- Herring Framework 9

Draft Affected Environment (AE)

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5.0 AFFECTED ENVIRONMENT

The Affected Environment is described in this action based on valued ecosystem components (VECs), including target species, non-target species, physical environment and Essential Fish Habitat (EFH), protected resources, and human communities. VECs represent the resources, areas and human communities that may be affected by the alternatives under consideration in this amendment. VECs are the focus since they are the "place" where the impacts of management actions occur.

The Council recently completed Amendment 8 to the Atlantic Herring FMP that included a detailed Affected Environment, with some updates through 2019 in Framework 8 (NEFMC 2020). This action updates several key tables and figures with data through 2020 and in some cases 2021, but for the most part references the information recently included in Amendment 8 (NEFMC 2018b).

5.1 TARGET SPECIES (ATLANTIC HERRING)

This section describes the life history and stock population status for Atlantic herring, as well as herring's role as forage in the ecosystem. A complete description of the Atlantic herring resource is in the FEIS for Amendment 1 to the Atlantic Herring FMP (NEFMC 2006, Section 7.1). Updated information is in Amendment 5 and Amendment 8 to the Atlantic Herring FMP. Information in this section has been updated through 2019.

Life history details about the Atlantic herring resource are described in Amendment 8. In summary, Atlantic herring, *Clupea harengus*, is widely distributed in continental shelf waters of the Northeast Atlantic, from Labrador to Cape Hatteras. Spawning occurs in the summer and fall, starting earlier along the eastern Maine coast and southwest Nova Scotia (August – September) than in the southwestern Gulf of Maine (early to mid-October in the Jeffreys Ledge area) and Georges Bank (as late as November – December; Reid et al. 1999). In general, GOM herring migrate from summer feeding grounds along the Maine coast and on GB to SNE/MA areas during winter, with larger individuals tending to migrate farther distances.

In the past, the herring resource along the east coast of the United States was divided into the Gulf of Maine and Georges Bank stocks (Anthony & Waring 1978). However, no methods are available to identify stock of origin for fish caught in the mixed stock fishery or during fishery-independent surveys. Consequently, herring from the Gulf of Maine and Georges Bank are combined for assessment and management purposes into a single stock complex, although three spawning stock components occupy three distinct locations: in the Gulf of Maine, southwest Nova Scotia-Bay of Fundy, and Georges Bank. A more detailed description of this stock definition is in Amendment 1.

5.1.1 Stock Assessment

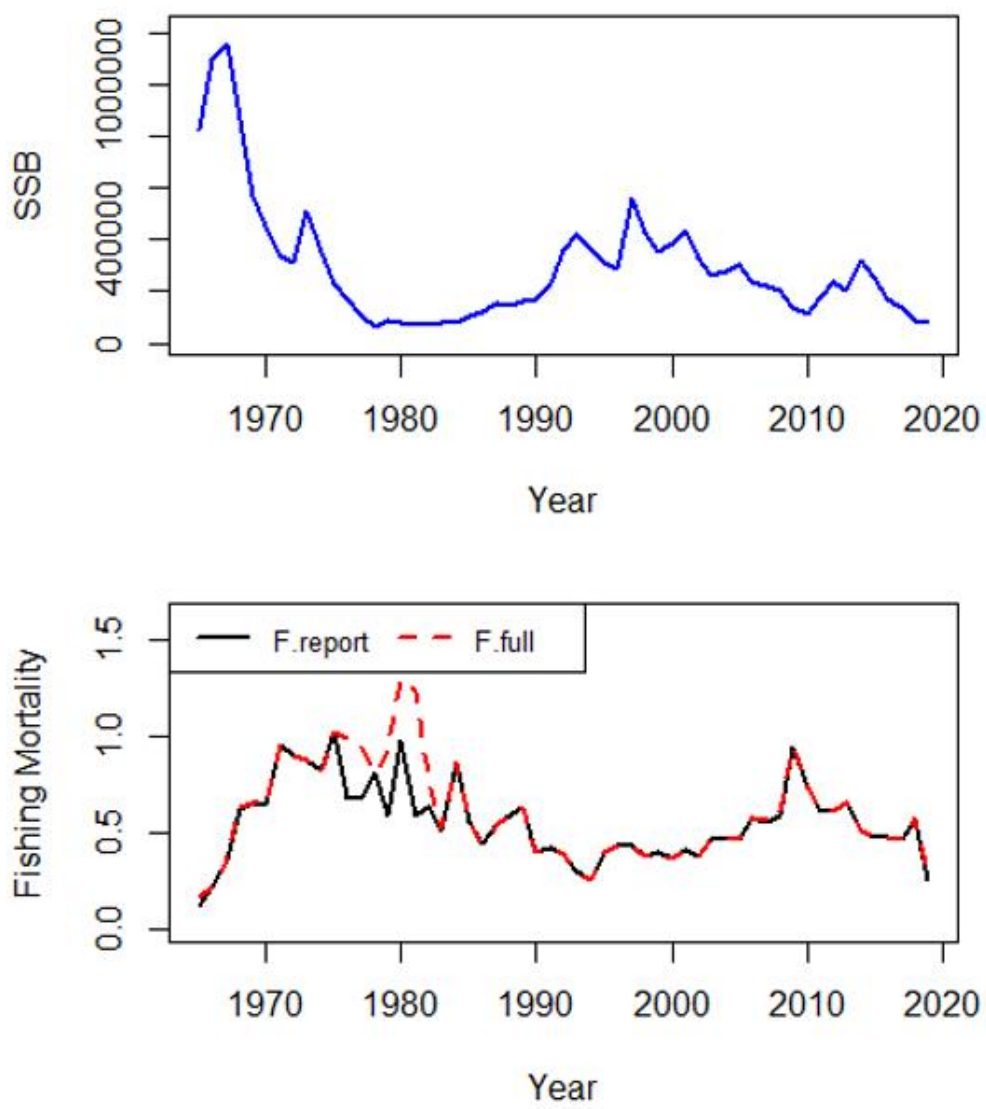
The Atlantic herring stock was most recently assessed during spring 2020 Management Track Assessment (NEFSC 2020a). The 2020 assessment used all the same data sources of the previous assessment (NMFS spring, fall, acoustics collected in fall, and summer shrimp bottom trawl survey). Overall, SSB generally declined from 1965 to a time series low in 1978 and then generally increased from 1978 through the mid-1990s. SSB declined again from 1997 to 2010, increased for several years until 2014, and has been declining since. In addition, fishing mortality has been relatively stable since the decreases in the 1990s, with a gradual increase in 2009, followed by a general declining fishing mortality since then (Figure 1).

With data updates, the 2019 SSB was estimated to be 77,883 mt (80% probability interval: 57,150-111,125 mt), compared to the full range of estimated biomass of 62,007 mt in 1978 to 1,152,400 mt in 1967 (Figure 1). The average F between ages 7 and 8 was used for reporting results related to fishing mortality (F7-8) because these ages are fully selected by the mobile gear fishery, which has accounted for

most of the landings since 1986. F7-8 in 2019 equaled 0.25 (80% probability interval: 0.17-0.37) and ranged from 0.12 in 1965 to 1.02 in 1975 (Figure 1).

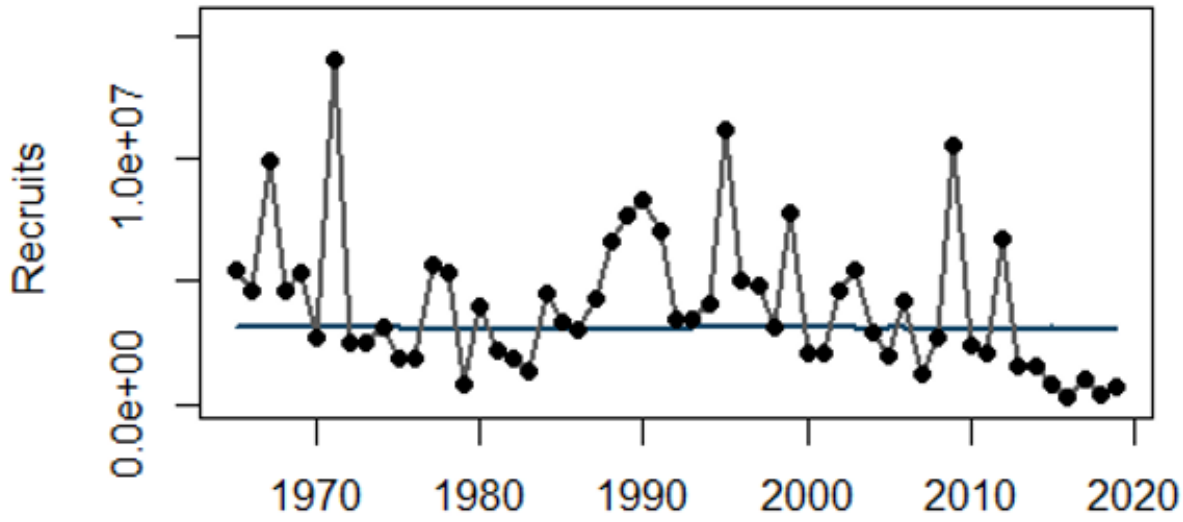
Age-1 recruitment has been below average since 2013 (Figure 2). The time series high for recruitment was in 1971 (1.4 billion age-1 fish). The time series low (2.8 million fish) occurred in 2016, and the second lowest (4.1 million fish) occurred in 2018, although this estimate is highly uncertain. Five of the six lowest annual recruitment estimates have occurred since 2015 (2015, 2016, 2017, 2018, and 2019).

Figure 1. Atlantic herring spawning stock biomass (mt) and fishing mortality time series from the age structured assessment program (ASAP model), 1965-2019.



Source: NEFSC (2020a).
Note: F.report is the average F for ages 7 and 8 for all gear types and is the time series used for stock status.

Figure 2. Atlantic herring annual recruit (000s) time series, 1965-2019.



Source: NEFSC (2020a).
Note: The horizontal line is the average recruitment estimated by the ASAP model over the time series, the annual recruitment values are estimated as deviations +/- from the underlying average.

5.1.2 Stock Status

MSY reference points from the 65th Stock Assessment Workshop (NEFSC 2018b) were based on a selectivity curve aggregated between the mobile and fixed gear fleets. The proportion of the catch coming from the fixed gear fleet has increased in recent years, which made the MSY reference points unduly affected by the Canadian, fixed gear catches, which are not quota controlled. Thus, MSY reference points in the 2020 assessment were estimated based on the mobile fleet selectivity pattern, which is an entirely US fleet. MSY reference points were still premised on a proxy of F40%, as in SAW 65. The newly proposed reference points from the 2020 assessment are no longer affected by the relative amount of mobile and fixed fleet catches.

FMSY proxy = 0.543

SSBMSY proxy = 269,000 mt

(½ SSBMSY proxy = 134,500), and

MSY proxy = 99,400 mt.

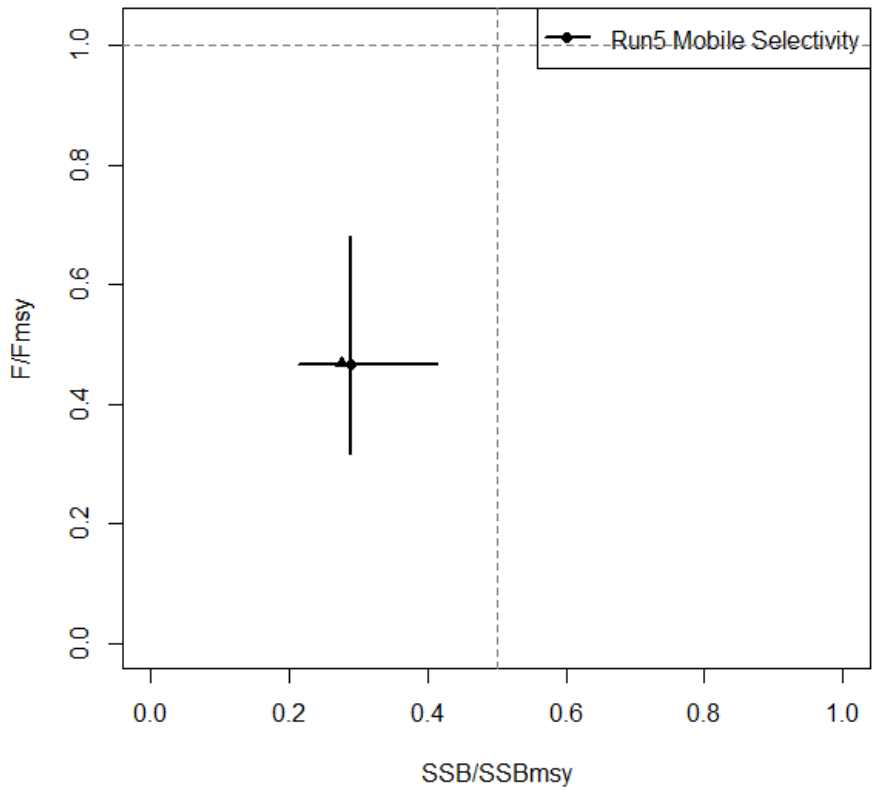
The 2020 management track assessment concluded that for the terminal year of the assessment, 2019, the Atlantic herring resource is below ½ SSBMSY proxy (2019 biomass of 77,883 mt), and fishing mortality is below the F_{MSY} proxy threshold (2019 F7-8 = 0.253; Figure 3). Therefore, Atlantic herring is ***overfished but not subject to overfishing.***

The assessment did include some cautionary notes about the status of the stock. In the short-term, the relatively poor recruitments in 2013-2019 will increase the probability of the stock remaining overfished.

Growth (i.e., weight at age) also continues to be relatively low relative to the 1990s, and this seems to be a longer-term feature of the stock that also reduces production. The stock, however, seems to be capable of producing relatively large and small year classes regardless of growth, and so recruitment is likely the more significant driver of short-term vulnerability.

The major sources of uncertainty are natural mortality, stock-recruit relationship, and stock structure. Natural mortality (M) was assumed constant in the 2020 management track, as in SAW 65, but M is likely to vary among time and age (size). A definitive explanation for the continued poor recruitment has not been identified, and there may be multiple factors causing below average recruitment. Finally, stock structure remains an uncertainty for this stock assessment, particularly mixing with the Nova Scotian stock. Migration can be conflated with changes in mortality or fishery selectivity and contribute to retrospective patterns.

Figure 3. Atlantic herring stock status based on the ASAP model.



Source: NEFSC (2020a).
Note: Error bars represent the 80% probability intervals. The triangle represents the model result if an adjustment were to be made for the retrospective pattern.

NOAA's Assistant Administrator for Fisheries formally determined on October 2, 2020, that the Atlantic herring stock is overfished based on the best scientific information available. The Council was informed of this change in stock status on October 13, 2020. NOAA Fisheries recommends that the Council submit a rebuilding plan within 15 months to ensure sufficient time to implement the appropriate regulations within two years of the notification letter.

5.1.3 Importance of Herring as Forage

Atlantic herring play an important role as forage in the Northeast U.S. shelf ecosystem. They are eaten by a wide variety of fish, marine mammals, birds, and (historically) by humans in the region. The structure of the Northeast U.S. shelf ecosystem features multiple forage species rather than a single dominant forage species. Herring share the role of forage here with many other species including sand lance, mackerels, squids, and hakes, although herring are distinguished by a high energy density (caloric content) relative to other pelagic prey in the ecosystem. This diversity of forage options leads to a complex and diverse food web supporting many different predators. The relative importance of herring as forage varies by predator group, due to differences in predator life history, foraging style, and bioenergetics. Therefore, predator responses to changing herring populations vary, and depend on the extent to which other forage is available.

Amendment 8 detailed the information available on herring as forage including the species that consume herring in the Northeast and the food habits of Atlantic herring (NEFMC 2018b). Similarly, the 2018 assessment updated the estimate of consumption of herring at various life stages (NEFSC 2018b). Total consumption of herring by fish predators has been variable, with lesser total amounts of herring predation earlier in the time series compared to later. Prey length data show that much of the predation is on larger fish, and this is likely due to the design of the bottom trawl survey sampling design that focuses offshore. It is believed that similar or even greater amounts of predation on juvenile herring is likely occurring in nearshore areas by fish predators, as well as other predators such as birds and marine mammals.

Climate and environmental conditions can be major drivers of pelagic fish dynamics. In the Northeast U.S., Atlantic herring and other pelagics have lower sensitivity to climate risks than other species due to high mobility but have high potential to change distribution. The impact of climate change on Atlantic herring is negative to neutral relative to other Northeast species. All Northeast U.S. species have high or very high exposure to climate change risks, as this ecosystem is changing more rapidly than much of the world ocean (Hare et al. 2016).

5.2 Non-target Species (Bycatch)

Non-target species refers to species other than Atlantic herring which are caught/landed by federally permitted vessels while fishing for herring. The 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. In contrast to bycatch, there is no statutory mandate to reduce incidental catch. When non-target species are encountered in the Atlantic herring fishery, they are either discarded (bycatch) or they are retained and sold as part of the catch (incidental catch). Most catch by herring vessels on directed trips is Atlantic herring, with extremely low percentages of bycatch (discards). In some cases, Atlantic mackerel is targeted in combination with Atlantic herring during some of the year in the southern New England and Mid-Atlantic areas and is therefore not considered a non-target species because in many cases, vessels are targeting and landings herring and mackerel on the same trip.

Due to the high-volume nature of the Atlantic herring fishery, non-target species, including river herring (blueback herring and alewives), shad (hickory shad and American shad), and some groundfish species (particularly haddock), are often retained once the fish are brought on board (NEFMC 2012, p. 173). The catch of non-target species in the directed Atlantic herring fishery can be identified through sea sampling (observer) data collected by the Northeast Fisheries Observer Program (NEFOP). Portside sampling data collected by MADMF and MEDMR can be used to estimate catch of any non-target species that are

landed. Dealer and VTR data can be used to identify/cross-check incidental landings of some non-target species that may be separated from Atlantic herring.

The primary non-target species in the directed Atlantic herring fishery are groundfish (particularly haddock) and the river herring/shad (RH/S) species. There are accountability measures in place for both haddock and river herring/shad if area and gear specific catch cap is exceeded. Dogfish, squid, butterfish, and Atlantic mackerel are also common species encountered in the directed Atlantic herring fishery. However, in some cases (especially Atlantic mackerel), while herring is often the target species, mackerel is also landed, and some trips are quite mixed in terms of mackerel and herring landings. Therefore, Atlantic mackerel is not considered a non-target species since there can be substantial landings of that species for various segments of the fishery during certain seasons and in certain areas. Comprehensive information about the catch of these species in the Atlantic herring fishery is in Section 5.2 of Amendment 5 and Sections 3.2 and 3.3 of Framework 3 to the Atlantic Herring FMP.

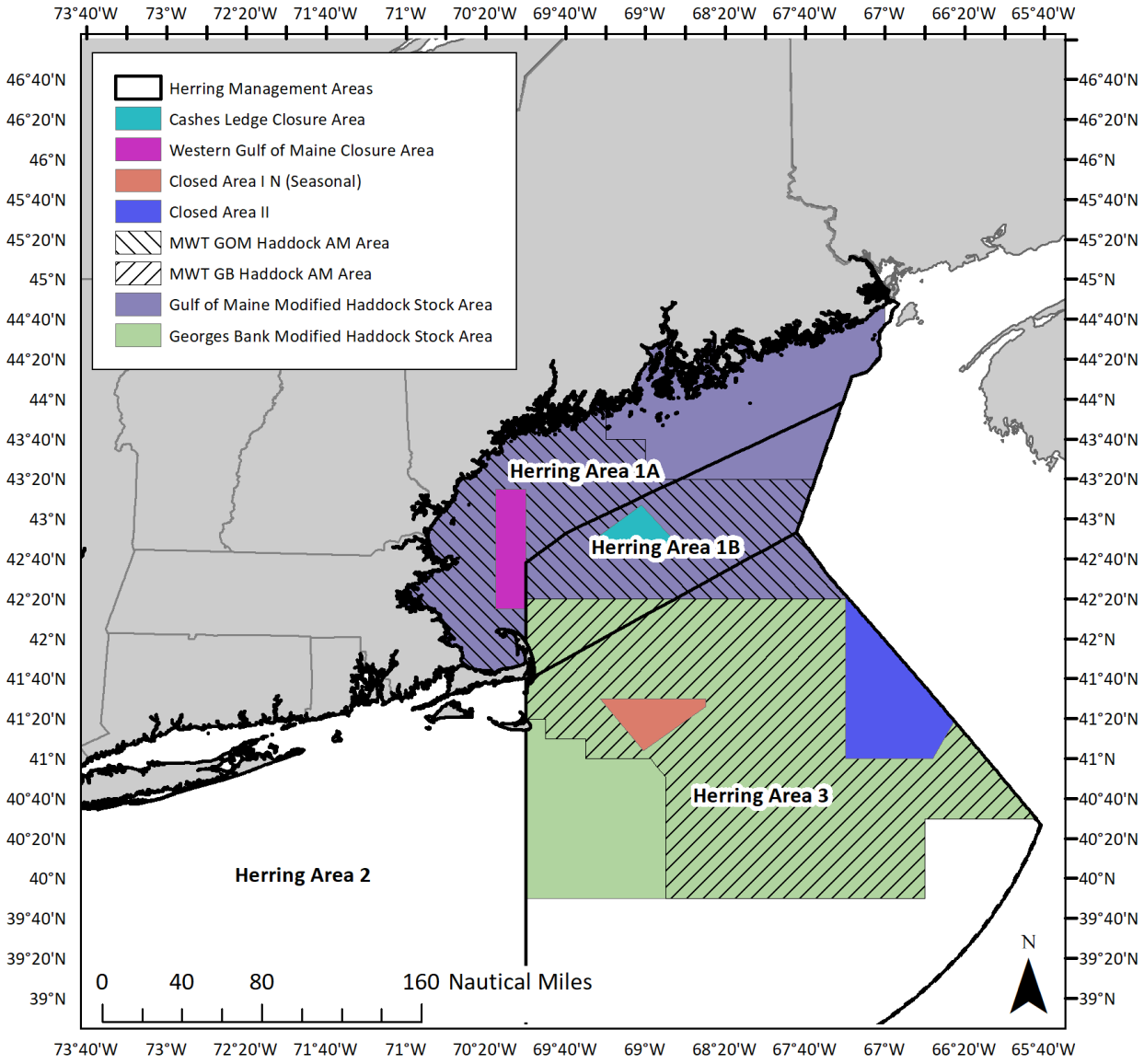
Haddock

Haddock has two stocks: Gulf of Maine and Georges Bank. For Gulf of Maine haddock, as of the 2019 groundfish operational assessments, the stock is not overfished and overfishing is not occurring, with 2018 SSB estimated to be at 82,763 mt, which is 1,035% of the biomass target (NEFSC 2020b). Recreational catch estimates were re-estimated in this update by using the re-calibrated MRIP data. In general, inclusion of the re-calibrated data resulted in an increase in SSB, F, and recruitment. The GOM haddock stock has experienced several large recruitment events since 2010. The population biomass is currently at an all-time high and overall, the population is experiencing low mortality (NEFSC 2017).

The Eastern GB haddock management unit is a transboundary stock; the US and Canada have signed a non-binding agreement to coordinate consistent management of this stock. GB haddock is not overfished, and overfishing is not occurring (NEFSC 2020b). There has been a steady increase in SSB from ~15,000 mt in the early 1990s, to about 252,000 mt in 2007. The dramatic increase 2005 - 2007 is due to the exceptionally large 2003-year class reaching maturity. From 2007 - 2010, SSB decreased 35% as that 2003-year class decreased due to natural and fishing mortality. The fishing mortality rate for this stock has been low in recent years. The retrospective adjusted 2018 SSB was estimated to be at 507,130 mt, which is 365% of the biomass target. The GB haddock stock shows a broad age structure, and broad spatial distribution. This stock has produced several exceptionally strong year classes in the last 15 years, leading to record high SSB in recent years. Catches in recent years have been well below the total quota (US + Canada). While all survey indices support the finding that this stock is at an all-time high, weights at age have been declining since the large 2003-year class and show further declines with the most recent data (NEFSC 2020b).

Haddock is managed by the NEFMC under the Northeast Multispecies FMP. Framework Adjustment 59 to the Northeast Multispecies FMP increased the midwater trawl Atlantic herring fishery sub-ACL for Georges Bank haddock to 2% for FY2020-2022 (NEFMC 2020), up from 1.5% for a few fishing years before that and, and up from 1% from even earlier years. The GOM haddock sub-ACL has been maintained at 1%. When the haddock incidental catch cap for a particular haddock stock (GOM or GB) has been caught, all herring vessels fishing with MWT gear are prohibited from fishing for, possessing, or landing, more than 2,000 lb of herring in the respective haddock accountability measure area for the rest of the multispecies fishing year (Map 1). There is also a pound-for-pound payback for any overages. This has only occurred once since 2012 for GB haddock (Table 9).

Map 1. GOM and GB haddock stock areas (shaded) with herring MWT accountability measures (hatched) with herring management area boundaries and current closure areas per Omnibus Habitat Amendment 2 (2018).



River Herring/Shad

In 2017, there was an updated river herring assessment that concluded the coastwide meta-complex of river herring stocks on the U.S. Atlantic coast remains depleted to near historic lows. There is evidence for declines in abundance due to several factors, but their relative importance could not be determined. The overfished and overfishing status is unknown for the coastwide stock complex, as estimates of total biomass, fishing mortality rates, and corresponding reference points could not be developed. While status on a coastwide basis remains unchanged, there are some positive signs of improvement for some river systems, with increasing abundance trends for several rivers in the Mid-Atlantic throughout New England

region. While abundance in these river systems are still at low levels, dam removals and improvements to fish passage have had a positive impact on run returns (ASMFC 2017).

The 2020 American Shad Benchmark Stock Assessment and Peer Review Report indicate American shad remain depleted on a coastwide basis. Multiple factors, such as overfishing, inadequate fish passage at dams, predation, pollution, water withdrawals, channelization of rivers, changing ocean conditions, and climate change are likely responsible for shad decline from historic abundance levels. Additionally, the assessment finds that shad recovery is limited by restricted access to spawning habitat. Current barriers partly or completely block 40% of historic shad spawning habitat, which may equate to a loss of more than a third of spawning adults. The "depleted" determination was used instead of "overfished" because the impact of fishing on American shad stocks cannot be separated from the impacts of all other factors responsible for changes in abundance. The benchmark assessment was endorsed by the Peer Review Panel and accepted by the Shad & River Herring Management Board for management use (ASMFC 2020b).

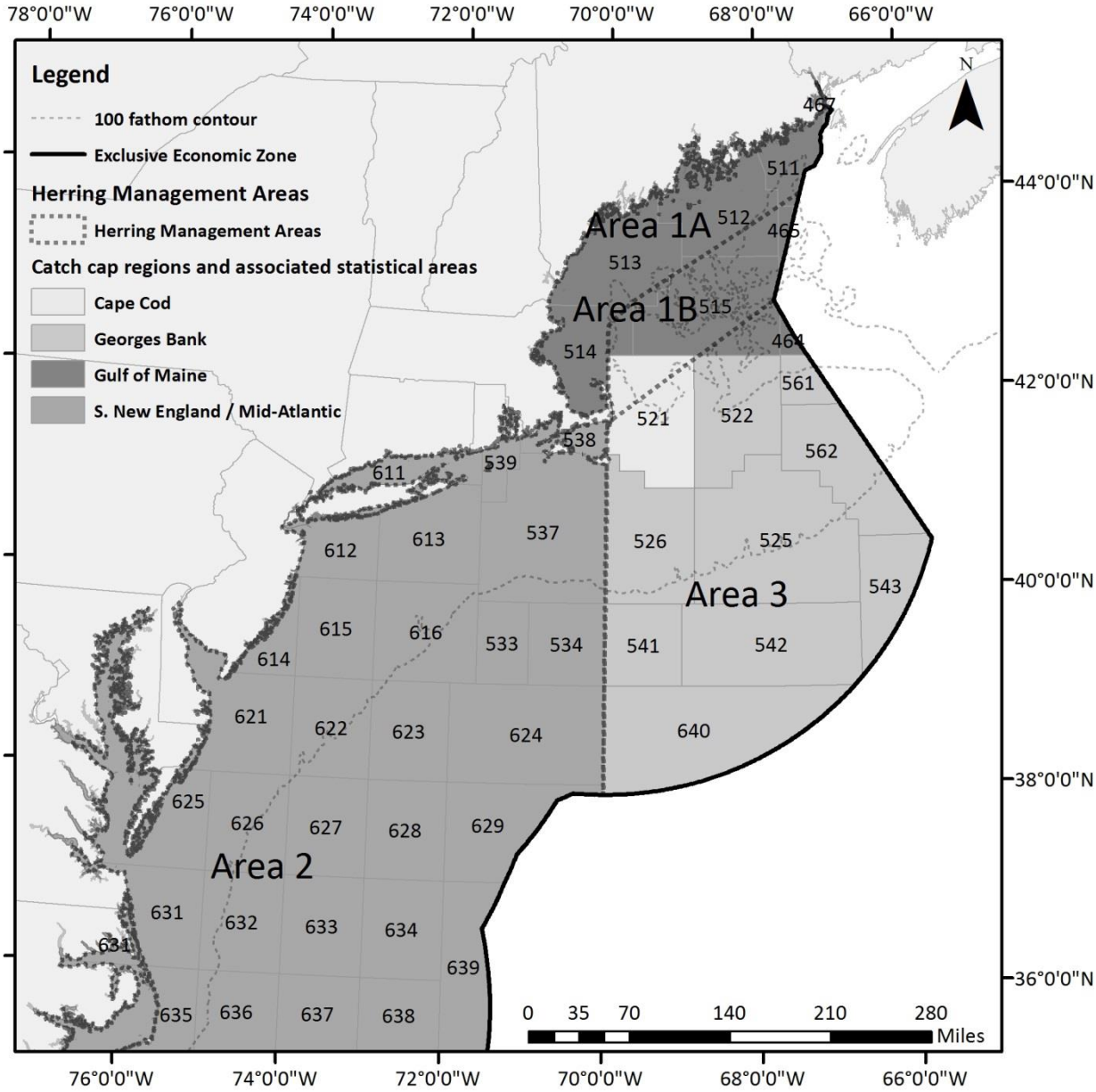
River herring and shad are primarily managed under Amendments 2 and 3 to the ASMFC FMP for Shad and River Herring (ASMFC 2009 and 2010), respectively which address concerns regarding declining populations of these species. For river herring and shad, states and jurisdictions had to develop Sustainable Fishery Management Plans (SFMPs) to maintain a commercial and/or recreational fisheries past January 2012.

In December 2014, NMFS implemented river herring and shad catch caps for the Atlantic herring fishery for 2014 and 2015 (Map 2). Catch of river herring and shad on fishing trips that land over 6,600 lb of herring count towards the caps. Caps in the herring fishery are area and gear specific. If NMFS determines that 95% of a river herring and shad cap has been harvested, a 2,000 lb herring possession limit for that area and gear will become effective for the rest of the fishing year. This low possession limit essentially turns the area into a closed area for directed herring fishing until the start of the next fishing year. Bycatch is monitored and reported on the GARFO website: https://www.greateratlantic.fisheries.noaa.gov/aps/monitoring/riverherringshad.html.

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 on this issue, reviewed the legal requirements, summarized the species and fishery information, described updated actions taken related to RH/S, summarized new research, and identified potential actions for this issue (NEFMC 2018c). The Council discussed the issue at its April and June 2018 meetings and decided to maintain the current management structure for river herring and shad, and not add these as stocks in the Atlantic Herring FMP at this time.

In June 2019, NMFS completed a review of the status of alewife and blueback herring. They determined that listing these species under the ESA is not warranted at this time (*Federal Register* notice: https://deferalregister.gov/d/2019-12908). The determination found that while river herring have declined from historical numbers, and overutilization remains a risk to these species, recent fisheries management efforts have helped to reduce risks from fishing mortality. NMFS found that while the abundance of river herring in some rivers continues to be depleted, there are robust populations in other areas.

Map 2. Atlantic herring management areas and RH/S catch cap areas.



5.2.1 Monitoring of Non-target Species in the Herring Fishery

Fishery bycatch is monitored primarily using Federal fishery observers, though observer rates have varied annually and by fishery. Calculating an observer rate by gear type is difficult due to the overlap with other fisheries (e.g., overlap with squid and whiting in the small-mesh bottom trawl (SMBT) fishery). Thus, the data in Table 1 were pulled in a more general approach and included all trips by the three main gear types used in the Atlantic herring fishery. Observed purse seine and midwater trawl trips are predominantly targeting Atlantic herring, while non-herring trips are included in the SMBT coverage rates reported here.

Amendment 8 includes detailed analyses of the bycatch species for each gear type used in the herring fishery.

In February 2020, NMFS implemented the New England Industry-Funded Monitoring (IFM) Omnibus Amendment to allow industry-funded monitoring in any fishery managed by the Council to better assess catch and reduce uncertainty around catch estimates. The amendment also established IFM in the herring fishery. Covid-19 has delayed full implementation of this action, more detail below.

Table 1. Midwater trawl (MWT), purse seine (PS), and small mesh bottom trawl (SMBT) observer coverage rates, SBRM (April-March) years 2012-2019

Gear	2012	2013	2014	2015	2016	2017	2018	2019	2020
Midwater Trawl	40.5%	24.3%	19.9%	5.3%	20.9%	10.7%	4.1%	8.7%	5.1%
Purse Seine	5.2%	6.0%	3.7%	2.1%	2.2%	1.7%	1.0%	*	*
Small-mesh Bottom Trawl	4.3%	8.0%	10.1%	9.1%	10.9%	17.2%	13.8%	14.1%	1.3%

Source: DMIS and OBDBS databases as of August 31, 2021.
Notes: MWT includes both single and paired midwater trawl gears; PS excludes tuna purse seine trip; SMBT includes bottom trawl gear with codend mesh size less than 5.5" excluding bottom otter twin trawl, scallop and shrimp trawl trips.
Includes observer trips with at least 1 observed haul divided by VTR trips reporting kept catch, and all fisheries using these gear types, **not** just herring and mackerel fisheries.
* Confidential vessel activity information.

Beginning July 1, 2020, vessels issued Category A or B herring permits are required to pay for at-sea monitoring coverage on trips selected for IFM coverage. IFM coverage is in addition to observer coverage required by the Standardized Bycatch Reporting Methodology (SBRM). The IFM coverage target for the herring fishery is 50 percent of trips and will be calculated by combining SBRM coverage with IFM coverage. This additional coverage will help reduce uncertainty around catch estimates in the herring fishery, especially catch tracked against haddock and river herring/shad catch caps.

Midwater trawl vessels have the option of being issued an exempted fishing permit (EFP) to use electronic monitoring and portside sampling instead of at-sea monitoring coverage to satisfy IFM requirements. NOAA Fisheries worked with interested vessels to develop the terms and conditions of the EFP.

The amendment maintains the requirement that midwater trawl vessels must carry an observer to fish in the Groundfish Closed Areas; however, beginning in 2020 vessel owners will have the option of purchasing observer coverage to access Groundfish Closed Areas.

The start date to begin assigning IFM coverage in the herring fishery was delayed until July 1, 2020. The training class for new portside samplers in the herring fishery was delayed due to the health mandates and travel restrictions in place in 2020 and will be rescheduled for later in 2020.

Framework 6 included a detailed description of the monitoring program in place before implementation of IFM as well as the various reporting requirements and methods used to monitor herring and bycatch in the herring fishery.

5.3 PROTECTED SPECIES

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Table 2 lists protected species that occur in the affected environment of the Atlantic herring FMP and have the potential to be impacted by the proposed action (e.g., removal of forage, interactions in the fishery or with gear type(s) like those primarily used in the fishery (i.e., midwater trawl and purse seine gear)) have been observed/documented.

Table 2. Species protected under the ESA and/or MMPA that may occur in the affected environment of the herring FMP.

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, West Indies DPS, (*Megaptera novaeangliae*)	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 (I, F)
Pygmy sperm whale (*Kogia breviceps*)	Protected (MMPA)	No
Dwarf sperm whale (*Kogia sima*)	Protected (MMPA)	No
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	Yes (I)
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes (I, F)
Short Beaked Common dolphin (*Delphinus delphis*)	Protected (MMPA)	Yes (I, 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)***	***No***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes (F)
PINNIPEDS		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes (I, F)
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes (I, F)
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	No
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	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?***
SEA TURTLES		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	No
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	No
Green sea turtle, North Atlantic DPS (*Chelonia mydas*)	Threatened	No
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic Ocean DPS	Threatened	No
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
FISH		
Cusk (*Brosme brosme)*	Candidate	No
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

Notes: Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.[1] Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters).

[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.

Cusk is a NMFS "candidate species" under the ESA. Candidate species are those petitioned species for which NMFS has determined that listing may be warranted under the ESA and those species for which NMFS has initiated an ESA status review through an announcement in the *Federal Register*. If a species is proposed for listing, the conference provisions under Section 7 of the ESA apply (50 CFR 402.10); however, candidate species receive no substantive or procedural protection under the ESA. Thus, cusk will not be discussed further in this and the following sections; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed action. Additional information on cusk can be found at: https://www.greateratlantic.fisheries.noaa.gov/protected/pcp/cs/index.html.

5.3.1 Protected Species and Critical Habitat Unlikely to be Impacted (via interactions with gear, removal of forage, or destruction of essential features of critical habitat) by the Atlantic herring FMP

Table 2 identifies 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 Atlantic herring fishery but are not likely 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 occurrence of the species is not known to overlap with the area primarily affected by the action, the species does not forage on Atlantic herring, and/or, based on the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports, there have been no documented interactions between the species and the primary gear type used to prosecute the Atlantic herring fishery (i.e., purse seine and midwater (including pair) trawl)

To aid in the identification of MMPA protected species not likely to be impacted by the action, the most recent 10 years of data provided in the MMPA List of Fisheries (LOF), the Greater Atlantic Region (GAR) Marine Animal Incident Database (unpublished data), and marine mammal stock assessment (SAR) and serious injury and mortality reports were referenced[1] (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 Observer Program, unpublished data; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://apps-nefsc.fisheries.noaa.gov/rcb/publications/center-reference-documents.html; NOAA Fisheries marine mammal species directory: https://www.fisheries.noaa.gov/species-directory/marine-mammals.

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), the most recent 10 years of observer data (i.e., 2010-2019; NMFS Observer Program, unpublished data), the GAR Marine Animal Incident Database (unpublished data), Marine Mammal SARS, and NMFS NEFSC reference documents (marine mammal serious injury and mortality reports) were referenced. ESA section 7 consultations issued by NMFS on the Atlantic herring fishery over the last 10 years were also used. On February 9, 2010, NMFS issued an ESA section 7 consultation that fully analyzed and considered the effects of the herring fishery on ESA listed species and designated critical habitat (NMFS 2010). The February 9, 2010, consultation concluded that the herring fishery is not likely to interact with any ESA-listed species and is not likely to adversely affect ESA-listed species or designated critical habitat; given this, no take was anticipated or exempted by NMFS. Since the completion of the 2010

[1] For marine mammals protected under the MMPA, the most recent 10 years of data primarily covers the period from 2009-2018; however, the GAR Marine Animal Incident Database (unpublished data) contains large whale entanglement reports for 2019.

informal consultation, multiple herring fishery management actions have been authorized, new species listed, critical habitat designated, and new information on ESA listed species (North Atlantic right whales; Pace III et al. 2017) published.

In accordance with § 402.16, NMFS has reviewed every herring fishery management action authorized since 2010 and has determined that none of the herring fishery management actions triggered reinitiation of ESA Section 7 consultation. Further, since the 2010 consultation, based on the best available information, NMFS has also determined that none of the new listings, designated critical habitat, or new information on a listed species warranted the reinitiation of consultation on the herring fishery (NMFS 2012; 2014; 2015; 2016a; b; 2021). Given this information, and the fact that there have been no observed or documented interactions between any ESA listed species and gear used in the herring fishery (i.e., primarily purse seine and mid-water trawl) since 1989, the date of NMFS' earliest observer records for federally managed fisheries, we were able to identify those ESA listed species or designated critical habitat not likely to be impacted by the proposed action.

5.3.2 Protected Species Potentially Impacted by the Proposed Action

5.3.2.1 Large Whales

Large whales, such as humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. Humpback, fin, sei, and fin whales are euryphagous, foraging opportunistically on small crustaceans (e.g., krill, copepods), small schooling fish (e.g., Atlantic herring) 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 35ºN) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N) (Hayes et al. 2019; NMFS 1991; 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 & Mate 2003; Brown, et al. 2002; Kenney 2001; Kenney et al. 1986; Kenney et al. 1995; Mayo & 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 Stock Assessment Reports.

5.3.2.2 Small Cetaceans and Pinnipeds

Table 2 identifies small cetaceans and pinnipeds that may occur in the affected environment of the Atlantic herring fishery and also have the potential to be impacted by the operation of the Atlantic herring fishery. 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), 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 20 that have the potential to be impacted by the operation of the Atlantic herring fishery are harbor and gray seals. These pinniped species have a predominantly piscivorous diet (e.g., Atlantic 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 (35ºN). 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 Stock Assessment Reports.

5.3.3 Gear Interactions with Protected Species

The Atlantic herring fishery is primarily prosecuted with purse seine and midwater trawl (single or pair) gears, and to a lesser extent by small mesh bottom trawl gear (Section 5.5.1). Specifically, since 2008, VTR data indicates that small mesh bottom trawl vessels account for under 10% of herring landings. Given that bottom trawl effort in the Atlantic herring fishery is so small, as seen by the small amount of catches of this species by this gear type, and because the alternatives described in this document are not expected to result in a notable change in fishing effort using this gear types, there is low likelihood that any protected species interactions with the Atlantic herring fishery will be due to interactions with bottom trawl gear. Thus, the following sections only focus on interaction risks to protected species associated with purse seine and midwater trawl (single or pair) gears.

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 from as early as 1989 (Marine Mammal Stock Assessment Reports; NMFS Observer Program, unpublished data). As the distribution and occurrence of protected species and the operation of fisheries (and, thus, risk to protected species) have changed over the last 30 years, we use the most recent 10 years of available information to best capture the current risk to protected species from fishing gear. For marine mammals protected under the MMPA, this primarily covers the period from 2009-2018 (Hayes et al. 2017; 2018; Hayes, et al. 2019; Hayes et al. 2020; Waring et al. 2015; Waring et al. 2016)[2]; however, the Greater Atlantic Region (GAR) Marine Animal Incident Database (unpublished data) contains large whale entanglement reports for 2019.

5.3.3.1 Gear interactions with marine mammals

Depending on species, marine mammal interactions have been observed in purse seine, and/or midwater trawl gear. Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually, classifying U.S. 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). The most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports are from 2009-2018. MMPA LOF's issued between 2017 and 2021 encompass this timeframe, with each year the LOF was issued categorizing the Gulf of Maine herring purse seine fishery as a Category III fishery, and commercial midwater trawl fisheries (Northeast or Mid-Atlantic) as Category II fisheries.

5.3.3.1.1 Large whales

Midwater Trawl. Based on the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports (i.e., 2009-2018), minke whales are the only large whale species in which an interaction with midwater trawl gear has been observed or documented. There has been only one observed minke whale incidentally taken in MWT gear. The incident occurred in 2009 and was a result of

[2] MMPA LOF; NMFS NEFSC reference documents (marine mammal serious injury and mortality reports): https://nefsc.noaa.gov/publications/crd/.

a minke whale becoming entangled in NOAA research MWT gear (whale was released alive, but seriously injured; Henry *et al.* 2015). Since this incident, there have been no observed or reported interactions between minke whales and MWT gear (Cole, et al. 2013; Henry et al. 2017; Henry et al. 2015; 2016; Henry et al. 2020; Henry et al. 2019) (Marine Mammal Stock Assessment Reports). In fact, the most recent marine mammal stock assessment report (2012-2016), estimates the annual average minke whale mortality and serious injury from the Northeast MWT fishery to be zero (Hayes, et al. 2019). Thus, although interactions between MWT gear and minke whales are possible, the interaction risk is low.

Purse Seine. Since 2009, three humpback whales were reported as possibly interacting with purse seine gear operating in the Gulf of Maine targeting Atlantic herring (i.e., animals were incidentally encircled as purse seine was being closed, but no indication contact with the seine was made). All interactions, however, resulted in the animals being released from the nets unharmed (Cole, et al. 2013; Henry, et al. 2017; Henry, et al. 2015; 2016; Henry, et al. 2019) (Marine Mammal Stock Assessment Reports). Thus, although interactions are possible with large whales, purse seines are **not expected to be a source of injury or mortality** to them.

5.3.3.1.2 Small cetaceans and pinnipeds

Midwater Trawl Gear. Several species of small cetaceans and pinnipeds are at risk of interacting with midwater trawl gear (Marine Mammal Stock Assessment Reports; MMPA 2015-2020 LOFs). For marine mammals protected under the MMPA, the most recent 10 years of observer, stranding, and/or marine mammal serious injury and mortality reports are from 2009-2018; MMPA LOF's issued between 2017 and 2021 consider data over most of this timeframe (i.e., 2009-2017) and were reviewed to provide a list of species (Table 3) that have been observed (incidentally) seriously injured and/or killed between 2008 and 2016 by List of Fisheries Category II MWT fisheries that operate in the affected environment of the Atlantic herring fishery.

Table 3. Small cetacean and pinniped species observed seriously injured and/or killed by Category II midwater trawl fisheries in the affected environment of the Atlantic herring fishery.

Fishery	Category	Species Observed or reported Injured/Killed
Mid-Atlantic Midwater Trawl (including Pair Trawl)	II	Harbor seal
		Gray Seal
		Atlantic white-sided dolphin
		Bottlenose dolphin (offshore)
		Risso's dolphin
		Short-beaked common dolphin
		Long-finned pilot whale
Northeast Midwater Trawl (including Pair Trawl)	II	Gray seal
		Harbor seal
		Short-beaked common dolphin
		Atlantic white-sided dolphin
		Long-finned pilot whale
Source: MMPA 2017-2021 LOFs.		

In 2006, based on observed MWT interactions with long-finned pilot whales, short -finned pilot whales, common dolphins, and white sided dolphins, the Atlantic Trawl Gear Take Reduction Team (ATGTRT)

was convened to address the incidental mortality and serious injury of these species incidental to bottom and MWT fisheries operating in the New England and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are a "strategic stock", nor do they currently interact with a Category I fishery,[3] it was determined that developing a take reduction plan was unnecessary. In lieu of such plan, the ATGTRT agreed to develop an Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). The ATGTRS identifies informational and research tasks, as well as education and outreach needs to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero. The ATGTRS also identifies several voluntary measures that certain trawl fishing sectors could use to potentially reduce the incidental capture of marine mammals.

Purse Seine. There have been no observed small cetacean interactions with purse seines used to prosecute any Greater Atlantic Region fishery (primarily Gulf of Maine Atlantic herring). As a result, this gear type is not expected to pose an interaction risk with small cetacean species, and therefore, is not expected to be source of serious injury or mortality to any small cetacean.

Purse seines, however, specifically those operating in the Gulf of Maine targeting Atlantic herring, are known to interact with pinniped species. Between 2009 and 2018, pinniped species have been observed in purse seine gear (Table 4); none of these interactions have resulted in mortality or confirmed serious injury to the seal (Hayes, et al. 2019; Josephson et al. 2019; 2021). As a result, although interactions are possible with seals, we do not expect purse seines to pose a serious injury or mortality risk to these species. This conclusion is further supported by the fact that the List of Fisheries has identified the Gulf of Maine Atlantic herring purse seine fishery as a Category III fishery, that is, a fishery that causes a remote to no likelihood of causing serious injury or mortality to marine mammals.

Table 4. 2009-2018 Observed gray and harbor seal interactions with the Gulf of Maine Atlantic herring purse seine fishery.

Seal Species	Number of Observed Interactions	Released Alive (No Serious Injury or Mortality)
Unknown	12	Yes
Harbor Seal	5	Yes
Gray Seal	12	Yes

[3] Category I fisheries have frequent incidental mortality and serious injury of marine mammals.

5.4 Physical Environment and Essential Fish Habitat

The Atlantic herring fishery occurs in four areas defined as Areas 1A, 1B, 2, and 3 (Map 2). These areas collectively cover the entire Northeast U.S. shelf ecosystem, which has been defined as the Gulf of Maine south to Cape Hatteras, North Carolina, extending from the coast seaward to the edge of the continental shelf, including offshore to the Gulf Stream (Sherman et al. 1996). Roughly, Areas 1A and 1B cover the Gulf of Maine, Area 2 covers southern the New England/Mid-Atlantic region, and Area 3 covers Georges Bank. Amendment 5 to the Atlantic Herring FMP includes a detailed characterization of these areas.

The current EFH designation for Atlantic herring was developed through Omnibus Habitat Amendment 2 (OHA2). The designations for adults and juveniles identify nearly the entire Gulf of Maine as EFH and designate other areas on the southern half of Georges Bank and throughout the Mid-Atlantic Bight. The larval designation includes scattered locations throughout the Gulf of Maine and Georges Bank. The egg designation includes shallower waters of the Gulf of Maine and Georges Bank. Interactive maps of EFH for each species and life stage are on the NOAA EFH Mapper. Details are in OHA2 Volume 2 (designations), Appendix A (designation methods), and Appendix B (supplementary information).

The environment that may be affected by the Proposed Action has been identified as EFH for the benthic life stages of several species (Table 5). More information is in the FMP document that most recently updated each species' EFH designation and the NOAA EFH mapper.

Table 5. 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
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

5.5 HUMAN COMMUNITIES

This action evaluates the effect management alternatives may have on the economy, way of life, and traditions of human communities. These social and economic impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While social and economic impacts could be solely experienced by individuals, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

Summarized here are the fisheries and human communities most likely to be impacted by the Alternatives under Consideration. Social, economic and fishery information herein helps describe the response of the fishery to past management actions and predicting how the alternatives under consideration in this action may affect human communities. Also, this section establishes a descriptive baseline to compare predicted and actual changes resulting from management. Additional information is contained in Amendment 8 (NEFMC 2018b, Volume I, Section 3.6).

MSA Section 402(b), 16 U.S.C. 1881a(b) states that no information gathered in compliance with the Act can be disclosed, unless aggregated to a level that obfuscates the identity of individual submitters. The fishery data in this amendment are thus aggregated to at least three reporting units, to preserve confidentiality. Additional standards are applied to reporting the fishing activity of specific states or fishing communities. To report landings activity to a specific geographic location, the landings have been attributed to at least three fishing permit numbers and the landings must be sold to three dealer numbers. However, the dealers do not necessarily have to be in the same specific geographic location.

5.5.1 Herring Fishery

The U.S. Atlantic herring fishery occurs in the Northwest Atlantic shelf region from Cape Hatteras to Maine, including an active fishery in the inshore Gulf of Maine and seasonally on Georges Bank (Map 2). Atlantic herring is managed as one stock complex, but this stock likely has inshore and offshore components that segregate during spawning. In recognition of the spatial structure of the herring resource, the Atlantic herring Annual Catch Limit (ACL) is divided into sub-ACLs and assigned to four herring management areas. Area 1 is the Gulf of Maine (GOM) divided into an inshore (Area 1A) and offshore section (Area 1B); Area 2 is in the coastal waters between MA and NC (generally referred to as southern New England/Mid-Atlantic), and Area 3 is on Georges Bank (GB).

The Atlantic herring fishery generally occurs south of New England in Area 2 during the winter (January-April), and oftentimes as part of the directed mackerel fishery. There is overlap of the herring and mackerel fisheries in Area 2 and in Area 3 during the winter months, although catches in Area 3 tend to be relatively low. The herring summer fishery (May-August) generally occurs throughout the GOM in Areas 1A, 1B and in Area 3 (GB) as fish are available. Restrictions in Area 1A have pushed the fishery in the inshore GOM to later months (late summer). The midwater trawl (single and paired) fleet is restricted from fishing in Area 1A in the months of January through September because of the Area 1A sub-ACL split (0% January-May) and the purse seine-fixed gear only area (all Area 1A) that is effective June-September. A sub-ACL split for Area 1B (0% January – April, 100% May – December) has been effective for all vessels since 2014.

Autumn and winter fishing (September-December) tends to be more variable and dependent on fish availability; the Area 1A sub-ACL is almost always fully used (except in 2017 and 2018), and the inshore GOM fishery usually closes around November. As the 1A and 1B quotas are taken, larger vessels become increasingly dependent on offshore fishing opportunities (Georges Bank, Area 3) when fish may be available. Atlantic herring is caught in state waters and in the New Brunswick weir fishery.

5.5.1.1 Atlantic herring permits and vessels

Amendment 1 to the Atlantic Herring FMP established a limited access program in the herring fishery with three limited access (A, B, C) and one open access (D) permit categories (Table 6). The vessels that have not been issued a limited access herring permit but have been issued a limited access mackerel permit, are eligible for a Category E permit, a category established through Amendment 5 (implemented March 2014).

Table 6. Atlantic herring permit categories.

	Category	Description
Limited Access	A	Limited access in all management areas.
	B	Limited access in Areas 2 and 3 only.
	C	Limited access in all management areas, with a 25 mt (55,000 lb) Atlantic herring catch limit per trip and one landing per calendar day.
Open Access	D	Open access in all management areas, with a 3 mt (6,600 lb) Atlantic herring catch limit per trip and one landing per calendar day.
	E	Open access in Areas 2 and 3 only, with a 9 mt (20,000 lb) Atlantic herring catch limit per trip and landing per calendar day.

Active Vessels in the Atlantic Herring Fishery

The following describes the vessels recently participating in the Atlantic herring fishery, including nominal revenues for herring trips. Here, an active herring trip is defined liberally as any trip in which at least one pound of Atlantic herring is retained.

Since 2008, the number of vessels with an Atlantic herring permit has generally decreased (Table 7) (NEFMC 2018b, Section 3.6.1.4). This includes a decrease in the limited access directed fishery vessels (Categories A and B), with 39 permitted in 2020. In 2020, 36% of the limited access vessels were active.

Many of the limited access herring vessels (Categories A-C) are also active in the Atlantic mackerel fishery (managed by the MAFMC). For the open access vessels, just 2-4% of the Category D permits have been active since 2008 (Table 7) (NEFMC 2014). The Category E permit was implemented during permit year 2013 (May-April) and about 50-55 E permits have been issued annually since, mostly to vessels with a D permit as well; about 4-10% of the E permits have been active.

Although there has been much fewer total number of active limited access versus open access vessels, the limited access vessels account for about 99% of annual Atlantic herring landings and revenues (Table 8).

Table 7. Fishing vessels with federal Atlantic herring permits, permit years 2011-2020 (May-April).

Atlantic Herring Permit Year (May-April)											
Permit Category		**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Limited Access	**A only**	42 (60%)	42 (57%)	39 (67%)	40 (63%)	42 (50%)	39 (56%)	39 (56%)	38 (58%)	39 (59%)	39 (54%)
	B and C only	4*	4*	4 (75%)	4*	4*	4*	4*	3*	4*	4*
	C only	47 (23%)	47 (32%)	44 (30%)	42 (24%)	41 (27%)	41 (24%)	41 (34%)	41 (27%)	40 (20%)	43 (19%)
	Total	**93 (41%)**	**93 (44%)**	**87 (48%)**	**86 (43%)**	**87 (39%)**	**84 (41%)**	**84 (46%)**	**82 (43%)**	**83 (39%)**	**86 (36%)**
Open Access	**D only**	2,147 (3.9%)	2,065 (3.5%)	1,957 (3.3%)	1,838 (3.6%)	1,762 (3.4%)	1,776 (2.9%)	1,759 (3.2%)	1,747 (2.7%)	1,729 (2.0%)	1,696 (2.4%)
	D and E only			6*	52 (9.6%)	54 (5.6%)	53 (5.7%)	54 (7.4%)	49	49*	50*
	E only			0	1*	1*	1*	1*	1*	1*	1*
	Total	**2,147 (3.9%)**	**2,065 (3.5%)**	**1,963 (3.3%)**	**1,891 (3.8%)**	**1,817 (3.5%)**	**1,830 (3%)**	**1,817 (3.4%)**	**1,797 (2.8%)**	**1,779 (2%)**	**1,747 (2.4%)**

Source: GARFO Permit database and DMIS as of July 2021. () = Percent of vessels in the category that were active.
*Confidential vessel activity data

Table 8. Contribution of herring vessels by permit category to total landings, 2013-2020 (Jan.-Dec.).

Permit Category		**Fishing Year (Jan-Dec)**							
		2013	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Limited Access	A and BC	96.9%	98.0%	99.0%	98.7%	98.3%	98.7%	99.5%	99.5%
	C	2.6%	1.7%	0.9%	1.0%	1.0%	0.6%	0.2%	0.2%
	D, DE, and E	0.1%	0.1%	0.1%	0.2%	0.6%	0.2%	0.2%	0.2%

Source: GARFO Permit database and DMIS as of July 2021.

5.5.1.2 Atlantic herring catch

The Atlantic herring stock-wide ACL and management area sub-ACLs are tracked/monitored based on the total catch, – landings and discards, which is provided and required by herring vessels through the vessel monitoring system (VMS) catch reports and vessel trip reports (VTRs) as well as through Federal/state dealer data. Atlantic herring harvesters are required to report discards in addition to landed catch through these independent reporting methods.

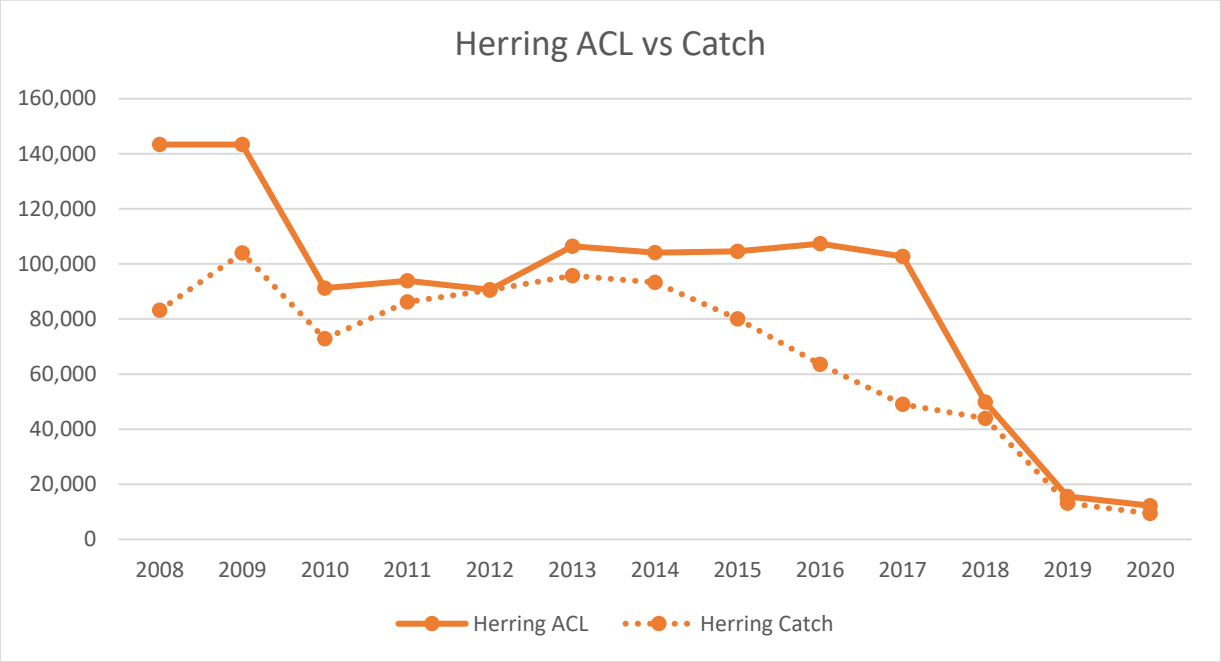
Herring catch limits have declined over time since the FMP was implemented in 1999. The first reduction was in 2006 to about 140,000 mt, followed by another relatively large reduction starting in 2010 with total quotas under 100,000 mt. The total catch limit has remained over 100,000 mt until it was dramatically reduced in 2018 to just under 50,000 mt and again in 2019 to just over 20,000 mt.

Herring catches were relatively high in 2010-2015 (Table 9, Figure 4), and decreased starting in 2016, until ACLs were dramatically reduced starting in 2018. It should be noted that the ACL is divided into four management areas (1A, 1B, 2 and 3), and the utilization does vary by area. In most years Area 1A is completely utilized, as well as Area 1B; however, Areas 2 and 3 are not usually fully utilized. In several years, some management areas have been closed to directed herring fishing (a 2,000 lb possession limit is implemented when 92% of that area's sub-ACL is projected to be caught). The right-hand column in Table 9 highlights the years when in-season possession limits have been implemented, or in-season bycatch caps were reached (RH/S and GB haddock), also closing an area to directed herring fishing.

Table 9. Summary of Atlantic annual ACL compared to final catch estimates (2008-2020) including relevant in-season actions

FY	Herring ACL	Herring Catch	Usage (%)	In-season actions that were implemented
2008	143,350	83,240	58.1%	
2009	143,350	103,943	72.5%	
2010	91,200	72,851	79.9%	
2011	93,905	86,245	91.8%	
2012	90,683	90,561	99.9%	*Herring Area 2, 3 and 1A closed early*
2013	106,375	95,764	90.0%	*Herring Area 2, 1A and 3 closed early*
2014	104,088	93,247	89.6%	*Herring 1B, 1A and 3 closed early*
2015	104,566	80,011	76.5%	*GB haddock catch cap in-season AM, Herring Area 1A closed early*
2016	107,360	63,581	59.2%	*Herring Area 1B closed early*
2017	102,656	49,072	47.8%	
2018	49,900	43,878	87.9%	*RHS:Mack Closure; RHS:Herr SNE MW and CC MW closures, Herring 1B closure*
2019	15,613	13,079	83.8%	*RHS:Mack Closure; Herring Area 2 closure*
2020	12,225	9,368	76.6%	

Figure 4. Comparison of annual Atlantic herring ACL and final catch (2008-2019)



5.5.1.2.1 Herring catch by sub-ACL

This action is considering alternatives to address overages of sub-ACLs. This section was developed to provide a more detailed summary of catch by herring management area. Table 10 calculates the difference, both percentage and the mt, between the final catch and final sub-ACLs. Rows shown in **bold** indicate years with sub-ACL overages. Historically, most sub-ACL overages occurred in Area 1B, with a few in Area 1A, a couple in Area 2, and only one in Area 3. Overages are less common in recent years. Note that catch data are from GARFO year-end reports and may be different than in-season quota monitoring values because of database corrections from the reconciliation process. The catch data may also differ from values used in stock assessments which use different data sources.

Table 10. Herring initial sub-ACL, final sub-ACL with accountability measure adjustment, and catch by year.

Year	Herring Area	Initial sub-ACL	Adjustment	Final sub-ACL (mt)	Catch (mt)	Percentage Difference	MT Difference
2009	**1A**	**45,000**	**-1,350**	**43,650**	**44,088**	**1**	**438**
2009	1B	10,000	-300	9,700	1,799	-81	-7,901
2009	2	30,000	0	30,000	28,032	-7	-1,968
2009	3	60,000	0	60,000	30,024	-50	-29,976
2010	**1A**	**26,546**	**0**	**26,546**	**28,424**	**7**	**1,878**
2010	**1B**	**4,362**	**0**	**4,362**	**6,001**	**38**	**1,639**
2010	2	22,146	0	22,146	20,831	-6	-1,315
2010	3	38,146	0	38,146	17,596	-54	-20,550
2011	**1A**	**26,546**	**2,705**	**29,251**	**30,676**	**5**	**1,425**
2011	1B	4,362	0	4,362	3,530	-19	-832

2011	2	22,146	0	22,146	15,001	-32	-7,145
2011	3	38,146	0	38,146	37,038	-3	-1,108
2012	1A	26,546	1,122	27,668	24,302	-12	-3,366
2012	**1B**	**4,362**	**-1,639**	**2,723**	**4,307**	**58**	**1,584**
2012	**2**	**22,146**	**0**	**22,146**	**22,482**	**2**	**336**
2012	**3**	**38,146**	**0**	**38,146**	**39,471**	**3**	**1,325**
2013	1A	31,200	-1,425	29,775	29,454	-1	-321
2013	1B	4,600	0	4,600	2,459	-47	-2,141
2013	2	30,000	0	30,000	26,562	-11	-3,438
2013	3	42,000	0	42,000	37,290	-11	-4,710
2014	1A	31,200	1,831	33,031	32,898	0	-133
2014	**1B**	**4,600**	**-1,722**	**2,878**	**4,399**	**53**	**1,521**
2014	2	30,000	-1,236	28,764	19,626	-32	-9,138
2014	3	42,000	-2,585	39,415	36,323	-8	-3,092
2015	1A	31,200	-620	30,585	28,861	-6	-1,724
2015	1B	4,600	322	4,922	2,819	-43	-2,103
2015	2	30,000	2,100	32,100	15,114	-53	-16,986
2015	3	42,000	2,910	44,910	33,217	-26	-11,693
2016	1A	30,300	224	30,524	27,831	-9	-2,693
2016	**1B**	**4,500**	**-1,656**	**2,844**	**3,657**	**29**	**813**
2016	2	29,100	2,127	31,227	13,463	-57	-17,764
2016	3	40,900	1,865	42,765	18,631	-56	-24,134
2017	1A	30,300	1,815	32,115	28,682	-11	-3,433
2017	1B	4,500	325	4,825	2,639	-45	-2,186
2017	2	29,100	2,127	31,227	3,617	-88	-27,610
2017	3	40,900	2,973	43,873	14,134	-68	-29,739
2018	1A	30,300	-2,262	28,038	24,861	-11	-3,177
2018	1B	4,500	-1,861	2,639	2,211	-16	-428
2018	2	29,100	-20,900	8,200	7,071	-14	-1,129
2018	3	40,900	-29,582	11,318	9,736	-14	-1,582
2019	1A	4,354	869	5,223	4,916	-6	-307
2019	1B	647	-19	628	159	-75	-469
2019	**2**	**4,188**	**-126**	**4,062**	**4,750**	**17**	**688**
2019	3	5,876	-176	5,700	3,254	-43	-2,446

Note: Bold rows indicate a sub-ACL overage. Percentage difference and metric ton (MT) difference in catch compared to the final sub-ACL.
Source: GARFO year-end catch reports

Figure 5 shows management area catch over time and how that has related to sub-ACLs (initial sub-ACLs in blue and adjusted sub-ACLs in black). There have generally not been drastic changes between initial and final sub-ACLs. In 2018, the large difference between catch and final sub-ACLs in Areas 2 and 3 was due to an in-season adjustment, not accountability measures. Sub-ACLs were relatively stable (i.e., not changing in large quantities from year to year) from 2010-2017 but have been reduced in recent years. Catch across sub-ACLs has also decreased in recent years. Catch in Areas 1A and 1B has tracked sub-ACLs more closely than catch in Areas 2 and 3. There were large catch underages in Areas 2 and 3 between 2015 and 2017.

Figure 5. Catch by herring area, blue points are initial sub-ACLs and black points are final sub-ACLs.

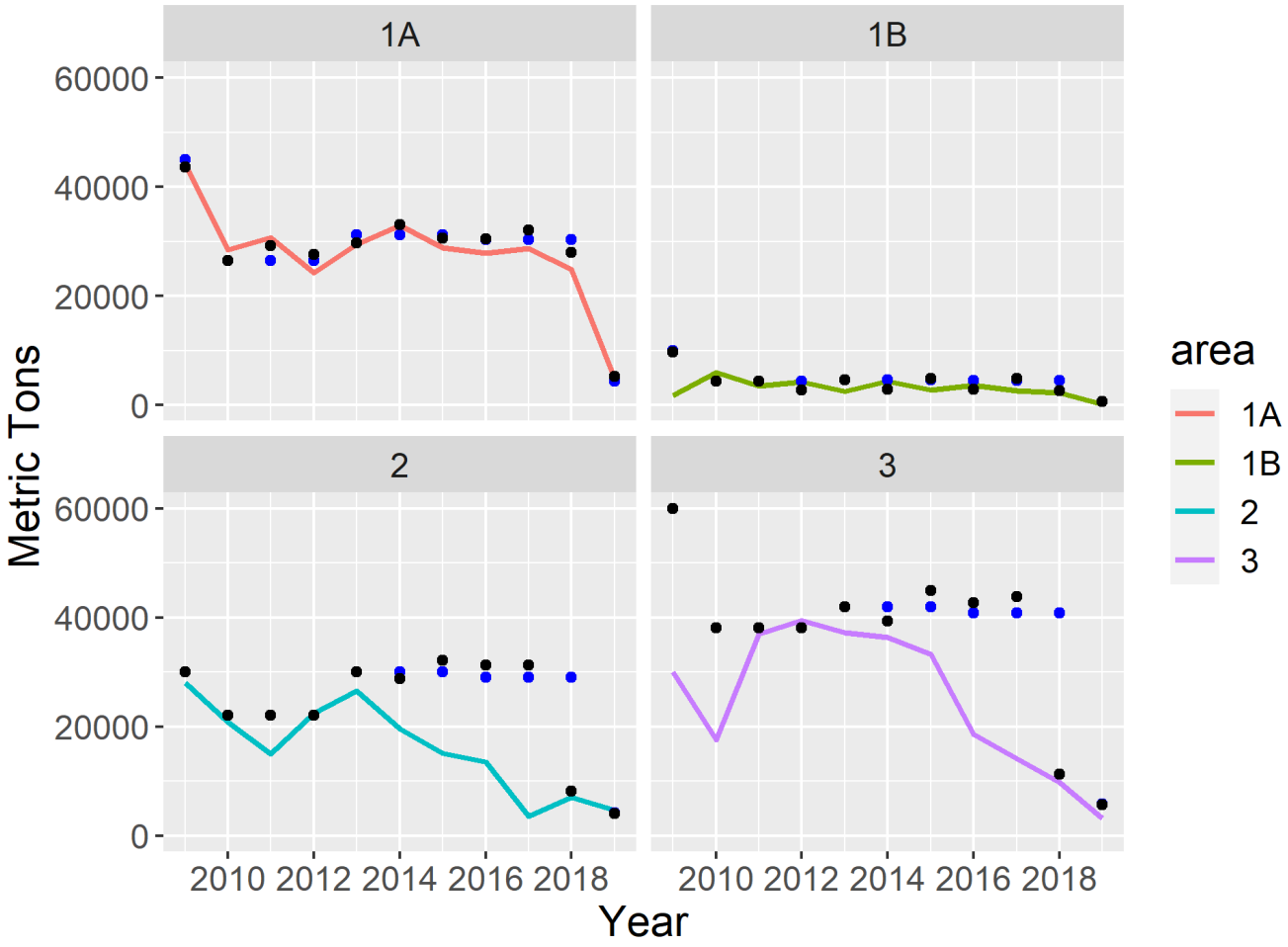


Figure 6 shows the percentage difference between catch and the final sub-ACLs. Catch below the horizontal line indicates an underage and catch above the horizontal line indicates an overage. Overages in Area 1B seem to have larger percentage differences because the sub-ACLs are small. When evaluating overages and underages in units of percentages, there have been large underages in Areas 1B, 2, and 3. Because the percentage difference is not equivalent across areas, it is important to also consider the mt difference between catch and final sub-ACLs (See Figure 3).

Figure 6. Percentage difference between catch and final sub-ACLs.

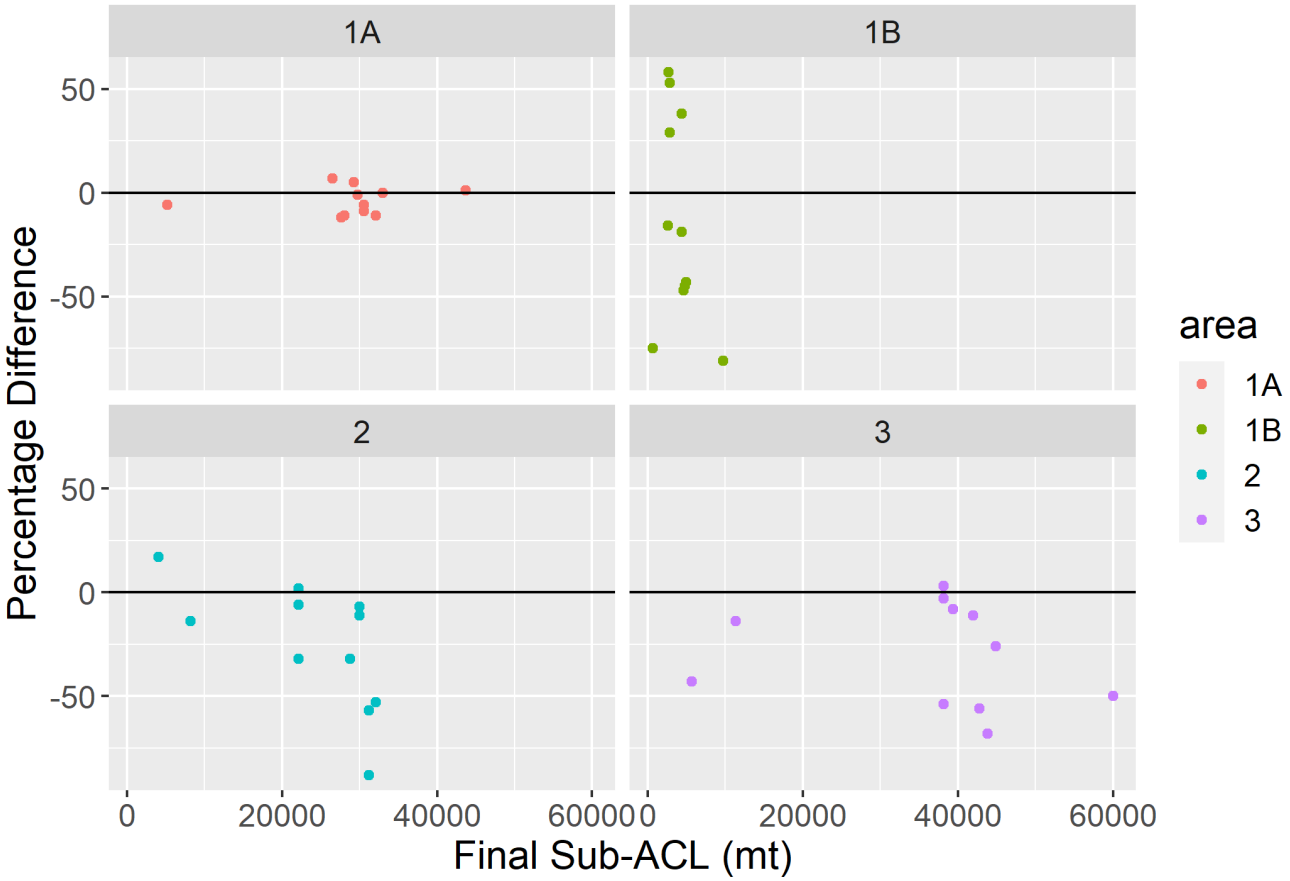


Figure 7 shows the metric ton difference between catch and final sub-ACLs. When evaluating overages and underages in units of metric tons, there have not been large overages, but there have been large underages in Areas 2 and 3. There is not a strong relationship between increasing sub-ACLs and overages.

Figure 7. Difference between catch and final sub-ACLs.

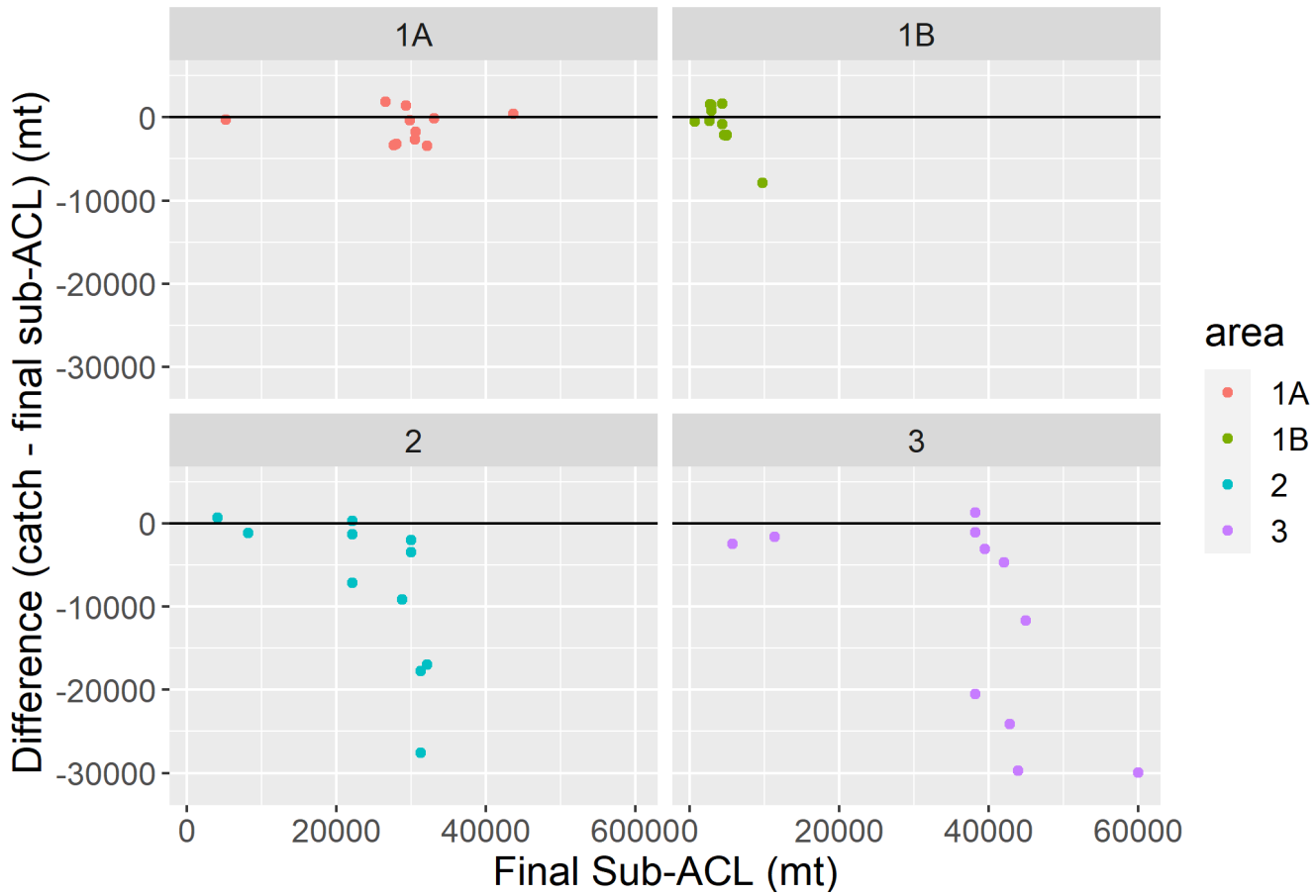
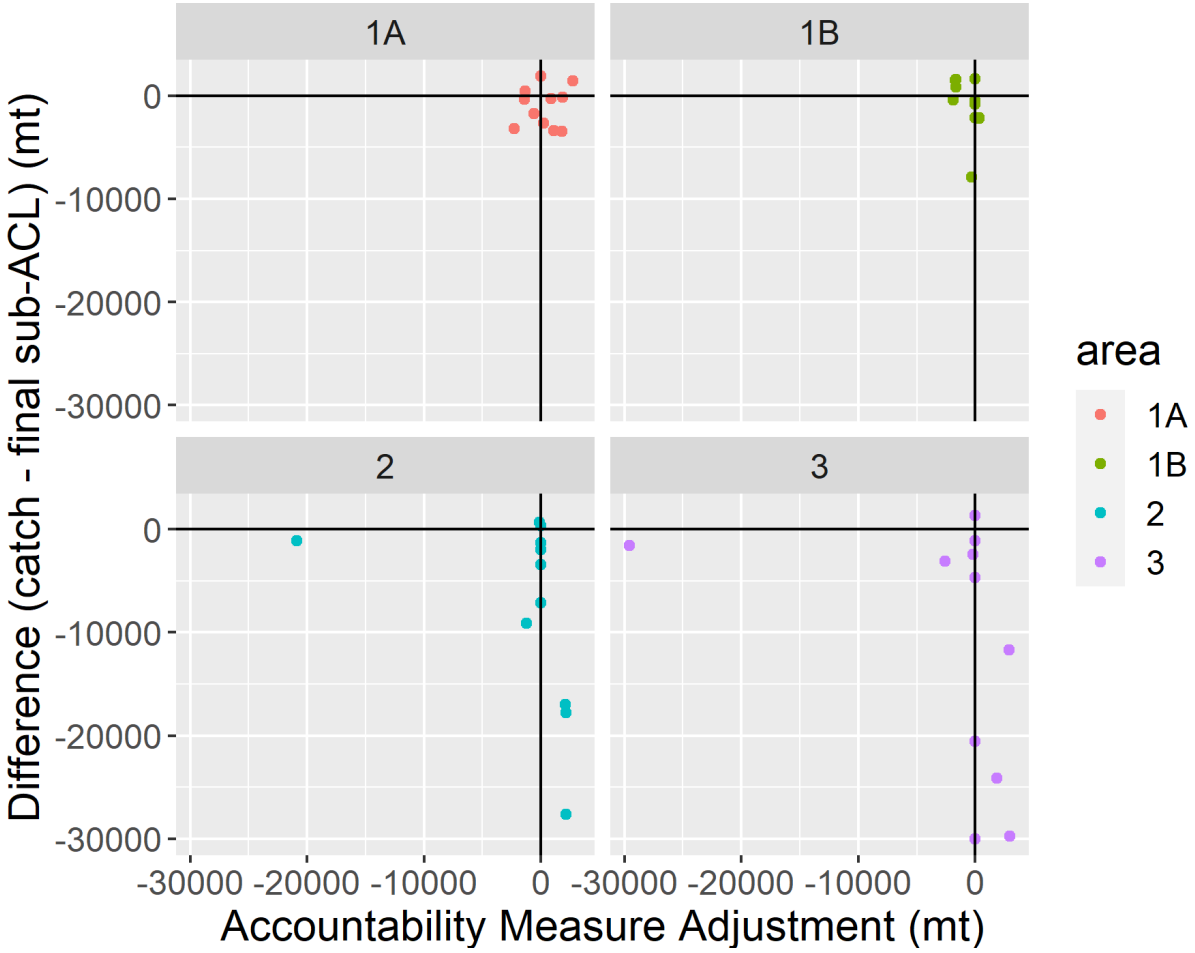


Figure 8 shows the relationship between AMs and overages/underages; a point right of vertical indicates a sub-ACL increase and a point left of vertical indicates a sub-ACL decrease. There is not a strong relationship between AMs (increases to the sub-ACLs) and overages/underages.

Figure 8 - Relationship between AM and resulting overage/underage.



5.5.1.3 Effort in the herring fishery

Atlantic herring vessels primarily use purse seines or single or paired midwater trawls (MWT, Table 11). Herring and mackerel catches have been summarized in the table below by gear type and area. Total catch from the last five years have been summarized by area and gear type, as well as the total number of unique vessels that reported catch from within a specific herring management area through VTR. In general, the MWT fleet has harvested most landings since 2008 (NEFMC 2018b, Section 3.6.1.5). Some herring vessels use multiple gear types during the fishing year. Single and pair trawl vessels generally fish in all areas (October-December in Area 1A), though Areas 1A and 1B account for less of their total landings in recent years. The purse seine fleet fishes primarily in Area 1A and to a minor extent, Areas 1B and Area 2. Single MWT vessels have been most active in Area 3 and are combined with paired MWT landings in the table below for data confidentiality issues. Small mesh bottom trawl vessels account for a small percentage of herring landings recently; landings by other gear types (e.g., pots, traps, shrimp trawls, hand lines) are minor, but hand gear has been increasing in recent years, especially for mackerel in Area 1A and Area 3.

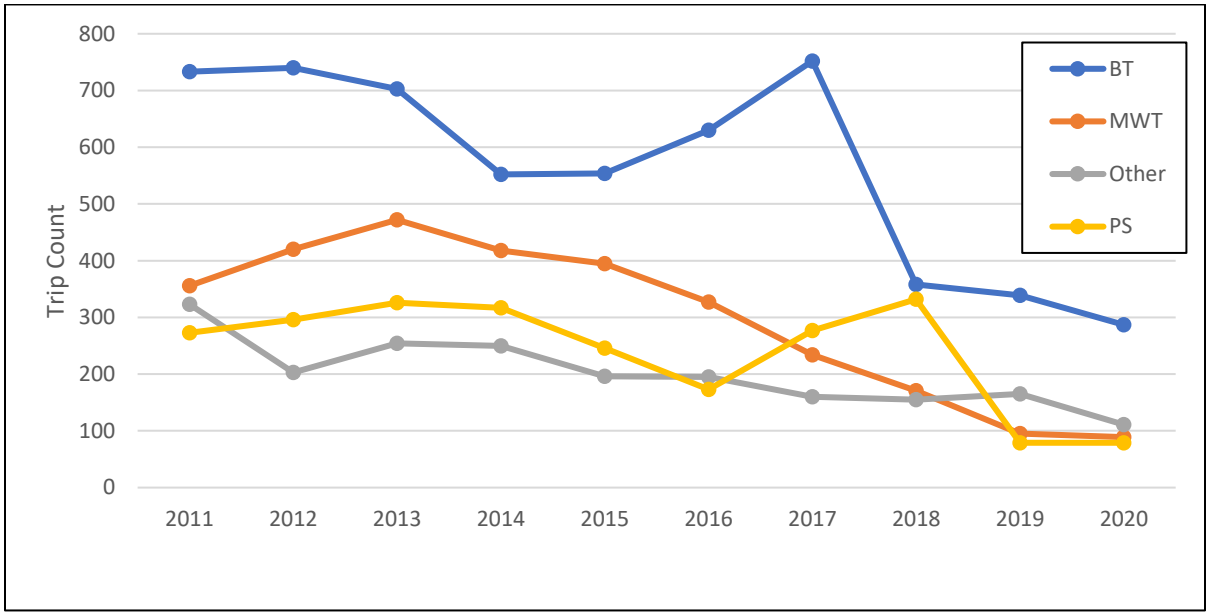
Table 11. Atlantic herring and mackerel commercial landings (mt) by fishing gear type and herring management area (with number of vessels in italics), 2015-2020.

Management Area	Species	Bottom Trawl	Hand Gear	Midwater Trawl	Purse Seine	Other
1A	Herring	818	3	23,352	95,612	29
		27	*17*	*1*	*16*	*8*
	Mackerel	250	2,885	7,148	*	43
		49	*108*	*9*		*31*
1B	Herring	19	*	11,301	150	*
		5		*11*	*3*	
	Mackerel	38	217	293		1
		16	*33*	*3*		*13*
2	Herring	10,496	0	32,367	*	3
		91	*5*	*17*		*18*
	Mackerel	5,155	40	16,687	*	12
		217	*57*	*15*		*129*
3	Herring	204		82,926		
		6		*13*		
	Mackerel	825	1,066	6,022		42
		45	*50*	*13*		*25*

Source: GARFO DMIS and VTR databases as of July 2021.
Notes: Data include all vessels that landed greater than zero pounds of Atlantic herring or Atlantic mackerel. Single and pair midwater trawl data are combined due to data confidentiality restrictions. Herring management areas determined from VTR reported locations. * = confidential

The number of trips landing herring has declined with the decrease in landings in recent years, both fishery-wide and by gear type (Figure 9). The greatest potion of herring trips is by vessels using bottom trawl gear, and trips using this gear type declined by 61% from 2011 to 2020, with 287 trips in 2020. Midwater trawl and purse seine trips declined by 25% and 29%, respectively, with just 89 and 79 trips in 2020.

Figure 9. Number of trips landing herring by gear type, 2011-2020

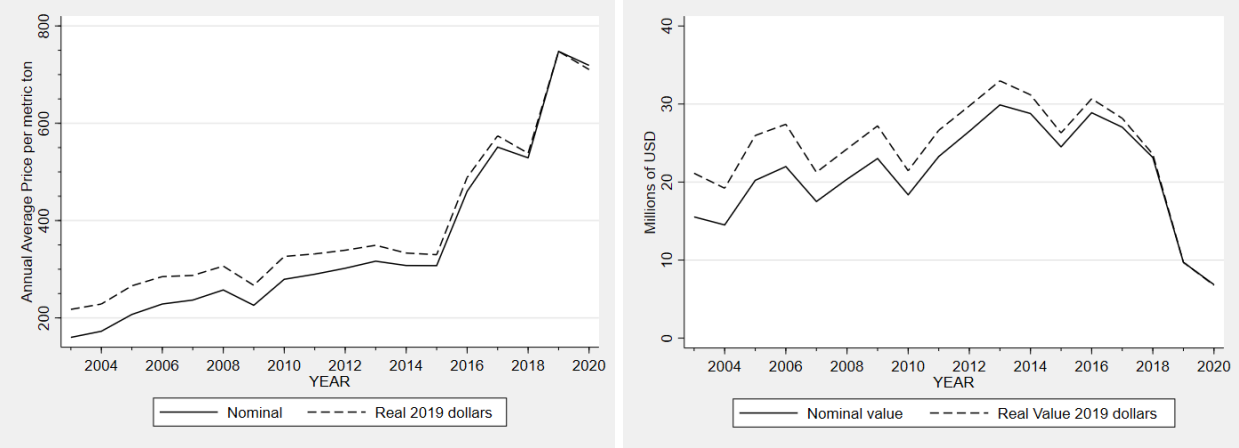


Source: NMFS dealer data as of August 2021.

5.5.1.4 Fishery Economics

Fishery prices and value. From 2004-2015, herring experienced moderate and steady increases in prices (in both real and nominal terms, Figure 10). From 2015 to 2019, prices increased dramatically, as total landings decreased. The price increases offset the decline in landings; however, in 2019, landings and revenue were historically low and even lower in 2020.

Figure 10. Annual average herring prices and total value in real and nominal terms, 2003-2020.



Source: NMFS dealer data as on June 25, 2021.
Note: U.S. GDP Implicit price deflator, 2020=100.

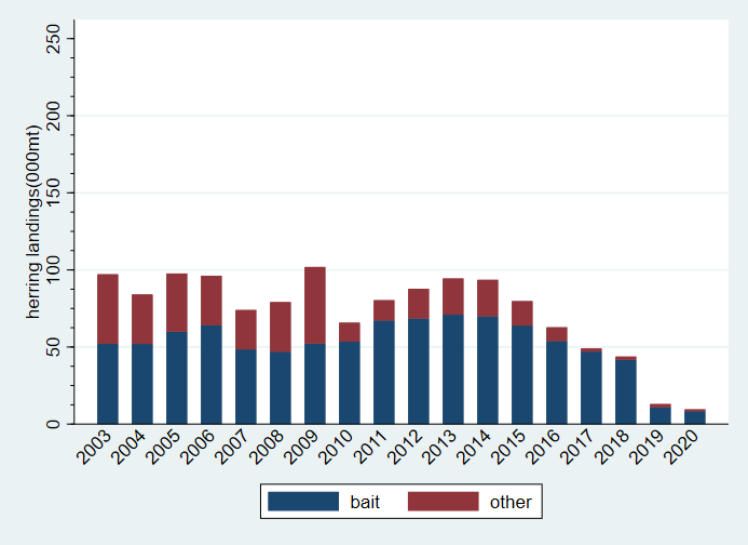
Usage, substitutes, and downstream industries. A large proportion of herring landings are sold as bait, and increasingly so in recent years (Figure 11), for many fisheries, such as lobster, tuna, and recreational fisheries. Historically, Atlantic herring is used for bait by smaller inshore vessels more than larger offshore vessels, because it is typically less expensive; in addition, alternative bait options like skates tend to be preferred for longer soaks in offshore waters and in southern waters. Generally, the herring used for bait goes through a large wholesale dealer to smaller dealers and lobster wharfs along the coast. The wholesale dealers generally have facilities where they sort, barrel, freeze and store bait for redistribution. The locations and processing and selling techniques also vary. Amendments 1, 5 and 8 further describe the ways in which herring is processed and sold.

The annual average price of Atlantic herring increased from about $300 in 2015 to peaking at $750 per metric ton in 2019 (Figure 10, Figure 12). During this time, landings declined (Table 9). Prices are generally highest in the late spring through summer and lowest in the winter. In recent years, landings have been low in late spring/summer often for regulatory reasons.

The lobster industry is the primary consumer of herring bait. Lobster fishing typically occurs in the second half of the year (June/July through November/December). Lobster prices tend to be highest the late spring and early summer (Figure 13). Annual average lobster prices have been about $4/lb, except for 2019 ($5/lb).

The ability of lobstermen to obtain substitute baits for Atlantic herring is constrained by state regulations, storage capacity of bait dealers, and economics. Menhaden is a commonly cited substitute product. The menhaden fishery typically has higher volumes in the second half of the year (June –October/November). Yearly average menhaden prices have been steady around $200/metric ton (Figure 14). As herring landings have declined since 2014, the quantity of menhaden used as bait has increased. The increase in menhaden used as bait has been less than the decrease in herring landings. Use of menhaden for bait has increased in importance relative to its use in fish meal and oil. Since 2013, the amount of menhaden landings used for bait rose has been increasing (Figure 15). During 2018, ex-vessel menhaden prices averaged $551 per mt in the State of Maine.[4] This was about 4% higher than average *ex-vessel* herring prices that year ($530/mt).

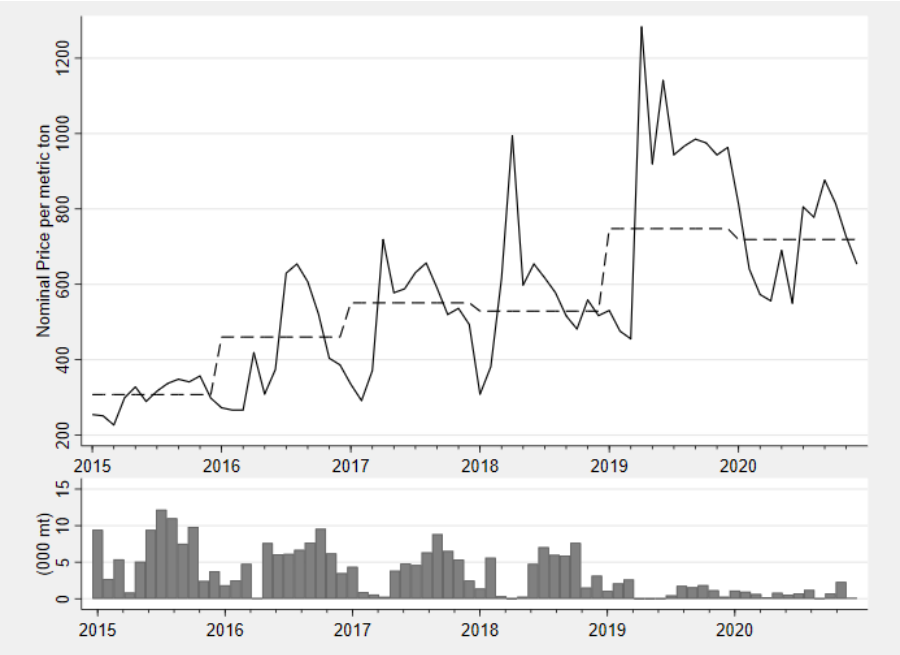
Figure 11. Annual herring sold for bait and non-bait purposes, 2003-2020.



Source: NMFS dealer data as on June 25, 2021.

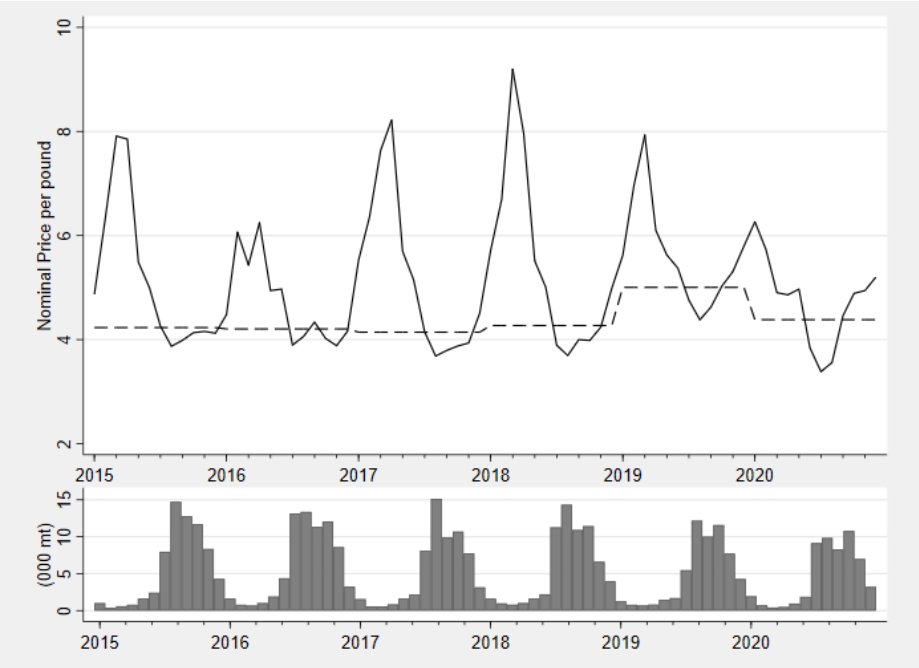
[4] https://www.maine.gov/dmr/commercial-fishing/landings/documents/14-18LandingsBySpecies.Table.pdf

Figure 12. Monthly nominal herring prices (solid); average annual prices (dashed); and monthly landings (bars below), 2015-2020.



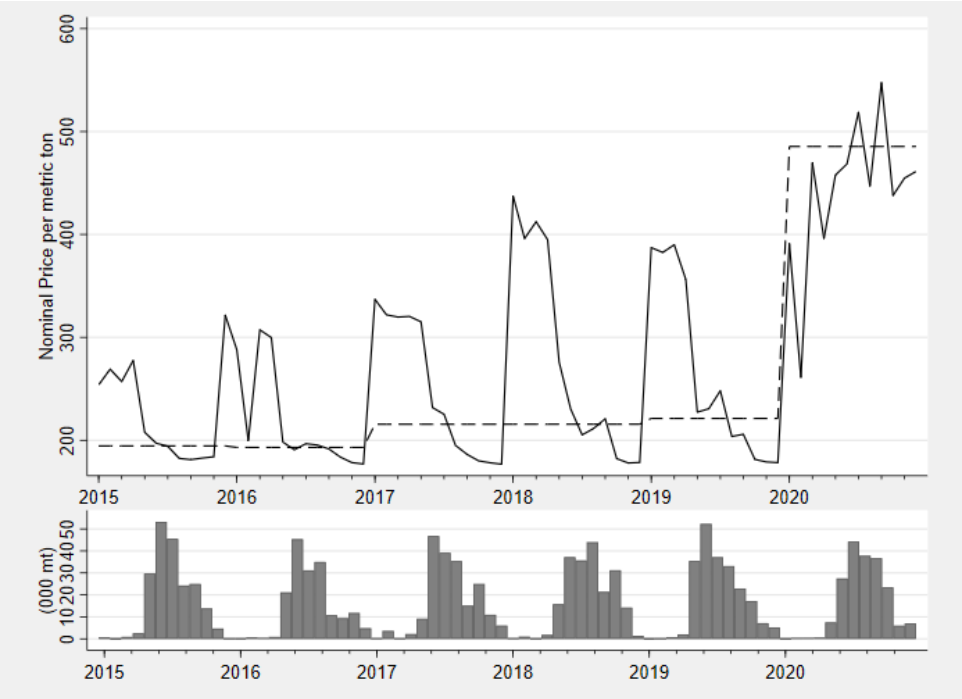
Source: NMFS dealer data as of June 25, 2021.

Figure 13. Monthly nominal lobster prices (solid); average annual prices (dashed); and monthly landings (bars below), 2015-2020.



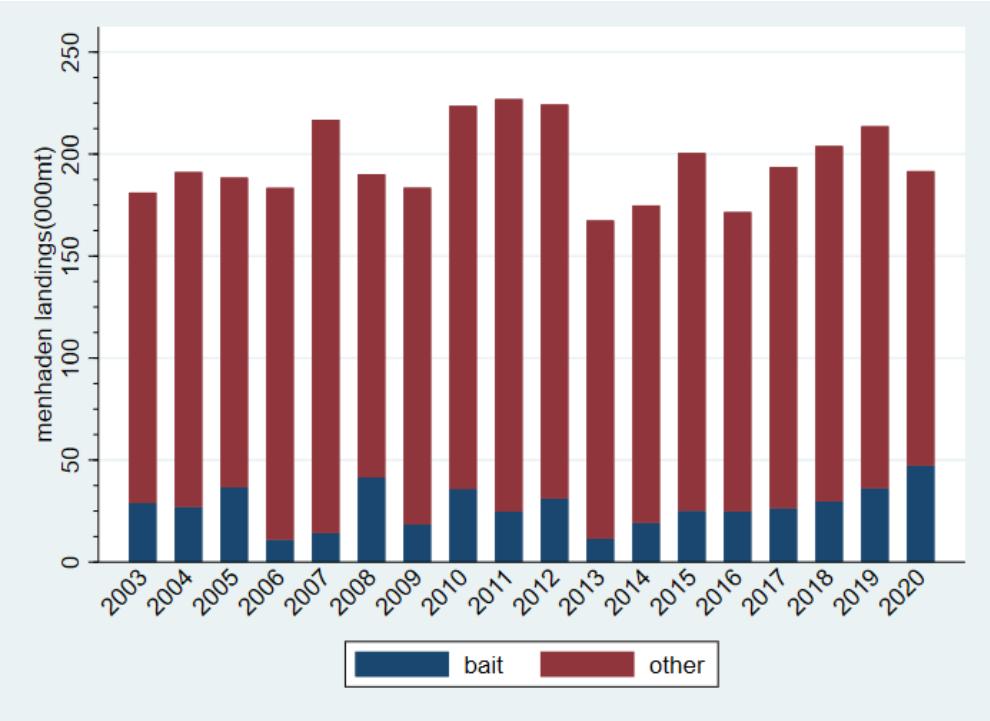
Source: NMFS dealer data as of June 25, 2021.

Figure 14. Monthly menhaden prices (solid); average annual prices (dashed); and monthly landings (bars below), 2015-2020.



Source: NMFS dealer data as of June 25, 2021.

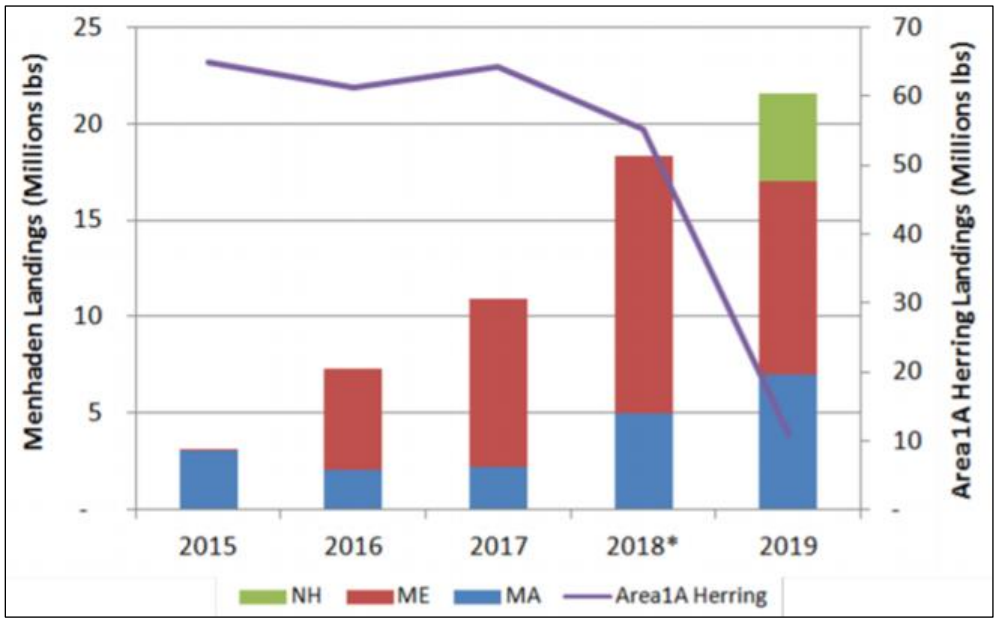
Figure 15. Annual menhaden sold for bait and non-bait purposes, 2003-2020.



Source: NMFS dealer data as of June 25, 2021.

Other sources of bait for the lobster fishery have increased in recent years as herring has become less available in the GOM. The harvest of menhaden in the GOM has increased for Maine, NH, and Massachusetts (Figure 16). This increase has helped supplement the shortage left by the reduced Atlantic herring quota during summer months.

Figure 16. Annual menhaden landings by state and Area 1A herring landings, 2015-2019



Source: ACCSP Data Warehouse and NOAA VTR Data NOTE: 2019 data are preliminary, and values are subject to change. Confidential data is omitted for some 2018 landings data (From ASMFC 2020b).

Alewife may be another potential substitute. Although volumes of alewife landings are low compared to herring. Landings from Maine sustainable rivers (as outlined by ASMFC) rose from about 588 mt in 2015 to 890 mt. Volumes of alewife landings in 2018 was just 3% of the volume of herring bait sales in 2018. The price of alewife in 2018 was $760/mt, making them a more expensive alternative for use as lobster bait. An ASMFC work group on lobster bait is currently surveying lobstermen and herring dealers to help determine how demand for herring and use of substitute baits may be changing, given recently low herring catch limits.

Dependence on Herring. Herring has been the primary source of revenue for the purse seine vessels, a major source of revenue for midwater trawls, and a minor revenue source for bottom trawls (Table 11) (NEFMC 2021), though herring fishing enables participation in other fisheries. Vessels active in the Atlantic herring midwater trawl fishery generally also have limited access permits in the Atlantic mackerel fishery and permits in a variety of other fisheries but are not necessarily active in all fisheries in which permits are held due to management or logistical constraints. Since 2017, both herring revenue and the percent dependence on herring has declined for vessels landing herring (Table 12).

Table 12. Revenue (in thousands $) by species for vessels that land Atlantic herring, 2017-2020

Year	Vessels	Herring	Mackerel	Squid	Menhaden	Other	Total
2017	74	$26,736 (38%)	$3,176	$24,223	$840	$16,299	**$71,274**
2018	69	$23,060 (31%)	$3,798	$29,362	$1,218	$16,801	**$74,239**
2019	55	$9,583 (22%)	$2,007	$19,265	$152	$12,038	**$43,044**
2020	51	$6,735 (16%)	$4,226	$17,788	$1,298	$12,547	**$42,595**
Source: NMFS VTR data, accessed June 25, 2021.							

5.5.2 Other Managed Resources and Fisheries

In addition to Atlantic herring, many other fisheries could be impacted by the alternatives under consideration. Atlantic mackerel is targeted in combination with Atlantic herring during part of the year, particularly in the southern New England and Mid-Atlantic areas. The lobster fishery is highly dependent on herring as bait. Herring is either a fishery bait source and/or a natural prey item for bluefin tuna, groundfish, and striped bass, which have commercial and recreational fisheries associated with them. Herring is also a prey for whales, other marine mammals, and sea birds, which have ecotourism industries associated with them. Amendment 8 (NEFMC 2018b, Section 3.6.2) contains extensive descriptions of the population status, management and fisheries and ecotourism for these species, and is incorporated herein by reference.

5.5.2.1 Mackerel fishery

Population status*:** The Atlantic mackerel stock was most recently assessed in 2017, with 2016 as the terminal year of data (NEFSC 2018a). Fishing mortality (F) in 2016 was estimated to be 0.47, so ***overfishing was occurring in 2016. The 2016 spawning stock biomass (SSB) was estimated to be 43,519 mt, or 22% of the SSB target so mackerel is "***overfished***" (below 50% of the target). The MAFMC developed a rebuilding program for mackerel with the 2019-2021 specifications.

Management: Many vessels that participate in the Atlantic herring fishery are also active in the Atlantic mackerel fishery managed by the Mid-Atlantic Fishery Management Council through the Atlantic Mackerel, Squid, and Butterfish (MSB) Fishery Management Plan. More information about mackerel management is at: http://www.mafmc.org/msb. There is no resource sharing agreement between Canada and the U.S. for Atlantic mackerel. The U.S. sets an upper limit on total catch, and simply deducts expected Canadian catch from the total catch. This has not caused issues to date but at the current low quotas, if Canada raises its quota/catches, then the U.S. may be shut out of the fishery under the current FMP.

Fishery: There are three commercial limited access Atlantic mackerel permit categories. When the directed fishery is open, there are no trip limits for Tier 1, Tier 2 has a 135,000 lb trip limit and Tier 3 has a 100,000 lb trip limit, which is reduced to 20,000 lb if it catches 7% of the commercial quota. Open access incidental permits have a 20,000 lb trip limit. There is also a smaller recreational fishery for mackerel (including private/rental and party/charter). The directed fishery is primarily composed of Tier 1 vessels. In 2020, there were 31 Tier 1 vessels (Table 13), 24 (77%) of which also had an Atlantic herring Category A permit. The Tier 1 vessels are primarily (71%) over 80 ft in length (NEFMC 2021).

Total landings of Atlantic mackerel (foreign and domestic) peaked at about 400,000 mt in 1973 but have been under 100,000 mt per year since 1977. Except for a peak in the early 2000s of about 40,000-55,000 mt, U.S. domestic landings have generally been under 30,000 mt since the 1960s (MAFMC 2015) and under 10,000 mt since 2011 (Table 14). Mackerel catches since 2008 have generally been under 50% of the total mackerel quota (NEFSC 2016). Revenue from the mackerel fishery has been under $5M per year since 2010 (MAFMC 2016b). From 2013-2017, most landings were with MWT gear (Figure 17).

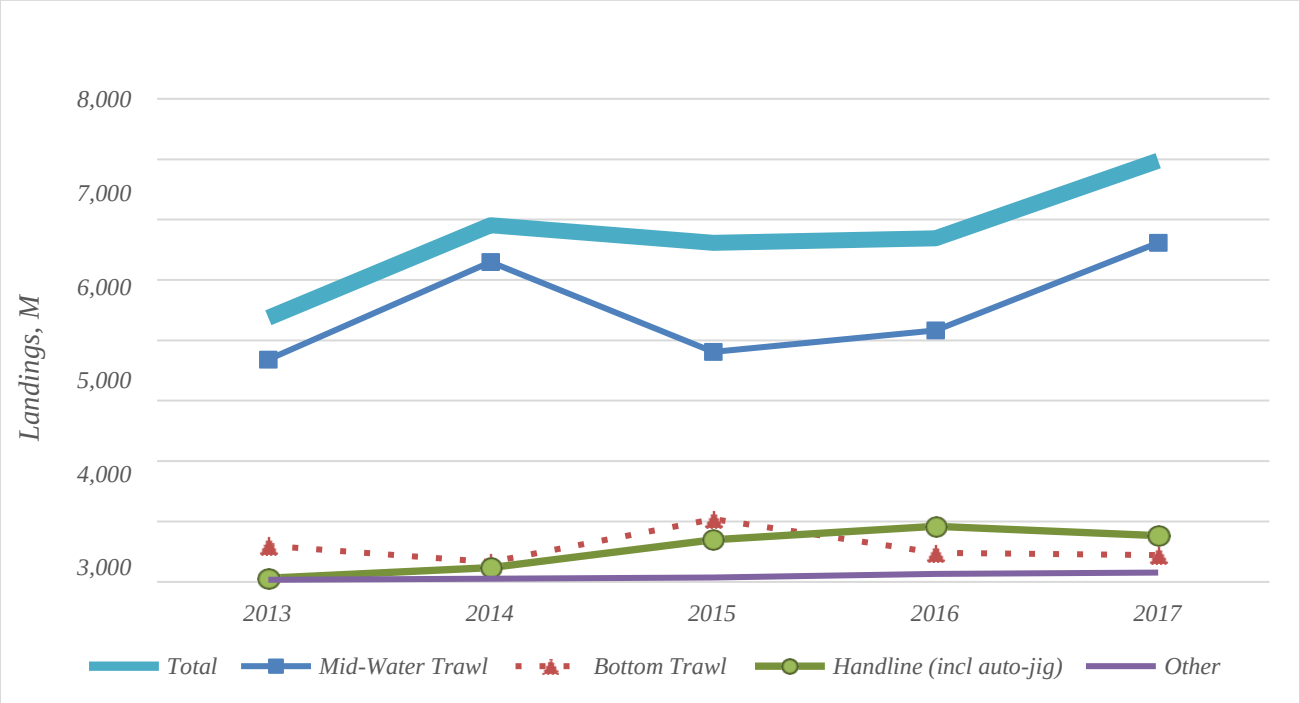
Table 13. Number of vessels with limited Atlantic mackerel permits by Atlantic herring permit category, 2020

Mackerel Permit Category	Herring permit categories							
	A	B/C	C	D	D/E	E	none	Total
Tier 1	24	0	6	0	1	0	0	**31**
Tier 2	2	1	5	3	13	0	0	**24**
Tier 3	1	1	12	22	31	1	2	**70**
Source: NMFS Permit database. Data as of September 2020.								

Table 14. Atlantic mackerel catch (mt) and quota, 2007-2016

Year	U.S. Domestic			Canadian Catch	Total Catch	Quota (U.S. + Canada)	% Quota Caught (US + Canada)
	Commercial Landings	Commercial Discards	Recreational Landings + Discards (Mostly Landings)				
2007	25,546	159	633	53,394	79,733	238,000	34%
2008	21,734	747	857	29,671	53,008	211,000	25%
2009	22,634	125	684	42,232	65,675	211,000	31%
2010	9,877	97	938	38,736	49,648	211,000	24%
2011	533	38	1,042	11,534	13,147	80,000	16%
2012	5,333	33	767	6,468	12,601	80,000	16%
2013	4,372	20	951	9,017	14,360	80,000	18%
2014	5,905	52	1,142	6,872	13,971	80,000	17%
2015	5,616	13	1,384	4,937	11,950	40,165	30%
2016	5,687	18	1,611	8,000	15,316		
Source: NEFSC (NEFSC 2016; 2020b).							

Figure 17. Mackerel landings by gear type, 2013-2017



Source: MAFMC (2019). (Still updating)

During 2005-2009, when annual domestic mackerel landings were 23,000-58,000 mt, the fishery was primarily focused in the waters of Mid-Atlantic and Southern New England, though there was fishing in the Gulf of Maine and the southern flank of Georges Bank. In more recent years, with much lower landings, the fishery has been less concentrated in the Mid-Atlantic, and waters of Rhode Island and in the Gulf of Maine have continued to be important, as have both the northern and southern flank of Georges Bank. Mackerel fishing also varies by season, depending on the mackerel resource conditions, as

well as other fisheries. Herring fishing patterns for example can impact when and where mackerel fishing occurs. The seasonality of the mackerel fishery has changed over time, back when mackerel landings were high (e.g., 2006) the fishery was dominated by Jan-Mar landings, and in more recent years that has shifted to Nov-Dec as well, but at much lower levels.

Members of the MAFMC MSB Advisory Panel reported in May 2016 that shifting of thermal habitat suitability is likely impacting the distribution and/or productivity of MSB species, a topic that was discussed in the 2017 mackerel assessment. The AP also noted that Atlantic herring management limits mackerel fishing, such as the summer closure of Herring Management Area 1A to midwater trawl gear, herring spawning closures, and recently, the Georges Bank haddock catch cap accountability measure, which closed most of Georges Bank to herring fishing October 22, 2015 to April 30, 2016 (MAFMC 2016a).

Herring and mackerel are often caught together. During development of this action the industry has explained that the current 2,000 possession limit of herring that is implemented when 92% of a herring sub-ACL or 95% of the total herring ACL is triggered, most herring vessels do not operate in that area because setting a net to target mackerel and remain under 2,000 pounds is very problematic and vessels are at risk of non-compliance.

5.5.2.2 Industries reliant on the predators of herring

Analysis of species that feed on herring was conducted in support of Amendment 8 to the Herring FMP, including a quantitative model designed to examine the effects of different herring control rules on outcomes for Bluefin tuna, common and arctic terns, and spiny dogfish. Bluefin tuna models suggested that the major factor in tuna outcomes was determined by individual herring growth rates, a life history trait which is not affected by managers. Tern metrics were sensitive to certain types of control rules (which featured either constant quotas or fixed quotas for three years with a limit on how much they could change). These were not adopted by the NEFMC. Spiny dogfish outcomes were also poor under those types of control rules. Like Bluefin tuna, spiny dogfish outcomes were influenced by herring life-history traits that are not within the control of fishery managers.

Bluefin tuna feeds on herring, and the tuna fishery also uses herring as bait. In 2016, about 7,000 commercial and 21,000 recreational bluefin tuna permits were issued. The bluefin tuna fishery (recreational and commercial combined) landed an average of 862.3 mt from the years 2012 to 2016, with most catch coming from the commercial rod and reel and longline fisheries in the northwest Atlantic (NEFMC 2018b). In 2018, U.S. commercial landings of bluefin tuna were 958 mt with $11.4M in revenue. While landings decreased over 2017 (1,312 mt), revenue increased ($10.1M). Common and arctic terns are protected under the Migratory Bird Treaty Act and managed by the U.S. Fish and Wildlife. There is no directed tourism or recreation activities focusing on these species. Spiny dogfish commercial landings in 2018 were 7,808 mt with $3.5M in revenue (NMFS 2020).

Other fisheries for species that feed on herring include striped bass and groundfish. In 2019, total Atlantic striped bass removals (commercial and recreational, including harvest, commercial discards, and recreational release mortality) were estimated at 5.47M fish, a 5% decrease relative to 2018. The recreational sector accounted for 87% of total removals by number (ASMFC 2020a). Groundfish landings in FY 2018 were 44.3M lb, generating $49.5M. While this is an increase over FY 2017 ($47.0M), overall groundfish landings and revenue have declined (NEFMC 2020).

Ecotourism, in the form of whale watching, also depends on marine life that forages on herring. As of 2017, there were 22 dedicated whale watching companies with 34 vessels from Maine to New Jersey and several in Delaware and Virginia. There are about 30 smaller, charter whale watch operations as well in the Northeast (NEFMC 2018a).

5.5.3 Fishing Communities

Consideration of the economic and social impacts on fishing communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the Magnuson-Stevens Fishery Conservation and Management Act, particularly National Standard 8 (MSFCMA 2007).

To gain a better perspective on the nature of the Atlantic herring fishery and the character of the affected human environment, a broader interpretation of fishing community has been applied to include almost all communities with a substantial involvement in or dependence on the Atlantic herring fishery. Some of the communities identified in this section may not fit the strict interpretation of the National Standard 8 (NS 8) criteria for substantial dependence on fishing. The fishing communities that meet the legal definition (as promulgated through NS 8) are likely to be considered a subset of the broader group of communities of interest that are engaged in the herring fishery and identified in this document.

5.5.3.1 Herring Fishing Communities Identified

There are over 150 communities that have been a homeport or landing port to one or more active Atlantic herring fishing vessels since 1997. These ports mostly occur from Maine to New Jersey. The level of activity in the herring fishery has varied across time. While the involvement of communities in the Atlantic herring fishery is described, it is important to remember that the involvement of vessels therein may vary.

Primary Port Criteria. The herring fishery primary ports are those that are substantially engaged in the fishery, and which are likely to be the most impacted by the alternatives under consideration. The primary ports meet at least one of the following criteria:

1. A ranking of high for engagement in on the Atlantic herring fishery on average in 2015-2019, according to the NOAA Fisheries Community Social Vulnerability Indicators (Table 16).
2. Atlantic herring landings averaging at least 10M lb (4,536 mt) per year from 2011-2020, or anticipated landings above this level based on interviews and documented fishery-related developments (Table 17).

Secondary Port Criteria. The herring fishery secondary ports are those that may not be as dependent or engaged in the fishery as the primary ports but are involved to a lesser extent. They are listed here to provide a broader scope of potential communities impacted by skate management measures. The secondary ports meet at least one of the following criteria:

1. A ranking of at least medium-high for engagement in or reliance on the Atlantic herring fishery on average in 2015-2019, according to the NOAA Fisheries Community Social Vulnerability Indicators (Table 16).
2. Port infrastructure dependent in part or whole on Atlantic herring (e.g., herring dealers, portside sampling stations).

Changes to these criteria since their use in Amendment 8 are: a) updating engagement and reliance indicators from 2011-2015 to 2015-2019, and b) updating average herring landings from 2007-2016 to 2011-2020 and using an average of 10M lb as the threshold rather than requiring 10M lb of landings each year; and 3) creation of secondary port criteria. Also, NOAA Fisheries has changed the indicator of herring engagement to include the number of homeported vessels with herring permits rather than the number of vessels landing herring. Herring landings and revenue and the number of herring dealers remain components of the indicator. The A8 criteria also included port infrastructure dependent on herring; that has become a secondary port criterion. Finally, dependence on herring as bait, geographic isolation and use of herring for value-added production have been dropped. Hundreds of ports depend on

herring as bait; geographic isolation is captured in the reliance indicator; and the ports with value-added production meet other criteria.

Herring Primary and Secondary Ports. Based on these updated criteria, there are eight primary ports in the Atlantic herring fishery (Table 15). Of these, the ports with the highest landings are Portland and Rockland, Maine and Gloucester and New Bedford, Massachusetts (***Table 17***). The primary ports comprised 89***%*** of total fishery landings during 2011-2020. There are 16 secondary ports from Maine to New Jersey, the non-confidential ports of which comprise 8% of herring landings during 2011-2020.

There are 266 other ports that had at herring engagement indicator of at least low on average in 2015-2019, indicating minor participation in the fishery recently. Ports are further described in Amendments 5 and 8. Community profiles are available from the NEFSC Social Sciences Branch website and in Clay et al. (2007).

Table 15. Primary and secondary ports in the Atlantic herring fishery

State	Community	Primary Criteria		Secondary Criteria		Primary/ Secondary
		Herring landings >10M lb	Herring indicator: High engagement	Herring indicator: Engagement or reliance > med-high	Port dependent	
ME	Machiasport **			√		Secondary
	Jonesport *			√	√	Secondary
	Gouldsbor/Corea/ Prospect Harbor *			√		Secondary
	Tremont **			√		Secondary
	Stonington		√	√		Primary
	Isle au Haut **			√		Secondary
	Rockland	√	√	√	√	Primary
	Vinalhaven *			√		Secondary
	Matinicus *			√		Secondary
	South Bristol *			√		Secondary
	Boothbay Harbor **			√		Secondary
	Portland	√	√	√	√	Primary
NH	Portsmouth **			√		Secondary
MA	Gloucester	√	√	√	√	Primary
	Boston **			√		Secondary
	New Bedford	√	√	√	√	Primary
	Fall River **				√	Secondary
RI	N. Kingstown *				√	Secondary
	Narragansett/Pt. Judith		√	√		Primary
NY	Montauk		√	√		Primary
	Wainscott **			√		Secondary
	Hampton Bays/ Shinnecock *			√		Secondary
NJ	Barnegat Light *			√		Secondary
	Cape May		√	√	√	Primary

Note: Sebasco, ME and Newport, RI were primary ports in Amendment 8, because of having some herring port infrastructure and lobster dependence. Sebasco no longer has herring port infrastructure lobster dependence was dropped from the criteria, so these ports are not listed.
* Was a primary port in A8, now a secondary port.
** New secondary port.

Table 16 - Atlantic herring fishing community engagement and reliance indicators, 2015-2019 average.

State	Community	Herring Fishing Community Indicator	
		Engagement	Reliance
ME	Machiasport (s)	Low	Med-High
	Jonesport (s)	Medium	High
	Gouldsboro/Corea/Prospect Harbor (s)	Med-High	High
	Tremont (s)	Medium	Med-High
	Stonington (p)	High	High
	Isle au Haut (s)	Low	High
	Rockland (p)	High	High
	Vinalhaven (s)	Low	Med-High
	Matinicus (s)	Low	Med-High
	South Bristol (s)	Medium	High
	Boothbay Harbor (s)	Medium	Med-High
	Portland (p)	High	High
NH	Portsmouth (s)	Med-High	Medium
MA	Gloucester (p)	High	High
	Boston (s)	Med-high	Low
	New Bedford (p)	High	Medium
	Fall River (s)	Medium	Low
RI	N. Kingstown (s)	Medium	Low
	Narragansett/Pt. Judith (p)	High	Med-High
NY	Montauk (p)	High	High
	Wainscott (s)	Low	High
	Hampton Bays/Shinnecock (s)	Med-High	Medium
NJ	Barnegat Light (s)	Medium	High
	Cape May (p)	High	High

Notes: List includes those communities that have a ranking of at least medium-high for herring engagement or reliance or are otherwise designated a primary (p) or secondary (s) port.
Source: NOAA Fisheries Community Social Vulnerability Indicators.

Table 17. Annualized Atlantic herring landings to top ports, 2011-2020

Port, State	2011-2020 Avg. landings (mt)	Rank	Herring permits [a]	Herring dealers [a]
Portland, ME (p)	16,767	1	23	77
Gloucester, MA (p)	12,611	2	27	32
Rockland, ME (p)	10,851	3	14	59
New Bedford, MA (p)	9,035	4	16	45
Narragansett/Pt. Judith, RI (p)	2,686	5	45	24
Stonington, ME (p)	1,348	6	7	26
N. Kingston, RI (s)	1,270	7	5	3
Cape May, NJ (p)	1,225	8	8	4
Jonesport, ME (s)	746	9	10	15
Gouldsboro/Corea/Prospect Harbor, ME (s)	743	10	10	31
Boston, MA (s)	684	11	11	14
Vinalhaven, ME (s)	463	12	3	5
Portsmouth, NH (s)	393	13	4	22
Newport, RI	379	14	5	5
Fall River, MA (s)	227	17	4	24
S. Bristol, ME (s)	222	19	4	5
Montauk, NY (p)	12	>30	45	20
Hampton Bays/Shinnecock, NY (s)	12	>30	32	16
Barnegat Light, NJ (s)	>1	>30	7	3
Other (n=94)	1,722			
Total (n=113)	**61,397**		**242**	**169**

Source: Dealer data, accessed July 2021.
Note: Dark shaded rows are primary ports. Secondary ports not listed are confidential.

5.5.3.2 Social and Gentrification Pressure Vulnerabilities.

The NOAA Fisheries Community Social Indicators (see also Jepson & Colburn 2013) are quantitative measures that describe different facets of social and economic well-being that can shape either an individual's or community's ability to adapt to change. The indicators represent different facets of the concepts of social and gentrification pressure vulnerability to provide context for understanding the vulnerabilities of coastal communities engaged in and/or reliant on commercial fishing activities. Provided here are these indicators for the primary and secondary herring ports (Table 18).

The Social Vulnerability Indicators. There are five social vulnerability indicators; the variables for which represent different factors that may contribute to a community's vulnerability. The **Labor force structure** index characterizes the strength/weakness and stability/instability of the labor force. The **Housing characteristics** index measures infrastructure vulnerability and includes factors that indicate housing that may be vulnerable to coastal hazards. The **Personal disruption** index represents factors that disrupt a community member's ability to respond to change because of personal circumstances affecting family life such as unemployment or educational level. The **Poverty** index is a commonly used indicator of vulnerable populations. The **Population composition** index shows the presence of populations who are traditionally considered more vulnerable due to circumstances often associated with low incomes and fewer resources. A high rank in any of these indicates a more vulnerable population.

Most herring port communities exhibited medium-high to high vulnerability in at least one of the five social vulnerability indicators. Across all herring ports, the highest indicator of vulnerability is labor force structure.

Gentrification Pressure Indicators. Gentrification pressure indicators characterize factors that, over time, may indicate a threat to the viability of a commercial or recreational working waterfront, including the displacement of fishing and fishing-related infrastructure. The **Housing Disruption** index represents factors that indicate a fluctuating housing market where some fishing infrastructure displacement may occur due to rising home values and rents. The **Retiree migration** index characterizes areas with a higher concentration of retirees and elderly people in the population. The **Urban sprawl** index describes areas with increasing population and higher costs of living. A high rank in any of these indicates a population more vulnerable to gentrification.

Almost all herring ports scored medium-high to high in at least one of the three gentrification pressure indicators. This suggests that shoreside fishing infrastructure and fishing family homes may face rising property values (and taxes) from an influx of second homes and businesses catering to those new residents, which may displace the working waterfront. Across all herring ports, the highest indicator of vulnerability is housing disruption.

Combined Social and Gentrification Pressure Vulnerabilities. Overall, 15 of the 24 port communities have medium to high levels of vulnerability for four or more of the eight indicators (combined social and gentrification pressure). This indicates high social and gentrification pressure vulnerability overall for both the primary and secondary communities. Stonington, ME and New Bedford and Fall River, MA have six indicators at the medium to high level.

Table 18. Social vulnerability and gentrification pressure in primary and secondary herring ports, 2018.

State	Community	Social vulnerability					Gentrification pressure		
		Labor Force Structure	Housing Characteristics	Environmental Justice indicators			Housing Disruption	Retiree Migration	Urban Sprawl
				Personal Disruption	Poverty	Population Composition			
ME	Machiasport (s)	Med-High	Med-High	Low	Medium	Low	Low	High	Low
	Jonesport (s)	Med-High	Med-High	Medium	Medium	Low	Low	Medium	Low
	Gouldsboro (s)	Med-High	Med-High	Low	Medium	Low	Med-High	Med-High	Low
	Tremont (s)	Low	Medium	Low	Low	Low	Med-High	Low	Low
	Stonington (p)	Medium	Med-High	Med-High	Med-High	Low	High	Medium	Low
	Isle au Haut (s)	Low	n/a*	Low	High	Low	n/a*	Low	Low
	Rockland (p)	Low	Med-High	Low	Medium	Low	Medium	Low	Low
	Vinalhaven (s)	Low	Medium	Low	Low	Low	Med-High	Low	Low
	Matinicus (s)	Medium	n/a*	Med-High	Low	Low	High	Medium	Low
	South Bristol (s)	Medium	Medium	Low	Low	Low	Med-High	Med-High	Low
	Boothbay Harbor (s)	High	Medium	Low	Low	Low	Low	High	Low
	Portland (p)	Low	Medium	Low	Medium	Low	Med-High	Low	Medium
NH	Portsmouth (s)	Low	Low	Low	Low	Low	Med-High	Low	Medium
MA	Gloucester (p)	Low	Low	Low	Low	Low	Medium	Low	Medium
	Boston (s)	Low	Low	Medium	Med-High	Med-High	High	Low	High
	New Bedford (p)	Low	Medium	Med-High	High	Med-High	Medium	Low	Med-High
	Fall River (s)	Medium	Medium	Med-High	Med-High	Medium	Medium	Low	Med-High
RI	N. Kingston (s)	Low	Low	Low	Low	Low	Medium	Low	Low
	Narragansett/Pt. Judith (p)	Medium	Low	Low	Low	Low	Med-High	Medium	Low
NY	Montauk (p)	Medium	Low	Low	Low	Low	High	Med-High	Med-High
	Wainscott (s)	Med-High	Low	Low	Medium	Low	High	Medium	High
	Hampton Bays/Shinnecock (s)	Low	Low	Low	Low	Medium	n/a*	High	n/a*
NJ	Barnegat Light	High	Low	Low	Low	Low	High	High	Med-High
	Cape May	Med-High	Low	Low	Low	Low	High	High	Medium

Source: NOAA Fisheries Community Social Indicators.
*n/a indicates ranking is not available due to incomplete data. (p) = herring primary port. (s) = herring secondary port

5.5.3.3 Trends in Fishing Communities

The ports of Portland and Rockland, Maine; Gloucester and New Bedford, Massachusetts and Pt. Judith, Rhode Island have been important landing ports for the herring fishery for some time. With the recent declines in herring landings overall, each of these ports have seen a decline in landings and the number of active dealers, with the largest reductions occurring in the top port of Portland (Figure 18, Figure 20). There has been a gradual decline since 2011 in the number of active herring permits (Table 7) and Portland has had the largest number of herring permits active by port (
Figure 19).

Figure 18. Herring landings in selected (non-confidential) primary ports, 2011-2020

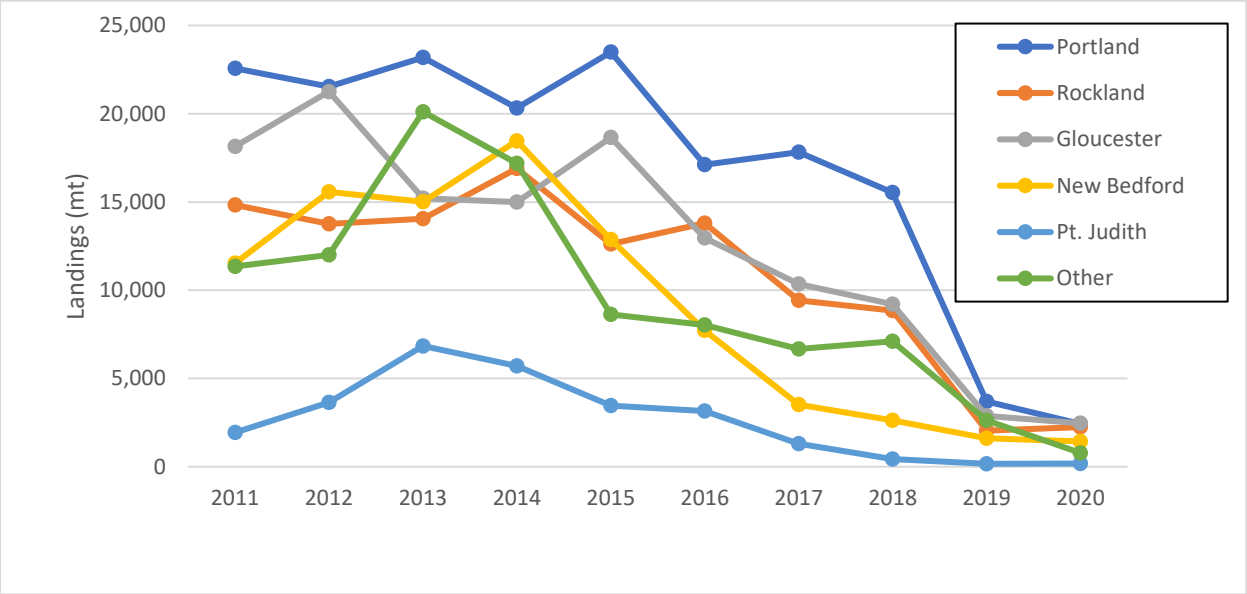


Figure 19. Active herring permits in selected (non-confidential) primary ports, 2011-2020

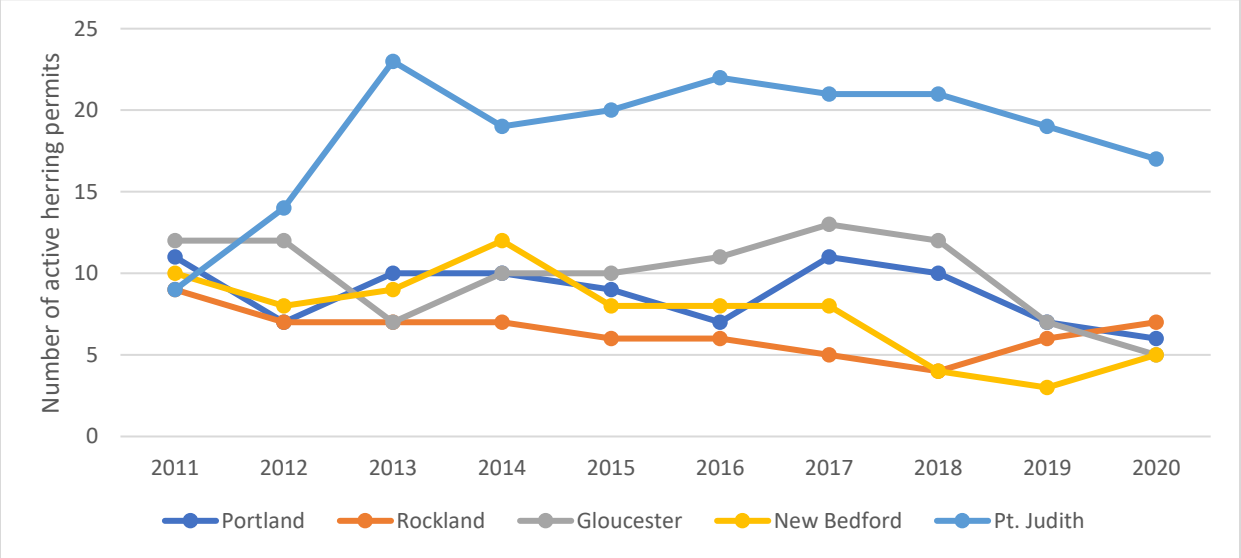
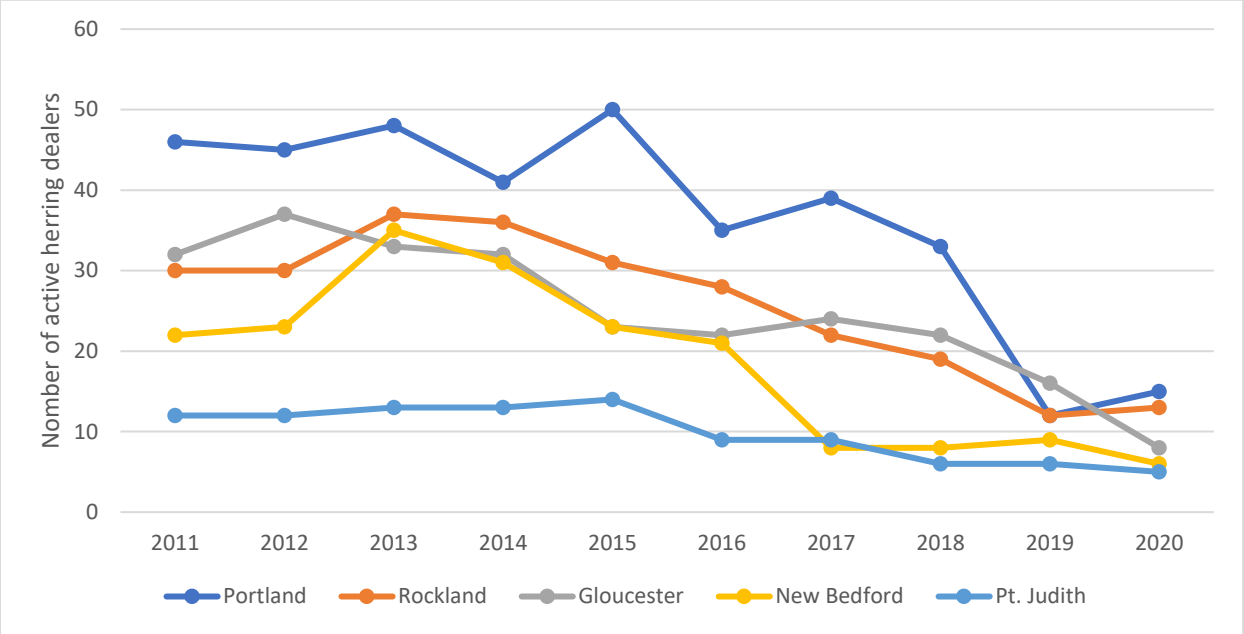


Figure 20. Active herring dealers in selected (non-confidential) primary ports, 2011-2020



Source: Data for Figure 18 to Figure 20 is dealer data, accessed July 2021.

Table 19. Diversity of home port locations for vessels that land herring in the ports for herring landings, 2015-2020.

Landing Port	Time Frame	% same port[1]	% different port[2]		
			Total	Same state	Different state
Rockland, ME	2015-2018	c	c	c	c
	2019-2020	c	c	c	c
Portland, ME	2015-2018	50%	50%	42%	8%
	2019-2020	14%	86%	81%	5%
Gloucester, MA	2015-2018	84%	16%	10%	6%
	2019-2020	76%	24%	15%	9%
New Bedford, MA	2015-2018	56%	44%	14	31%
	2019-2020	c	c	c	c
Point Judith, RI	2015-2018	99%	0%	0%	0%
	2019-2020	100%	0%	0%	0%
Cape May, NJ	2015-2018	17%	83%	0%	83%
	2019-2020	93%	7%	0%	7%

Source: DMIS data, accessed August 2021.
C = confidential
1 Percent of landings in port by vessels that have the same home port.
2 Percent of landings in port by vessels that have a different home port.

The Engagement Index can also be used to determine trends in a fishery over time. Across 2015-2019, the key primary ports of Rockland, Portland, Gloucester, New Bedford, Pt. Judith, Montauk and Cape May have all had high engagement in the herring fishery (Table 20). Engagement has declined in Prospect Harbor, Stonington, Boston, and Fall River across this period and increased in N. Kingston and Hampton Bays.

Table 20. Changes in engagement over time for all primary and secondary herring ports, 2015-2019

State	Community	Engagement Index				
		2015	2016	2017	2018	2019
ME	Machiasport (s)	Low	Medium	Low	Low	Low
	Jonesport (s)	Medium	Medium	Medium	Medium	Low
	Gouldsboro/Corea/ Prospect Harbor (s)	Med-High	High	Med-High	High	Low
	Tremont (s)	Low	Medium	Low	Medium	Low
	Stonington (p)	High	High	High	Med-High	Low
	Isle au Haut (s)	Low	Low	Low	Low	Low
	Rockland (p)	High	High	High	High	High
	Vinalhaven (s)	Low	Medium	Low	Low	Low
	Matinicus (s)	Low	Low	Low	Low	Low
	South Bristol (s)	Medium	Low	Medium	Medium	Medium
	Boothbay Harbor (s)	Medium	Low	Low	Medium	Medium
	Portland (p)	High	High	High	High	High
NH	Portsmouth (s)	High	Low	High	High	Medium
MA	Gloucester (p)	High	High	High	High	High
	Boston (s)	Medium	Med-High	High	Med-High	Medium
	New Bedford (p)	High	High	High	High	High
	Fall River (s)	Medium	Med-High	Low	Medium	Low
RI	N. Kingston (s)	Medium	Medium	Medium	Medium	Med-High
	Narragansett/Pt. Judith (p)	High	High	High	High	High
NY	Montauk (p)	High	High	High	High	High
	Wainscott (s)	Low	Low	Medium	Low	Medium
	Hampton Bays/Shinnecock (s)	Med-High	Med-High	Med-High	Med-High	High
NJ	Barnegat Light (s)	Medium	Medium	Medium	Medium	Medium
	Cape May (p)	High	High	High	High	High

Source: NOAA Fisheries Community Social Vulnerability Indicators.

5.5.3.4 Herring Fishery by States

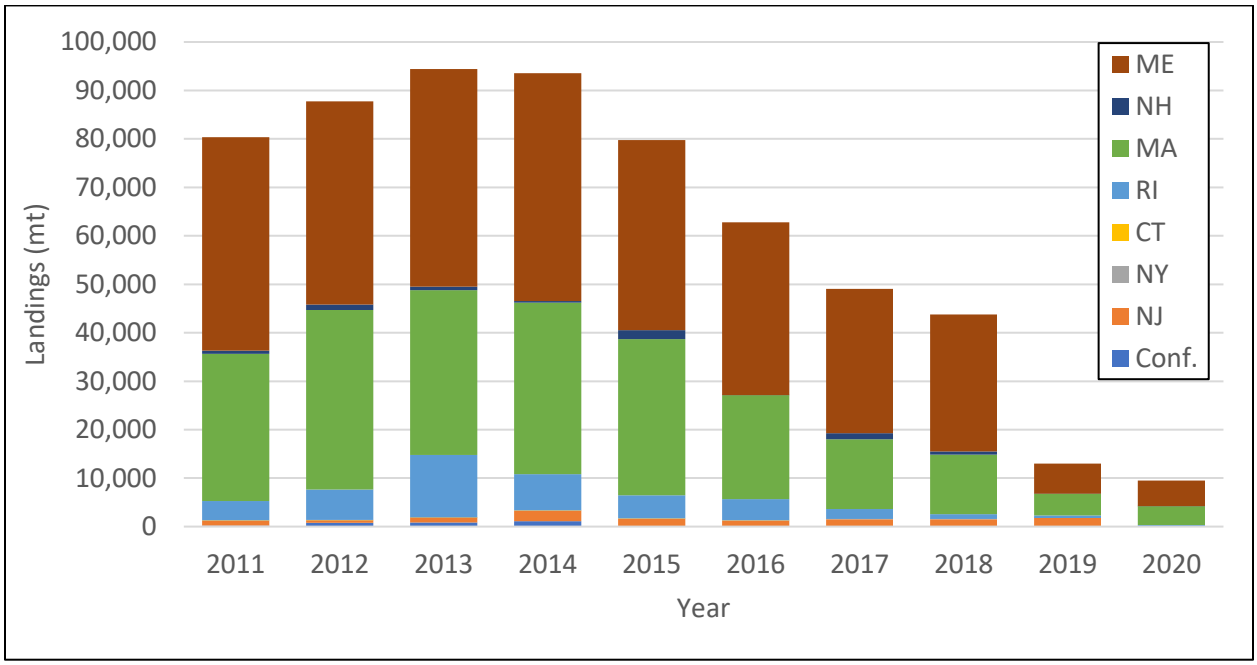
During 2011-2020, herring was landed in seven non-confidential states, mostly in Maine and Massachusetts (Table 21, Figure 21). New York and Rhode Island had the highest number of active herring permits and Maine and Massachusetts had the highest number of active dealers during that time. With the significant reduction in landings since 2014, there is now very little landings activity in states other than Maine and Massachusetts.

Table 21. Annualized Atlantic herring landings to states, 2011-2020

State/Port	2011-2020 Avg. landings (mt)	Herring permits [a]	Herring dealers [a]
Maine	32,225	36	95
New Hampshire	663	20	28
Massachusetts	22,570	47	76
Rhode Island	4,341	50	29
Connecticut	13	14	9
New York	30	75	32
New Jersey	1,259	41	14
Confidential state(s)	296	10	5
Total	**67,397**	**242**	**169**

Note: Some herring primary ports are confidential.
[a] Totals may not equal the sum of the parts, because permits can land in multiple ports and states.
Source: Dealer data, accessed July 2021.

Figure 21. Herring landings by state, 2011-2020.



5.5.3.5 Other Fisheries/Ecotourism

There are several other fisheries, as well as the ecotourism industry, that are potentially impacted by this action. Many ports have coexisting fisheries, including the Atlantic herring fishery. In all, about 140 communities have been identified as potentially impacted by the Atlantic Herring FMP. For example, the mackerel fishery is active primarily in North Kingstown, RI; Gloucester, MA; New Bedford, MA; Portland, ME; Cape May, NJ; Marshfield, MA; Provincetown, MA; and Point Judith, RI. The American lobster fishery is the primary end user of Atlantic herring as bait. American lobster is landed in many port communities on the Atlantic coast. In 2015, 18 of the top 20 ports for lobster landed value were in Maine (primarily midcoast to eastern Maine), and two were in Massachusetts. The communities in Maine to New Jersey important for the bluefin tuna fishery are: Gloucester and New Bedford, MA; Wakefield RI; Montauk, NY; and Brielle, Barnegat Light, and Cape May, NJ. Much more port information is in Amendment 8 (NEFMC 2018b, Section 3.6.3.2.2).

5.5.3.6 Environmental Justice

Executive Order 12898 requires federal agencies conduct their programs, policies, and activities in a manner to ensure individuals or populations are not excluded from participation in, or denied the benefits of, or subjected to discrimination because of their race, color, or national origin. These requirements of this executive order are meant to achieve what is generally referred to as environmental justice for communities that are affected by federal activities. Environmental justice is measured at the community level. Here, community is defined as a fishing community. Indicators of vulnerability for purposes of environmental justice can include but are not limited to income, race/ethnicity, household structure, education levels, and age. The focus of E.O. 12898 is to consider "the disproportionately high and adverse human health or environmental effects of [an agency's] programs, policies, and activities on minority populations and low-income populations in the United States and its territories…"

The poverty, population composition, and personal disruption indices (Table 18) can help identify the communities where environmental justice may be of concern. Herring ports that ranked medium-high to high for at least one of these indices are: Stonington, Isle au Haut and Matinicus, Maine and Boston, New Bedford and Fall River, Massachusetts. These communities may be more vulnerable to changes in federal actions, due to factors described above as important indicators for environmental justice.

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