has declined (*e.g.*, South Atlantic states), where it is under high fishing pressure (*e.g.*, Chesapeake Bay), and where the stock is shifting in abundance and distribution (*e.g.*, New England) and in the interest of minimizing user conflicts precipitated by the reduction fishery, which were identified throughout ASMFC's Amendment 3 to the Interstate Fishery Management Plan for Atlantic Menhaden process and in prior and subsequent actions (Atlantic States Marine Fisheries Commission, 2017). These management strategies are already reflected in both federal and state laws, including Virginia fisheries law. The VMRC not only has the obligation to manage the menhaden fishery pursuant to the mandated conservation and management measures (Va. Code Ann. § 28.2-203), but the authority

[1] The Magnuson-Stevens Act (MSA) provides the legal framework for the application of optimum yield, which is required as part of MSA's National Standard 1: "… conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield (OY) from each fishery for the U.S. fishing industry." OY is defined as "the amount of fish that will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems; that is prescribed on the basis of the maximum sustainable yield (MSY) from the fishery, as reduced by any relevant economic, social, or ecological factor; and, in the case of an overfished fishery, that provides for rebuilding to a level consistent with producing the MSY in such fishery. OY may be established at the stock or "stock complex" level, or at the fishery level. OY has been increasingly adopted by fishery managers in the U.S., and has been codified in case law (50 CFR § 600.310 - National Standard 1—Optimum Yield).

to promulgate those rules necessary to carry out those mandates (Va. Code Ann. § 28.2-201).[2]

"Hundreds of millions of dollars have been invested in improving the water quality in the Chesapeake Bay ... the people in Virginia are promised fishable and swimmable waters ... These achievements will mean nothing if the keystone marine species such as menhaden are depleted from the Bay ... I am here today to ask the VMRC to do its part to protect the fishery resources for the benefit of all the citizens and the wildlife of the Bay watershed. It is abundantly obvious the industrial reduction fishery operated ... in Reedville, Virginia, the only reduction fishery in the Chesapeake Bay, is drastically depleting the available food supply for economically important species such as striped bass and ecologically important species such as osprey..." - Roberta Kellum, former Virginia State Water Board Control member.

PRECAUTIONARY CATCH LIMITS.

Recommendation 1:
Establish a moratorium within the Chesapeake Bay.

"My request for you today is to initiate a moratorium on [the] menhaden reduction fishery for the year 2024 and in continuation until the Commission can review the marine scientist menhaden report in the Chesapeake Bay as directed by the Virginia State Senate." - Tom Burkett, University of Virginia, Virginia Coast Reserve LTER.

In the interest of establishing precautionary limits for recovery of the Chesapeake Bay menhaden populations and dependent predators and user groups there, we recommend a moratorium on Chesapeake Bay purse seine landings within the

[2] Virginia fisheries law closely resembles the MSA, providing a nearly identical framework for conservation and management measures, which must be applied to the menhaden fishery (Va. Code Ann. § 28.2-203). These required standards mandate that the agency shall: 1. prevent overfishing while achieving the optimum yield; 2. be based upon the best scientific, economic, biological and sociological information available; 3. to the extent practicable, an individual stock of fish shall be managed as a unit throughout the territorial waters of the Commonwealth, and interrelated stocks of fish shall be managed as a unit or in close coordination; 4. not discriminate among user groups, and allocation shall be (i) fair and equitable to all fishermen; (ii) reasonably calculated to promote conservation; and (iii) carried out in such manner that no person acquires an excessive share of such privileges; 5. promote efficiency in the utilization of fishery resources, except that no such measure shall have economic allocation as its sole purpose; 6. take into account variations among, and contingencies in, fisheries, fishery resources, and catches; 7. where practicable, minimize regulatory burdens which inhibit innovation, expansion, and normal business operations.

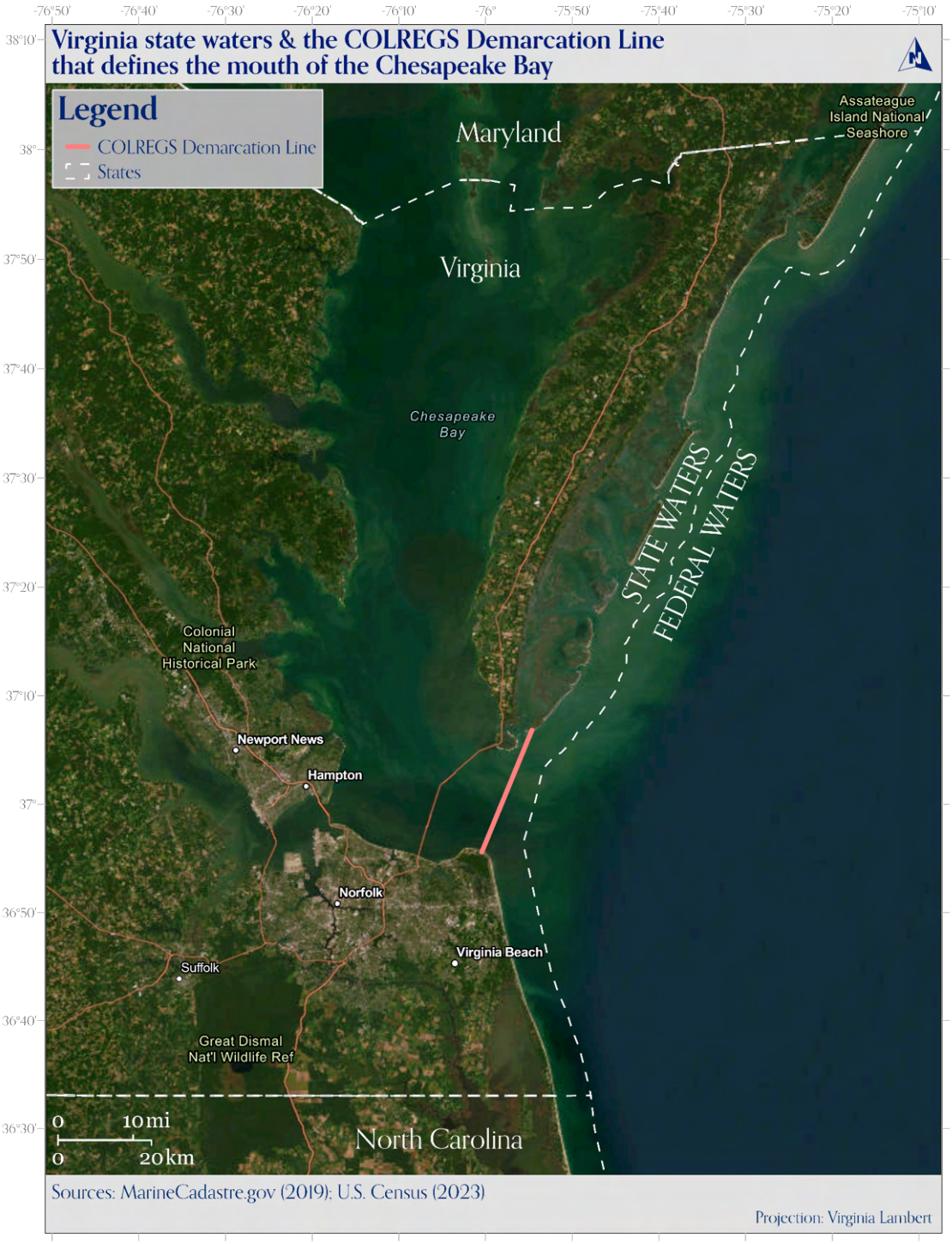
Chesapeake Bay extending to the COLREG Demarcation Line that separates the Chesapeake Bay entrance from the Atlantic Ocean (33 CFR 80.510, Chesapeake Bay Entrance, VA). This reduction should remain in force unless and until reliable, methodologically sound, Bay-wide estimates of menhaden stock abundance within the Bay are available that yield information to set appropriate biologically and ecologically based spatiotemporal catch limits. Spatiotemporal catch limits should also contemplate sustainability of important predators such as striped bass, bluefish, and ospreys, based on the best available science and broadly agreed-upon principles of ecosystem-based fishery management.

To acknowledge the practical realities of fishing, we recommend a limited exception to the moratorium, aimed at addressing safety concerns related to fishing in federal waters under extreme weather conditions. In such circumstances, we recognize the potential need for limited purse seine landings within the Bay; such emergency operations should not exceed 10% of the current Bay cap (5,100 metric tons).

Recommendation 2:
No less than 40% of the harvest should be taken from federal waters.

"Precautionary management that minimizes risk of collapse of the menhaden resource is critical to the wellbeing of the Bay, its fisheries, and water quality." - (Ed Houde, Eric Annis, Kevin Friedland, Cynthia Jones, Raemarie Johnson, Alexei Sharov, Joe Smith, Braddock Spear, Jim Uphoff, Doug Vaughan, Marek Topolski, Alesia Read, Jonathan Kramer, Shannon Green, Jessica Smits, 2011).

In addition, to limit the potential and actual negative consequences of high fishing pressure for menhaden on the menhaden population, their predators, and other marine wildlife in and around what is among the most important areas for menhaden along the Atlantic coast (*i.e.*, the mouth of the Bay), the current allocation to Virginia's reduction fishery (156,522 metric tons or 345 million pounds) should be limited by 60% within Virginia waters. This means that notwithstanding the recommended reduction within the Bay, the menhaden harvest within Virginia waters should remain under 94,000 metric tons, with the remaining harvest taken outside of Virginia waters, to remain in force unless and until appropriate estimates of menhaden seasonal stocks within the Bay and a clear understanding of the effects of their removals are available. Further, we recommend that because non-reduction purse-seine fishing comprises less than 9% of the total, that those limits not be impacted by these reductions.



Justification.
Setting catch limits based on biological, ecological, and environmental factors and/or past fishery performance is common practice in fisheries management. It often involves establishing indicator-specific reference points (such as the number of individuals in the population or the biomass of reproductive adults) with a desired population target

and a floor or threshold below which the population should not drop. Scientists worldwide emphasize the critical importance of setting meaningful thresholds, which, when reached, trigger swift management responses to protect the stock from crashing. This approach aims to prevent the population from reaching a level of depletion that could induce adverse ripple effects on the ecosystem.

Supplemental measures like spatiotemporal management also offer protection. Examples include establishing marine protected areas or imposing closed seasons during crucial reproductive and migratory periods. These "buffers" play an essential role in ensuring the sustainability of forage fish populations, which in turn support ecosystems and people. Examples of the successful implementation of precautionary moratoria and limits for forage species include capelin in the North Atlantic and krill in the Southern Ocean.[3]

The ASMFC has implemented a management mechanism for the coastwide Atlantic menhaden stock that accounts for the dietary needs of key predators such as bluefish, weakfish, spiny dogfish, and most notably, striped bass. This buffer aims to ensure adequate menhaden abundance to support predators and the fisheries that target menhaden. While the ASMFC has enacted some science-based, precautionary measures for menhaden, they have done so on a coastwide basis irrespective of the complex sub-regional dynamics of menhaden, their predators, and the menhaden fisheries (Atlantic States Marine Fisheries Commission, 2017). As a result, states like Virginia can choose to fish to quota maximums set forth by ASMFC.

"Despite recent increases in adult biomass, juvenile indices have declined coastwide and have remained particularly low in Chesapeake Bay" (Simpson et al., 2016)

The Virginia Administrative Code 4 VAC 20-1270-10 ET SEQ., promulgated pursuant to Va. Code Ann. § 28.2-203, is written in a manner that contemplates the application of a wide range of tools to effectively manage menhaden fisheries. In fact, Va. Code Ann. § 28.2-203 includes most of the mechanisms contained in the Magnuson-Stevens Fishery Conservation and Management Act (MSA), which serves as the primary fishing law in the United States and sets forth national standards for fisheries management. By incorporating the provisions of the MSA and its national standards, Virginia code enables implementation of scientifically-based management measures, such as setting

[3] A) Capelin fishing instituted moratoria in certain years to protect the population and ensure its recovery. The fishery has also implemented quotas, which are periodically adjusted based on scientific assessments and population status. As a result, the Icelandic capelin fishery has been Marine Stewardship Council (MSC)-certified as a sustainable and well-managed fishery (Marine Stewardship Council, n.d.). This certification highlights the adherence to responsible fishing practices in the Icelandic capelin fishery, including the use of pelagic trawl and purse seine methods. B) The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) regulates the krill fishery through catch limits and other measures. The catch limit is set with a precautionary approach to ensure the sustainability of krill and maintain the delicate balance of the Antarctic marine ecosystem. Additionally, CCAMLR established marine protected areas that safeguard specific regions and habitats important for krill and other species (Commission for the Conservation of Antarctic Marine Living Resources, 2021).

catch limits, determining optimum yield, minimizing bycatch, and preventing overfishing when promulgating regulations for the menhaden fishery. These tools provide a comprehensive framework that facilitates sustainable management and ensures the long-term viability of the fishery. By aligning with the principles of the MSA, the Virginia code promotes responsible fishery practices and supports the conservation and preservation of menhaden resources.

States other than Virginia that have eliminated the fishing of menhaden using purse seines within state waters (to 3 nm) have witnessed a remarkable recovery in their local menhaden populations, a finding that underscores the heterogeneity of the stock. This resurgence has had positive implications for various aspects of the ecosystem and industries dependent on them.

States other than Virginia that have eliminated the fishing of menhaden using purse seines within state waters (to 3 nm) have witnessed a remarkable recovery in their local menhaden populations, a finding that underscores the heterogeneity of the stock. This resurgence has had positive implications for various aspects of the ecosystem and industries dependent on them. New Jersey and New York exemplify this recovery with thriving whale watching businesses, made possible by the resurgence of marine mammals like humpback whales and dolphins, that now feed on menhaden in vast quantities. Similarly, in northern and southern New England, the revival of menhaden has become vital for the lobster fishery and false albacore, striped bass, and bluefin tuna in states like Rhode Island (The Saltwater Edge, 2021). With the decline in the availability of Atlantic herring, lobster fishers have increasingly relied on menhaden as bait. The restoration of menhaden populations in these areas has brought relief to the lobster fishery and helped sustain this important industry.

Virginia, as the key player in the menhaden fishery in the Chesapeake Bay and Atlantic-coastwide, bears the responsibility of collecting high-quality data to ensure effective management of the stock. However, the current state of data collection leaves much to be desired. The reduction industry, a significant contributor to the menhaden fishery, does not share its data publicly, which makes it challenging to generate an accurate picture of the population's status. Furthermore, there is a lack of fishery-independent surveys explicitly designed to understand menhaden population dynamics. Instead, researchers must rely on surveys like the Chesapeake Bay Multispecies Monitoring and Assessment Program and Maryland and Virginia Juvenile Striped Bass Surveys to glean information about menhaden indirectly. While these surveys provide some insight into menhaden dynamics, they fall short in providing the fine-grained spatiotemporal resolution needed to make informed management decisions and they are not specifically designed to understand menhaden. To effectively manage the menhaden stock, Virginia must prioritize the collection of data with a sufficient level of methodological rigor and spatiotemporal resolution to gain a full understanding of the population's dynamics and the impact of fishing.

OTHER PRECAUTIONARY MEASURES.

As discussed above, the Virginia code pertaining to menhaden fisheries (4 VAC 20-1270-10 *et seq*.) is written in a manner that allows for the application of a wide range of tools to effectively manage menhaden fisheries, including the establishment of precautionary spatial and temporal exclusion zones or buffers.

Recommendation 3:
Establish a permanent 1-nautical mile shoreline buffer for the entirety of Virginia's shoreline that prohibits the use of menhaden purse seines.

In the interest of supporting the resilience and recovery of menhaden populations in the Bay and along the Atlantic coast as well as many of their dependent predators, we recommend implementing through Chapter 4 VAC 20-1270-10 *et seq*. a minimum 1-nautical mile, permanent exclusion zone within Virginia waters using the best available shoreline location data. The existing 0.5-nautical mile exclusion zone for the Chesapeake Bay Bridge Tunnel should be further evaluated for the extent to which it adequately reduces user conflicts, minimizes bycatch and habitat disturbance, and catch of menhaden at key life history stages (e.g., migration and key feeding times).

As a complement to this exclusion zone, VMRC should review the potential risks and known instances of interacting with habitats such as seagrasses, oyster reefs, and fossilized oyster shells due to purse seine net contact with the seafloor.

Justification.

Following decades of reports by the fishery, government officials, the recreational fishing community, and others of net spills, Chesapeake Bay-bottom habitat disturbances, incidences of the catch of non-target species (bycatch, discussed below), and user conflicts such as vessel displacement of recreational fishers, the Commonwealth of Virginia sought to address these issues in 2022 through rulemaking modifications to Chapter 4 VAC 20 -1270-10 et seq., "Pertaining to Atlantic Menhaden," to modify purse seine area and time restrictions. The VMRC conducted limited analysis and public engagement to understand the broader need for and implications of implementing buffers like those being sought in Louisiana (discussed below).

Despite the attendance by hundreds of Virginians at a Dec. 6, 2022 public hearing and over 10,000 public comments gathered via petition that emphasized the need for more conservative spatial and temporal buffers (Theodore Roosevelt Conservation Partnership, 2022), in a five-to-four vote, the VMRC disappointed the recreational fishing, conservation, waterfront landowners, and tourism communities by opting for a resolution that strongly favors the reduction fishery and has no regulatory force. The

approved Memorandum of Understanding (MOU)[4] (Virginia Marine Resources Commission et al., 2023) aims to "... limit future spills incidents and to create a transparent and efficient spill response protocol," stating further that "it will reduce user conflict and strengthen the stewardship of Virginia's shared aquatic resources." This resolution does not adequately address conservation concerns and the issues of fish kills, net spills, habitat disturbances, and user conflicts, and is not built upon adequate evaluations of costs and benefits of spatial buffers.

"... a majority of sets in Virginia waters in recent years have been near the mouth of Chesapeake Bay and along the barrier islands of [the] Eastern Shore."
- (SouthEast Data, Assessment, and Review, 2015)

The VMRC has stated that the Virginia menhaden purse seine fishery has reported 14 fish spills between 2018-2021 (Virginia Marine Resources Commission et al., 2023). It is worth noting that this number is based on *voluntary industry reporting*. During its evaluation of potential time and areas closures, the VMRC acknowledged that while the chances of a net tear and fish spill from menhaden purse seine fisheries are extremely low (0.11%, which amounts to approximately 1.11 spills per 1,000 net sets) (Virginia Marine Resources Commission, 2022), the implications are significant given the scale of each net set, the total number of sets, the locations of some of these sets, potential impacts to Bay-bottom habitat, and known and potential catch of non-target species. Whenever such spills lead to dead fish appearing on public beaches during the summer, or involve managed and protected gamefish being inadvertently caught as bycatch, it significantly escalates awareness and concern among the public.

There is video, photo, and narrative evidence of the practice of fishing with purse seines close to shore. Some of these events are tied to associated fish spills caused by net tears and purposeful dumping due to the nets being over-capacity.

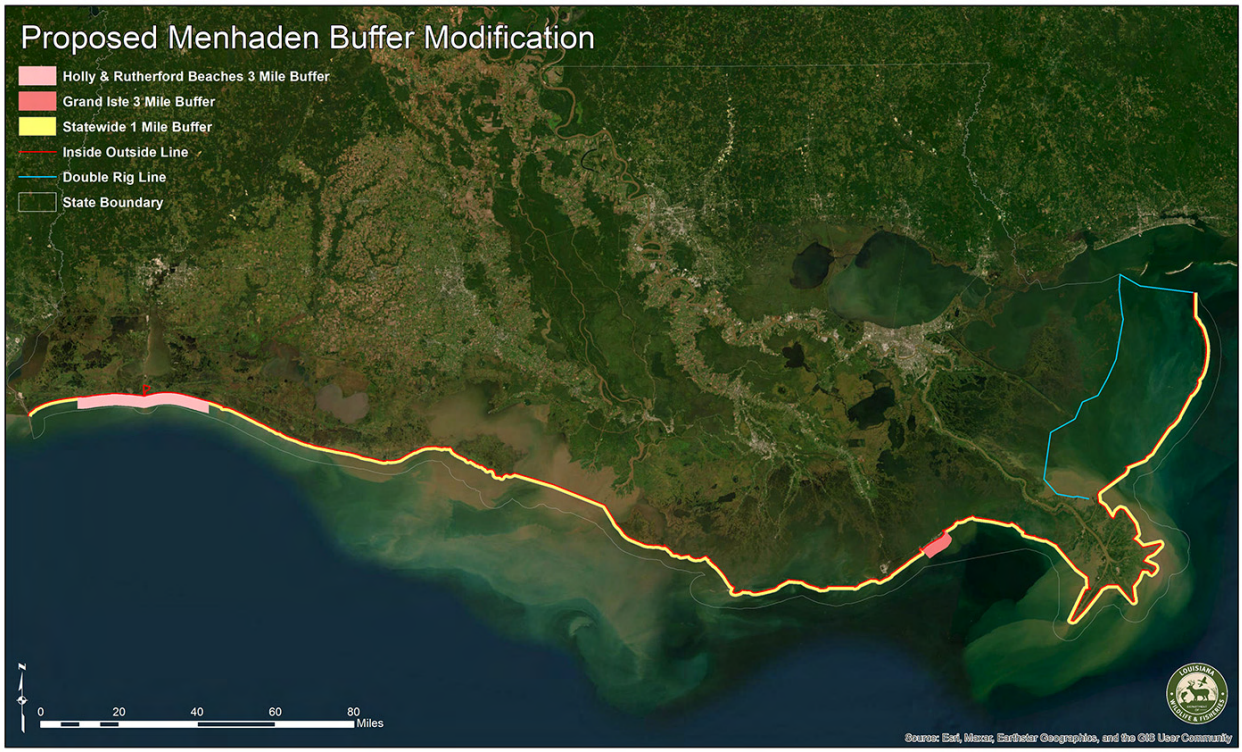
- "Omega Protein takes responsibility for some of the fish on Eastern Shore beach that enraged residents" (WAVY TV 10, 2022)
- "From 2010: Fishing company spills 50,000 fish, washing up on beaches" (13News Now, 2021)
- "Special Investigation: Huge menhaden haul, a controversial catch" (WAVY TV 10, 2015)
- "Menhaden: The Most Important Fish in the Bay" (Link, 2012)
- "Action needed to curb menhaden 'net spills,' harvest" (Leonard & Sikorski, 2022)

In addition to known examples of purposeful "slipping" (release) of nets due to overcapacity, safety concerns, equipment malfunctions, and bycatch, the risk of net tears from bottom obstructions in menhaden purse seine fisheries can be mitigated by keeping the fleet a certain distance from the shore, putting them in deeper waters. The location of spills, wind, and tides significantly influence where dead fish from spills end up. By prohibiting the fleet from operating within a known distance from the shore,

[4] An MOU differs from a Memorandum of Agreement (MOA) in that an MOU describes the terms of an agreement in a broad sense, signifying only a mutual understanding among parties, and does not, like an MOA, provide detailed consensus or reference specific actions and responsibilities of each party.

many dead fish from potential future spills can be prevented from reaching the shore. Based on Captain's Daily Fishing Reports data compiled and analyzed by the VMRC,[5] substantially less than 10% of the Bay effort (*i.e.*, individual sets) has occurred within this zone for both the reduction and bait fleets between 2016 and 2022 (Virginia Marine Resources Commission, 2022).

For context, Louisiana recently proposed, and will likely soon adopt, buffers applicable to the purse seine fishery for Gulf menhaden by initiating a rulemaking process to prohibit reduction fishing within a minimum of 1 mile from shore statewide and extending to 3 miles in specific, key areas (LeBreton, 2023). This move aims to protect menhaden populations in close proximity to the coast, recognizing their ecological importance and the role they play as a vital food source for numerous marine species. By implementing these fishing restrictions, Louisiana demonstrates its commitment to sustainable fisheries management and the preservation of the menhaden stock and its broader ecological and socioeconomic values. This action also acknowledges the potential impact of reduction fishing on the delicate Louisiana coastal ecosystem and seeks to strike a balance between the needs of the fishing industry and the long-term sustainability of this critical marine resource.



Source: (LeBreton, 2023)

[5] It is worth noting that the Captains Daily Fishing Reports-based net set locations appear to vary substantially in location from anecdotal reports of near-shore fishing as well as data available through Global Fishing Watch, a nonprofit that collects and analyzes vessel Automatic Identification System data to determine where fishing activities occur.

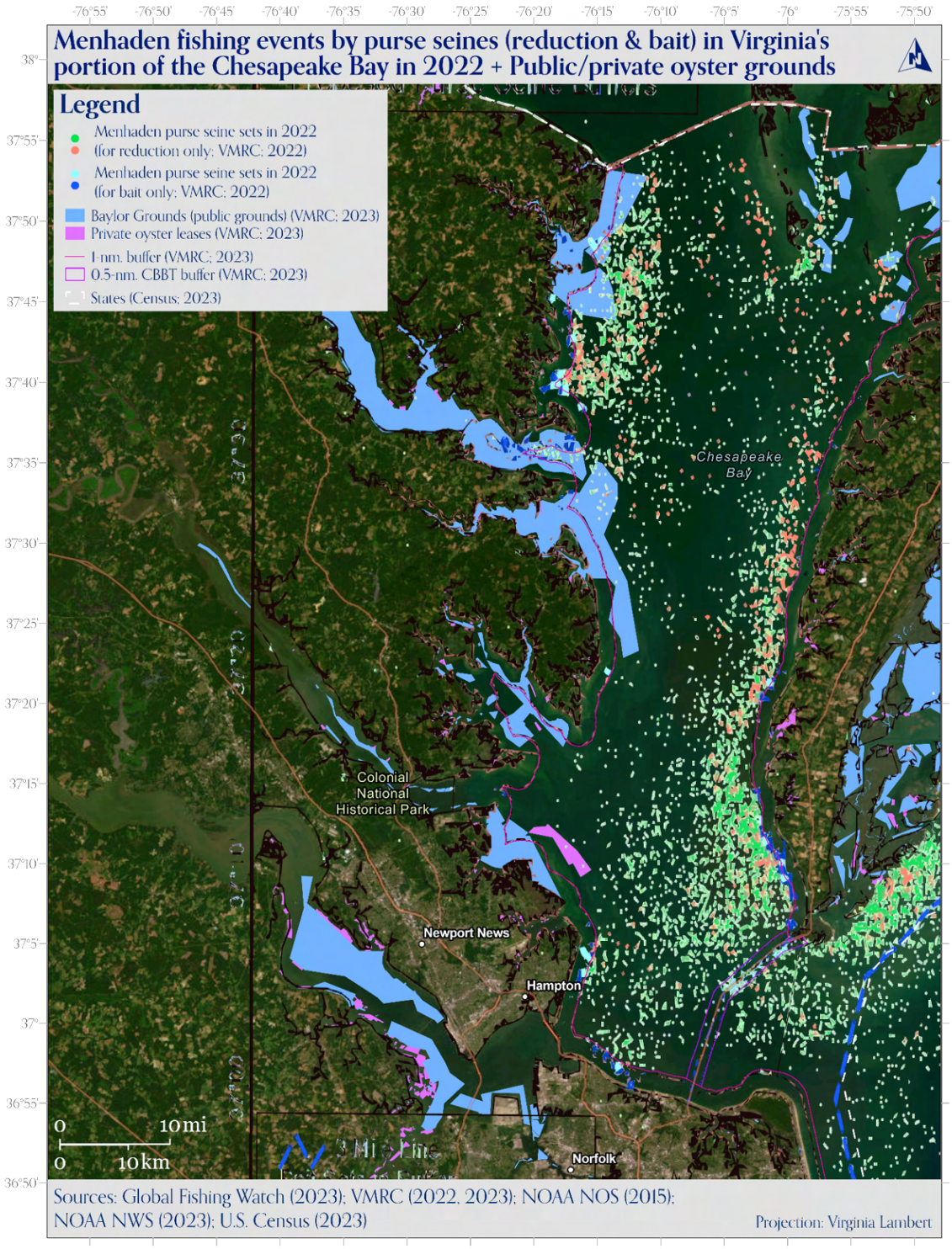
Virginia code § 28.2-314 prohibits any individual from catching fish, shellfish, or marine organisms using a trawl net, drag net, or similar device pulled through the waters by a boat or other craft. It also forbids buying, selling, or attempting to sell any fish captured with a trawl or drag net or comparable gear in the waters of the Commonwealth.

When large, heavy nets are deployed on the seafloor, it can injure or kill marine life, including both mobile and sessile (*e.g.*, seagrasses) organisms. Controlling the precise deployment of large purse nets is challenging, particularly in turbid, high-energy portions of the lower Chesapeake Bay at the mouths of its tributaries. Bottom contact by purse seine gear has been known to result in net tears in some fisheries. In light of the emerging evidence of habitat destruction by menhaden purse seine vessels, there are concerns from fishermen and conservationists about the potential for disturbance or destruction of the seafloor habitats in shallow waters. One petition from 2023 (Dunn, 2023) called on VMRC to bar purse seine fishing for menhaden in shallow Bay waters, arguing that purse nets could scrape the bottom, contrary to stated industry best practices.

Purse seine nets have been publicly acknowledged as being deployed at depths of 50-60 feet in Virginia's portion of the Chesapeake Bay, for example, by Capt. Thomas Moore of Ocean Harvesters in a December 6, 2022 VMRC meeting. The MSC, of which the Atlantic menhaden reduction fishery is an accredited member, emphasizes the importance of a "safety zone" beneath deployed nets. According to the MSC, purse seine fishing in open waters is typically efficient and minimally affects the seabed. It is crucial that the net is deployed at a depth ensuring a safety zone above the sea bottom to prevent the issues cited. While the VMRC has regulations dictating minimum net mesh size, there do not appear to be restrictions on net deployment depth, which indicates a need for careful review and regulatory changes.

Using GIS to overlay VMRC purse seine sets from 2022 (adapted from Fig. 1 of (Virginia Marine Resources Commission, 2022)) with key habitats such as oyster reefs (Virginia Marine Resources Commission, 2023), reveals that net sets do indeed occur in areas identified as Baylor Grounds and Private oyster leases. The extent to which these sets may impact public and/or private oyster grounds is not known, at least publicly.

Further research is required to verify direct habitat destruction in areas where menhaden purse seine vessels are active. The analysis should compare the location, respective depths of net sets, and the real/identified habitats such as seagrasses and oysters (for which there are high-quality spatial data available). Additionally, any analysis should endeavor to document all known occurrences of habitat disruptions to the best degree possible.


Menhaden fishing events by purse seines (reduction & bait) in Virginia's portion of the Chesapeake Bay in 2022 + Public/private oyster grounds
Legend
Menhaden purse seine sets in 2022 (for reduction only; VMRC; 2022)
Menhaden purse seine sets in 2022 (for bait only; VMRC; 2022)
Baylor Grounds (public grounds) (VMRC; 2023)
Private oyster leases (VMRC; 2023)
1-nm. buffer (VMRC; 2023)
0.5-nm. CBBT buffer (VMRC; 2023)
States (Census; 2023)
Chesapeake Bay
Colonial National Historical Park
Newport News
Hampton
Norfolk
0 10 mi
0 10 km
Sources: Global Fishing Watch (2023); VMRC (2022, 2023); NOAA NOS (2015); NOAA NWS (2023); U.S. Census (2023)
Projection: Virginia Lambert

Recommendation 4:
Implement and enhance the Atlantic Menhaden Research proposal to investigate localized depletion and its impacts on the Bay.

In coordination with the October 2023 Atlantic Menhaden Research Planning proposal (Latour and Jim Gartland, 2023), investigate the potential for localized depletion of menhaden–and its impacts on the ecosystem–in the Chesapeake Bay. This initial proposal should be expanded to include significant research and data independent of the reduction fishery's data and should include other relevant indicators such as striped bass and osprey population health. This should further include studying impacts on other user groups such as other commercial fisheries, charter and headboat businesses, recreational fishermen, and relevant components of Virginia's tourism industry. Finally, the study should be co-funded by the reduction fishery, for the benefit of the taxpayers of the Commonwealth.

"The reason we decided to finally begin to make statements about this issue is that we had moved from several hundred chicks starving in the nests to now thousands of chicks starving in the nests in the lower Bay. ... 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." - Dr. Bryan Watts of the College of William and Mary

Justification.
A complete picture of the dynamics of the menhaden population, menhaden fishing, and the effects of fishing menhaden on its predators in the Chesapeake Bay is limited due to several reasons, chief among them the lack of a consistent, long-term, and well-coordinated Bay-wide stock assessment and limited access to fishery-dependent landings information. The menhaden stock assessment methodology employed by the ASMFC is not spatially explicit, meaning it does not account for localized trends or variations in menhaden populations. This limitation may lead to the neglect of significant trends that exist, even at scales as large as the Chesapeake Bay and Gulf of Maine. The multi-faceted nature of the Bay, with its numerous stakeholders and competing uses, has made it difficult to develop a comprehensive and unified approach towards understanding the status of the menhaden stock there, despite the critical importance of the Bay as a key menhaden nursery.

The absence of a robust and coordinated assessment undermines effective management strategies, as it becomes challenging to balance the diverse needs and interests of various user groups, including commercial fishing, recreational fishing, and conservation efforts. Without a thorough understanding of the menhaden population dynamics specific to the Bay, it becomes challenging to allocate resources and make informed decisions regarding harvest limits and conservation measures. Ignoring these local trends may result in an incomplete assessment of the overall status of the

menhaden population coastwide, too. Therefore, there is a pressing need for enhanced coordination and collaboration among stakeholders to develop and implement a well-coordinated assessment strategy that captures the complexities of the Bay's menhaden population and supports sustainable management practices.

The ASMFC Atlantic Menhaden Technical Committee defined localized depletion as: "Localized depletion in the Chesapeake Bay is defined as a reduction in menhaden population size or density below the level of abundance that is sufficient to maintain its basic ecological (e.g. forage base, grazer of plankton), economic and social/cultural functions. It can occur as a result of fishing pressure, environmental conditions, and predation pressures on a limited spatial and temporal scale." (Maguire, 2009).

The Technical Committee and Ecological Reference Points Work Group have stated that additional data about the total population of Atlantic menhaden in the Chesapeake Bay, possibly gathered through aerial surveys, can help decide how much of the regional catch should be allowed from the Bay to maintain sustainable fishing (Ecological Reference Point Work Group and Atlantic Menhaden Technical Committee, 2021). This more straightforward strategy could help regulate the permitted amount of catch; however, it would not offer wider location-specific information, so it would not assist with allocations based on different regions. The developed ecological reference points would apply across the entire coast and ignore factors like local predator-prey interactions. There are also concerns about the reliability of combining two different methods to estimate fish abundance and about the lack of information about seasonal fish migration in and out of the Bay. This strategy wouldn't need a new model but would necessitate considerable resources to get accurate data on the total number of menhaden in the Chesapeake Bay, a process that currently doesn't exist. This strategy may be ready for review within 5-7 years from starting the survey, but this assumes a minimum of 3 years of data collection to assess year-to-year variations. However, if variations are high, more data would be needed before it's ready for official use. Even though a shorter data collection period may be enough for initial analysis, regular surveys would be necessary for ongoing management advice.

Recommendation 5a:
Require increased vessel and landings monitoring that may include the use of at-sea and dockside observers, electronic monitoring, and vessel monitoring systems, and evaluate landings (hold) capacity aboard reduction "mothership" vessels to ensure compliance and accurate reporting.

To better comprehend the dynamics and impacts of the menhaden purse seine fishery, it is suggested that these operations be required to use at-sea and dockside observers (per ASMFC (SouthEast Data, Assessment, and Review, 2020) and MSC recommendations (SAI Global, 2019)), vessel monitoring systems, and electronic

monitoring. These methods will monitor and document fishing activities, thereby making it easier to capture and understand the complete picture of the fishery and its potential impacts.

Justification.
There is currently no requirement for at-sea observers aboard the menhaden reduction fleet (ASMFC 2017). The NOAA Fisheries Northeast Fisheries Observer Program (NEFOP) has, since 2012, consistently not required observers for the fleet due to several reasons, including limited funds. While Virginia does have an observer program for fisheries prosecuted in state waters, VMRC has stated that funding for observer programs focuses on the fishery with the highest risk of interactions with endangered, threatened, protected species, in this case, the commercial gillnet fishery (GlobalTRUST, 2023). Net set locations and landings amounts, similarly, are not required to be shared publicly. Enhanced monitoring as recommended by the ASMFC and MSC is not being applied.

Recommendation 5b:
Improve data transparency and sharing by requiring that all landings data, including the locations of and landings for individual net sets, be publicly available.

The absence of public reporting of net set location and corresponding landings poses a significant concern. This lack of transparency directly contravenes the principles of good public policy, which advocates for informing decision-making processes. Furthermore, it undermines the scientific research that lays the foundation for our comprehension of the public resource. These policies and scientific insights are essential in enhancing our understanding and managing shared resources effectively. The non-disclosure of such critical information impedes the capacity to make informed decisions, ultimately to the detriment of the public interest.

Justification.
Sharing these data would offer a chance for academic institutions and other interested parties to conduct their own independent analyses, contributing to a broader understanding of the fishery's biological and ecological footprints and socioeconomic implications. This approach will promote comprehensive scientific research, facilitate transparency, and allow for evidence-based decision-making.

In its final 2019 MSC certification report, the MSC assessment team stated that enforcement and compliance information pertaining to the fleet's operations, as reported by State and Federal authorities, are typically neither documented nor disclosed. They recognized the significance and necessity of rules surrounding confidentiality in reporting enforcement and compliance data, but argued that these

principles don't suit the needs for transparency and accountability when the results of enforcement and compliance activities remain publicly inaccessible (SAI Global, 2019).

It is worth noting that Louisiana's recent Notice of Intent (NOI) (Louisiana Wildlife and Fisheries Commission, 2023) to amend rules to the menhaden fishery regarding the buffer zone include updated reporting requirements for spills. The Wildlife and Fisheries Commission issued citations to the Gulf fishery for failing to report the release of menhaden and for "excessive killing of fish" in September and October, 2023, respectively. The number of citations issued does not, however, speak to the full extent of accidental and intentional net releases in Louisiana, which total at least 18 as of October 2023 (Curtis, 2023).

The NOI stipulates a 48-hour period for retrieving any menhaden or bycatch that is unintentionally or intentionally released into the environment and provides penalties and restitution associated with failure to comply. Additionally, the NOI specifies that reporting must be made within 2 hours of any release. The proposed rule modification details specific reporting elements that must be included in the notification, including: date and time of the release; species of fish released; disposition of the fish released; name of the vessel which released the fish; estimation of the number of fish released; photo / video evidence of the release; coordinates of the release; and, causative factors of the release.

We also understand that the Louisiana Wildlife and Fisheries Commission will soon require that annual Gulf menhaden purse seine net set locations and more detailed landings data be made publicly available as part of this action.

Recommendation 5c:
Further evaluate bycatch of non-target species.

Conducting further evaluations of bycatch of non-target species within the menhaden reduction fishery is of paramount importance for a more comprehensive understanding of the fishery's effects on marine wildlife in the Chesapeake Bay. Mandatory vessel monitoring and improved public reporting of bycatch incidents are critical components of this recommendation. Through in-depth evaluations and assessment of bycatch rates in the fishery, stakeholders can guide informed decision-making processes, devise sustainable management practices, and develop effective mitigation strategies.

Justification.

Bycatch refers to the unintentional capture and incidental killing of non-target species during fishing operations. It primarily occurs when fishing gear is deployed to catch a specific species, but other marine organisms, including fish, marine mammals, sea turtles, or seabirds, are inadvertently caught as well. Bycatch is considered a

significant conservation concern and a threat to biodiversity, as it can contribute to the unsustainable depletion of non-target species and disrupt marine ecosystems. Efforts are being made globally to mitigate bycatch through the implementation of fishing regulations, creation of models that help to predict high-bycatch-risk times and areas, development of more selective fishing gear, and promotion of responsible fishing practices to minimize its ecological impacts.

The use of purse seine nets is generally regarded as a "clean" fishing method with low levels of bycatch compared to other gear types such as trawls. However, despite its relative selectivity, purse seines do still inadvertently catch non-target organisms. These organisms can suffer negative consequences as a result. When caught in purse seines, they often experience physical injury, stress, and are subjected to low oxygen conditions. As they are packed densely together in the net, their movements are restricted, leading to increased stress levels. Additionally, the high density of organisms depletes the available dissolved oxygen. If they do not die in the net, these combined factors can affect their ability to swim, reproduce, or find food. In some cases, the act of releasing bycatch back into the water can cause more stress, making it difficult for the animal to recover, particularly if the release is not done properly. Post-release mortality is a concern as some species may not survive the physical and physiological stress experienced during capture and handling, leading to delayed deaths. There is, therefore, a critical need for continuous improvements in fishing practices to reduce such incidental impacts on non-target organisms even in methods considered to be relatively clean.

“The impacts on bycatch species are poorly known. Data on bycatch are only collected on an ad hoc basis at infrequent intervals.” (SAI Global, 2019)

Accurate quantification of bycatch levels in the Atlantic menhaden reduction fishery is challenging due to several factors. Among them is the lack of mandatory independent observers on board during fishing operations. NOAA notes that the fishery has had “very limited observer coverage since 2008” (NOAA Fisheries, 2021). Without independent observers, it is difficult to obtain accurate information on bycatch levels, including the species caught, locations, and times when the bycatch occurs. This data is essential for the development and implementation of effective conservation measures and sustainable fishing practices. The 2019 MSC certification of the fishery recommended ”... that bycatch studies be undertaken on an ongoing basis and that, in order to ensure comparability between studies, these future bycatch studies should be conducted in a more cohesive and standardized manner than has historically been the case” (SAI Global, 2019). In addition every effort should be made to ensure that studies are designed in such a way that the composition of catches by weight can be estimated.Numerous commercial fisheries that target other species along the Atlantic coast are required to have these at-sea observers and/or electronic forms of monitoring (e.g., using on-board cameras). Yet since the menhaden reduction fleet is not required to have monitoring on board, bycatch levels in the Atlantic menhaden reduction fishery

are not well known, and the extent of incidental impacts on non-target species is not fully understood.

"The mid-Atlantic menhaden purse seine fishery historically reported an annual incidental take of one to five common bottlenose dolphins ... There has been very limited federal observer coverage since 2008. ... Because there is no systematic observer program for this fishery, no estimate of bycatch mortality is available." (SAI Global, 2019).

A 2016 literature review assessed potential bycatch of red drum (*Sciaenops ocellatus*) in the Gulf menhaden fishery. Its findings and recommendations are relevant to Atlantic menhaden. The analysis aims to emphasize the potential occurrence of bycatch in the menhaden fishery and the importance of investigating its potential impact on stock dynamics. "Assuming the lowest percentage of total bycatch by weight, which is 0.66% of menhaden landings, the total bycatch ranged from 500 mt in 1948 to 6,500 mt in 1984. Conversely, using the highest percentage of bycatch by weight, which is 3.1% of menhaden landings, the total bycatch ranged from 2,300 mt in 1948 to 30,500 mt in 1984." The estimates provided in the analysis are preliminary and based on sporadic observations of incidental bycatch. The authors note that there are significant limitations to the prior analyses that they reviewed, such as sampling deficiencies and a focus on numbers rather than weights, which hinder the provision of unbiased species composition and bycatch estimates. A compound index approach, similar to that used in trophic ecology, may offer a better representation of bycatch by standardizing weight, number, and occurrence metrics. As it stands, assessing the potential impact of bycatch on red drum in the Gulf menhaden fishery is challenging due to the limited data available. Absence of a federal observer program for the commercial fleet causes additional obstacles in determining the composition and volume of bycatch. The study emphasizes that more comprehensive data collection and improved reporting methods are necessary to better understand and address the issue of bycatch in the menhaden fishery (Sagarese, Skyler R. Nuttall, Matthew A. Serafy, Joseph E & Scott-Denton, 2016).

"Logbook information about bycatch is not likely collected in logbooks as ... there is no space in the logbook for catches other than target catch [emphasis added] since the fishery was always considered a "clean fishery" with limited/negligible amount of bycatch." (GlobalTRUST, 2021).

While quantifying the exact levels of bycatch in the Atlantic menhaden reduction fishery may be challenging, there is ample anecdotal evidence suggesting that the fishery does experience incidental catch of various species. Predatory fish, such as striped bass, have been observed as bycatch in this fishery. Likewise, reports indicate the unintentional capture of marine mammals, such as dolphins, as well as turtles, seabirds, and sharks. Although anecdotal, these accounts highlight the potential for non-target species to be incidentally caught in the fishery. It emphasizes the need for

further research and monitoring to fully understand the extent of bycatch and inform the development of appropriate conservation measures to mitigate its impacts on these vulnerable species in the Atlantic menhaden reduction fishery.

"There is no regular review of measures in place to minimize the fishery's impact on ETP [endangered, threatened, and protected] species." (SAI Global, 2019).

The menhaden purse seine fishery is categorized in accordance with the Marine Mammal Protection Act by NOAA due to the extent of incidental deaths or severe injuries of marine mammals caused by fishery interactions. The design of purse seines leaves little chance for game fish that feed on menhaden to escape before the net is closed, or 'pursed.' NOAA specifically notes that bottlenose dolphin is the species of concern; the fishery is therefore included in its Bottlenose Dolphin Take Reduction Plan. The current classification stems from comparisons to other purse seine fisheries, such as the Category II Gulf of Mexico Menhaden purse seine fishery, and potential interactions involving bottlenose dolphins from northern and southern migratory coastal stocks. It is worth noting that a humpback whale was reported by a fisherman as entangled in a net by the fishery in 2001 (NOAA Fisheries, 2021). There is an ongoing project that focuses on observing sea turtle interactions within the Gulf of Mexico menhaden purse seine fishery. This project, which kicked off in 2020, involves NOAA and fishing industry partners testing various observer methods in the field to elucidate the extent of turtle interactions and potential bycatch. Turtles were observed in the nets during the first phase of the project (Deepwater Horizon Open Ocean Trustee Implementation Group, 2021).

We request responses from VMRC regarding each of the foregoing recommendations (1-5), including the justifications and analyses for any responsive actions or inaction. We further request that the VMRC make specific findings for each of the requirements in Virginia fisheries law. All findings and responses should be in accordance with the VMRC's statutory obligations and authorities, pursuant to Va. Code Ann. § 28.2-200 et seq.

CONCLUSION.

If the management and regulation of Virginia's menhaden fishery is improved, we will secure healthier and more productive fisheries in Virginia waters, a healthier Chesapeake Bay ecosystem, and a healthier economy in the Bay region.

The undersigned thank the VMRC for its consideration of this petition for rulemaking.

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