ENVIRONMENTAL ASSESSMENT

In Support of the Exempted Fishing Permit Application for an Atlantic Thread Herring Purse Seine Fishery; from Lund's Fisheries, Inc. and Axelsson Seiner, Inc., Cape May, NJ.

Assessment required by the National Marine Fisheries Service

Presented to the SCEMFIS IAB, October 24, 2023[1]

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Abstract: This Environmental Assessment examines the potential issuance of an exempted fishing permit for an Atlantic thread herring purse seine fishery in the mid-Atlantic region from 2024 to 2026. This experimental fishery aims to establish a sustainable, environmentally friendly commercial purse seine fishery for Atlantic thread herring, responding to the increasing presence of this southern species in northern waters due to warming temperatures. The project seeks to assess catch data, develop marketing strategies, and reduce reliance on imported fish, benefiting regional bait markets and improving resilience of the Port of Cape May's menhaden purse seine fishery. The proposed action is expected to have negligible impacts on thread herring, protected species, other potential bycatch species, or habitats, but is expected to have significant positive impacts on human communities.

[1] This research was supported by the National Science Foundation (NSF) through the Industry/University Cooperative Research Center (I/UCRC) program supporting the Science Center for Marine Fisheries (SCEMFIS) under NSF awards 1841435 and 1841112 and through membership fees provided by the SCEMFIS Industry Advisory Board (IAB). The draft has been reviewed and approved by the IAB. Note: Michael Simpkins abstained from the review process as this analysis will be submitted to his agency for formal evaluation at a later stage.

1. EXECUTIVE SUMMARY

This document presents an overview of a proposed purse seine fishery for Atlantic thread herring (*Opisthonema oglinum*) in the mid-Atlantic region, under consideration for an exempted fishing permit (EFP). The comprehensive analysis contained herein addresses all requirements of the Endangered Species Act (ESA) and the National Environmental Policy Act (NEPA).

Atlantic thread herring, an emerging species typically found in southern waters, has been increasingly observed in northern regions due to rising water temperatures. Lund's Fisheries, Inc. and Axelsson Seiner, Inc. are jointly proposing to establish a purse seine fishery targeting this species in the mid-Atlantic region. The experimental fishery is scheduled to operate during May through November over the next three years (2024-2026). The primary objective of this proposed action is to create a thriving and environmentally sustainable fishery, capitalizing on an emerging resource in a warming ocean. The fishery aims to meet the demands of food markets, serve recreational and commercial bait markets, and supply markets catering to animals in zoos, aquariums, and marine rescue centers. The alternatives under consideration are limited to the current status quo (Alternative 1) or issuing the EFP (Alternative 2, the preferred alternative).

Analysis of the experimental fishery indicates that it will have negligible impacts on target species (i.e., thread herring), protected species (including those listed under the ESA and Marine Mammal Protection Act (MMPA)), other potential bycatch species, or their habitats. The experimental work conducted under this EFP is expected to yield benefits for human communities, encompassing economic aspects and providing an opportunity for fishery-dependent biostatistical sampling of the target stock. The experiment is designed to aid in developing a marketing strategy, evaluate the feasibility of reducing reliance on imported fish from Mexico and Costa Rica in significant regional bait markets, and enhance the resilience of the Port of Cape May's menhaden purse seine fishery and those dependent on it seasonally. The fishery-dependent biostatistical sampling directly aligns with the Mid-Atlantic Fishery Management Council's (MAFMC) need for "adequate scientific information" on forage fish stocks, furthering the sustainable use of the stock. The preferred Alternative 2 is favored over the status quo (Alternative 1) as it opens the door to demonstrating the potential for a commercial purse seine fishery targeting Atlantic thread herring in the mid-Atlantic region, with the potential for significant benefits to human communities.

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2.4 Acronyms

ACCSP	Atlantic Coastal Cooperative Statistics Program
ACL	Annual Catch Limit
ASMFC	Atlantic States Marine Fisheries Commission
CEQ	Council on Environmental Quality
DPS	Distinct Population Segment
ECOMON	Ecosystem Monitoring
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
ESA	Endangered Species Act
FAD	Fish Aggregating Device
FMP	Fishery Management Plan
GARFO	Greater Atlantic Regional Fisheries Office
GB	Georges Bank
GOM	Gulf of Maine
LOF	List of Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MWT-AH-SCC	Mid-water trawl trips targeting Atlantic herring south of Cape Cod
MWT-AM-DM/FL-CM	Mid-water trawl trips targeting Atlantic menhaden on the fishing vessels Dyrsten and Flicka, owned by H & L Axelsson, Inc., operating in Cape May
MSA	Magnuson-Stevens Fishery Conservation and Management Act
NEAMAP	Northeast Area Monitoring and Assessment Program
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
OHA2	Omnibus Habitat Amendment 2

PS-AH/AM-GOM	Purse seine trips targeting Atlantic herring or Atlantic menhaden in the Gulf of Maine
SAR	Stock Assessment and Serious Injury and Mortality Report
UFOA	Unmanaged Forage Omnibus Amendment
VEC	Valued Ecosystem Component
VIMS	Virginia Institute of Marine Science

3. BACKGROUND AND PURPOSE

3.1 Background of the Proposed Action

Atlantic thread herring, ranging from southern Brazil to the Gulf of Maine, is a coastal pelagic schooling fish often found near the water's surface (Finucane and Vaught, 1986). This species is one of several emerging fish, predominantly found in the southern regions, that are increasingly being observed in mid-Atlantic waters (based on personal communications with purse seiners in Cape May). This trend is likely linked to rising water temperatures (Morson et al., 2019).

A purse seine fishery operated in coastal waters off North Carolina between Cape Hatteras and Cape Fear in the late summer and fall in the late 1980s and early 1990s (Smith, 1994). The herring were harvested for reduction, primarily ranging from 1 to 5 years of age (Smith, 1994). Although a commercial purse seine fishery continues off the Florida coast in federal waters within the Gulf of Mexico, it has been absent from Atlantic waters for several years due to purse seine restrictions imposed by several southern Atlantic states (Figures 1 and 2).

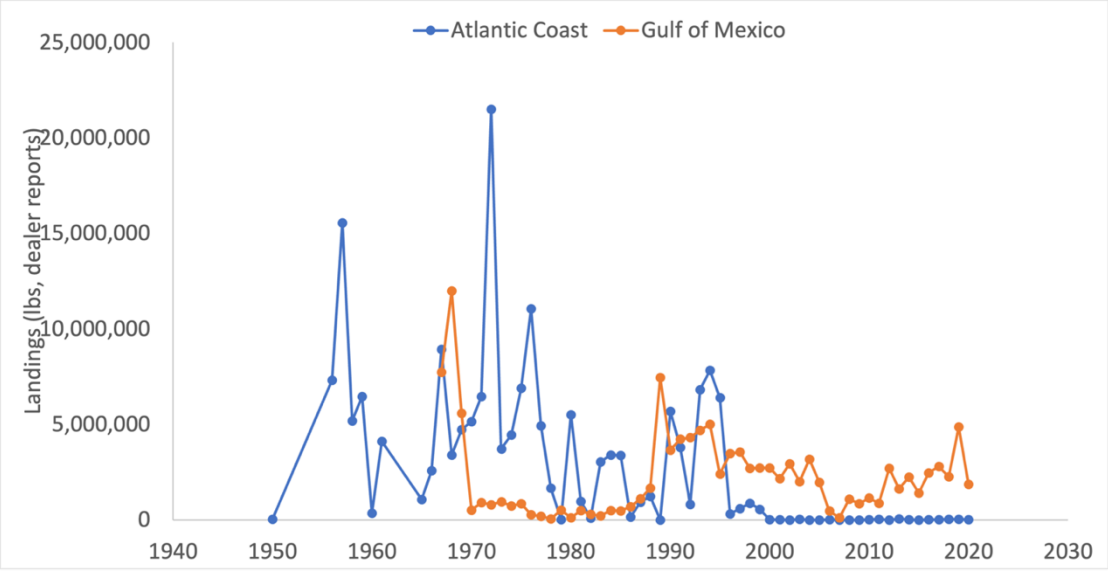


Figure 1. Commercial landings of Atlantic thread herring from non-confidential dealer reports from 1950-2020 for the Atlantic Coast and Gulf of Mexico from the Atlantic Coastal Cooperative Statistics Program (ACCSP).

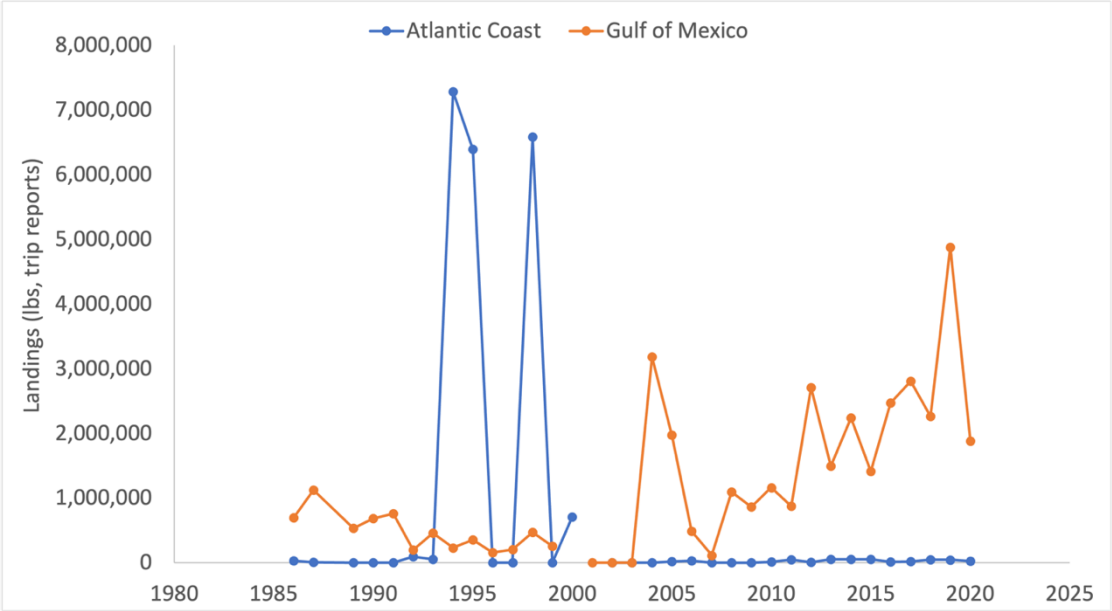


Figure 2. ACCSP non-confidential commercial trip report landings of Atlantic thread herring from the Atlantic Coast and Gulf of Mexico from 1986-2020.

Recreational anglers harvest thread herring along the Atlantic Coast and in the Gulf of Mexico, as reported in the Marine Recreational Information Program (MRIP) data (Figures 3 and 4). These anglers typically use thread herring as bait for other target species, given its high protein content compared to Atlantic menhaden, making it a valuable recreational bait source. Naturally, there is an interest among mid-Atlantic fishermen and bait dealers to engage in the sustainable fishing of Atlantic thread herring.

As mid-Atlantic waters warm, more Atlantic thread herring are expected to migrate into these waters during the spring and move southward in the late fall. This seasonal movement presents a promising opening for the establishment of a new fishery. Lund's Fisheries, Inc. and Axelsson Seiner, Inc. are proposing to establish a purse seine fishery for this species in the mid-Atlantic region under an EFP.

This EFP would offer a valuable source of recreational bait and enhance the overall resilience of the Port of Cape May's fishery. Moreover, it has the potential to reduce the need for importing thread herring into the US from Mexico and Costa Rica (source: https://fishandbait.com/product-category/baitfish/thread-herring/imported-thread/). It serves as an alternative for Cape May menhaden fishermen and vessels during the New Jersey menhaden fishing season, capitalizing on an emerging species due to shifting climate conditions. Additionally, it provides a template for assessing other emerging fisheries.

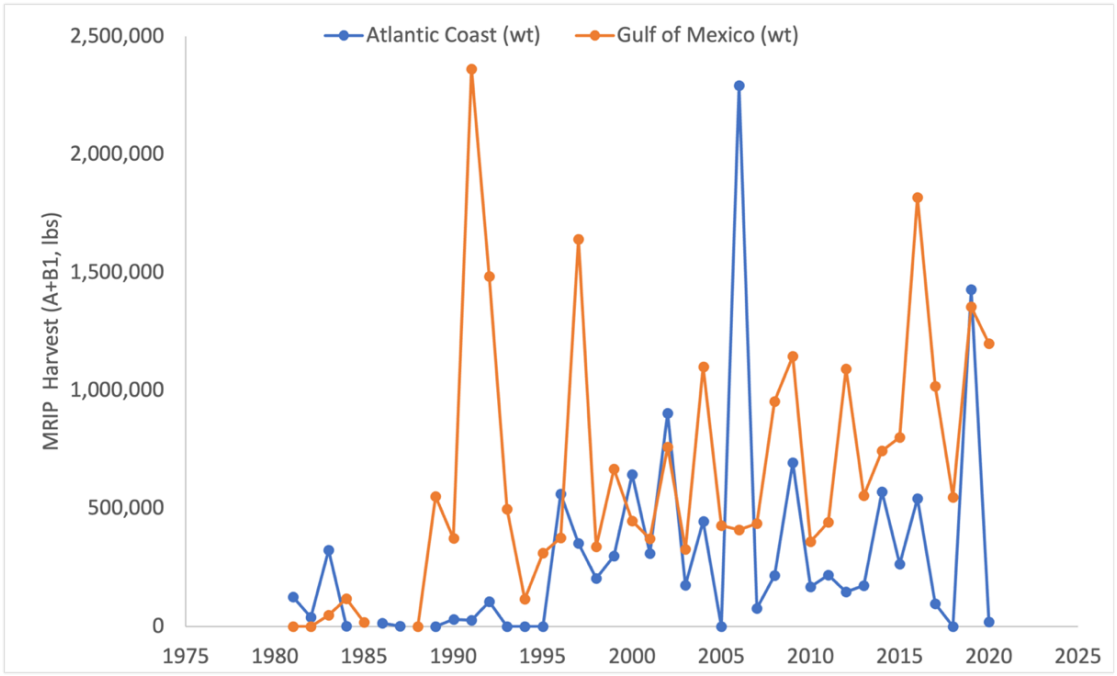


Figure 3. Atlantic thread herring harvest (A+B1) (lbs) from the MRIP data for the Atlantic Coast and Gulf of Mexico from 1981-2021. A=Thread herring that were caught and brought back to dock and identified by a sampler. B1=Thread herring that were caught and killed but not available for identification by the sampler.

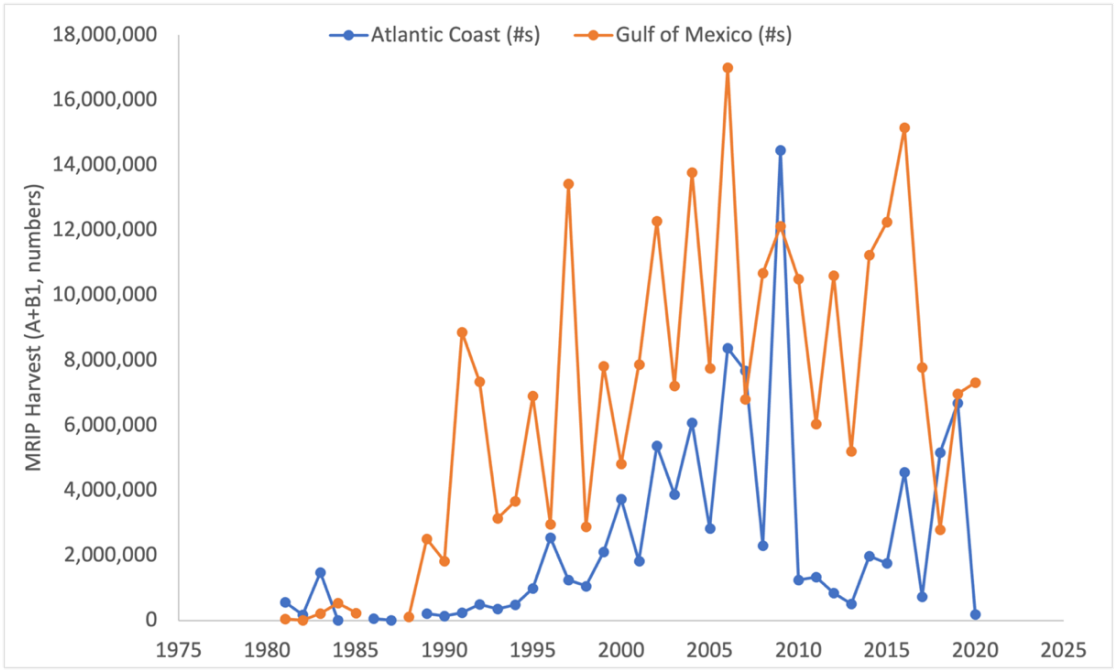


Figure 4. Number of Atlantic thread herring harvested (A+B1) from MRIP for the Atlantic Coast and the Gulf of Mexico from 1981-2021. A=Thread herring that were caught and brought back to dock and identified by a sampler. B1= Thread herring that were caught and killed but not available for identification by the sampler.

3.2 Purpose and Need for the Proposed Action

The primary purpose of this action is to explore the feasibility of establishing a sustainable commercial purse seine fishery targeting Atlantic thread herring in the mid-Atlantic region while ensuring environmental sustainability. In addition to this main goal, the action aims to facilitate the assessment of catch, effort, and bycatch data over a span of three fishing years, develop a marketing strategy, evaluate the feasibility of replacing imported fish from Mexico and Costa Rica in significant regional bait markets, and contribute to the resilience of the Port of Cape May's menhaden purse seine fishery and the livelihoods of those who depend on it seasonally.

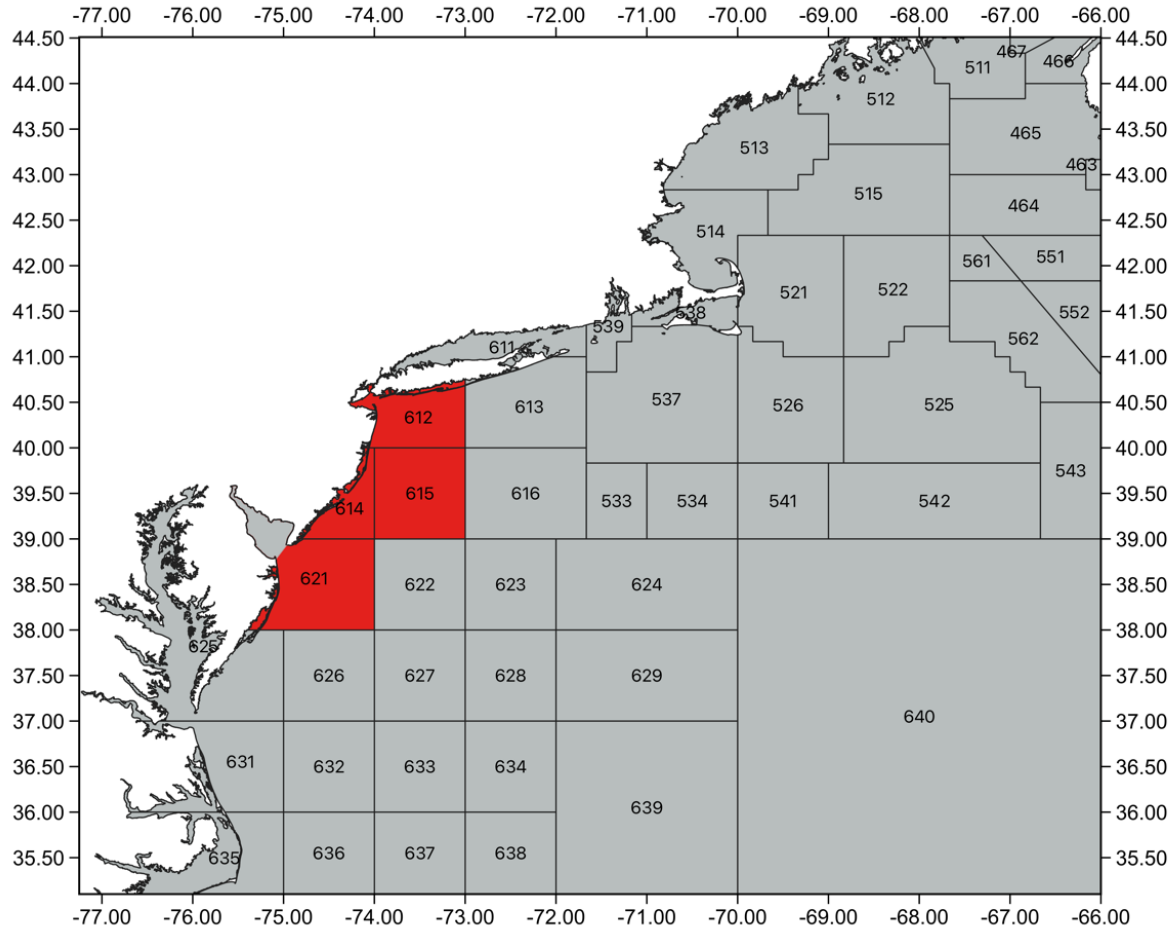
The action is needed to unlock the potential for a commercial purse seine fishery targeting Atlantic thread herring in the mid-Atlantic region, which promises substantial benefits for local communities due to the emergence of this species. Additionally, it offers the opportunity for fishery-dependent biostatistical sampling of the target stock, aligning directly with the MAFMC's need for "adequate scientific information" on forage fish stocks, thereby promoting the sustainable use of this species.

4. DESCRIPTION OF PROPOSED ACTION

4.1 Detailed of the Experimental Fishery

The experimental fishery will cover the geographic area within the normal operational range of the region's menhaden purse seine bait fishery. It will be conducted in Federal waters, extending from Ocean City, Maryland, north to Montauk, Long Island, New York, and within the management jurisdiction of the MAFMC, likely including statistical areas 612, 614, 615, and 621 (Map 1). The fishery will take place from 3 to 30 miles offshore, depending upon fish availability. Area to be fished will be determined by spotter plane, intuition, visual observation aboard the vessel, sonar, echosounder, and bird activity, similar to the practices in the region's Atlantic menhaden purse seine fishery. Depth fished will vary depending on how far the fish are inshore or offshore, typically ranging from 3-35 fathom. All thread herring will be processed as frozen bait at Lund's Fisheries' plant, in Cape May, New Jersey.

The participation will involve up to four purse seine and four catcher vessels currently operating in the Atlantic menhaden bait fishery from the port of Cape May, each with at least one federal permit on board, depending upon Federal requirements (Table 1). For each haul, there will be one purse seine vessel and one carrier vessel involved. There will be a grate on the pump with 6-inch squares. Excluder bars will be installed on the dewatering box to separate small pelagic species from non-target species. Suction velocity will be approximately 5,000 pounds of fish per minute. All landings will be appropriately documented and reported by the plant through the SAFIS.



Map 1. Proposed fishing areas (marked by red).

Table 1. List of purse and catcher vessels, which will be paired together for the season.

Vessel Name	Vessel Type
Opportune	Catch
Onered	Carry
Gannet	Catch
Brianna Louise	Carry
Charisma	Catch
Eva Marie	Carry
Morning Star	Catch
Kingfisher	Carry

NOAA provides net information about purse seine fisheries. The California tuna purse seine fishery, which operates under the Marine Mammal Protection Act (MMPA), utilizes nets with lengths ranging from 300 to 6,000 feet, depending on the specific location of the fishery (source: https://www.fisheries.noaa.gov/marine-mammal-protection/california-tuna-purse-seine-fishery-mmpa-list-fisheries). Similarly, the herring, anchovy, smelt, squid, or lampara purse seine fishery in Washington and Oregon, also employs nets ranging from 300 to 6,000 feet (source: https://www.fisheries.noaa.gov/west-coast/marine-mammal-protection/wa-or-herring-anchovy-smelt-squid-purse-seine-or-lampara). These summaries indicate a wide range of net sizes utilized in different fisheries depending upon where the fishery is taking place. Moreover, Omega Protein uses nets approximately 1,400 feet long in their fishing operations. In the current EFP application, a quote for a purse seine of approximately 2,000' in length and 180' in depth, with 1" mesh (25 mm), has been included. However, it remains unclear that a net this large would be required in a successful fishery. Atlantic menhaden and thread herring school differently, with menhaden more tightly schooling on the surface and thread herring schooling more laterally, requiring a longer net to capture the school successfully. On the other hand, in shallower waters, the 900-foot net, as restricted by the state of New Jersey for the menhaden fishery, may be sufficient. With this being an experimental fishery, a sufficient net size that would be used in deeper, Federal waters is yet to be determined.

An average trip has been estimated as landing approximately 75,000 pounds of thread herring per day. A 3,000-metric ton (6.6 million pounds) catch limit is requested for each of the three years proposed for this project. This value is determined through historical research, as Dr. Ed Houde (1977) collected eggs and larvae of the thread herring from the eastern Gulf of Mexico and estimated a potential annual thread herring yield in the range of 60,300 to 120,600 metric tons in the eastern Gulf.

4.2 Timeframe and Frequency of Fishing Operations

The fishing season is scheduled from May through November, as fishermen have seen shoals of fish available 3-30 miles offshore within the designated fishing area during the season (personal communications). Most trips will be taken during July, August, and September, due to fish availability (personal communications with fishermen).

For each of the catching vessels that would be in operation, an average of three weekly purse seine trips lasting between 24 to 48 hours is estimated, with up to 5 trips per week possibly being attempted. Anticipated daily fishing activities include one to five sets per day, contingent upon the availability of fish. If the fish schools are of small tonnage, anticipated daily fishing activities will be five sets a day. If fishing is good, one set will make the trip.

It will take 15 minutes to set the seine, 15 minutes to purse the net closed and a further 45 minutes to haul the net to the point of pumping. The amount of time to pump the net out will vary depending on the amount of fish in the net and weather conditions, typically ranging from 10 to 60 minutes. The proposed fishery could result in a total of 80 trips per year per catching vessel.

4.3 Bycatch Monitoring and Mitigation Measures

4.3.1 Voidance of Fish Aggregating Devices

Fish Aggregating Devices (FADs) are fishing tools, often artificial buoys or rafts deployed in the ocean, designed to attract and concentrate fish, improving fishing efficiency. While effective, they can also lead to overfishing and unintended capture of non-target species. In the proposed fishery, FADs will not be employed, which will help minimize the risk of bycatch.

4.3.2 Mechanical Separation Measures

There will be a grate on the pump with 6-inch squares. Excluder bars will be installed on the dewatering box to separate small pelagic species from non-target species.

4.3.3 Monitoring Protocols

In the proposed fishery, bycatch will be primarily monitored by an observer on the catch boat or carry boat, with cameras as a preferred alternative, along with a robust shoreside monitoring ability, which will be ensured to take place at the Cape May plant. The gear will not be deployed if protected species, such as whales, dolphins, or sea turtles, are observed to be present near the fish schools intended to be caught.

4.3.4 Personal Experience

The fishermen possess ample experience in safely releasing protected species from seines.

5. ALTERNATIVES UNDER CONSIDERATION

The Council on Environmental Quality (CEQ) regulations implementing NEPA require a range of alternatives to be analyzed for a federal action. The alternatives analyzed may be limited to a range of alternatives that could reasonably achieve the need that the proposed action is intended to address. Section 3.2 of this document describes the purpose and need of the proposed action. Two alternatives are considered.

5.1 Alternative 1 (Status Quo): No EFP Issued

An Atlantic thread herring purse seine fishery has not been operational in the mid-Atlantic region for several years. Alternative 1 represents a baseline scenario in which nothing changes, facilitating a comparison of the potential impacts and benefits of the proposed action (i.e., issuing the EFP).

5.2 Alternative 2: An EFP Issued

Under alternative 2, the experimental fishery would be permitted to operate in Federal waters, extending from Ocean City, Maryland, north to Montauk, Long Island, New York, and within the management jurisdiction of the MAFMC, likely including statistical areas 612, 614, 615, and 621, during May through November in the following three years. Section 4 of this document contains detailed information about the experimental fishery.

This is a preferred alternative. As described in section 3.2, the proposed action would explore the feasibility of establishing a sustainable commercial purse seine fishery targeting Atlantic thread herring in the mid-Atlantic region while ensuring environmental sustainability, and benefit human communities.

6. AFFECTED ENVIRONMENT

The affected environment consists of the physical, biological, and human components of the environment expected to experience impacts if any of the actions considered in this document were to be implemented. This document focuses on five aspects of the affected environment, which are defined as valued ecosystem components (VECs; Beanlands and Duinker, 1984). The VECs include target species (i.e., thread herring), non-target species, protected species, physical environment and essential fish habitat (EFH), and human communities.

The following sections describe the recent condition of the VECs. Section 7 describes the expected impacts of the alternatives on each VEC.

6.1 Target Species (Atlantic Thread Herring)

This section describes the life history, distribution, and stock status for Atlantic thread herring, as well as its role as forage in the ecosystem.

Atlantic thread herring is a clupeid species, which is widely distributed throughout the western Atlantic, spanning from Maine to Brazil (Finucane and Vaught, 1986). It is a coastal species that is abundant in waters shallower than 35 meters, with a preference for the upper 3–5 meters of the water column, often forming large, dense schools (Houde, 1977; Finucane and Vaught, 1986; Smith, 1994). In the northeastern Gulf, Atlantic thread herring, measuring between 115 and 225 mm in fork length, range from 0 to 6 years of age, with substantial growth occurring in the first year (Houde et al., 1983). Maturity is typically reached at 1–2 years (Finucane and Vaught, 1986). Spawning occurs in May and June off North Carolina and from April-September in the Gulf of Mexico (Houde, 1977). The oldest thread herring on record was captured off North Carolina and was 8 years old (Smith, 1994). These fish are most observed in waters with temperatures ranging from 23 to 29 °C and salinity levels between 32 and 39 (Finucane and Vaught, 1986).

On the west coast of Florida, adult Atlantic thread herring exhibit specific migration patterns. They primarily migrate south during the fall, where they overwinter in the warm waters between

Fort Myers, Florida, and the Florida Keys (Finucane and Vaught, 1986). As spring arrives, they migrate north along the coast and are frequently found off the west coast of Florida during the summer months. This migratory behavior and their ability to adapt to varying water conditions play a significant role in their ecological presence.

Atlantic thread herring prey primarily on phytoplankton, zooplankton, and organic debris, which they filter from the water column using their numerous gill rakers. They play an important role as forage in the US shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and by humans in the region (Finucane and Vaught, 1986; Smith, 1994; Simons et al., 2013).

These fish are believed to expand their range northward due to increasing water temperature. Atlantic thread herring were captured in the Northeast Area Monitoring and Assessment Program (NEAMAP) and Northeast Fisheries Science Center (NEFSC) surveys (Figures 5 and 6). Although these surveys are not pelagic surveys, they do show that these pelagic fish do occur and have been persistent in the northeast portion of their range. Larval surveys (ECOMON), conducted by the NEFSC, show that larval thread herring do occur in the mid-Atlantic region (Figures 7-9). Larvae were present most often in the spring and summer for all regions and most years of the survey (Figure 8) and have shown an increasing presence since 2000 (Figure 9). A larval fish survey conducted in a southern New Jersey estuary over 24 years indicated that thread herring larvae were increasing in number (Mean density of 0.561/1000 m^3; Morson et al., 2019).

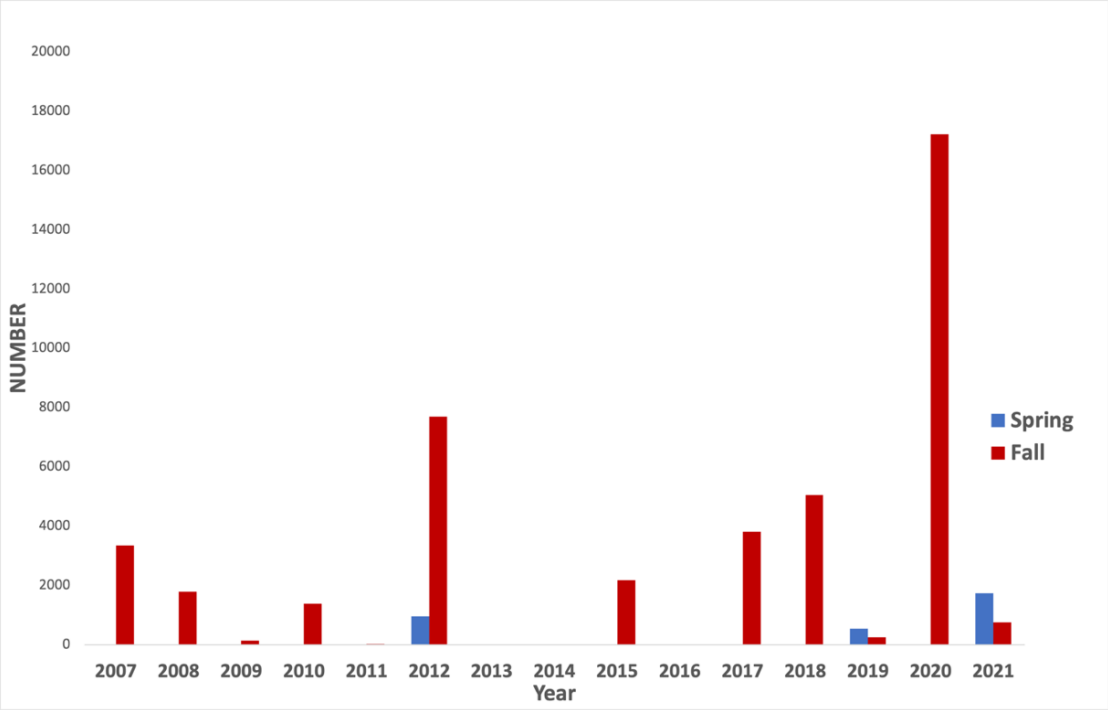


Figure 5. Total number of Atlantic thread herring caught in North East Area Monitoring and Assessment Program (NEAMAP) Spring and Fall Survey by year for all regions. No data were collected in spring 2020. Depth Strata 20-60 ft. *Data provided by VIMS. NEAMAP samples from Cape Cod, MA south to Cape Hatteras, NC.

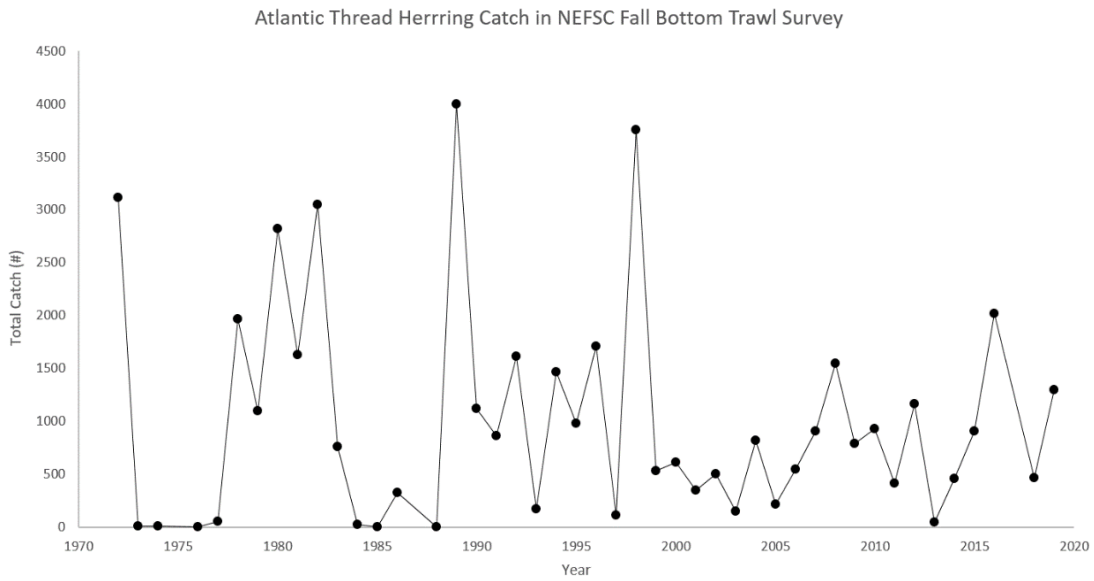


Figure 6. Total catch (#) of Atlantic thread herring in the NEFSC fall bottom trawl survey from 1972-2019. *Data provided by NEFSC.

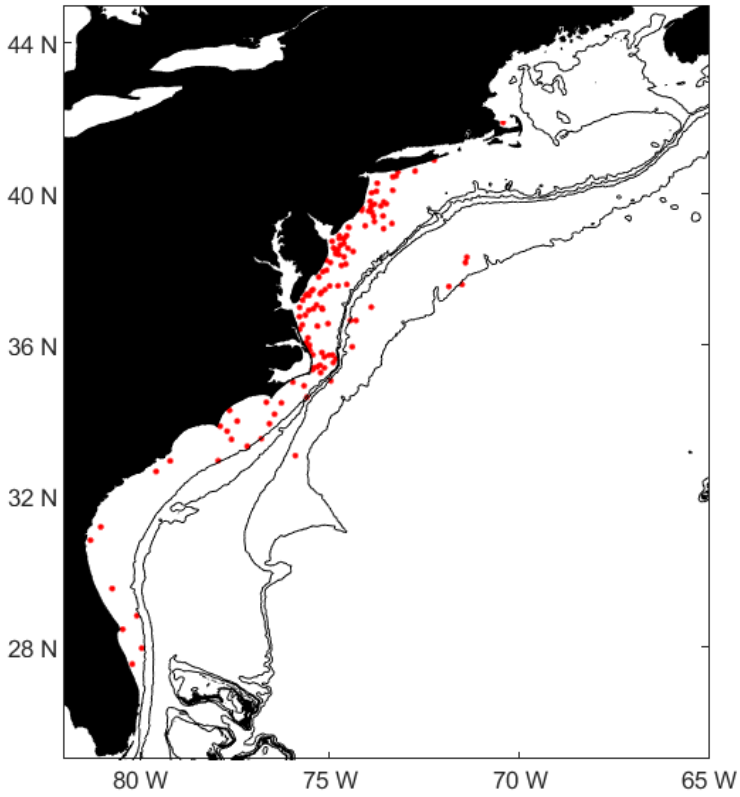


Figure 7. Plot of tows that caught Atlantic thread herring from the NEFSC Ecosystem Monitoring (ECOMON) program larval fish survey. Some larvae may be misidentified in the database. *Data provided by NEFSC.

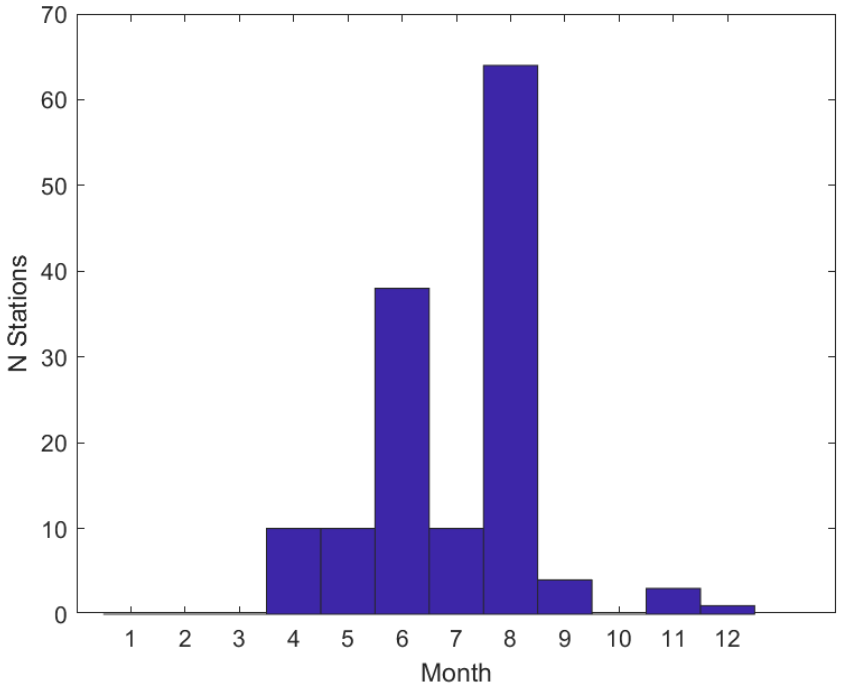


Figure 8. Number of stations by month that contained Atlantic thread herring larvae from the ECOMON survey. Some larvae may be misidentified in the database. *Data provided by NEFSC.

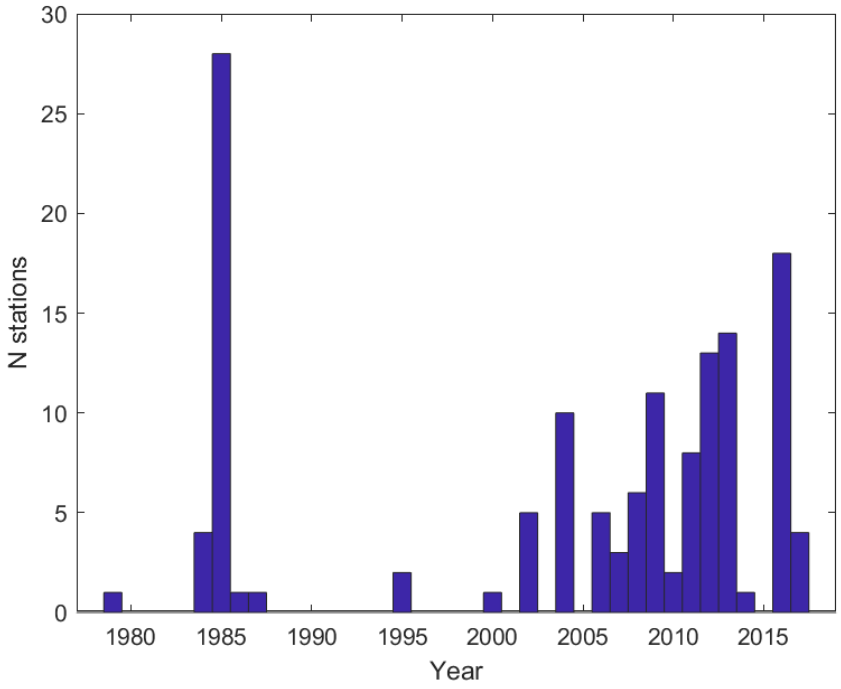


Figure 9. Number of stations by year that contained Atlantic thread herring larvae from the ECOMON survey. Some larvae may be misidentified in the database. *Data provided by NEFSC.

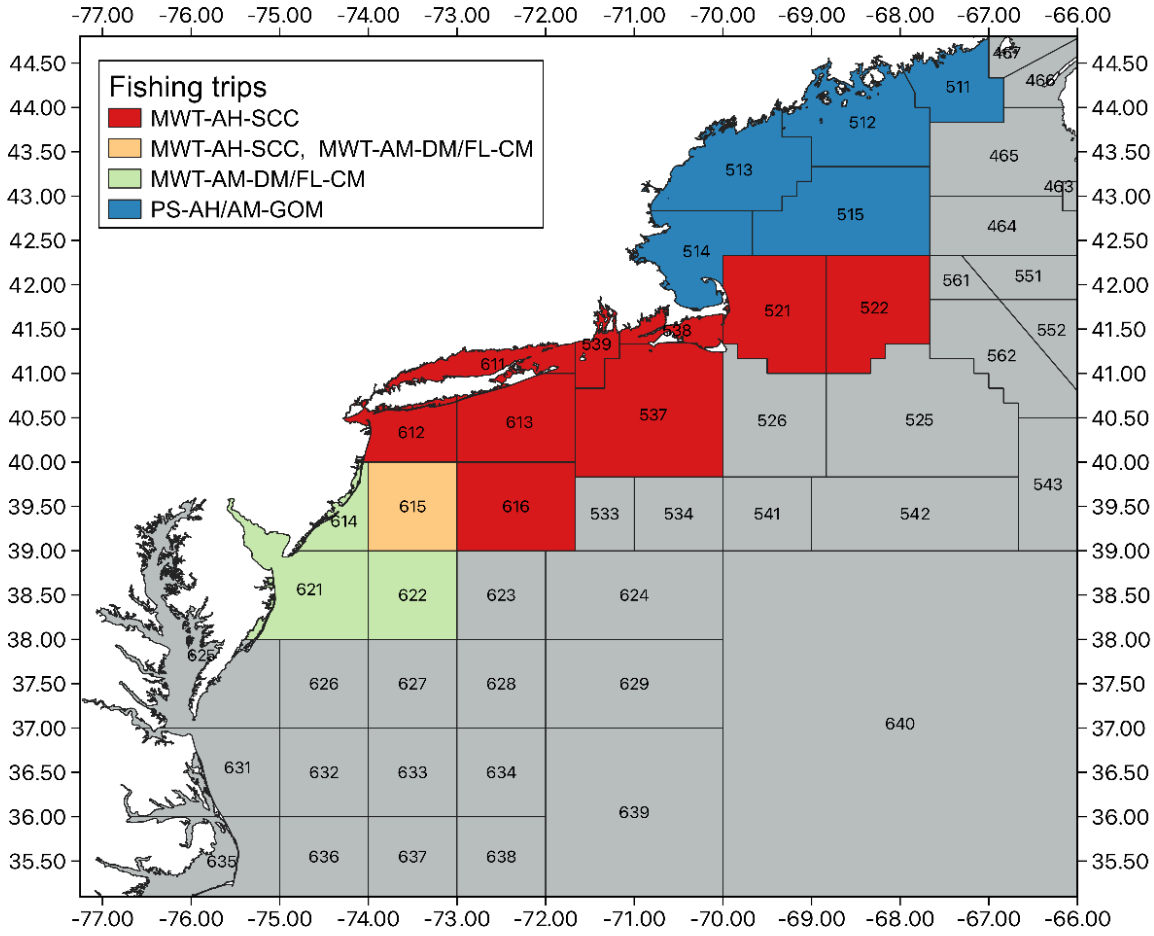
6.2 Non-target Species

Non-target species refers to species other than Atlantic thread herring which will be caught/landed by federally permitted vessels while fishing for these herrings. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) defines bycatch as fish that are harvested in a fishery, but are not retained (sold, transferred, or kept for personal use), including economic discards and regulatory discards (16 U.S.C. § 1802(2)). The MSA mandates the reduction of bycatch, as defined, to the extent practicable (16 U.S.C.§ 1851(a)(9)). Incidental catch, on the other hand, is typically considered to be non-targeted species that are harvested while fishing for a target species and is retained and/or sold. When non-target species are encountered in a fishery, they are either discarded (bycatch) or they are retained and sold as part of the catch (incidental catch).

The following sections summarize the current conditions of non-target species in various analogous fisheries over both long-term periods and across a wide spatial range. The Atlantic menhaden purse seine fishery serves as an analogy to detect the incidental bycatch of the proposed fishery, given these two fisheries target a species of similar size and ecological role in the food web, operate in the same area during the same season, use the same gear type, and employ a comparable level of fishing effort.

Historical observer data from the Northeast Fisheries Observer Program (NEFOP) provides valuable analogies for understanding the proposed fishery. This data encompasses mid-water trawl trips targeting Atlantic herring south of Cape Cod (MWT-AH-SCC; 2007-present), purse seine trips targeting Atlantic herring or Atlantic menhaden in the Gulf of Maine (PS-AH/AM-GOM; 2007-present), and mid-water trawl trips targeting Atlantic menhaden on the fishing vessels Dyrsten and Flicka, owned by H & L Axelsson, Inc., operating in Cape May (MWT-AM-DM/FL-CM; 2014-present). These fisheries either operate in the same or adjacent areas to the proposed fishery and/or utilize the same gear type. Statistical areas where these fishing trips occurred are shown in Map 2.

There are 922 observed MWT-AH-SCC fishing trips from 2007 to the present, taking place in statistical areas 521, 522, 537, 538, 539, 611, 612, 613, 615 and 616. There are 470 observed PS-AH/AM-GOM fishing trips from 2007 to the present, among which 455 trips targeting on Atlantic herring and 15 trips targeting on Atlantic menhaden. There are 5 observed MWT-AM-DM/FL-CM fishing trips from 2014 to the present, taking place in statistical areas 614, 615, 621 and 622.



Map 2. Fishing areas of observed fishing trips.

Incidental bycatch of other finfish species in the Atlantic menhaden purse seine fishery has been a topic of study for many years (Christmas et al., 1960; Oviatt, 1977; Smith, 1896). Past studies have indicated that there is little or no bycatch in the menhaden purse seine fishery. The Virginia Institute of Marine Science (VIMS) studied bycatch levels in the Atlantic menhaden fishery. Results from that study indicated that bycatch in the 1992 Atlantic menhaden reduction fishery was minimal, comprising about 0.04% by number (Austin et al., 1994). The maximum percentage of bycatch occurred in August (0.14%) while the lowest occurred in September (0.002%). Among important recreational species, bluefish accounted for the largest portion of bycatch (0.0075% of the total menhaden catch).

River Herring/Shad

In 2017, an updated assessment of river herring concluded that the coastwide meta-complex of river herring stocks on the US Atlantic coast remains at historically low levels. The overfished and overfishing status of the coastwide stock complex is unknown because estimates of total biomass, fishing mortality rates, and associated reference points could not be developed. While

the coastwide status remains unchanged, there are some positive signs of improvement in certain river systems, with increasing abundance trends observed from the mid-Atlantic to the New England region. Although abundance in these river systems remains low, dam removals and improvements in fish passage have positively impacted run returns (ASMFC, 2017a).

The 2020 American Shad Benchmark Stock Assessment and Peer Review Report indicates that American shad continue to be depleted on a coastwide basis. Multiple factors, including overfishing, insufficient fish passage at dams, predation, pollution, water withdrawals, river channelization, changing ocean conditions, and climate change, likely lead to the decline in shad from historic abundance levels. The assessment also reveals that shad recovery is constrained by restricted access to spawning habitat. The term "depleted" is used instead of "overfished" because it is challenging to separate the impact of fishing on American shad stocks from the influences of all other factors affecting abundance. The benchmark assessment was endorsed by the Peer Review Panel and accepted by the Shad & River Herring Management Board for management purposes (ASMFC, 2020).

The MAFMC has focused on limiting incidental catch of river herring and shad in the Atlantic mackerel fishery through a catch cap, which was implemented under Amendment 14 to the Atlantic Mackerel, Squid, and Butterfish Fishery Management Plan (FMP; MAFMC, 2013). In December 2014, National Marine Fisheries Service (NMFS) established catch caps for river herring and shad in the Atlantic herring fishery for 2014-2015. River herring and shad caught on fishing trips that land over 6,600 lbs of herring count toward the caps. Caps are area- and gear-specific. If 95% of a cap is harvested, a 2,000 lbs herring possession limit is imposed for the rest of the fishing year, effectively closing the area for directed herring fishing until the next year.

In 2018, the Council developed a white paper to support its consideration of adding river herring and shad as stocks in the Atlantic herring fishery. The white paper reviewed previous decisions, legal requirements, species and fishery information, updated actions, new research, and potential strategies (NEFMC, 2018). The Council, after discussions in its April and June 2018 meetings, maintained the existing management structure, not designating them as stocks in the Atlantic Herring FMP at that time.

In June 2019, NMFS reviewed the status of alewife and blueback herring and determined that listing them under the ESA was not warranted (Federal Register notice: https://deferalregister.gov/d/2019-12908). While river herring have declined from historical levels, recent fisheries management efforts have mitigated the risks from fishing mortality. Although some river herring populations remain depleted, robust populations exist in other areas.

Despite concerns regarding the conservation status of these species, the proposed action is unlikely significantly impact river herring/shad species (see section 7.2.2).

6.3 Protected Species

Protected species are those afforded protections under the ESA (species listed as threatened or endangered under the ESA) and/or MMPA. Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually (https://www.fisheries.noaa.gov/national/marine-mammal-

protection/marine-mammal-protection-act-list-fisheries), classifying US commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions). Atlantic thread herring has been added to the mid-Atlantic menhaden purse seine fishery (source: https://www.fisheries.noaa.gov/national/marine-mammal-protection/mid-atlantic-menhaden-purse-seine-fishery-mmpa-list-fisheries), which is listed as Category II fishery with occasional interactions with bottlenose dolphins (Northern Migratory coastal and Southern Migratory coastal stocks).

Table 2 lists protected species in the affected environment that have the potential to be impacted by the proposed action; for example, removal of forage, interactions in the fishery or with gear type primarily used in the fishery (i.e., purse seine gear) have been observed/documented. Since the Atlantic thread herring has been incorporated into the mid-Atlantic menhaden purse seine fishery, as mentioned above, observed/documented bycatch information from this fishery is utilized to complete the table.

Historical observer data collected by NEFOP from MWT-AH-SCC (2007-present), PS-AH/AM-GOM (2007-present), and MWT-AM-DM/FL-CM (2014-present) fishing trips provide valuable analogies for the proposed fishery. These analogies are particularly relevant because they operate in areas that are either the same as or adjacent to the proposed fishery, and/or they utilize the same gear type.

Table 2. Species protected under the ESA and/or MMPA that may occur in the affected environment. Species italicized and in bold are MMPA strategic stocks. Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters).

Species	Status[2]	Potential for action to impact (via interactions (I) with Atlantic herring fishing gear and/or removal of forage (F)) protected species?
CETACEANS		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***No***
Humpback whale (*Megaptera novaeangliae*), West Indies DPS	Protected (MMPA)	Yes (I, F)
Fin whale (Balaenoptera physalus)	***Endangered***	***Yes (F)***
Sei whale (Balaenoptera borealis)	***Endangered***	***Yes (F)***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter macrocephalus)	***Endangered***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes (I, F)
Pilot whale (Globicephala spp.)[3]	Protected (MMPA)	Yes (F)
Pygmy sperm whale (*Kogia breviceps*)	Protected (MMPA)	No
Dwarf sperm whale (*Kogia sima*)	Protected (MMPA)	No
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	No
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes (F)
Short Beaked Common dolphin (*Delphinus delphis*)	Protected (MMPA)	Yes (F)
Atlantic Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Striped dolphin (*Stenella coeruleoalba*)	Protected (MMPA)	No
Beaked whales (*Ziphius and Mesoplodon spp*)[4]	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[5]	***Protected (MMPA)***	***Yes (I, F)***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes (F)
PINNIPEDS		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes (F)
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes (F)
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	No
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	No
SEA TURTLES		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	No

Species	Status[2]	Potential for action to impact (via interactions (I) with Atlantic herring fishing gear and/or removal of forage (F)) protected species?
Green sea turtle (*Chelonia mydas*), North Atlantic DPS	Threatened	No
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic Ocean DPS	Threatened	No
FISH		
Giant manta ray (*Manta birostris*)	Threatened	No
Atlantic salmon	Endangered	No
Atlantic sturgeon (*Acipenser oxyrinchus*)		
Gulf of Maine DPS	Threatened	No
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	No
CRITICAL HABITAT		
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No
North Atlantic Right Whale Critical Habitat	ESA (Protected)	No
North Atlantic DPS of Green Sea Turtle	ESA (Proposed)	No

Notes:

[1] A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).

[2] Status is defined by whether the species is listed under the ESA as endangered (i.e., at risk of extinction), threatened (i.e., at risk of endangerment), or protected under the MMPA. Marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species for which ESA listing may be warranted.

[3] There are two species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often referred to as *Globicephala spp*.

[4] There are multiple species of beaked whales in the Northwest Atlantic. They include the Cuvier's (*Ziphius cavirostris*), Blainville's (*Mesoplodon densirostris*), Gervais' (*Mesoplodon europaeus*), Sowerbys' (*Mesoplodon bidens*), and Trues' (*Mesoplodon mirus*) beaked whales. Species of *Mesoplodon* are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.

[5] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

6.3.1 Protected Species and Critical Habitat Unlikely to be Impacted by the Proposed Action

Table 2 has critical habitat designated under the ESA, as well as multiple ESA listed and/or marine mammal protected species that occur in the affected environment of the proposed action but are unlikely to be impacted (via interactions with gear, removal of forage, or destruction of essential features of critical habitat) by the action. This determination has been made because either the species occurrence is unknown to overlap with the area primarily affected by the action, the species does not forage on thread herring, and/or, there have been no documented

interactions between the species and the primary gear type used to prosecute the fishery (i.e., purse seine).

To aid in the identification of MMPA protected species not likely to be impacted by the action, data provided in the MMPA LOF, and marine mammal stock assessment and serious injury and mortality reports (SARs) were referenced (see Marine Mammal SARs for the Atlantic Region: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region; MMPA LOF: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-protection-act-list-fisheries; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://www.fisheries.noaa.gov/resource/publication-database/marine-mammal-mortality-and-serious-injury-reports; NOAA Fisheries marine mammal species directory: https://www.fisheries.noaa.gov/species-directory/marine-mammals; NEFOP observer data, 2007-2023, unpublished).

To help identify ESA listed species not likely to be impacted by the action, NOAA Fisheries endangered species directory (https://www.fisheries.noaa.gov/species-directory/threatened-endangered), Marine Mammal SARs, and NMFS NEFSC reference documents (marine mammal serious injury and mortality reports) were referenced. Given these references, and the fact that no sea turtles, Atlantic sturgeon, or other protected species were killed, captured, entangled, or observed in the mid-Atlantic menhaden purse seine fishery (ASMFC, 2017b), and there has been no documented bycatch of ESA listed species in the three observed groups of fishing trips, we were able to identify those ESA listed species not likely to be impacted by the proposed action.

In the case of critical habitat, this determination has been made because operation of the proposed fishery will not affect the essential physical and biological features of North Atlantic right whale, loggerhead sea turtle (Northwest Atlantic Ocean distinct population segment, DPS) or proposed green sea turtle (North Atlantic DPS) critical habitat and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS, 2014; NMFS, 2015a; NMFS, 2015b; NMFS, 2023).

6.3.2 Protected Species Potentially Impacted by the Proposed Fishery

6.3.2.1 Large Whales

Large whales, such as humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. They exhibit euryphagous feeding behavior, foraging opportunistically on small crustaceans (e.g., krill, copepods), small schooling fish (e.g., herring, herring-like species) and/or cephalopods (e.g., squid) (Smith et al., 2015; NOAA Fisheries marine mammal species directory; Marine Mammal SARs for the Atlantic Region). Generally, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N) (Hayes et al., 2019; NMFS, 1991a; 2010; 2011). This is a simplification of whale movements, particularly as it relates to winter movements. It is unknown if all individuals of a population migrate to low latitudes in the winter, although increasing evidence suggests that for some species (e.g., humpback whales), some portion of the population remains in higher

latitudes throughout the winter (Brown et al., 2002; Clapham et al., 1993; Cole et al., 2013; Khan et al., 2010; 2011; 2012; Khan et al., 2009; NOAA, 2008; Swingle et al., 1993; Vu et al., 2012; Waring et al., 2014). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movement of large whales to foraging grounds in the spring/summer is well understood. Large whales consistently return to these foraging areas each year; therefore, these areas can be considered important areas for whales (Baumgartner et al., 2003; Baumgartner and Mate, 2003; Brown et al., 2002; Kenney, 2001; Kenney et al., 1986; Kenney et al., 1995; Mayo and Marx, 1990; Payne et al., 1986; Payne et al., 1990; Schilling et al., 1992). More information on the biology, status, and range wide distribution of whale species is in the Marine Mammal SARs.

6.3.2.2 Small Cetaceans and Pinnipeds

Table 2 identifies small cetaceans and pinnipeds that may occur in the affected environment of the proposed action and have the potential to be impacted by the action. Small cetaceans can be found throughout the year in the Northwest Atlantic Ocean, foraging on a diverse range of marine organisms, including, but not limited to, schooling fish (e.g., Atlantic herring, mackerel, herring-like species), cephalopods (e.g., squid), and/or crustaceans (e.g., shrimp, krill) (Smith et al. 2015; NOAA Fisheries marine mammal species directory; Marine Mammal SARs for the Atlantic Region).

The pinnipeds in Table 2 that have the potential to be impacted by the operation of the action are harbor and gray seals. These pinniped species have a predominantly piscivorous diet (e.g., herring, flatfish, gadids) and are primarily found throughout the year or seasonally from New Jersey to Maine (Smith et al., 2015; NOAA Fisheries marine mammal species directory; Marine Mammal SARS for the Atlantic Region). However, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35°N). More information on the biology and range wide distribution of each species of small cetacean and pinniped in Table 2 is in the Marine Mammal SARs.

Common bottlenose dolphins are found throughout the western Atlantic coast, with primary habitat along the US ranging from New York through Florida. The distribution of the species changes seasonally, with a greater abundance of bottlenose dolphins found in the mid-Atlantic waters in summer (NMFS, 2008). In winter, most bottlenose dolphins are found south of the Virginia-North Carolina border (NMFS, 2008). The species is often aggregated in groups, ranging up to 15 individuals inshore and even larger herds offshore. Bottlenose dolphins eat a variety of prey including invertebrates and fish.

6.3.3 Gear Interactions with Protected Species

Protected species are at risk of interacting with various types of fishing gear, with interaction risks associated with gear type, quantity, soak or tow duration, and degree of overlap between gear and protected species. Information on observed or documented interactions between gear and protected species is available (Marine Mammal SARs; NEFOP observer data, unpublished).

Historically, Atlantic menhaden purse seine fishermen reported an annual incidental take of one to five coastal bottlenose dolphins (NMFS, 1991b). Since then, large bycatch excluders are now widespread throughout the fishing fleet. Recently, there have been no documented mortalities or serious injuries in mid-Atlantic menhaden purse seine gear of common bottlenose dolphins. The Atlantic purse seine fishery reported the lethal incidental take of one minke whale in 1990 (NMFS, 1993); however, the target species of the purse seine (i.e., tuna or menhaden) is unknown. In addition, an incidental take of a humpback whale in the mid-Atlantic menhaden purse seine fishery was reported in 2001 (66 FR 6545, January 22. 2001); however, in 2005 humpback whales were removed from the list species killed or injured in the fishery because an interaction had not been reported in subsequent years.

In 2006, the mid-Atlantic menhaden purse seine fishery was elevated from a Category III fishery to a Category II fishery (71 FR 48802, August 22, 2006). This change was made after interactions with bottlenose dolphins in other purse seine fisheries, such as those in the Gulf of Mexico. This required the fishery to comply with registration requirements, applicable take reduction plan requirements, and observer coverage. However there has been very limited federal observer coverage since 2008, but no incidents have been observed.

As an analogy, on observed PS-AH/AM-GOM fishing trips from 2007 to the present, all reported interactions between protected species and purse seine gear resulted in the animals being safely released from the nets (Table 3; Cole et al., 2013; Henry et al., 2017; Henry et al., 2015; 2016; Henry et al., 2019; Marine Mammal SARs). Hence, even though interactions with large whales or bottlenose dolphins may occur, purse seines are not anticipated to cause injury or mortality to these animals.

Table 3. Protected species under the ESA and/or MMPA that interacting with gears on observed PS-AH/AM-GOM fishing trips from 2007 to the present.

Species	Bycatch (#)	Year	Condition
Gray seal	92	2008, 2010, 2011, 2012, 2013, 2014, 2016 ,2018, 2022	92 Alive
Seal	12	2007, 2011, 2015, 2016	11 Alive, 1 Unknown
Harbor seal	6	2008, 2011, 2012, 2013	6 Alive
Humpback whale	4	2008, 2012	4 Alive
Minke whale	1	2008	1 Alive

6.4 Physical Environment and Essential Fish Habitat

The proposed action will be conducted in Federal waters, extending from Ocean City, Maryland, north to Montauk, Long Island, New York, and within the management jurisdiction of the MAFMC, likely including statistical areas 612, 614, 615, and 621 (Map 1).

The mid-Atlantic region exhibits diverse physical features, including varying water depths and a mix of sandy beaches, rocky shores, estuaries, and marshlands. The mid-Atlantic bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The inshore areas are influenced by many large coastal rivers and estuarine areas. Its biological richness is supported by major ocean currents, like the Gulf Stream, providing nutrient-rich waters that sustain a complex food web. More information on the affected physical and biological environments is available in Stevenson et al. (2004).

The NEFSC produces regular updates on conditions of the northeast shelf ecosystem. Highlights from the 2019 update (NEFSC, 2019) regarding habitat include:

- Measures to reduce nutrient inputs appear to have significantly improved water quality in the Chesapeake Bay.
- The northeast U.S. shelf continues to be among the fastest warming waters globally.
- The most northerly Gulf Stream north wall positions were recorded in 2014-2017.
- The mid-Atlantic summer 2018 sea surface temperatures were the third highest on record.
- Bottom temperatures are also increasing, with the past six years being above average.
- Summer primary production is increasing in the mid-Atlantic and New England, driving by warmer temperature and increased bacterial remineralization and nutrient recycling.
- Seasonal peaks in abundance of certain key zooplankton species have shifted.

The EFH designation for the proposed action is developed through Omnibus Habitat Amendment 2 (OHA2; https://www.fisheries.noaa.gov/action/omnibus-essential-fish-habitat-amendment-2). The designations for adults and juveniles identify throughout the mid-Atlantic bight. Interactive maps of EFH for each species and life stage are on the NOAA EFH Mapper (https://www.habitat.noaa.gov/apps/efhmapper/).

Fishing activities are generally not expected to impact EFH for species which inhabit the water column. However, there may be an impact on EFH for the benthic life stages of several species (Table 4). More information is in the FMP document that most recently updated each species' EFH designation and the NOAA EFH mapper.

Table 4. Current EFH designation information sources (Note OHA2 = Omnibus Habitat Amendment 2).

Species	Authority	Plan Managed Under	Most recent update
Monkfish	NEFMC, MAFMC	Monkfish	OHA2
Atlantic herring	NEFMC	Atlantic Herring	OHA2
Atlantic salmon	NEFMC	Atlantic salmon	OHA2
Atlantic sea scallop	NEFMC	Atlantic Sea Scallop	OHA2
American plaice	NEFMC	NE Multispecies	OHA2
Atlantic cod	NEFMC	NE Multispecies	OHA2
Atlantic halibut	NEFMC	NE Multispecies	OHA2
Atlantic wolffish	NEFMC	NE Multispecies	OHA2
Haddock	NEFMC	NE Multispecies	OHA2
Ocean pout	NEFMC	NE Multispecies	OHA2
Offshore hake	NEFMC	NE Multispecies	OHA2
Pollock	NEFMC	NE Multispecies	OHA2
Red hake	NEFMC	NE Multispecies	OHA2
Redfish	NEFMC	NE Multispecies	OHA2
Silver hake	NEFMC	NE Multispecies	OHA2
White hake	NEFMC	NE Multispecies	OHA2
Windowpane flounder	NEFMC	NE Multispecies	OHA2
Winter flounder	NEFMC	NE Multispecies	OHA2
Witch flounder	NEFMC	NE Multispecies	OHA2
Yellowtail flounder	NEFMC	NE Multispecies	OHA2
Barndoor skate	NEFMC	NE Skate Complex	OHA2
Clearnose skate	NEFMC	NE Skate Complex	OHA2
Little skate	NEFMC	NE Skate Complex	OHA2
Rosette skate	NEFMC	NE Skate Complex	OHA2
Smooth skate	NEFMC	NE Skate Complex	OHA2
Thorny skate	NEFMC	NE Skate Complex	OHA2
Winter skate	NEFMC	NE Skate Complex	OHA2
Red crab	NEFMC	Red Crab	OHA2
Spiny dogfish	MAFMC/NEFMC	Spiny Dogfish	Original FMP
Atlantic surfclam	MAFMC	Atlantic Surfclam Ocean Quahog	Amendment 12
Ocean quahog	MAFMC	Atlantic Surfclam Ocean Quahog	Amendment 12
Bluefish	MAFMC	Bluefish FMP	Amendment 1

Species	Authority	Plan Managed Under	Most recent update
Atlantic mackerel	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Butterfish	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Longfin squid	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Shortfin squid (*Illex*)	MAFMC	Squid, Mackerel, Butterfish	Amendment 11
Black sea bass	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Scup	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Summer flounder	MAFMC	Summer Flounder, Scup, and Black Sea Bass	Amendment 12
Golden Tilefish	MAFMC	Tilefish	Amendment 1
Blueline Tilefish	MAFMC	Tilefish	Amendment 6
Chub Mackerel	MAFMC	Atlantic Mackerel, Squid, Butterfish	Amendment 21

6.5 Human Communities

This section summarizes commercial Atlantic thread herring catches over the past 14 years (2010-2023) in Florida, which serves as a noteworthy reference point for the proposed action. Descriptive information on the fisheries is included, and quantitative commercial fishery information is presented. This section establishes a descriptive baseline against which to compare predicted socioeconomic changes resulting from each alternative considered in this document.

6.5.1 Commercial Atlantic Thread Herring Fisheries

There have been commercial Atlantic thread herring fisheries in Florida for at least a dozen years. These fisheries utilize varying gear types, with purse seines being prevalent on the Gulf side and lampara seines (a smaller version of encircling nets) commonly employed on the Atlantic coast. These fisheries operate under a 'bait' license. Sales of the catch are made to wholesale dealers, with Aylesworth Fish & Bait (https://fishandbait.com/) being one of the long-standing companies involved in these activities.

Thread herring catches have been consistently greater on the Gulf side than on the Atlantic coast, ranging from 875,165 lbs in 2011 to 4,876,844 lbs in 2019 (The year 2023 was not considered due to the incomplete fishing year; Table 5). The highest annual landings typically occur in the Gulf (Table 6).

Table 5. Landings from Florida Trip Ticket Data. Keys are included in the Gulf Coast.

Year	Coast	Pounds	Trips	Value
2010	Atlantic	13,664.20	24	$ 7,243.98
2010	Gulf	1,160,631.60	59	$ 181,473.38
2011	Atlantic	31,904.48	28	$ 17,426.92
2011	Gulf	875,165.00	49	$ 122,899.58
2012	Atlantic	5,522.04	12	$ 5,949.10
2012	Gulf	1,702,108.00	124	$ 233,900.07
2013	Atlantic	17,494.20	82	$ 21,299.99
2013	Gulf	1,625,377.44	145	$ 265,219.31
2014	Atlantic	15,428.74	89	$ 7,311.82
2014	Gulf	2,240,706.48	140	$ 372,662.69
2015	Atlantic	2,455.88	148	$ 10,126.58
2015	Gulf	1,412,651.30	152	$ 284,939.53
2016	Atlantic	2,564.92	41	$ 10,880.00
2016	Gulf	2,469,040.06	202	$ 490,188.53
2017	Atlantic	2,148.80	36	$ 10,906.12
2017	Gulf	2,804,170.92	278	$ 593,684.60
2018	Atlantic	14,403.60	48	$ 21,155.47
2018	Gulf	2,259,503.32	136	$ 477,907.74
2019	Atlantic	18,617.49	76	$ 19,443.06
2019	Gulf	4,876,844.88	268	$ 1,011,833.19
2020	Atlantic	8,311.45	49	$ 9,030.88
2020	Gulf	1,879,029.50	121	$ 449,678.18
2021	Atlantic	10,688.12	49	$ 14,418.97
2021	Gulf	1,143,581.52	102	$ 291,785.47
2022	Atlantic	7,162.23	81	$ 28,958.24
2022	Gulf	1,345,742.12	86	$ 344,297.55
2023	Atlantic	4,627.72	33	$ 4,678.58
2023	Gulf	671,375.69	38	$ 182,795.61

Table 6. The minimum, maximum, mean, and median percentage of annual landings by the areas (Panhandle, Gulf, and Atlantic) for 2010-present. The panhandle region is Pensacola to Panama City fishing areas.

Statistic	Atlantic	Gulf	Panhandle
Min	0.10%	29.12%	1.93%
Max	4.08%	97.14%	69.40%
Mean	0.87%	76.52%	22.62%
Median	0.60%	80.19%	19.58%

6.5.2 Fishing Communities

Consideration of the socioeconomic impacts on fishing communities of proposed fishery regulations is required by the National Environmental Policy Act of 1969 as Amended (NEPA, 1970) and the MSA, with a specific emphasis on National Standard 8 (MSA, 2007), which defines a "fishing community" as “a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and US fish processors that are based in such community” (16 U.S.C. § 1802(17)).

In the context of the proposed action, "fishing communities" encompass Lund's Fisheries, Inc. and Axelsson Seiner, Inc., which are anticipated to play a vital role in supporting around 20 families through their involvement in the fishery. The extent of these communities' economic benefits will be contingent upon factors such as the volume of fish harvested and the selling price, making the proposed fishery a potential driver of socioeconomic well-being in the region.

7. ENVIRONMENTAL IMPACTS OF ALTERNATIVES

The impacts of the alternatives under consideration are evaluated herein relative to the VECs described in the Affected Environment (section 6) and to each other. This action evaluates the potential impacts using the criteria in Table 7.

Table 7. Guidelines for defining the direction and magnitude of impacts of alternatives on each VEC.

VEC	Resource Condition	Impact of Action		
		Positive (+)	Negative (-)	No Impact (0)
Target and Non-target Species	Overfished status defined by the MSA	Alternatives that would maintain or are projected to result in a stock status above an overfished condition*	Alternatives that would maintain or are projected to result in a stock status below an overfished condition*	Alternatives that do not impact stock/populations
ESA-listed Protected Species (endangered or threatened)	Populations at risk of extinction (endangered) or endangerment (threatened)	Alternatives that contain specific measures to ensure no interactions with protected species (e.g., no take)	Alternatives that result in interactions/take of listed resources, including actions that reduce interactions	Alternatives that do not impact ESA listed species
MMPA Protected Species (not also ESA listed)	Stock health may vary but populations remain impacted	Alternatives that will maintain takes below PBR and approaching the Zero Mortality Rate Goal	Alternatives that result in interactions with/take of marine mammal species that could result in takes above PBR	Alternatives that do not impact MMPA Protected Species
Physical Environment /Habitat/EFH	Many habitats degraded from historical effort	Alternatives that improve the quality or quantity of habitat	Alternatives that degrade the quality, quantity or increase disturbance of habitat	Alternatives that do not impact habitat quality
Human Communities (Socioeconomic)	Highly variable but generally stable in recent years	Alternatives that increase revenue and social well-being of fishermen and/or communities	Alternatives that decrease revenue and social well-being of fishermen and/or communities	Alternatives that do not impact revenue and social well-being of fishermen and/or communities

Impact Qualifiers		
A range of impact qualifiers is used to indicate any existing uncertainty	Negligible	To such a small degree to be indistinguishable from no impact
	Slight as in slight positive or slight negative	To a lesser degree / minor
	Moderately positive or negative	To an average degree (i.e., more than “slight”, but not “high”)
	High, as in high positive or high negative	To a substantial degree (not significant unless stated)
	Significant	Affecting the resource condition to a great degree, see 40 CFR 1508.27.
	Likely	Some degree of uncertainty associated with the impact

*Actions that will substantially increase or decrease stock size, but do not change a stock status may have different impacts depending on the particular action and stock. Meaningful differences between alternatives may be illustrated by using another resource attribute aside from the MSA status, but this must be justified within the impact analysis.

7.1 Impacts on Target Species (Atlantic Thread Herring)

7.1.1 Impacts of Alternative 1 (Status Quo) on Target Species

There would be no impacts of alternative 1 on target species because there would be no change in the current fishing activities. The status quo would ensure that no additional pressures are added to the marine environment from the Atlantic thread herring purse seine fishery.

7.1.2 Impacts of Alternative 2 (EFP Issued) on Target Species

The EFP applicants estimate an average daily landing of about 75,000 pounds of thread herring during a trip. They have requested a catch limit of 3,000 metric tons (6.6 million pounds) for each of the three years proposed for the project. Research by Dr. Ed Houde in 1977, based on egg and larval collections from the eastern Gulf of Mexico, estimated the potential annual yield of thread herring to be between 60,300 and 120,600 metric tons in that region. The projected catch of thread herring from this EFP is estimated to remain far below the lower threshold of this estimated yield, suggesting minimal effects on the thread herring stock compared to status quo fishing.

Alternative 2 impacts on thread herring stock are not expected to hinder the stock's sustainability or its ongoing capacity to produce a sustainable biomass. Furthermore, it won't alter the stock's distribution in ways that might affect its sustainability. Thus, the impacts of Alternative 2 **are negligible on thread herring**.

7.2 Impacts on Non-target Species

7.2.1 Impacts of Alternative 1 (Status Quo) on Non-target Species

In the status quo scenario, without EFP issued, there would be no additional pressures or impacts on non-target species from Atlantic thread herring purse seine fishery under this alternative.

7.2.2 Impacts of Alternative 2 (EFP Issued) on Non-target Species

Most catches from the analogous fisheries consist of target species, with extremely low percentages of bycatch. The predominant non-target catch from the directed Atlantic herring and menhaden fisheries in the proposed fishing area is the river herring/shad species. The observed PS-AH/AM-GOM fishing trips use the same gear type as the proposed fishery, providing further information on purse seines. The catch of river herring/shad species on these trips constitutes only a minute fraction of the total catch (less than 1% in all years; Table 8). On observed MWT-AM-DM/FL-CM trips, there is no catch of river herring/shad. The monitoring and mitigation measures for bycatch implemented in the proposed fishery (section 4.3) are designed to prevent the catch of non-target species.

In summary, Alternative 2 **is expected to produce either no impact or only negligible impacts on non-target species**. The negligible impacts on river herring/shad are consistent with their current depleted stock status, as indicated by the latest stock assessments, which were unable to define reference points due to lack of data.

Table 8. Total target catch and bycatch (weight, lbs) of the river herring/shad species per year on observed PS-AH/AM-GOM fishing trips.

Target	Year/year group	Trip #	Target catch	Incidental catch	Discards
Atlantic herring	2007	15	2,122,267	0	0
	2008	35	6,805,470	358	0
	2009	53	9,843,509	1,031	2.4
	2010	42	1,820,818	479	0.4
	2011	97	9,506,794	132	1.2
	2012	54	7,057,342	302	1.4
	2013	57	7,100,414	784	3
	2014	28	3,915,757	0	0
	2015	15	2,549,525	8	0.2
	2016	14	2,984,135	120	0.5
	2017	14	2,106,870	290	0.2
	2018	15	1,684,342	7,331	9.3
	2019	3	318,578	0	0
	2020-2021	7	256,336	0	0
	2022	6	468,932	136	0.3
Atlantic menhaden	2020-2021	7	47,393	10	0
	2022	8	116,529	0.8	0.5

7.3 Impacts on Protected Species

7.3.1 Impacts of Alternative 1 (Status Quo) on Protected Species

Given that there would be no change in current fishing activities under Alternative 1, there would be no additional impacts on protected species.

7.3.2 Impacts of Alternative 2 (EFP Issued) on Protected Species

As provided in section 6.3, ESA listed species and designated critical habitat are not expected to be impacted by the proposed fishery; MMPA (non-ESA listed) protected species of large whales (e.g., humpback and minke whales), species of small cetaceans, and pinnipeds have the potential to be impacted by the proposed fishery, via foraging and/or interactions with fishing gear predominantly used in the fishery (i.e., purse seine). Although interactions are possible with these MMPA protected species, purse seines are **not expected to be source of serious injury or mortality** to them (details provided in section 6.3.3).

Regarding foraging, removal of Atlantic thread herring below the lower threshold of the estimated yield (section 7.1) will show negligible (i.e., for those protected species that do not forage on thread herring) to slight negative impacts (i.e., for protected species that do forage on thread herring). However, given that the Atlantic thread herring is an emerging species in the mid-Atlantic region, **any foraging impacts on protected species in this area are expected to be minimal.**

The monitoring and mitigation strategies detailed in section 4.3 aim to prevent bycatch of protected species in the proposed fishery. In summary, Alternative 2 **is expected to produce negligible impacts on protected species**.

7.4 Impacts on Physical Environment and Essential Fish Habitat

7.4.1 Impacts of Alternative 1 (Status Quo) on Physical Environment and Essential Fish Habitat

Alternative 1 will not impact physical environment and essential fish habitat, as it involves no action.

7.4.2 Impacts of Alternative 2 (EFP Issued) on Physical Environment and Essential Fish Habitat

The proposed fishery employs purse seining, which typically does not make contact with the seabed. Even on the rare occasions when purse seines might touch the seafloor, the impacts are considered minimal and/or temporary. According to the MSA, such impacts don't require mitigation. This method lessens the potential for habitat disruption and lowers the risk to

sensitive benthic ecosystems. Consequently, Alternative 2 **is expected to have negligible impacts on the physical environment or EFH**.

7.5 Impacts on Human Communities

7.5.1 Impacts of Alternative 1 (Status Quo) on Human Communities

Maintaining the status quo means that local communities would not experience any change in socio-economic benefits tied to the fishing industry. There would be no new job opportunities, nor would there be any diversification in their economic base from the Atlantic thread herring purse seine fishery.

7.5.2 Impacts of Alternative 2 (EFP Issued) on Human Communities

The issuance of the EFP under Alternative 2 has the potential to create immediate and direct socioeconomic benefits for the fishing communities involved. With the proposed average daily landing of about 75,000 pounds of thread herring during a trip, the fishing communities, i.e., Lund's Fisheries, Inc. and Axelsson Seiner, Inc., could see an increase in their revenue, which would trickle down to support the approximately 20 families associated with them.

Given that these fisheries primarily operate under a “bait’ license and sell their catch to wholesale dealers like Aylesworth Fish & Bait, there's potential for increased business partnerships and expanded market reach. The growth in landings could be leveraged to negotiate better rates with dealers or possibly explore additional markets, further enhancing the economic stature of these fishing communities. Thus, alternative 2 **is expected to have significant positive impacts on human communities**.

7.6 Cumulative Effects Analysis

7.6.1 Introduction

A cumulative effects analysis (CEA) is required by the Council on Environmental Quality (CEQ; 40 CFR part 1508.7) and NOAA policy and procedures for NEPA, found in NOAA Administrative Order 216-6A (Companion Manual, January 13, 2017). The purpose of the CEA is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective. Rather, the intent is to focus on those effects that are truly meaningful. The following remarks address the significance of the expected cumulative impacts as they relate to the proposed Atlantic thread herring purse seine fishery.

A cumulative effects assessment makes effect determinations based on a combination of: 1) impacts from past, present, and reasonably foreseeable future actions; 2) the baseline conditions of the VECs (the combined effects from past, present, and reasonably foreseeable future actions

plus the present condition of the VEC); and 3) impacts of the alternatives under consideration for this action.

7.6.1.1 Consideration of the Valued Ecosystem Components

The VECs for the proposed Atlantic thread herring purse seine fishery are generally the "place" where the impacts of management actions occur, and are identified in section 6.

- *Target Species*
- *Non-target species*
- *Protected species*
- *Physical environment / Essential Fish Habitat*
- *Human communities*

The CEA identifies and characterizes the impacts on the VECs by the alternatives under consideration when analyzed in the context of other past, present, and reasonably foreseeable future actions.

7.6.1.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the Atlantic thread herring fishery. The mid-Atlantic region from Ocean City, Maryland, north to Montauk, Long Island, New York, and within the management jurisdiction of the MAFMC, is the core geographic scope for each of the VECs. The core geographic scope for the managed species is the proposed fishing region (Map 1). For non-target species, that range may be expanded and would depend on the range of each species in the mid-Atlantic region. For habitat, the core geographic scope is focused on EFH within the Exclusive Economic Zone (EEZ) but includes all habitat utilized by Atlantic thread herring, and non-target species in the mid-Atlantic region. The core geographic scope for protected species is their range in the mid-Atlantic region. For human communities, the core geographic boundaries are defined as space that occupied by the fishing communities from Lund's Fisheries, Inc. and Axelsson Seiner, Inc, directly involved in the harvest or processing of thread herring (section 6.5.2)

7.6.1.3 Temporal Boundaries

Overall, while the effects of the historical Atlantic thread herring fishery are important and considered in the analysis, the temporal scope of past and present actions for Atlantic thread herring, non-target species and other fisheries, the physical environment and EFH, and human communities is primarily focused on actions that occurred after Unmanaged Forage Omnibus Amendment (UFOA) implementation (MAFMC, 2017). An assessment using this timeframe demonstrates the changes to resources and the human environment that have resulted through management under the Council process and through US prosecution of the fishery. For protected species, the scope of past and present actions is focused on the 1980s and 1990s (when NMFS

began generating stock assessments for marine mammals and sea turtles that inhabit waters of the US EEZ) through the present.

The temporal scope of future action for all VECs extends about three years into the future (2026), in line with the three-year EFP application. The dynamic nature of resource management for these species and lack of information on projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty. The impacts discussed in this section are focused on the cumulative effects of the proposed action (i.e., the suite of preferred alternatives) in combination with the relevant past, present, and reasonably foreseeable future actions over these time scales.

7.6.2 Relevant Actions Other Than Those Proposed in this Document

This section summarizes the past, present, and reasonably foreseeable future actions and effects that are relevant for this cumulative effects assessment. Some past actions are still relevant to the present and/or future actions.

7.6.2.1 Fishery Management Actions

7.6.2.1.1 Atlantic Thread Herring FMP Actions

Past, present, and reasonably foreseeable future actions for Atlantic thread herring management only includes the implementation of the UFOA by the MAFMC. Key actions are described below.

Target species fishery related actions:

In 2016, the MAFMC designated over 50 forage species as ecosystem components in all of the Council's FMPs. Vessels fishing between New York and Cape Hatteras, North Carolina are subject to an incidental possession limit of 1,700 lbs for all ecosystem component species combined (MAFMC, 2017). These species were previously unmanaged in mid-Atlantic federal waters. The intent of this action was to prohibit the development of new and expansion of existing directed commercial fisheries on these species in mid-Atlantic federal waters until the Council has had an adequate opportunity to assess the scientific information relating to the fisheries and any potential impacts to existing fisheries, fishing communities, and the marine ecosystem. As such, cumulative impacts of management actions are, if anything, slightly positive since threadfin herring have benefitted from protections provided to "ecosystem component species."

Non-target species:

There has not been a directed Atlantic thread herring fishery; therefore, there have been no bycatch caps established to reduce bycatch of non-target species.

Physical habitat/EFH:

The MAFMC is currently undertaking a multi-year effort to provide new and improved habitat science products (e.g., more comprehensive habitat use information, integrative habitat use modeling tools, and refined maps) that will allow the Council to review and potentially revise its existing EFH maps and text descriptions. When these improved habitat science products are available, the Council may consider initiating an amendment to revise the EFH text and maps for some or all Council-managed species.

The EFH Omnibus Amendment 2 (April 2018) reviewed and updated EFH designations, identified Habitat Areas of Particular Concern, and updated the status of current knowledge of gear impacts. It also implemented new management measures for minimizing the adverse impact of fishing on EFH that affect all species managed by the NEFMC. This action overall generally has positive impacts on the physical habitat and EFH in the region. The Council also approved an omnibus clam dredge framework that identifies areas within the Habitat Management Area that are currently fished or contain high energy sand and gravel that could be suitable for a hydraulic clam dredging exemption. The Council also recently developed a deep-sea coral amendment to protect deep-sea coral habitats throughout New England from the negative impacts of fishing gears. The new deep-sea protection zone will be a closure to all bottom-tending gears, with an exemption for the red crab pot fishery. The clam framework or coral amendment are unlikely to have direct impacts on the Atlantic thread herring resource or fishery.

Protected Resources:

There has not been a directed Atlantic thread herring fishery; therefore, there have been no specific gear or time and area closures related to measures designed to reduce threats to protected species. Atlantic thread herring has been added to the mid-Atlantic menhaden purse seine fishery, which is listed as Category II fishery with occasional interactions with bottlenose dolphins. This required the fishery to comply with registration requirements, applicable take reduction plan requirements, and observer coverage. However there has been very limited federal observer coverage since 2008, but no incidents have been observed.

Human communities:

Since there has been no directed Atlantic thread herring fishery, it has had no impacts on human communities.

7.6.2.1.2 Other Fishery Management Actions

In addition to the Atlantic thread herring FMP, there are many other FMPs and associated fishery management actions for other species that impacted these VECs over the temporal scale described in section 7.6.1.3. These include FMPs managed by the MAFMC, NEFMC, ASMFC, and to a lesser extent the South Atlantic Fishery Management Council. Omnibus amendments are also frequently developed to amend multiple FMPs at once. Actions associated with other FMPs and omnibus amendments have included measures to regulate fishing effort for other species,

measures to protect habitat and forage species, and fishery monitoring and reporting requirements.

Other FMPs:

There have been no other FMPs for Atlantic thread herring.

Omnibus Actions:

The primary omnibus actions that have had impacts on the Atlantic thread herring fishery and resource is the Omnibus Habitat Amendment. It is described in more detail above – see section 7.6.2.1.

7.6.2.1.3 Fishery Management Action Summary

The Council has taken several actions to manage the associated Atlantic thread herring fishery. The MSA is the statutory basis for federal fisheries management. The cumulative impacts on the VECs of past, present, and reasonably foreseeable future federal fishery management actions under the MSA should generally be associated with positive long-term outcomes because they constrain fishing effort and manage stocks at sustainable levels. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are sometimes necessary to bring about long-term sustainability of a resource, and as such should promote positive effects on human communities in the long-term.

In general, the UFOA implemented by the MAFMC is designed to prohibit the development of new and expansion of existing directed commercial fisheries on forage species, including thread herring, in mid-Atlantic federal waters until the Council has had an adequate opportunity to assess the scientific information relating to the fisheries and any potential impacts to existing fisheries, fishing communities, and the marine ecosystem. Similarly, the plan overall minimizes the impacts of this fishery on protected resources and EFH to the extent practicable.

7.6.2.2 Non-Fishing Impacts

7.6.2.2.1 Other Human Activities

Non-fishing activities that occur in the marine nearshore and offshore environments and connected watersheds can cause the loss or degradation of habitat and/or affect the fish and protected species that utilize those areas. The impacts of most nearshore, human-induced, non-fishing activities tend to be localized in the areas where they occur, although effects on species could be felt throughout their populations since many marine organisms are highly mobile. For offshore projects, some impacts may be localized while others may have regional influence, especially for larger projects. The following discussion of impacts is based on past assessments of activities and assumes these activities will continue as projects are proposed.

Examples of non-fishing activities include point source and non-point source pollution, shipping, dredging/deepening, wind energy development, oil and gas development, construction, and other

activities. Specific examples include at-sea disposal areas, oil and mineral resource exploration, aquaculture, construction of offshore wind farms, and bulk transportation of petrochemicals. Episodic storm events and the restoration activities that follow can also cause impacts. The impacts from these activities primarily stem from habitat loss due to human interaction and alteration or natural disturbances. These activities are widespread and can have localized impacts on habitat related to accretion of sediments, pollutants, habitat conversion, and shifting currents and thermoclines. For protected species, primary concerns associated with non-fishing activities include vessel strikes, dredge interactions (especially for sea turtles and sturgeon), and underwater noise. These activities have both direct and indirect impacts on protected species. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the productivity of managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these VECs to the impacts of fishing effort. Non-fishing activities can cause target, non-target, and protected species to shift their distributions away from preferred areas, and may also lead to decreased reproductive ability and success (from current changes, spawning disruptions, and behavior changes), disrupted or modified food web interactions, and increased disease. While localized impacts may be more severe, the overall impact on the affected species and their habitats on a population level is unknown, but likely to have impacts that mostly range from no impact to slight negative, depending on the species and activity.

Non-fishing activities permitted by other Federal agencies (e.g., beach nourishment, offshore wind facilities) require examinations of potential impacts on the VECs. The MSA imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH (50 CFR 600.930). NMFS and the eight regional fishery management councils engage in this review process by making comments and recommendations on federal or state actions that may affect habitat for their managed species. Agencies need to respond to, but do not necessarily need to adopt these recommendations. Habitat conservation measures serve to potentially minimize the extent and magnitude of indirect negative impacts federally-permitted activities could have on resources under NMFS' jurisdiction. In addition to guidelines mandated by the MSA, NMFS evaluates non-fishing effects during the review processes required by Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act for certain activities that are regulated by Federal, state, and local authorities. Non-fishing activities must also meet the mandates under the ESA, specifically Section 7(a)(2)[2], which ensures that agency actions do not jeopardize the continued existence of endangered species and their critical habitat.

In recent years, offshore wind energy and oil and gas exploration have become more relevant activities in the Greater Atlantic region. They are expected to impact all VECs, as described below.

2 "Each Federal agency shall, in consultation with and with the assistance of the Secretary, ensure that any action authorized, funded, or carried out by such agency (hereinafter in this section referred to as an "agency action") is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of critical habitat."

Impacts of Offshore Wind Energy Development on Biological Resources (Target species, Non-target Species, Protected Species) and the Physical Environment

Construction activities may have both direct and indirect impacts on marine resources, ranging from temporary changes in distribution to injury and mortality. Impacts could occur from changes to habitat in the areas of wind turbines, offshore substations, and cable corridors and increased vessel traffic to and from these areas. Species that reside in affected wind farms year-round may experience different impacts than species that seasonally reside in or migrate through these areas. Species that typically reside in areas where wind energy structures are installed may return to the area and adapt to habitat changes after construction is complete. Inter-array and electricity export cables will generate electromagnetic fields, which can affect patterns of movement, spawning, and recruitment success for various species. Effects will depend on cable type, transmission capacity, burial depth, and proximity to other cables. Substantial structural changes in habitats associated with cables are not expected unless cables are left unburied (see below). However, the cable burial process may alter sediment composition along the corridor, thereby affecting infauna and emergent biota. Taormina et al. (2018) provide a recent review of various cable impacts, and Hutchison et al. (2020) and Taormina et al. (2020) examine the effects of electromagnetic fields in particular.

The full build out of offshore wind farms will result in broad habitat alteration. For example, wind turbine and offshore substation foundations may alter the hydrodynamics of the area, which may affect primary productivity and physically change the distribution of prey and larvae. It is not clear how these changes will affect the reproductive success of marine resources. Scour and sedimentation could have negative effects on egg masses that attach to the bottom. Benthic habitat will be altered due to the placement of scour protection at wind turbine and offshore substation foundations, and over cables that are not buried to target depth in the sediment, converting soft substrates into hard substrates. This could alter species composition and predator/prey relationships by increasing favorable habitat for some species and decreasing habitat for others. The placement of wind turbines and offshore substations will also establish new vertical structure in the water column, which could serve as reefs for bottom species, fish aggregating devices for pelagic species, and substrate for the colonization of other species, e.g., mussels. Various authors have studied these types of effects (e.g., Bergström et al., 2013; Dannheim et al., 2019; Degraer et al., 2019; Langhamer, 2012; Methratta and Dardick, 2019; Stenberg et al., 2015).

Elevated levels of sound produced during site assessment activities, construction, and operation of offshore wind facilities will impact the soundscape[3]. Temporary, acute, noise impacts from construction activity could impact reproductive behavior and migration patterns; the long-term impact of operational noise from turbines may also affect behavior of fish and prey species, through both vibrations in the immediate area surrounding them in the water column, and through the foundation into the substrate. Depending on the sound frequency and source level, noise impacts to species may be direct or indirect (Finneran, 2015; 2016; Nowacek et al., 2007; NRC, 2000; 2003; 2005; Madsen et al., 2006; Piniak, 2012; Popper et al., 2014; Richardson et

3 See NMFS Ocean Noise Strategy Roadmap:
https://cetsound.noaa.gov/Assets/cetsound/documents/Roadmap/ONS_Roadmap_Final_Complete.pdf

al., 1995; Thomsen et al., 2006). Exposure to underwater noise can directly affect species via behavioral modification (avoidance, startle, spawning) or injury (sound exposure resulting in internal damage to hearing structures or internal organs) (Bailey et al., 2010; Bailey et al., 2014; Bergström et al., 2014; Ellison et al., 2011; Ellison et al., 2018; Forney et al., 2017; Madsen et al., 2006; Nowacek et al., 2007; NRC, 2003; 2005; Richardson et al., 1995; Romano et al., 2004; Slabbekoorn et al., 2010; Thomsen et al., 2006; Wright et al., 2007). Indirect effects are likely to result from changes to the acoustic environment of the species, which may affect the completion of essential life functions (e.g., migrating, breeding, communicating, resting, foraging)[4] (Forney et al., 2017; Richardson et al., 1995; Slabbekoorn et al., 2010; Thomsen et al., 2006).

Wind energy project survey and construction activities and turbine/cable placement will substantially affect NMFS scientific research surveys, including stock assessment surveys for fisheries and protected species[5] and ecological monitoring surveys. Disruption of such scientific surveys could increase scientific uncertainty in survey results and may significantly affect NMFS' ability to monitor the health, status, and behavior of marine resources and protected species and their habitat use within this region. Based on existing regional Fishery Management Councils' acceptable biological catch control rule processes and risk policies (e.g., 50 CFR §§ 648.20 and 21), increased assessment uncertainty could result in lower commercial quotas and recreational harvest limits that may reduce the likelihood of overharvesting and mitigate associated biological impacts on fish stocks. However, this would also result in lower associated fishing revenue and reduced recreational fishing opportunities, which could result in indirect negative impacts on fishing communities.

Impacts of Offshore Wind Energy Development on Socioeconomic Resources

One offshore wind pilot project off Virginia installed two turbines in federal waters in 2020**.** Two more projects were approved in 2021. More than 20 leases have been issued for future wind energy development in federal waters from Massachusetts to North Carolina (Map 3). BOEM has a goal of deploying 30 gigawatts of wind energy production capacity in Federal waters by 2030. Currently, the majority of that proposed development is reasonably foreseeable along the Atlantic coast. BOEM has recently begun a planning process for the Gulf of Maine via a regional intergovernmental renewable energy task force (https://www.boem.gov/Gulf-of-Maine). It is not clear at this time where development might occur in the Gulf of Maine. Given the water depth in the region, floating turbines will likely be the primary type of wind turbine foundations to be deployed in the area. As the number of wind farms increases, so too would the level and scope of impacts to affected habitats, marine resources, and human communities.

Offshore wind energy development is being considered in parts of the outer continental shelf that overlap with the Atlantic thread herring resource, specifically in the mid-Atlantic region, which is only part of the Atlantic thread herring fishery compared to the potential offshore wind energy sites currently under consideration (Map 3). The Atlantic thread herring purse seine fishery will be active in the mid-Atlantic region. The social and economic impacts of offshore wind energy on fisheries could be generally negative due to the overlap of wind energy areas with productive

4 See NMFS Ocean Noise Strategy Roadmap (footnote #2)

5 Changes in required flight altitudes due to proposed turbine height would affect aerial survey design and protocols (BOEM 2020a).

thread herring fishing grounds. Impacts may vary by year based on the temporal and spatial variation in the thread herring fishing activity.

There could also be social and economic benefits in the form of jobs associated with construction and maintenance, and replacement of some electricity generated using fossil fuels with renewable sources (AWEA, 2020).

It remains unclear how fishing or transiting to and from fishing grounds (whether or not those grounds are within a wind farm) might be affected by the presence of a wind farm. While no offshore wind developers have expressed an intent to exclude fishing vessels from wind turbine arrays once construction is complete, it will be difficult, if not impossible, for operators to tow bottom-tending mobile gear, fish a purse seine, or transit amongst the wind turbines, depending on the spacing and orientation of the array and weather conditions.[6] If vessel operators choose to avoid fishing or transiting within wind farms, effort displacement and additional steaming time could result in negative socioeconomic impacts to affected communities, including increased user conflicts, decreased catch and associated revenue, safety concerns, and increased fuel costs. If vessels elect to fish within wind farms, effects could be negative due to reduced catch and associated revenue, user conflicts, gear damage/loss, and increased risk of allision or collision.

Impacts of Oil and Gas Development on Biological and Socioeconomic Resources

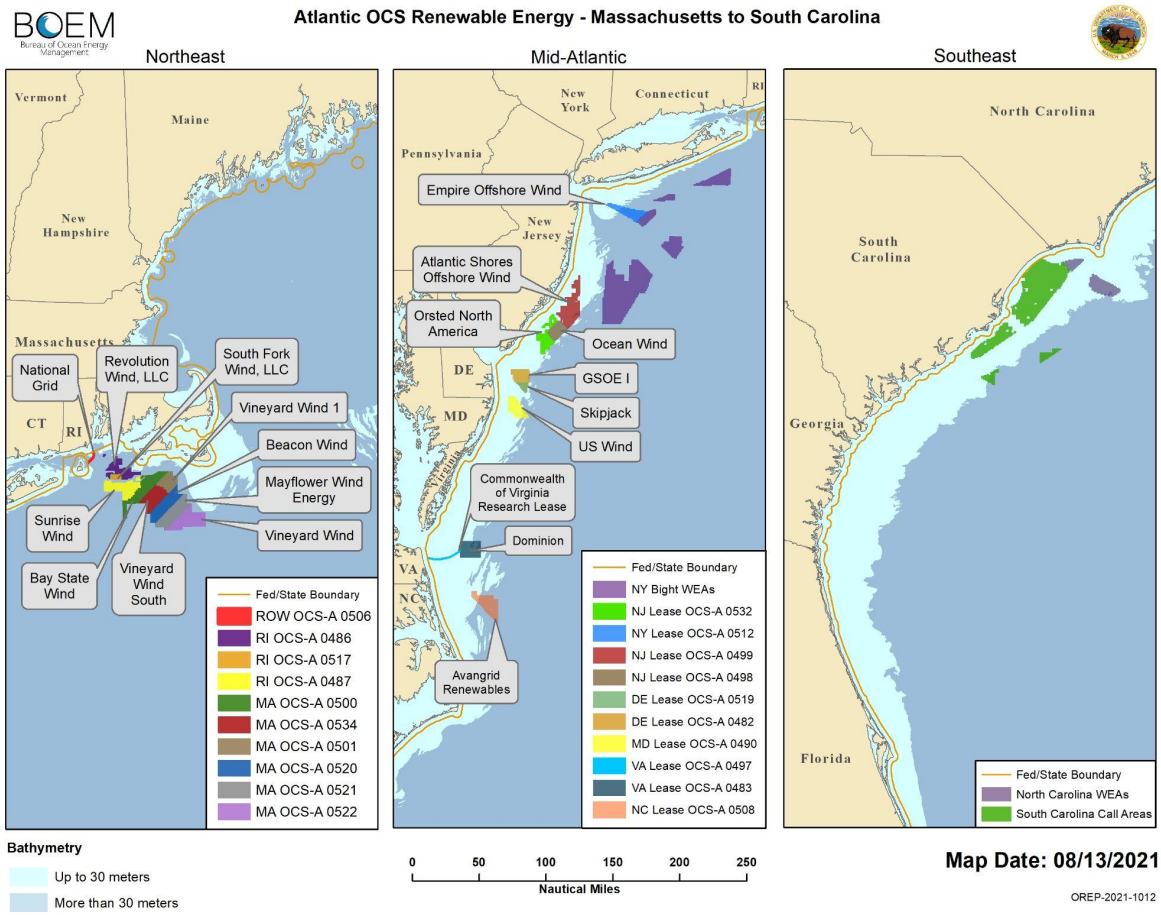
For oil and gas, this timeframe could include leasing and possible surveys, depending on the direction of BOEM's 5-year planning process in the North and Mid-Atlantic regions. (Note that there are fewer oil and gas development activities in the region than offshore wind; therefore, the non-fishing impacts focus more heavily on offshore wind.) Seismic surveys to detect and quantify mineral resources in the seabed impact marine species and the acoustic environment within which marine species live. These surveys have uncertain impacts on fish behaviors that could cumulatively lead to negative population level impacts. For protected species (sea turtle, fish, small cetacean, pinniped, large whale), the severity of these behavioral or physiological impacts is based on the species' hearing threshold , the overlap of this threshold with the frequencies emitted by the survey, as well as the duration of time the surveys would operate, as these factors influence exposure rate (Ellison et al., 2011; Ellison et al., 2018; Finneran, 2015; Finneran, 2016; Madsen et al., 2006; Nelms et al., 2016; Nowacek et al., 2007; Nowacek et al., 2015; NRC, 2000; 2003; 2005; Piniak, 2012; Popper et al., 2014; Richardson et al., 1995; Thomsen et al., 2006; Weilgart, 2013; Weilgart, 2018). If fishery resources are affected by seismic surveys, then so in turn the fishermen targeting these resources would be affected. However, such surveys could increase jobs, which may provide some positive effects on human communities (BOEM, 2020b). It is important to understand that seismic surveys for mineral resources are different from surveys used to characterize submarine geology for offshore wind

6 The United States Coast Guard has considered transit and safety issues related to the Massachusetts and Rhode Island lease areas in a recent port access route study, and has recommended uniform 1 mile spacing in east-west and north-south directions between turbines to facilitate access for fishing, transit, and search and rescue operations. Future studies in other regions could result in different spacing recommendations (UCSG 2020).

installations, and thus these two types of activities are expected to have different impacts on marine species.

Offshore Energy Summary

The overall impact of offshore wind energy and oil and gas exploration on the affected species and their habitats at a population level is unknown, but likely to range from no impact to moderate negative, depending on the number and locations of projects that occur. The individual project phases (site assessment, construction, operation, and decommissioning) as well as different aspects of the technology (foundations, cables/pipelines, turbines) will have varying impacts on resources. Mitigation efforts, such as habitat conservation measures, time of year construction restrictions, layout modifications, and fishery compensation funds could lessen the magnitude of negative impacts as well. The overall impact on socioeconomic resources is likely slight positive to moderate negative; potentially positive due to a potential increase in jobs and recreational fishing opportunities, but negative due to displacement and disruption of commercial fishing effort.



Map 3. Map of BOEM wind call areas, wind energy areas, and wind leasing areas on the Atlantic outer continental shelf. *Source: https://www.boem.gov/sites/default/files/images/Map-of-Atlantic-OCS-renewable-energy- areas_8_13_2021.jpg*

7.6.2.2.2 Global Climate Change

Global climate change affects all components of marine ecosystems, including human communities. Physical changes that are occurring and will continue to occur to these systems include sea-level rise, changes in sediment deposition; changes in ocean circulation; increased frequency, intensity and duration of extreme climate events; changing ocean chemistry; and warming ocean temperatures. The rates of physical and chemical changes in marine ecosystems have been most rapid in recent decades (Johnson et al., 2019). Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems, which may alter the fundamental production characteristics of marine systems (Stenseth et al., 2002). The general trend of changes can be explained by warming causing increased ocean stratification, which reduces primary production, lowering energy supply for higher trophic levels and changing metabolic rates. Different responses to warming can lead to altered food-web structures and ecosystem-level changes. Shifts in spatial distribution are generally to higher latitudes (i.e., poleward) and to deeper waters as species seek cooler waters within their normal temperature preferences. Climate change will also potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors. Survival of marine resources under a changing climate depends on their ability to adapt to change, but also how and to what degree those other human activities influence their natural adaptive capacity.

Thread herring is one of several emerging fish, predominantly found in the southern regions, that are increasingly being observed in mid-Atlantic waters (based on personal communications with purse seiners in Cape May). This trend is likely linked to rising water temperatures (Morson et al., 2019). Biological sensitivity of thread herring to climate change remains uncertain. The science of predicting, evaluating, monitoring and categorizing these changes continues to evolve. The social and economic impacts of climate change on thread herring are positive for stakeholders and communities in the mid-Atlantic region.

7.6.3 Magnitude and Significance of Cumulative Effects

In determining the magnitude and significance of the cumulative impacts of the preferred alternatives, the incremental impacts of the direct and indirect impacts should be considered, on a VEC-by-VEC basis, in addition to the effects of all actions (those identified and discussed relative to the past, present, and reasonably foreseeable future actions of both fishing and non-fishing actions). Table 9 provides a summary of likely impacts found in the various groups of management alternatives contained in this action. The CEA baseline that, as described above in section 7.4.2 represents the sum of past, present, and reasonably foreseeable future actions and conditions of each VEC. When an alternative has a positive impact on the VEC, for example, reduced fishing mortality on a managed species, it has a positive cumulative effect on the stock size of the species when combined with “other” actions that were also designed to increase stock size. In contrast, when an alternative has negative effects on a VEC, such as increased mortality, the cumulative effect on the VEC would be negative and tend to reduce the positive effects of the other actions. The resultant positive and negative cumulative effects are described below for each VEC. As seen above in section 7.6.2.2, non-fishing impacts on the VECs generally range from no impact to slight negative.

7.6.3.1 Magnitude and Significance of Cumulative Effects on Target Species

Past fishery management actions taken through the UFOA ensure that Atlantic thread herring is managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts of annual specification of management measures are largely dependent on how effective those measures are in meeting the objectives of preventing overfishing and achieving optimum yield, and on the extent to which mitigating measures are effective; however, these actions have generally had a slightly positive cumulative effect on Atlantic thread herring. It is anticipated that the future management actions described in section 7.6.2.1 will have additional indirect positive effects on the target species through actions which reduce catch, reduce and monitor bycatch, protect habitat, and protect the ecosystem services on which the productivity of the target species depends.

As noted previously in section 7.1, the preferred alternative (alternative 2) is not expected to result in significant catch beyond potential annual yield. Therefore, impacts of the proposed fishery on target species are not expected to change relative to current conditions under the preferred alternative (i.e., generally negligible for target species). The proposed action described in this document would not influence the past and anticipated positive cumulative effects on target species by achieving the objectives specified in the forage FMP.

When the direct and indirect effects of alternative 2 are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield slightly positive impacts on Atlantic thread herring*.

7.6.3.2 Magnitude and Significance of Cumulative Effects on Non-target Species

There has not been a directed Atlantic thread herring fishery in the Greater Atlantic Region for many years; therefore, there have been no bycatch caps established to reduce bycatch of non-target species. As noted previously in section 7.2, the preferred alternative is expected to produce either no impact or only negligible impacts on non-target species. Therefore, impacts of the proposed action on non-target species are not expected to change relative to the current condition under the preferred alternative (i.e., no to only negligible for non-target species).

When the direct and indirect effects of alternative 2 are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield no, to only negligible, impacts on non-target species.*

7.6.3.3 Magnitude and Significance of Cumulative Effects on Protected Species

Given their life history dynamics, large changes in protected species abundance over long time periods, and the multiple and wide-ranging fisheries management actions that have occurred, the cumulative impacts on protected species were evaluated over a long-time frame (i.e., from the early 1970s when the MMPA and ESA were implemented through the present).

Numerous protected species (ESA listed and/or MMPA protected) occur in the Northwest Atlantic. The distribution and status of those species in the region are described in section 6.3. Depending on species and status, the population trends for these protected resources are variable, and as follows:

Sea Turtles

Nest counts inform population trends for sea turtle species. In the affected environment (see section 6.3), four sea turtle species were identified in the region: Northwest Atlantic Ocean DPS of loggerhead, Kemp's ridley, North Atlantic DPS of green, and leatherback sea turtles. For the Northwest Atlantic Ocean DPS of loggerhead sea turtles, there are five unique recovery units that comprise the DPS. Nesting trends for each of these recovery units are variable; however, recent data from Florida index nesting beaches, which comprise most of the nesting in the DPS, indicate a 19% increase in nesting from 1989 to 2018 (https://myfwc.com/research/wildlife/sea-turtles/nesting/loggerhead-trends/). For Kemp's ridley sea turtles, from 1980 through 2003, the number of nests at three primary nesting beaches (Rancho Nuevo, Tepehuajes, and Playa Dos) increased 15 percent annually (Heppell et al., 2005); however, due to recent declines in nest counts, decreased survival of immature and adult sea turtles, and updated population modeling, this rate is not expected to continue and the overall trend is unclear (NMFS and USFWS, 2015; Caillouett et al., 2018). The North Atlantic DPS of green sea turtle is showing a positive trend in nesting (Seminoff et al., 2015). Leatherback turtle nesting in the Northwest Atlantic is showing an overall negative trend, with the most notable decrease occurring during the most recent time frame of 2008 to 2017 (Northwest Atlantic Leatherback Working Group, 2018).

Large Whales

Large whale assessment indicates that for some species there is decreasing (i.e., North Atlantic right whales) trend in the population, while for other species, as a trend analysis has not been conducted, it is unknown what the population trajectory is.[7]

Small Cetaceans and Pinnipeds

For most small cetaceans and pinniped populations, it is unknown what the population trajectory is as a trend analysis has not been conducted for these populations.[8] However, in the most recent stock assessment reports, population trends were provided for common bottlenose dolphin stocks and gray seals; the analysis indicated a declining trend in population size for all common bottlenose dolphin stocks and an increasing trend for the gray seal population (Hayes et al., 2018; Hayes et al., 2019).

7 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

8 https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-region

Atlantic Sturgeon

Population trends for Atlantic sturgeon are difficult to discern; however, the most recent stock assessment report concludes that Atlantic sturgeon, at both coastwide and DPS level, are depleted relative to historical levels (ASSRT, 2007; ASMFC, 2017c).

Atlantic Salmon

There is no population growth rate available for Gulf of Maine DPS Atlantic salmon; however, the consensus is that the DPS exhibits a continuing declining trend (NOAA, 2016; USFWS and NMFS, 2018).

Summary

Taking into consideration the above information, past fishery management actions taken through the respective FMPs and annual specifications process have had slight indirect positive cumulative effects on protected species. The actions have constrained fishing effort both at a large scale and locally, and have implemented, pursuant to the ESA, MMPA, or MSA, gear modifications, requirements, and management areas. These measures and/or actions have served to reduce interactions between protected species and fishing gear. It is anticipated that the proposed action, described in section 7.3 will result in negligible impacts on protected species. These impacts could be broad in scope.

When the direct and indirect effects of alternative 2 are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions*), the cumulative effects are expected to yield negligible impacts on protected species*.

7.6.3.4 Magnitude and Significance of Cumulative Effects on Physical Environment

Past fishery management actions taken through the UFOA have had negligible cumulative effects on habitat. The EFH and Habitat Areas of Particular Concern were designated for the managed resources. It is anticipated that the proposed action described in section 4 will result in negligible impacts on the physical environment or EFH (section 7.4). Many additional non-fishing activities, as described in section 7.6.2.2, are concentrated near-shore and likely work either additively or synergistically to decrease habitat quality. The effects of these actions have negatively affected habitat. These impacts could be broad in scope. All the VECs are interrelated; therefore, the linkages among habitat quality, managed resources and non-target species productivity, and associated fishery yields should be considered. Some actions, such as coastal population growth and climate change may indirectly impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. Implementation of the UFOA and protection of sensitive habitats have mitigated some negative effects.

As noted previously in section 7.4, the preferred alternative is expected to have negligible impacts on the physical environment or EFH. Therefore, the impacts of the proposed fishery on

the physical environment are not expected to change relative to the current condition under the preferred alternative (i.e., slight negative for physical environment).

When the direct and indirect effects of alternative 2 are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield non-significant no impact to slight negative impacts on the physical environment and EFH.*

7.6.3.5 Magnitude and Significance of Cumulative Effects on Human Communities

The absence of a directed Atlantic thread herring commercial fishery, combined with past fishery management actions implemented via the UFOA, has had negligible cumulative effects on human communities. It is anticipated that the proposed action described in section 4 will result in direct positive effects for human communities (section 7.5). Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to human communities have had overall negligible cumulative effects. Positive effects are expected from the proposed fishery.

When the direct and indirect effects of alternative 2 are considered in combination with all other actions (i.e., past, present, and reasonably foreseeable future actions), *the cumulative effects are expected to yield significant positive impacts on human communities*.

7.6.4 Proposed Action on all the VECs

The preferred alternative (i.e., an EFP issued) are described in section 5. The direct and indirect impacts of the proposed action on the VECs are described in sections 6 and are summarized in the Executive Summary (section 1). The magnitude and significance of the cumulative effects, including additive and synergistic effects of the proposed action, as well as past, present, and future actions, have been taken into account (section 7.6.3).

When considered in conjunction with all other pressures placed on the fisheries by past, present, and reasonably foreseeable future actions, the preferred alternative is not expected to result in any significant negative impacts. This action proposes a commercial purse seine fishery targeting Atlantic thread herring under an EFP in the mid-Atlantic region. It presents an opportunity to explore the feasibility of a sustainable Atlantic thread herring fishery. Over three fishing years, this will enable the collection of data on catch, effort, and bycatch, the development of a marketing strategy, and the evaluation of replacing imported fish from Mexico and Costa Rica in key regional bait markets. It will also support the resilience of the Port of Cape May's menhaden purse seine fishery and the seasonal livelihoods dependent on it. Furthermore, the initiative facilitates fishery-dependent biostatistical sampling of the target stock, aligning with the MAFMC’s requirement for comprehensive scientific data on forage fish stocks. This promotes the sustainable utilization of the species. In sum, this action is poised to yield positive effects on both biological and human ecosystems (Table 9).

The preferred alternative can ensure long-term sustainability, while minimizing environmental impacts. The regulatory atmosphere within which federal fishery management operates requires that management actions be taken in a manner that will optimize the conditions of managed

species, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs from past, present and reasonably foreseeable future actions have generally been positive and are expected to continue in that manner for the foreseeable future.

This is not to say that some aspects of the VECs are not experiencing negative impacts, but rather that, when considered as a whole and as a result of the management measure implemented in these fisheries, the overall long-term trend is positive.

There are no significant negative cumulative effects associated with the preferred alternative based on the information and analyses presented in this document and in past management documents (Table 9). Cumulatively, from 2024 through 2026, it is anticipated that alternative 2 will result in *non-significant negative impacts on all VECs, with significant positive impacts on human communities, negligible impacts on target species, protected resources and habitat, and no to negligible impacts on non-target species.*

Table 9. Summary of Cumulative Effects of the Preferred Alternative.

	Target Species	**Non-Target Species**	**Protected Resources**	**Habitat**	**Human Communities**
Direct/Indirect Impacts of Preferred Alternative	Negligible	No to negligible	Negligible	Negligible	Significant positive
Combined Cumulative Effects Assessment Baseline Conditions	Negligible to slightly positive	No	Negligible to slightly positive	Slight negative to negligible	Negligible
Cumulative Effects	Slightly positive	No to negligible	Negligible to slightly positive	Slight negative to negligible	Positive

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