

Unmanaged Forage Omnibus Amendment

Amendment 20 to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan

Amendment 18 to the Mackerel, Squid, and Butterfish Fishery Management Plan

Amendment 19 to the Surf Clam and Ocean Quahog Fishery Management Plan

Amendment 6 to the Bluefish Fishery Management Plan

Amendment 5 to the Tilefish Fishery Management Plan

Amendment 5 to the Spiny Dogfish Fishery Management Plan

Including an Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility
Act Analysis

March 2017

Prepared by the Mid-Atlantic Fishery Management Council
in cooperation with the National Marine Fisheries Service

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1. Executive Summary

Forage species are small, low to mid trophic level species which are subject to extensive predation throughout their lifespan and serve as important conduits of energy from low to high trophic levels. Forage species play an important role in sustaining the productivity and structure of marine ecosystems by linking low trophic level species such as phytoplankton and zooplankton to higher trophic level species, including predatory species sought after by commercial and recreational fisheries. Recent scientific studies highlight the importance of forage species to marine ecosystems and suggest that forage species warrant special consideration in fisheries management.

This document contains a summary and analysis of management measures considered by the Mid-Atlantic Fishery Management Council to prohibit the development of new and expansion of existing directed commercial fisheries on certain unmanaged forage species in Mid-Atlantic Federal waters. The Council intends to prohibit such fisheries until they have had an adequate opportunity to assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem. The purposes of this action are to (1) advance an ecosystem approach to fisheries management in the Mid-Atlantic through consideration of management alternatives that would afford protection to currently unmanaged forage species through regulation of landings and/or possession of those species; (2) consider management alternatives that address data collection and reporting of landings of currently unmanaged forage species; and (3) consider measures to establish a process for new fisheries for such species to develop or existing fisheries to expand.

The Council considered several management alternatives to address the purpose and need of this amendment. The alternatives were analyzed in terms of their expected impacts on the following components of the affected environment, which are referred to as Valued Ecosystem Components, or VECs:

- The forage species included in this amendment
- Species managed by the Mid-Atlantic Council
- Other predators of the forage species included in the amendment (specifically, large tunas, billfish, swordfish, sharks, and sea birds)
- Protected species
- The socioeconomic environment
- Physical habitat

The alternatives considered by the Council are summarized in Table 1 and described in more detail in section 5. The expected impacts of these alternatives on the VECs are summarized in Table 2 and described in more detail in section 6.

Alternative set 1 contains alternatives for several previously unmanaged forage taxa. Under alternative 1.A the Council would take no action on commercial fisheries for these taxa. There

appears to be low demand for these taxa; therefore, fishing effort and landings are not expected to change over the short-term if no action is taken. Recent levels of fishing mortality are presumed to have had slight negative impacts on unmanaged forage species; however, these impacts are not well understood. The impacts of alternative 1.A on unmanaged forage species are expected to be slight negative in the short-term due to continued (presumed) low levels of fishing mortality. By extension, short-term impacts on non-target species and predators of unmanaged forage species (including Council-managed species, protected species, and other predators) are expected to be slight negative. Socioeconomic impacts are expected to be slight positive in the short-term due to continued profits generated from landings of these species. Short-term impacts to physical habitat are expected to be slight negative due to expected *status quo* levels of interactions between fishing gear and physical habitat. If fishing effort and fishing mortality were to increase beyond recent levels over the longer-term, for example in response to increased demand, then alternative 1.A could have slight to moderate negative impacts on unmanaged forage species, their predators, non-target species, and physical habitat. Socioeconomic impacts would be mixed (i.e. both positive and negative) due to the potential for increased profits, but also potential negative impacts to socially and economically important predators. Of all the alternatives considered for these taxa (i.e. alternatives 1.A -1.C), alternative 1.A is expected to have the most positive socioeconomic impacts and the most negative impacts on the other VECs.

Alternative 1.B would prohibit possession of several previously unmanaged forage taxa by commercial vessels fishing in Mid-Atlantic Federal waters. Because recent levels of directed fishing for these taxa in Federal waters are assumed to be low, alternative 1.B would likely lead to only a slight decrease in fishing effort, compared to the no action alternative (alternative 1.A). By slightly reducing fishing effort, it would also slightly reduce fishing mortality for these taxa. In this way, alternative 1.B is expected to have slight positive short-term impacts for unmanaged forage species. By extension, short-term impacts on non-target species and predators of unmanaged forage species (including Council-managed species, protected species, and other predators) are expected to be slight positive. Socioeconomic impacts are expected to be slight negative in the short-term due to elimination of profits from landings of these species. Impacts to physical habitat are expected to be slight positive due to a slight reduction in the potential for interactions between fishing gear and physical habitat. Alternative 1.B would prevent large-scale commercial harvest of these species in the Mid-Atlantic in the future, which would be possible under the no action alternative; therefore, alternative 1.B is expected to have long-term moderate positive impacts on unmanaged forage species, as well as their predators, and non-target species, compared to the no action alternative. Long-term impacts to habitat are expected to be slight to moderate positive. Long-term socioeconomic impacts are expected to be mixed (i.e. both positive and negative) due to decreased profits and potential positive impacts to socially and economically important predators. Of all the alternatives considered for these taxa (i.e. alternatives 1.A -1.C), alternative 1.B is expected to have the most negative socioeconomic impacts and the most positive impacts on the other VECs.

Alternative 1.C contains two sub-alternatives for possession limits for several previously unmanaged forage taxa. Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species. Alternative 1.C.ii is a preferred alternative and would implement an incidental possession limit of 1,700 pounds combined weight for all of these taxa. An examination of commercial fish dealer data suggests that very few trips during 1996-2015 would have been restricted by these possession limits. These alternatives are thus not expected to result in a change in fishing effort or a change in fishing mortality for unmanaged forage species in the near future. They are therefore expected to have the same short-term impacts on all VECs as the no action alternative (alternative 1.A). Both alternatives 1.C.i and 1.C.ii could allow an increase in fishing effort over the longer-term compared to recent levels; however, this increase would be lesser than what is possible over the longer-term under the no action alternative. Therefore, the long-term impacts of alternatives 1.C.i and 1.C.ii on unmanaged forage species are expected to be slight negative (compared to recent impacts) to moderate positive (compared to the no action alternative). By extension, they are expected to have long-term slight negative to moderate positive impacts on predators of forage species, non-target species, and physical habitat. Long-term socioeconomic impacts are expected to be mixed (i.e. both positive and negative) due to lower profits than would be possible under the no action alternative, as well as potential positive impacts to socially and economically important predators. When ranked by their impacts on all the VECs, the alternatives in alternative set 1.C fall between alternatives 1.A (no action) and 1.B (prohibit possession).

Alternative set 2 contains alternatives for chub mackerel. Chub mackerel has a separate range of alternatives from the other forage taxa in this amendment because it was targeted to a much greater extent and landed in much higher volumes than the other species in recent years. Alternative 2.A is the no action alternative for chub mackerel. Under the no action alternative, fishing effort, fishing mortality, and landings of chub mackerel are expected to remain at or slightly below 2013-2015 levels in the short-term. There are no quantitative stock assessments for chub mackerel in the Mid-Atlantic; therefore, it is not known how recent levels of fishing mortality have impacted the chub mackerel stock. These impacts are presumed to be slight negative because there have been no indications of substantial declines in abundance. If the fishery continues to expand, impacts could become moderate negative. The short-term impacts of alternative 2.A on unmanaged forage species are expected to be slight negative. By extension, the short-term impacts on non-target species and predators of chub mackerel (including Council managed species, protected species, and other predators) are also expected to be slight negative. Short-term impacts to physical habitat are expected to be slight negative due to expected *status quo* levels of interactions between fishing gear and habitat. Short-term socioeconomic impacts are expected to be positive due to continued revenues from chub mackerel landings. The long-term impacts range from slight negative (if fishing mortality remains similar to recent levels) to moderate negative (if fishing mortality increases) for all VECs, except that long-term socioeconomic impacts are expected to be mixed due to positive impacts from revenues from chub mackerel and potential negative socioeconomic impacts if abundances of socially and

economically important predators decline. Of all the alternatives considered for chub mackerel (alternatives 2.A – 2.C), alternative 2.A is expected to have the most positive socioeconomic impacts and the most negative impacts on the other VECs.

Alternative set 2.B contains three sub alternatives for the designation of chub mackerel. These alternatives are largely administrative in nature as they do not imply any specific catch or landings limits. Two of these alternatives (alternatives 2.B.i and 2.B.ii) would establish a framework and legal basis for implementing catch and/or landings limits. The third alternative (alternative 2.B.iii) would not. Of the three alternatives, alternative 2.B.ii has the strongest legal requirements for sustainable fisheries management and is therefore expected to have the most positive impacts on all VECs. Alternative 2.B.iii would not establish a framework or legal basis for management measures and is therefore expected to have the least positive impacts on all the VECs of the three sub-alternatives.

Alternative set 2.C.i contains four alternatives for an annual chub mackerel landings limit. These limits vary from a low of 900,127 pounds per year (under alternative 2.C.i.a) to a high of 5.25 million pounds per year (under alternative 2.C.i.d). Two of these alternatives (i.e. alternatives 2.C.i.a and 2.C.i.b) are expected to notably restrict fishing effort and fishing mortality compared to the no action alternative; therefore, they are expected to have short-term moderate positive impacts for chub mackerel, non-target species, predators of chub mackerel, and physical habitat. The other two landings limit alternatives (alternatives 2.C.i.c and 2.C.i.d) are expected to allow fishing effort to remain at recent levels over the short-term; therefore, they are expected to have the same short-term impacts on the VECs as the no action alternative (alternative 2.A). All four landings limit alternatives would place a restriction on fishing effort and fishing mortality, which would be absent under the no action alternative; therefore, compared to the no action alternative, they are all expected to have slight to moderate positive long-term impacts on chub mackerel, non-target species, predators of chub mackerel, and physical habitat. They are expected to result in mixed long-term socioeconomic impacts due to restricted landings (and thus restricted revenues) compared to the no action alternative, but also positive impacts for socially and economically important predators of chub mackerel.

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the landings limit is reached. These possession limits are intended to be used in combination with one of the landings limit alternatives in alternative set 2.C.i. The impacts of the possession limits depend in large part on which landings limit is chosen. The two measures together (the possession and landings limit) would determine the overall allowable landings of chub mackerel in a given year.

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is fully harvested. Alternative 2.C.ii.a would increase the effectiveness of the annual landings limit in constraining landings. It is expected to have slight positive impacts on the chub mackerel stock because it would limit fishing effort and fishing mortality compared to

the no action alternative. In turn, it is expected to have slight positive impacts for predators of chub mackerel and non-target species, including Council-managed species, protected species, and other predators. By limiting fishing effort, it is also expected to have slight positive impacts on protected species. By limiting potential revenues from landings of chub mackerel, it is expected to have slight negative to neutral socioeconomic impacts, depending on the landings limit alternative with which it is coupled. Alternative 2.C.ii.a is the most restrictive of the three chub mackerel possession limit alternatives; therefore, it is expected to have the most positive impacts on unmanaged forage species, predators of chub mackerel, and non-target species, as well as the most negative socioeconomic impacts.

Alternative 2.C.ii.b would implement a 10,000 pound possession limit after the chub mackerel landings limit is met. Alternative 2.C.ii.c would implement a 40,000 pound possession limit. These two alternatives are expected to restrict only a small number of vessels; therefore, when considered separately from the landings limit alternatives, they are expected to have minor impacts on all the VECs. However, both would represent a restriction on fishing effort (and thus, fishing mortality) compared to the no action alternative; therefore, they are both expected to have slight positive impacts for chub mackerel, non-target species, predators of chub mackerel, and physical habitat, and slight negative socioeconomic impacts compared to the no action alternative.

The Council considered alternatives for sunset provisions for the chub mackerel management measures (alternative set 2.C.iii). Under alternative 2.C.iii.a, there would be no sunset provisions. Any chub mackerel management measures implemented through this amendment would remain in place until modified by future management actions. When considered separately from the management measures, this alternative would have neutral impacts on all the VECs. Under alternative 2.C.iii.b any chub mackerel measures implemented through this amendment would expire after three years. This is a preferred alternative. This alternative presumes that some management measures would be implemented. In the short-term, the impacts on the VECs would be identical to those of the alternatives that would be implemented. In the long-term (i.e. after three years), the impacts would be the same as the long-term impacts of the no action alternative (alternative 2.B).

The Council also considered a variety of administrative alternatives, including alternatives for the process for considering whether to allow new fisheries or expansion of existing fisheries (alternative set 3.A), as well as alternatives related to permitting (alternative set 3.C), reporting (alternative set 3.E), the management unit for the amendment (alternative set 3.F), future framework actions (alternative set 3.G), and transit provisions (alternative set 3.H). These alternatives are administrative in nature and are therefore expected to have minor, if any, impacts on the VECs.

The Council identified the following as preferred alternatives:

- Alternative 2.B.ii: designate the taxa included in the amendment (except chub mackerel) as ecosystem components (ECs) and implement an incidental possession limit of 1,700 pounds for all those taxa combined (section 5.1.3.2)
- Alternative 3.A.iii: manage chub mackerel as neither an EC nor a stock in the fishery through the Council's discretionary authority under MSA section 303(b)(12) (section 5.2.2.3)
- Alternative 3.B.i.c: implement an annual chub mackerel landings limit of 2.86 million pounds (section 5.2.3.1.3)
- Alternative 3.B.ii.c: implement a chub mackerel possession limit of 40,000 pounds after the annual landings limit is reached (section 5.2.3.2.3)
- Alternative 4.A.iii.b: require use of an exempted fishing permit (EFP) prior to development of new or expansion of existing fisheries for ECs and adopt a new policy for Council review of EFP applications relating to ECs (section 5.3.1.3.2)
- Alternative 4.A.iv: consider stock in the fishery designation or use of discretionary management measures prior to allowing new fisheries or expansion of existing fisheries for ECs (section 5.3.1.4)
- Alternative 4.C: require commercial vessels which possess ECs in Mid-Atlantic Federal waters to have a commercial fishing permit from the Greater Atlantic Regional Fisheries Office (section 5.3.3)
- Alternative 4.E: add codes for EC species to required catch and landings reporting mechanisms (section 5.3.5)
- Alternative 4.F.ii: management unit for the amendment defined as the exclusive economic zone (excluding state waters), bounded by the CT/NY boundary extended seaward to the north and Cape Hatteras, NC to the south (section 5.3.6.2)
- Alternative 4.G.i: identify the list of ECs as a frameworkable item (section 5.3.7.2.1)
- Alternative 4.G.ii: identify possession and landings limits as frameworkable items (section 5.3.7.2.2)

The preferred alternatives are expected to help maintain abundances of several prey species for various predators, including Council-managed predators, protected species predators, and others. They are also expected to limit the potential for interactions between fishing gear and protected species and between fishing gear and physical habitat. They are expected to result in minor decreases in revenues and may generate indirect socioeconomic benefits by maintaining abundances of prey species for socially and economically important predators.

When the preferred alternatives are considered in conjunction with all other impacts on the VECs from all other relevant past, present, and reasonably foreseeable future actions, they are expected to have broadly positive impacts and are not expected to have any significant cumulative effects (either positive or negative).

Table 1: Summary of alternatives considered for the Unmanaged Forage Omnibus Amendment. Preferred alternatives are indicated with bold, underlined text.

Alt. Set	Alternatives		
1: Alternatives for species other than chub mackerel	1.A: No action		
	1.B: Designate as Ecosystem Components (ECs) & prohibit possession		
	<u>1.C: Designate as ECs & implement an incidental possession limit (preferred)</u>	1.C.i: Incidental possession limit of 1500 pounds per EC species	
		<u>1.C.ii: Incidental possession limit of 1700 pounds for all EC species combined (preferred)</u>	
2: Alternatives for chub mackerel	2.A: No action		
	2.B: Chub mackerel designation	2.B.i: Manage chub mackerel as an EC	
		2.B.ii: Manage chub mackerel as a stock in the fishery	
		<u>2.B.iii: Manage chub mackerel as neither an EC nor a stock in the fishery through the Council's discretionary authority under MSA section 303(b)(12) (preferred)</u>	
	2.C: Chub mackerel management measures	<u>2.C.i: Annual landings limit (preferred)</u>	2.C.i.a: 900,127 pound annual landings limit
			2.C.i.b: 1.75 million pound annual landings limit
			<u>2.C.i.c: 2.86 million pound annual landings limit (preferred)</u>
			2.C.i.d: 5.25 million pound annual landings limit
	<u>2.C.ii: Possession limits to come into effect after the annual landings limit is met (preferred)</u>	2.C.ii.a: No possession allowed after annual landings limit is met	
		2.C.ii.b: 10,000 pound possession limit	
		<u>2.C.ii.c: 40,000-pound possession limit (preferred)</u>	
	2.C.iii: Sunset Provisions for Chub Mackerel	2.C.iii.a: No sunset provisions	
<u>2.C.iii.b: Chub mackerel measures sunset 3 years after implementation (preferred)</u>			

Table 1, continued:

Alt. Set	Alternatives		
3: Administrative alternatives	3.A: New fisheries and expansion of existing fisheries	3.A.i: No action on new fisheries and expansion of existing fisheries	
		3.A.ii: No new or expanded fisheries for EC species	
		<u>3.A.iii: Require Exempted Fishing Permit (EFP) prior to development of new or expansion of existing fisheries for ECs (preferred)</u>	3.A.iii.a: <i>Status quo</i> EFP process
		<u>3.A.iii.b: New policy for Council review of EFP applications relating to ECs (preferred)</u>	
		<u>3.A.iv: Consider stock in the fishery designation or use of discretionary management measures prior to allowing new fisheries or expansion of existing fisheries for ECs (preferred)</u>	
	3.B: List of fisheries and authorized gear types	3.B.i: No action	
	3.C: Permitting	3.C.i: No action	
	3.D: Notification of landings	3.D.i: No action	
		3.D.ii: Request regular updates from GARFO on landings of EC species in the Mid-Atlantic	
	3.E: Reporting systems	3.E.i: No action	
		<u>3.E.ii: Add codes for EC species to required catch/landings reporting mechanisms (preferred)</u>	
		3.F.i: Federal waters, bounded by seaward lines extending from CT/NY boundary and VA/NC boundary (no action)	
		<u>3.F.ii: Federal waters, bounded by seaward lines extending from CT/NY boundary and Cape Hatteras, NC (preferred)</u>	
	3.G: Frameworkable items	3.G.i: No action on frameworkable items	
3.G.ii: Identify items which can be modified through future framework adjustments		<u>3.G.ii.a: List of EC species (preferred)</u>	
		<u>3.G.ii.b: Possession limits and landings limits (preferred)</u>	
		3.G.ii.c: Spatial and seasonal closures	
		3.G.ii.d: Recreational fishing regulations	
3.H: Transit provisions	3.H.i: No transit provisions		
	3.H.ii: Vessels allowed to transit through Mid-Atlantic Federal waters with forage species on board caught in other regions		

Table 2: Summary of expected impacts of the alternatives on the five VECs. Some sub-alternatives are grouped together due to their similar impacts on the VECs. Neutral impacts are indicated with a 0, - indicates a negative impact, and + indicates a positive impact on baseline conditions of the VEC. SI indicates a slight impact. Directional indicators (-,0,+) not preceded by SI indicate moderate impacts. “Mixed” refers to both positive and negative impacts.

Alternative Set	Sub Alternative	Expected Impacts on VECs									
		Unmanaged Forage Species		Council Managed Species & Other Predators		Protected Species		Socioeconomic		Physical Habitat	
		Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
1: Alternatives for species besides chub mackerel	1A: No action	SI-	- to SI-	SI-	- to SI-	SI-	- to SI-	SI+	Mixed	SI-	- to SI-
	1.B: Prohibit possession	SI+	+	SI+	+	SI+	+	SI-	Mixed	SI+	SI+ to +
	1.C: Incidental possession limit (2 alternatives, 1 preferred)	SI-	SI- to +	SI-	SI- to SI+	SI-	SI- to SI+	SI-	Mixed	SI-	SI- to SI+
2: Alternatives for chub mackerel	2.A: No action	SI-	- to SI-	SI-	- to SI-	SI-	- to SI-	SI+	Mixed	SI-	SI-
	2.B.i: Manage chub mackerel as an EC and 2.B.ii: Manage chub mackerel as a stock in the fishery	SI+	SI+	SI+	SI+	SI+	SI+	SI+	SI+	SI+	SI+
	2.B.iii: Manage chub mackerel as neither an EC nor a stock in the fishery (preferred)	0	0	0	0	0	0	0	0	0	0
	2.C.i.a: 900,127 lb/year landings limit	+	+	SI+ to +	SI+ to +	SI+ to +	SI+ to +	-	Mixed, mostly -	SI+ to +	SI+ to +
	2.C.i.b: 1.75 million lb/year landings limit	+	+	SI+ to +	SI+ to +	SI+ to +	SI+ to +	-	Mixed, mostly -	SI+ to +	SI+ to +

Table 2, continued:

Alternative Set	Sub-Alternative	Expected Impacts on VECs									
		Unmanaged Forage Species		Council Managed Species & Other Predators		Protected Species		Socioeconomic		Physical Habitat	
		Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term	Short Term	Long Term
2: Alternatives for chub mackerel, continued	2.C.i.c: 2.86 million lb/year landings limit (preferred)	SI-	+	SI-	SI+ to +	SI-	SI+ to +	SI+	Mixed	SI-	SI+ to +
	2.C.i.d: 5.25 million lb/year landings limit	- to SI-	SI+ to +	SI-	SI+ to +	SI-	SI+ to +	SI+	Mixed	SI-	SI+ to +
	2.C.ii.a: Prohibit possession after landings limit is reached	SI+	SI+	SI+	SI+	SI+	SI+	SI- to 0	SI- to 0	SI+	SI+
	2.C.ii.b: 10,000 lb possession limit after landings limit is reached	SI+	SI+	SI+	SI+	SI+	SI+	SI- to 0	SI- to 0	SI+	SI+
	2.C.ii.c: 40,000 lb possession limit after landings limit is reached (preferred)	0 to SI+	SI+	SI+	SI+	SI+	SI+	SI- to 0	SI- to 0	SI+	SI+
	2.C.iii.a: No sunset provisions	0	0	0	0	0	0	0	0	0	0
	2.C.iii.b: Measures sunset after 3 years (preferred)	Depends on other alts. chosen	- to SI-	Depends on other alts. chosen	- to SI-	Depends on other alts. chosen	- to SI-	Depends on other alts. chosen	Mixed	Depends on other alts. chosen	- to SI-
3: Administrative alternatives	SI+ to 0	SI+ to 0	SI+ to 0	SI+ to 0	SI+ to 0	SI+ to 0	SI+ to 0	SI- to SI+	SI- to SI+	0	0

2. List of Acronyms and Abbreviations

ABC	Allowable Biological Catch
ACL	Annual Catch Limit
AM	Accountability Measure
AP	Advisory Panel
ASMFC	Atlantic States Marine Fisheries Commission
ATGTRS	Atlantic Trawl Gear Take Reduction Strategy
ATGTRT	Atlantic Trawl Gear Take Reduction Team
CEA	Cumulative Effects Analysis
CEQ	Council on Environmental Quality
CeTAP	Cetacean and Turtle Assessment Program
CI	Confidence Interval
Council	Mid-Atlantic Fishery Management Council
DPS	Distinct Population Segment
EAFM	Ecosystem Approach to Fisheries Management
EC	Ecosystem Component
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
EMU	Ecological Marine Unit
EO	Executive Order
ESA	Endangered Species Act
FMP	Fishery Management Plan
GARFO	Greater Atlantic Regional Fisheries Office of NMFS
HMS	Highly Migratory Species
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NEFOP	Northeast Fisheries Observer Program
NEFSC	Northeast Fisheries Science Center
NMFS	National Marine Fisheries Service

OY	Optimum Yield
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SAFE	Stock Assessment and Fishery Evaluation
SAFIS	Standard Atlantic Fisheries Information System
SSC	Scientific and Statistical Committee
USFWS	United States Fish and Wildlife Service
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System
VTR	Vessel Trip Report

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4. Introduction

4.1. Purpose and Need

This amendment is needed to prohibit the development of new and expansion of existing directed commercial fisheries on unmanaged forage species in Mid-Atlantic Federal waters until the Council has had an adequate opportunity to assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem. The purposes of this action are to (1) advance an ecosystem approach to fisheries management in the Mid-Atlantic through consideration of management alternatives that would afford protection to currently unmanaged forage species by regulating landings and/or possession of those species; (2) consider management alternatives to address data collection and reporting of landings of currently unmanaged forage species; and (3) consider measures to establish a process for new fisheries for such species to develop or existing fisheries to expand (Table 3).

Table 3: The need and purposes of this amendment.

Need	Purposes
To prohibit the development of new and expansion of existing directed commercial fisheries on unmanaged forage species in Mid-Atlantic Federal waters until the Council has had an adequate opportunity to assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem.	To advance an ecosystem approach to fisheries management in the Mid-Atlantic through the consideration of management alternatives that would afford protection to currently unmanaged forage species by regulating landings and/or possession of those species.
	Consider management alternatives to address data collection and reporting of landings of currently unmanaged forage species.
	Consider measures to establish a process for new fisheries for currently unmanaged forage species to develop or existing fisheries to expand.

4.2. Background

Forage species are small, low to mid trophic level species which are subject to extensive predation throughout their lifespan and serve as important conduits of energy from low to high trophic levels. Many forage species form large schools. Some forage species exhibit high inter-annual variability in recruitment, often due to environmental factors. Forage species play an important role in sustaining the productivity and structure of marine ecosystems by linking low trophic level species such as phytoplankton and zooplankton to higher trophic level species, including predatory species sought after by commercial and recreational fisheries (Clay et al. 2014). Recent scientific studies highlight the importance of forage species to marine ecosystems and suggest that they warrant special consideration in fisheries management (e.g. Alder et al. 2008, Smith et al. 2011, Pikitch et al. 2012a, Pikitch et al. 2014).

The Mid-Atlantic Fishery Management Council (Council) identified forage species and their management as a key area of focus under its Ecosystem Approaches to Fisheries Management (EAFM) guidance document (MAFMC 2016). This amendment was initiated, in part, as a result of discussions related to the Council's move from traditional single species management towards EAFM. The Council defines EAFM as a fishery management approach which recognizes the biological, economic, social, and physical interactions among the components of ecosystems and attempts to manage fisheries to achieve optimum yield while taking those interactions into account.

Public input also played an important role in the initiation of this amendment. For example, the Council undertook a visioning and strategic planning process in 2011 and 2012, which included extensive outreach to key stakeholder groups and to the general public. Surveys, roundtable sessions, and position letters collected as part of this process revealed that management of fisheries for forage species is a key concern for many Council constituents (MAFMC 2012).

Some forage species, including Atlantic herring (*Clupea harengus*), Atlantic menhaden (*Brevoortia tyrannus*), Atlantic mackerel (*Scomber scombrus*), butterfish (*Peprilus triacanthus*), longfin squid (*Doryteuthis pealeii*), and *Illex* squid (*Illex illecebrosus*), are the target of important commercial fisheries in the Mid-Atlantic. These fisheries supply markets for human food, bait, and poultry and livestock feed. These fisheries are managed by the Mid-Atlantic Fishery Management Council, the New England Fishery Management Council, and/or the Atlantic States Marine Fisheries Commission (ASMFC). For the purposes of this amendment, "unmanaged" species are those which are not currently managed in any way by the Mid-Atlantic, New England, or South Atlantic Fishery Management Councils, or by the ASMFC.

Other forage species such as silversides (multiple species in the family Atherinopsidae), sand lances (*Ammodytes americanus* and *A. dubius*), and chub mackerel (*Scomber colias*) are harvested in commercial fisheries which supply bait for recreational fishing, feed for aquariums, food for human consumption, and other uses; however, these fisheries are not currently managed by a regional Fishery Management Council, the ASMFC, or by state fisheries management agencies.

Many other forage species such as lanternfish (multiple species in the family Myctophidae), copepods (multiple species in the subclass Copepoda), and krill (multiple species in the order Euphausiacea) are not currently harvested in directed commercial fisheries in the Mid-Atlantic; however, increasing global demand for fish for human consumption, for bait, and for fishmeal and fish oil could encourage the development of new commercial fisheries for these or other forage species. In recognition of this potential, the Council voted in December 2014 to "initiate a regulatory action to prohibit the development of new, or expansion of existing, directed fisheries on unmanaged forage species until adequate scientific information is available to promote ecosystem sustainability". The Council later agreed that this action would take the form of an omnibus amendment to the Council's existing Fishery Management Plans (FMPs) and would

address only commercial fisheries in Mid-Atlantic Federal waters (i.e. this amendment will not apply to recreational fisheries or to commercial fisheries in state waters). The Council does not intend to prohibit the development of new and expansion of existing fisheries for unmanaged forage species indefinitely, but rather only until the Council has had an adequate opportunity to assess the scientific information relating to any new or expanded fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem.

Additionally, the Council does not intend to prohibit the harvest of all unmanaged forage species. In August 2016, the Council agreed on a list of nine families, one order, four species, and two other groupings to include in this amendment (Table 4). These taxaⁱ were prioritized by the Council due to their importance in marine ecosystems and/or their perceived potential to become the target of large-scale commercial fisheries. Section 6.1 includes brief summaries of the life history of each taxon as well as descriptions of the Council's justification for including each taxon in this amendment. In general, these taxa were included because they were documented as prey for commercially and/or recreationally important species and/or the Council thought they could become the target of directed commercial fisheries. Some taxa are also important for other ecologically or socially important species such as marine mammals and sea birds.

The Council's Scientific and Statistical Committee (SSC) agreed to a definition of forage species (Table 5; Clay et al. 2014) which served as a starting point for Council discussions regarding which taxa to include in this amendment. This definition had some limitations and ultimately the list of taxa included in this amendment (Table 4) was largely based on Council judgement as to the most important prey for socially and economically important species, as well as those forage species with the greatest potential for future development of large-scale commercial fisheries. One major limitation of the SSC's definition is that it does not address invertebrates, which the Council wished to consider through this amendment. Additionally, the criteria that a forage species comprise "a considerable portion of the diet of other predators in the ecosystem in which it resides throughout its lifespan (usually >5% diet composition for > 5 yrs.)" proved too high a threshold for most Council-managed species. Most Council-managed species consume a variety of prey items throughout the year and rely on very few species for at least 5% of their diet.ⁱⁱ Additionally, there were no uniform quantitative metrics available to compare the trophic level of a number of forage species, or to assess the number of trophic linkages for each species; therefore, the Council relied on expert judgement when considering these aspects of the SSC's definition.

The Council sought to identify a prioritize list of taxa, rather than a longer, more comprehensive list, to minimize the burden of the proposed new regulations (described in section 5) on existing managed fisheries. Several ecologically important species are not included in this amendment

ⁱ "Taxa" (the plural of taxon) refers to taxonomic groups of any rank, such as species, families, etc.

ⁱⁱ As shown in stomachs sampled in Northeast Fisheries Science Center (NEFSC) spring and fall bottom trawl surveys in Mid-Atlantic and/or southern New England offshore strata (strata 01010-01120 and 01610-01760) during 1973-2015.

because they were considered low priorities for inclusion due to their limited potential to support future large-scale commercial fisheries. For example, polychaete worms (class Polychaeta) comprise about 37% of the diet of scup (*Stenotomus chrysops*; a Council-managed species) and ctenophores (also known as comb jellies, phylum Ptenophora) comprise almost 9% of the diet of spiny dogfish (*Squalus acanthias*; a Council-managed species)ⁱⁱⁱ. Both polychaetes and ctenophores are low trophic level and could be considered forage species; however, they are not included in this amendment because the Council saw limited potential for future development of large-scale commercial fisheries for these species.

The Council approved a range of management alternatives to address the purpose and need of the amendment (section 4.1). These include alternatives to regulate landings and/or possession of the taxa listed in Table 4, alternatives to address data collection and reporting of landings, alternatives for a process for new fisheries to develop or existing fisheries to expand, alternatives to define the geographic scope of the amendment, and other alternatives. The alternatives are described in detail in section 5. The expected impacts of each alternative on six components of the affected environment (i.e. unmanaged forage species, Council managed species, other predators of forage species, protected species, the socioeconomic environment, and physical habitat) are described in section 7.

Table 4: List of taxa approved by the Council in August 2016 for inclusion in the Unmanaged Forage Omnibus Amendment. The list is meant to include only those species which are found in Mid-Atlantic Federal waters and are not managed by the New England, Mid-Atlantic, or South Atlantic Fishery Management Councils, or by the Atlantic States Marine Fisheries Commission.

- | |
|--|
| <ul style="list-style-type: none"> • Anchovies (Family Engraulidae) • Argentines (Family Argentinidae) • Greeneyes (Family Chlorophthalmidae) • Halfbeaks (Family Hemiramphidae) • Herrings, sardines (Family Clupeidae) • Lanternfish (Family Myctophidae) • Pearlsides (Family Sternoptychidae) • Sand lances (Family Ammodytidae) • Silversides (Family Atherinopsidae) • Cusk-eels (Order Ophidiiformes) • Chub mackerel (<i>Scomber colias</i>) • Bullet mackerel/bullet tuna (<i>Auxis rochei</i>) • Frigate mackerel/frigate tuna (<i>Auxis thaxard</i>) • Atlantic saury (<i>Scomberesox saurus</i>) • Pelagic mollusks except sharptail shortfin squid (<i>Illex oxygonius</i>) • Copepods, Krill, Amphipods & other species under 1 inch as adults |
|--|

ⁱⁱⁱ Ibid.

Table 5: Definition of forage fish developed by the Ecosystems Subcommittee of the Mid-Atlantic Fishery Management Council's Scientific and Statistical Committee (Clay et al. 2014).

<p>Forage is defined as a species that:</p> <ul style="list-style-type: none">• Is small to moderate in size (average length of ~5-25 cm) throughout its lifespan, especially including adult stages;• Is subject to extensive predation by other fishes, marine mammals, and birds throughout its lifespan;• Comprises a considerable portion of the diet of other predators in the ecosystem in which it resides throughout its lifespan (usually >5% diet composition for > 5 yrs.);• Has or is strongly suspected to have mortality with a major element due to consumptive removals;• Is typically a lower to mid trophic level (TL) species; itself consumes food usually no higher than TL 2-2.5 (typically zooplankton and or small benthic invertebrates);• Has a high number of trophic linkages as predator and prey; serves as an important (as measurable by several methods) conduit of energy/biomass flow from lower to upper TL;• Often exhibits notable (pelagic) schooling behavior;• Often exhibits high variation in inter-annual recruitments; and• Relative to primary production and primary producers, has a ratio of production and biomass, respectively, to those producers not smaller than on the order of 10^{-3} to 10^{-4}

5. Management Alternatives

The Council approved a range of management alternatives to meet the purpose and need of the amendment. Many of these alternatives were designed with the intent of protecting unmanaged forage species while placing minimal restraints on existing managed fisheries in the Mid-Atlantic.

After examining historical landings of the taxa included in this amendment (Table 4), the Council developed a separate set of management alternatives for chub mackerel (*Scomber colias*). Commercial fish dealer-reported landings of chub mackerel in the northeast region over 1996-2015 were much higher than reported landings of all the other taxa included in the amendment. In recent years, chub mackerel were also targeted to a greater extent than the other taxa (section 6.4.1). Alternative set 1 includes alternatives for taxa other than chub mackerel (section 5.1). Alternative set 2 includes alternatives for chub mackerel (section 5.2).

The Council approved a range of administrative alternatives to address various aspects of the amendment. These include alternatives relating to how the Council will consider allowing new fisheries or expansion of existing fisheries for the taxa included in the amendment, as well as alternatives for the management unit of the amendment, permit requirements, monitoring and

reporting of landings, and items that can be addressed through future frameworks (alternative set 3; section 5.3).

The following sections describe each alternative in more detail. Section 7 summarizes the expected impacts of each alternative on several components of the affected environment (i.e. unmanaged forage species, Council managed species, other predators of forage species, protected species, the socioeconomic environment, and physical habitat).

5.1. Alternative Set 1: Alternatives for Taxa other than Chub Mackerel

Alternative set 1 includes a range of sub-alternatives for managing the taxa included in the amendment (Table 4) except for chub mackerel. The alternatives for chub mackerel are described in section 5.2.

Except for the no action alternative, each of the sub-alternatives in alternative set 1 would designate all the taxa included in the amendment (except chub mackerel) as ecosystem components (ECs) in the Council's existing FMPs. ECs are defined in the National Standards Guidelines as "stocks that a Council...has determined do not require conservation and management, but desire to list in an FMP in order to achieve ecosystem management objectives" (50 CFR 600.305(d)(13)). The National Standards Guidelines state that, "stocks that are predominately caught in Federal waters and are overfished or subject to overfishing, or likely to become overfished or subject to overfishing, are considered to require conservation and management" (50 CFR 600.305(c)). Beyond such stocks, the National Standards Guidelines include a non-exhaustive list of factors to consider when deciding whether a stock requires conservation and management (50 CFR 600.305(c)).

In previous versions of the National Standards Guidelines, stocks requiring conservation and management and included in FMPs were defined as stocks "in the fishery". The National Standards Guidelines revisions which published in October 2016 (81 Federal Register 7158, October, 18, 2016) replace the term "in the fishery" with "in need of conservation and management". Much of the development of this amendment occurred before the 2016 National Standards Guidelines were adopted; therefore, this document uses the term "in the fishery".

All stocks currently managed by the Council are stocks in the fishery. The Magnuson-Stevens Fishery Conservation and Management Act (MSA) lists several items which must be evaluated and described for stocks in the fishery. These requirements are largely aimed at preventing overfishing and ensuring sustainable fisheries. Because ECs should not be likely to become overfished or subject to overfishing in the absence of conservation and management measures, Councils may use the EC designation without meeting all the MSA requirements for stocks in the fishery.

The EC designation implies no regulatory action; however, the National Standards Guidelines state that, "management measures can be adopted in order to, for example, collect data on the EC

species, minimize bycatch or bycatch mortality of EC species, protect the associated role of EC species in the ecosystem, and/or to address other ecosystem issues” (50 CFR 600.305(c)(5)).

The sub-alternatives in alternative set 1 all use the EC designation; however, each would implement different management measures to meet the goal of the amendment.

5.1.1. Alternative 1.A: No Action on Taxa other than Chub Mackerel

Under alternative 1.A, no new regulations to prohibit the development of new or expansion of existing directed commercial fisheries on unmanaged forage taxa (except chub mackerel) would be implemented in Mid-Atlantic Federal waters. Various existing regulations for other fisheries such as gear regulations and spatial and seasonal closures would continue to limit the ability of vessels participating in managed fisheries to target some unmanaged forage species. However, vessels abiding by all other existing regulations would be able to retain and land unmanaged forage species under this alternative. Several unmanaged forage species, including argentines, bay anchovies, sand lances, chub mackerel, frigate mackerel, and silversides, are caught in existing managed fisheries in the Mid-Atlantic and have been landed and sold in the past (section 6.4.1).

This alternative could not be implemented in combination with any of the other alternatives in alternative set 1; however, it could be implemented in combination with any of the alternatives in alternative set 2 (alternatives for chub mackerel; section 5.2) or in alternative set 3 (administrative alternatives; section 5.3).

5.1.2. Alternative 1.B: Designate as Ecosystem Components and Prohibit Possession

Under alternative 1.B, all unmanaged forage taxa included in the amendment (Table 4), except for chub mackerel, would be designated as ECs in the Council’s existing FMPs and possession of those taxa by commercial fishing vessels in Mid-Atlantic Federal waters would be prohibited. Vessels which catch those taxa while pursuing other fisheries would be required to discard those taxa.

Alternative 1.B could not be implemented in combination with alternative 1.A (no action on taxa besides chub mackerel) or either of the alternatives in alternative set 1.C (incidental possession limits for taxa besides chub mackerel). It could be implemented in combination with all other alternatives described in this document.

5.1.3. Alternative 1.C: Designate as Ecosystem Components and Implement an Incidental Possession Limit

Alternative 1.C would designate all the taxa in Table 4, except chub mackerel, as ECs and would establish a possession limit for those taxa in Mid-Atlantic Federal waters. Alternative 1.C includes two sub-alternatives related to the possession limit. These two sub-alternatives could be implemented in combination.

5.1.3.1. Alternative 1.C.i: Designate as Ecosystem Components and Implement an Incidental Possession Limit of 1,500 Pounds per Species

Under alternative 1.C.i, the Council would designate all the taxa in Table 4, except for chub mackerel, as ECs and would implement a possession limit of 1,500 pounds per species in Mid-Atlantic Federal waters. This option was developed by some members of the Council's Ecosystems and Ocean Planning Advisory Panel (AP). These advisors said most of the species under consideration are small, low-value species and vessels would not make a large profit from 1,500 pounds of landings; therefore, a 1,500-pound possession limit would discourage vessels from targeting these species. According to these advisors, a 1,500-pound possession limit would allow some small-scale commercial harvest, but would effectively prohibit large-scale commercial fisheries. This trip limit is meant to apply to each species individually; therefore, total landings of all EC species could exceed 1,500 pounds per trip under this alternative.

Alternative 1.C.i could not be implemented in combination with alternative 1.A (no action on taxa besides chub mackerel) or 1.B (prohibit possession of taxa besides chub mackerel). It could be implemented in combination with all other alternatives described in this document, including alternative 1.C.ii (incidental possession limit of 1,700 pounds combined). If it were implemented in combination with alternative 1.C.ii, vessels in Mid-Atlantic Federal waters could not possess more than 1,700 pounds of all the taxa in Table 4 (except chub mackerel) combined and could not possess more than 1,500 pounds of any individual species.

5.1.3.2. Alternative 1.C.ii: Designate as Ecosystem Components and Implement an Incidental Possession Limit of 1,700 Pounds for all Species Combined (Preferred)

Under alternative 1.C.ii, the Council would designate all the taxa in Table 4, except chub mackerel, as ECs and would implement a possession limit in Mid-Atlantic Federal waters of 1,700 pounds for all those taxa combined. This is a preferred alternative.

1,700 pounds is roughly equivalent to the 99th percentile of northeast commercial dealer-reported combined landings per trip of bay anchovy, argentine, sand eel, harvestfish^{iv}, octopus^v, and Atlantic silverside from 1996 through 2015. Several members of the Council's Ecosystem and Ocean Planning AP developed this alternative.^{vi} This alternative is intended to cap landings of EC species at their recent historical levels.

^{iv} Harvestfish (*Peprilus paru*) were previously considered for inclusion in the amendment. In April 2016, the Council decided not to include harvestfish in the amendment, based on the recommendations of the Ecosystem and Ocean Planning AP and Committee. This recommendation was based on the prevalence of harvestfish in state waters and the existence of state-waters fisheries for this species.

^v Most species of octopus are benthic; however, at least one pelagic octopus (which would fall under the category of "pelagic mollusks"; Table 4), the tuberculate pelagic octopus (*Ocythoe tuberculata*), may be found in the Mid-Atlantic. Only females of this species are pelagic (Pechenik 2005, Mangold et al. 2016).

^{vi} The AP members who developed this alternative recommended that the Council not include bullet mackerel or frigate mackerel in the amendment; therefore, the calculation of the 99th percentile did not include available data on

Alternative 1.C.ii could not be implemented in combination with alternative 1.A (no action on taxa besides chub mackerel) or 1.B (prohibit possession of taxa besides chub mackerel). It could be implemented in combination with all other alternatives described in this document, including alternative 1.C.i (possession limit of 1,500 pounds per species). If it were implemented in combination with alternative 1.C.i, vessels in Mid-Atlantic Federal waters could not possess more than 1,700 pounds of all the taxa in Table 4 (except chub mackerel) combined and could not possess more than 1,500 pounds of any individual species.

5.2. Alternative Set 2: Alternatives for Chub Mackerel

The Council developed a separate range of management alternatives for chub mackerel due to the relatively high chub mackerel landings in recent years (Table 16), compared to landings of all the other taxa included in the amendment (section 6.4.1).

5.2.1. Alternative 2.A: No Action on Chub Mackerel

Under alternative 2.A, no new regulations to prohibit the development of new or expansion of existing directed commercial fisheries for chub mackerel would be implemented in Mid-Atlantic Federal waters. Various existing regulations for other fisheries such as gear regulations and spatial and seasonal closures would continue to limit the ability of vessels participating in managed fisheries to target chub mackerel. However, vessels abiding by all other existing regulations would be able to retain and land chub mackerel under this alternative. As described in section 6.4.1, some vessels landed chub mackerel during between 1996 and 2015 while abiding by existing regulations.

This alternative could not be implemented in combination with any of the other alternatives in alternative set 2; however, it could be implemented in combination with any of the alternatives in alternative set 1 (alternatives for taxa other than chub mackerel; section 5.1) or in alternative set 3 (administrative alternatives; section 5.3).

5.2.2. Alternative Set 2.B: Designation for Chub Mackerel

As described in section 5.1, the Council developed alternatives which would designate the taxa included in this amendment (besides chub mackerel) as ECs. The 2009 National Standards Guidelines stated that ECs should be non-target species and should not generally be retained for sale or personal use. The 2016 revisions to the National Standards Guidelines removed this language; however, the Guidelines now state that catch in an existing fishery and targeted fishing are factors that should be considered when determining whether a stock requires conservation and management and thus should not be managed as an EC (50 CFR 600.305(c)). As previously

landings of frigate mackerel. There were no dealer-reported landings of bullet mackerel, or many of the other species in Table 4.

stated, the 2016 revisions were implemented after most of the development of this amendment had taken place.

Chub mackerel is the target of a directed fishery. Targeted and incidental fisheries resulted in landings of at least one million pounds in the northeast during 2013-2015 (section 6.4.1.8). For this reason, the Council considered two alternative designations for chub mackerel, each of which are described in more detail in the following sections.

5.2.2.1. Alternative 2.B.i: Manage Chub Mackerel as an Ecosystem Component

Under alternative 2.B.i, the Council would designate chub mackerel as an EC. Section 5.1 describes the EC designation in detail. The management measures which would be implemented using this designation are included in alternative set 2.C (section 5.2.3).

Alternative 2.B.i could not be implemented in combination with alternative 2.A (no action on chub mackerel), 2.B.ii (designate chub mackerel as a stock in the fishery), or 2.B.iii (designate chub mackerel as neither an EC nor a stock in the fishery). It could be implemented in combination with all other alternatives described in this document. It is intended to be implemented in combination with one of the alternatives in alternative set 2.C.i (annual landings limits) and one of the alternatives in alternative set 2.C.ii (possession limits).

5.2.2.2. Alternative 2.B.ii: Manage Chub Mackerel as a Stock in the Fishery

Under alternative 2.B.ii, the Council would implement measures to manage chub mackerel as a stock in the fishery. The MSA lists several required provisions of FMPs for stocks that are in the fishery. For example, the Council must evaluate and describe maximum sustainable yield (MSY)^{vii}, optimum yield (OY)^{viii}, “specific objective and measurable criteria for identifying when the fishery...is overfished” (also known as status determination criteria), a control rule for allowable biological catch (ABC)^{ix}, mechanisms for specifying annual catch limits (ACLs) in relation to the ABC, and accountability measures (AMs) for when the ACLs are exceeded.

^{vii} The National Standards Guidelines (50 CF 600.310) define MSY as “the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions and fishery technological characteristics (e.g. gear selectivity), and the distribution of catch among fleets.”

^{viii} The MSA defines OY as “the amount of fish which (A) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems; (B) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and (C) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.”

^{ix} The National Standards Guidelines (50 CF 600.310) define ABC as “a level of a stock or stock complex’s annual catch that accounts for scientific uncertainty in the estimate of the OFL and any other scientific uncertainty...and should be specified based on the ABC control rule”. The OFL is the overfishing limit and is the level of annual catch above which overfishing is occurring.

Councils are also required to describe essential fish habitat (EFH)^x for stocks in the fishery. None of these measures are required for ECs (MSA section 303(a); 50 CFR 600.310).

Alternative 2.B.ii could not be implemented in combination with alternatives 2.A (no action on chub mackerel), 2.B.i (designate chub mackerel as an EC), or 2.B.iii (designate chub mackerel as neither an EC nor a stock in the fishery). It could be implemented in combination with all other alternatives described in this document. It is intended to be implemented in combination with one of the alternatives in alternative set 2.C.i (annual landings limits) and one of the alternatives in alternative set 2.C.ii (possession limits).

5.2.2.3. Alternative 2.B.iii: Manage Chub Mackerel as Neither an EC nor a Stock in the Fishery Through the Council’s Discretionary Authority Under MSA Section 303(b)(12) (Preferred)

Under alternative 2.B.iii, the Council would develop management measures for chub mackerel without designating them as either an EC or a stock in the fishery. This is the preferred alternative for the designation of chub mackerel.

The 2009 National Standards Guidelines stated that “as a default, all stocks in an FMP are considered to be ‘in the fishery’, unless they are identified as EC species through an FMP amendment process”. The 2016 revisions removed this language.

The Council has, in the past, developed management measures for some species without designating them as either stocks in the fishery or ECs. For example, the Council developed a catch cap for river herring and shad in the Atlantic mackerel fishery without designating river herring and shad as ECs or stocks in the fishery. MSA section 303(b)(12) provided the legal basis for this action. Section 303(b)(12) states that any FMP prepared by a Council may “include management measures in the plan to conserve target and non-target species and habitats, considering the variety of ecological factors affecting fishery populations”. This language also provides the legal basis for use of the EC designation.

Alternative 2.B.iii could not be implemented in combination with alternatives 2.A (no action on chub mackerel), 2.B.i (designate chub mackerel as an EC), or 2.B.ii (designate chub mackerel as a stock in the fishery). It could be implemented in combination with all other alternatives described in this document. It is intended to be implemented in combination with one of the alternatives in alternative set 2.C.i (annual landings limits) and one of the alternatives in alternative set 2.C.ii (possession limits).

^x The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”.

5.2.3. Alternative Set 2.C: Management Measures for Chub Mackerel

The Council considered a single set of alternatives for landings and possession limits for chub mackerel, regardless of which designation is used (EC, stock in the fishery, or neither; alternative set 2.B). These alternatives are described in the following sections. The alternatives are structured such that commercial landings in Federal waters in the northeast (i.e. the Mid-Atlantic and New England) would count towards an annual landings limit (alternative set 2.C.i). After the landings limit is reached, possession of chub mackerel would either be prohibited or an incidental possession limit would be enforced in Mid-Atlantic Federal waters only (alternative set 2.C.ii). None of the alternatives would implement a possession limit before the annual landings limit is met and none of the alternatives would limit possession in New England or in state waters for state-only permitted fishermen.

The landings limit alternatives are based on historical landings in the northeast. Although the Council intends for this amendment to apply to Mid-Atlantic Federal waters, they agreed that landings in New England and the Mid-Atlantic should count towards the annual landings limit. After the annual landings limit is met, only vessels fishing in the Mid-Atlantic would be restricted to either no possession or an incidental possession limit. None of the alternatives would restrict landings in New England, either before or after the annual landings limit is met. The Council discussed, but ultimately rejected, the idea of counting only landings in the Mid-Atlantic towards the annual landings limit. The Council rejected this idea because it could allow vessels to catch chub mackerel in the Mid-Atlantic and land their catch in New England. Without requirements such as Vessel Monitoring Systems (VMS), which is currently only required in certain fisheries, it is difficult to know precisely where fish are caught (as opposed to where they are landed, which can be determined from dealer reports). Therefore, the Council agreed that to best constrain chub mackerel catch from the Mid-Atlantic, landings throughout the northeast should count towards the annual landings limit and possession in the Mid-Atlantic should be restricted after the annual limit is met.^{xi}

If the stock in the fishery designation (alternative 2.B.ii) were used, the landings and possession limits described in alternative set 2.C may not be appropriate. As previously described, the MSA requires that the Council adopt an ABC for stocks in the fishery based on the recommendations of the Council's SSC. The SSC is required to consider the best scientific information available when recommending an ABC. Landings and possession limits must be set at a level to ensure

^{xi} It is assumed that most chub mackerel landings in the northeast in recent years were caught in the Mid-Atlantic. For example, 96% of the chub mackerel reported on Vessel Trip Reports (VTRs) from the northeast region from January 2010 through mid-June 2016 were caught in the Mid-Atlantic (Dr. Jerome Hermsen, NMFS Greater Atlantic Regional Office, personal communication). Dealer data is typically considered the most accurate source of information on the number of pounds landed; however, they do not provide information on the location of the catch. VTRs include fishermen's self-reported estimates of catch, landings, and the location of catch. Because VTRs are meant to be self-reported best estimates, they typically include incomplete and imprecise information.

that the ABC is not exceeded. The Council has not yet considered or adopted an ABC for chub mackerel; therefore, it is not known if the landings and possession limits described below could be implemented if chub mackerel were managed as a stock in the fishery (alternative 2.B.ii).

5.2.3.1. Alternative 2.C.i: Annual Landings Limit for Chub Mackerel

The Council considered four alternatives for annual chub mackerel landings limits. As previously described (section 5.2.3), all commercial landings in the northeast would count towards these landings limits.

These alternatives were structured such that the Council would choose only one of the sub-alternatives under alternative set 2.C.i in combination with one of the alternatives in alternative set 2.B (designation for chub mackerel), one of the alternatives in alternative set 2.C.ii (possession limit for chub mackerel), and one of the alternatives in alternative set 2.C.iii (sunset provisions). These alternatives could not be selected in combination with alternative 2.A (no action on chub mackerel); however, they could be selected in combination with any of the alternatives under alternative set 1 (alternatives for taxa other than chub mackerel) and/or any of the alternatives under alternative set 3 (administrative alternatives).

5.2.3.1.1. Alternative 2.C.i.a: 900,127 Pound Annual Chub Mackerel Landings Limit

Under alternative 2.C.i.a, a 900,127-pound annual landings limit for chub mackerel would be implemented. This is equivalent to average annual landings in the northeast from 2006 through 2015, according to commercial fish dealer reports.

5.2.3.1.2. Alternative 2.C.i.b: 1.75 Million Pound Annual Chub Mackerel Landings Limit

Under alternative 2.C.i.b, a 1.75-million-pound annual landings limit for chub mackerel would be implemented. This is equivalent to average annual landings in the northeast from 2011 through 2015, according to commercial fish dealer reports.

5.2.3.1.3. Alternative 2.C.i.c: 2.86 Million Pound Annual Chub Mackerel Landings Limit (Preferred)

Under alternative 2.C.i.c, a 2.86 million-pound annual landings limit for chub mackerel would be implemented. This is equivalent to average annual landings in the northeast from 2013 through 2015, according to commercial fish dealer reports. This is the preferred alternative for the annual chub mackerel landings limit.

5.2.3.1.4. Alternative 2.C.i.d: 5.25 Million Pound Annual Chub Mackerel Landings Limit

Under alternative 2.C.i.d, a 5.25 million-pound annual landings limit for chub mackerel would be implemented. This is equivalent to commercial landings of chub mackerel in the northeast in

2013, as shown in commercial fish dealer reports. This is the highest amount of annual chub mackerel landings recorded during 1996-2015.

5.2.3.2. Alternative 2.C.ii: Possession Limits for Chub Mackerel After the Annual Landings Limit Is Met

The Council considered three alternatives related to possession of chub mackerel after the annual landings limit (alternative 2.C.i) is met. These alternatives are described in the following sections.

The alternatives were structured such that the Council would choose only one of the sub-alternatives under alternative set 2.C.ii in combination with one of the alternatives in alternative set 2.B (designation for chub mackerel), one of the alternatives in alternative set 2.C.i (annual landings limit for chub mackerel), and one of the alternatives in alternative set 2.C.iii (sunset provisions). These alternatives could not be selected in combination with alternative 2.A (no action on chub mackerel); however, they could be selected in combination with any of the alternatives under alternative set 1 (alternatives for taxa other than chub mackerel) and/or any of the alternatives under alternative set 3 (administrative alternatives).

5.2.3.2.1. Alternative 2.C.ii.a: No Possession Allowed After Annual Chub Mackerel Landings Limit is Met

Under alternative 2.C.ii.a, possession of chub mackerel would be prohibited in Mid-Atlantic Federal waters after the annual landings limit is met. Any chub mackerel caught incidentally while pursuing other species would have to be discarded. This prohibition would be enforced in Mid-Atlantic Federal waters only.

5.2.3.2.2. Alternative 2.C.ii.b: 10,000 Pound Possession Limit in Effect After Annual Chub Mackerel Landings Limit is Met

Under alternative 2.C.ii.b, vessels in Mid-Atlantic Federal waters would be restricted to a 10,000 pound chub mackerel possession limit after the annual landings limit is met. This prohibition would be enforced in Mid-Atlantic Federal waters only.

Ten thousand pounds is roughly equivalent to the average chub mackerel landings per trip as shown in northeast commercial fish dealer data from 1996 through 2015 (Table 16). As described in more detail in section 6.4.1.8, over the past several years, a small number of relatively large vessels (i.e. greater than 140 feet in length) landed high amounts of chub mackerel (i.e. thousands to tens of thousands of pounds or more at a time). Many smaller vessels landed much smaller amounts. The difference between the average and the median chub mackerel landings per trip during 1996-2015 illustrates this point. The average was 10,000 pounds per trip and the median was 16 pounds per trip. The small number of vessels landing high

volumes drove up the average, while the median is more reflective of the many trips which landed small volumes.

The possession limits considered for chub mackerel are intended to be incidental possession limits. The amount of chub mackerel catch which is truly incidental is not well understood and is likely different for larger, faster vessels than for smaller, slower vessels. Several commercial fishing industry members said that chub mackerel abundance is highly variable and is largely based on environmental conditions. Levels of incidental catch likely vary year to year based on environmental conditions, in addition to varying based on the size and speed of the vessels which catch them. For these reasons, the average landings per trip over 1996-2015 (i.e. 10,000 pounds) was considered a reasonable proxy for an incidental level of catch for the fishery as a whole.

5.2.3.2.3. Alternative 2.C.ii.c: 40,000 Pound Possession Limit in Effect After Annual Chub Mackerel Landings Limit is Met (Preferred)

Under alternative 2.C.ii.c, vessels in Mid-Atlantic Federal waters would be restricted to a 40,000 pound chub mackerel possession limit after the annual landings limit is met. This is the preferred chub mackerel possession limit alternative.

This alternative was first proposed by a Council member who is familiar with the chub mackerel fishery. According to this Council member, 40,000 pounds of chub mackerel are needed to fill a bait truck. With prices rarely exceeding \$0.40 per pound during 1996-2015 (Table 16), vessels would not likely target chub mackerel when restricted to a 40,000-pound possession limit; however, they would have an incentive to land chub mackerel caught incidentally. A 40,000 pound possession limit could, therefore, discourage discards. The vessels responsible for most chub mackerel landings in the northeast over the past several years are large trawl vessels by Mid-Atlantic standards. Commercial fish dealer data show that these vessels have occasionally landed a few hundred thousand pounds of chub mackerel at a time^{xii}; thus, a 40,000-pound possession limit would represent a substantial restriction on what these vessels are capable of landing.

5.2.3.3. Alternative Set 2.C.iii: Sunset Provisions for Chub Mackerel Management Measures

The Council considered two alternatives for sunset provisions for chub mackerel management measures. These alternatives are described in the following sections. These alternatives presume that chub mackerel management measures would be implemented through this amendment; therefore, they could not be used in combination with alternative 2.A (no action on chub mackerel). They could be used in combination with any other alternative in this document.

^{xii} More details on chub mackerel landings from these vessels are not provided to protect confidential data representing fewer than three vessels and/or dealers.

5.2.3.3.1. Alternative 2.C.iii.a: No Sunset of Chub Mackerel Management Measures

Under alternative 2.C.iii.a the management measures implemented for chub mackerel would remain in place unchanged until they are modified by a future framework action or amendment. The measures would not sunset (i.e. expire after a certain amount of time).

5.2.3.3.2. Alternative 2.C.iii.b: Chub Mackerel Management Measures Sunset 3 Years After Implementation (Preferred)

Under alternative 2.C.ii.b any chub mackerel management measures implemented through this amendment would expire three years after implementation. This is a preferred alternative.

This alternative was developed during discussions of the designation for chub mackerel (alternative set 2.B). Some Council members thought that, given the scale of the recent chub mackerel fishery, chub mackerel should be managed as a stock in the fishery. However, it could take a year or more to develop measures to meet the various MSA requirements for stocks in the fishery (e.g. ABCs, ACLs, AMs, EFH) and the fishery would remain unregulated in the interim. This sunset provision alternative was developed for a situation where temporary management measures were implemented (under alternative 2.B.i or 2.B.iii), with the intent that, within three years, these measures would be replaced with new measures based on an ABC, at which time chub mackerel would become a stock in the fishery.

5.3. Alternative Set 3: Administrative Alternatives

The Council considered a range of administrative alternatives for this amendment, each of which are described in the following sections.

5.3.1. Alternative Set 3.A: Alternatives for New Fisheries and Expansion of Existing Fisheries

The Council does not intend to prohibit directed commercial fisheries for unmanaged forage species indefinitely, but rather only until the Council has had an adequate opportunity to assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem. The Council developed a range of alternatives relating to how they will consider allowing new fisheries or expansion of existing fisheries for the taxa included in this amendment. The following sections describe these alternatives.

5.3.1.1. Alternative 3.A.i: No Action on New Fisheries and Expansion of Existing Fisheries

Under alternative 3.A.i the Council would not develop any new regulations relating to new fisheries or expansion of existing fisheries for the taxa included in the amendment (Table 4). The Council could develop future amendments or framework actions to allow new fisheries or

expansion of existing fisheries; however, under alternative 3.A.i, the Council would undertake no such actions as part of this amendment.

Under alternative 3.A.i, individuals could land higher amounts than the possession limits implemented through this amendment if they obtain an Exempted Fishing Permit (EFP) from the NMFS Greater Atlantic Regional Fisheries Office (GARFO) allowing them to do so (section 5.3.1.3). EFPs are typically issued for one year at a time. Although they can be renewed annually, they would not be a practical way to pursue a new fishery over the long-term.

Alternative 3.A.i could not be implemented in combination with any of the other sub-alternatives under alternative set 3.A. Because it assumes that fisheries for unmanaged forage species are restricted in some way, it also could not be used in combination with alternatives 1.A (no action on taxa other than chub mackerel) or 2.A (no action on chub mackerel). It could be implemented in combination with any of the other alternatives.

5.3.1.2. Alternative 3.A.ii: No New or Expanded Fisheries for EC Species

Under alternative 3.A.ii, the Council would not allow any new fisheries or expansion of any existing fisheries for the taxa included in this amendment as ECs.

The Council stated that they do not intend to prohibit new fisheries or expansion of existing fisheries indefinitely, but rather only until they have had an opportunity to both assess the scientific information relating to any new or expanded directed fisheries and consider potential impacts to existing fisheries, fishing communities, and the marine ecosystem. This language is reflected in the purpose and need statements for this amendment (section 4.1). Alternative 3.A.ii is, therefore, inconsistent with the purpose and need of the amendment.

Alternative 3.A.ii could not be implemented in combination with any of the other sub-alternatives under alternative set 3.A. Because it assumes that fisheries for unmanaged forage species are restricted in some way, it also could not be used in combination with alternatives 1.A (no action on taxa other than chub mackerel) or 2.A (no action on chub mackerel). It could be implemented in combination with any of the other alternatives.

5.3.1.3. Alternative 3.A.iii: Require an EFP Prior to Development of New or Expansion of Existing Fisheries for ECs

An EFP is a permit issued by GARFO that authorizes a vessel to conduct fishing activities that are otherwise prohibited under the regulations at 50 CFR part 648 or 697. EFPs are typically issued for activities in support of fisheries-related research, including seafood product development and/or market research. Anyone who intends to engage in an activity that is not considered scientific research but that would be otherwise prohibited under these regulations is

required to obtain an EFP prior to commencing the activity. An EFP exempts a vessel only from those regulations specified in the EFP. All other applicable regulations remain in effect.^{xiii}

The Council considered two alternatives which would require use of an EFP as a first step in a process to allow new fisheries for ECs to develop, or as a first step towards allowing landings beyond those implemented through this amendment. The following sections describe these alternatives.

5.3.1.3.1. Alternative 3.A.iii.a: *Status Quo* EFP Application Process

Under alternative 3.A.iii.a, the Council would require use of an EFP as a first step in a process for considering whether to allow any new fisheries or expansion of existing fisheries for ECs. Under this alternative, there would be no changes to the existing process for applying for and obtaining an EFP.

Under the current EFP application process, individuals wishing to obtain an EFP must submit an application to GARFO. The GARFO Regional Administrator consults with the executive director of the Mid-Atlantic Council regarding exemptions from Mid-Atlantic Council FMP regulations. The Regional Administrator may not grant an exemption unless he or she determines that the purpose, design, and administration of the exemption is consistent with the management objectives of the respective FMP, the provisions of the MSA and other applicable law, and that granting the exemption will not have a detrimental effect on the stocks and the fishery, cause any quota to be exceeded; or create significant enforcement problems.^{xiv}

Alternative 3.A.iii.a could not be implemented in combination with alternative 3.A.i (no action on new fisheries and expansion of existing fisheries), alternative 3.A.ii (no new fisheries or expansion of existing fisheries), or with alternative 3.A.iii.b (new process for Council review of EFP applications). Because it assumes that fisheries for unmanaged forage species are restricted in some way, it also could not be used in combination with alternatives 1.A (no action on taxa other than chub mackerel) or 2.A (no action on chub mackerel). It could be implemented in combination with any of the other alternatives.

5.3.1.3.2. Alternative 3.A.iii.b: Council Review of EFP Applications for ECs (Preferred)

Under alternative 3.A.iii.b, the Council would require use of an EFP as a first step in a process for considering whether to allow any new fisheries or expansion of existing fisheries for ECs and would establish a new policy for Council review of EFP applications prior to review by GARFO. Alternative 3.A.iii.b is a preferred alternative.

^{xiii} More information on the requirements for EFPs and the process for review of EFP applications is available at: www.greateratlantic.fisheries.noaa.gov/aps/permits/forms/efploaeeaaopossessionloaguidance.pdf

^{xiv} Ibid.

The regulations which describe how to apply for an EFP and which give NMFS Regional Administrators the authority to approve or disapprove EFPs are codified at 50 CFR 600.745. These are national regulations and the Council does not have the authority to modify them. Regulations for EFPs in the Greater Atlantic Region can be found at 50 CFR 628.12. The Council can recommend changes to these regulations; however, these regulations cannot supersede the national regulations at 50 CFR 600.745. Because of how these regulations are structured, the Council cannot require individuals to submit their EFP applications to the Council prior to submitting them to GARFO; however, they can recommend that individuals do so.

The Pacific Fishery Management Council established a process which encourages individuals to submit EFP applications to them prior to submission to the NMFS West Coast Regional Office. EFP applications are reviewed by the Pacific Council and its advisory bodies, including its SSC, at regular intervals. The requirements and process for the review are outlined in Council Operating Procedures.^{xv}

Alternative 3.A.iii.b could not be implemented in combination with alternative 3.A.i (no action on new fisheries and expansion of existing fisheries), alternative 3.A.ii (no new fisheries or expansion of existing fisheries), or alternative 3.A.iii.a (*status quo* EFP application process). Because it assumes that fisheries for unmanaged forage species are restricted in some way, it also could not be used in combination with alternatives 1.A (no action on taxa other than chub mackerel) or 2.A (no action on chub mackerel). It could be implemented in combination with any other alternative.

5.3.1.4. Alternative 3.A.iv: Consideration of Stock in the Fishery Designation and/or Use of Interim Discretionary Management Measures Prior to Allowing New or Expansion of Existing Fisheries for ECs (Preferred)

Under alternative 3.A.iv, the Council would prohibit landings of ECs beyond the levels allowed for in this amendment until they have considered whether the stock in question should be managed as a stock in the fishery or whether the Council should use other discretionary measures to regulate the fishery. Discretionary measures are those implemented under the authority of section 303(b)(12) of the MSA and include measure implemented using the EC designation (section 5.1). Alternative 3.A.iv is a preferred alternative.

Alternative 3.A.iv could not be implemented in combination with alternative 3.A.i (no action on new fisheries and expansion of existing fisheries), or with alternative 3.A.ii (no new fisheries or expansion of existing fisheries). Alternative 3.A.iv could be implemented in combination with any of the other alternatives.

^{xv} Available at: <http://www.pcouncil.org/council-operations/operating-procedures/> The process and requirements for review of EFP applications relating to the Pacific Council's regulations on unmanaged forage species are described in Council Operating Procedure 24.

5.3.2. Alternative Set 3.B: List of Authorized Fisheries and Gear Types at 50 CFR 600.725

All federally authorized fisheries and gear types for the Mid-Atlantic region are listed in the Code of Federal Regulations at 50 CFR 600.725. If an individual intends to pursue a fishery or use a gear type that is not on this list, he or she must first notify the Council of this intent in writing. If the Council believes that the new fishery or the use of the new gear could be detrimental to conservation and management efforts, the Council may take action to prohibit the new development through an emergency action, an FMP amendment, or development of a new FMP (50 CFR 600.747).

5.3.2.1. Alternative 3.B.i: No Action on List of Fisheries and Gear Types (Preferred)

Under alternative 3.B.i the Council would take no action regarding the list of fisheries and gear types at 50 CFR 600.725. This is a preferred alternative.

Alternative 3.B.i could be implemented in combination with any other alternative, except alternative 3.B.ii (modify the list of fisheries and gear types).

5.3.2.2. Alternative 3.B.ii : Update List of Authorized Fisheries and Gear Types

The regulations regarding the list of authorized fisheries and gear types (50 CFR 600.747) align with the goal of this amendment by ensuring that the Council is notified of and has the opportunity to respond to new fisheries as they arise. This could be useful in helping the Council determine if any additional species should be added to the regulations implemented through this amendment. However; the list of authorized fisheries and gear types currently includes two general categories of commercial fisheries which may allow individuals to pursue fisheries for unmanaged forage species without first notifying the Council of their intent to do so (Table 6).

Under alternative 3.B.ii, the Council would request that NMFS update the list of approved fisheries and gear types to modify one or more of these general categories to ensure that individuals intending to target currently unmanaged forage species in Federal waters first notify the Council of their intent to do so. The list of fisheries and authorized gear types is meant to describe all existing fisheries. When other NMFS regional offices have updated this list, they undertook an involved public outreach process to ensure that the list accurately describes all existing fisheries and no existing fisheries are unintentionally excluded from the list.

Alternative 3.B.ii could be implemented in combination with any other alternative, except alternative 3.B.i (no action on the list of fisheries and gear types).

Table 6: The fisheries and authorized gear types listed in 50 CFR 600.725 which limit the Council’s ability to address new commercial fisheries for unmanaged forage species as they develop.

Fishery	Authorized gear type
16. Coastal Gillnet Fishery (Non-FMP)	Gillnet
27. Commercial Fishery (Non-FMP)	Trawl, pot, trap, gillnet, pound net, dredge, seine, handline, longline, hook and line, rod and reel, spear

5.3.3. Alternative Set 3.C: Permitting

The Council considered two alternatives related to commercial fishing permits. These alternatives are described in the following sections.

5.3.3.1. Alternative 3.C.i: No Action on Permitting

Under alternative 3.C.i, the Council would take no action regarding commercial fishing permits as part of this amendment. This alternative could be implemented in combination with all other alternatives described in this document, except alternative 3.C.ii (described in the next section).

5.3.3.2. Alternative 3.C.ii: Require GARFO Permit to Possess ECs (Preferred)

Alternative 3.C.ii would require commercial fishing vessels to obtain a commercial fishing permit from GARFO in order to possess chub mackerel and any taxa designated as ECs in the amendment. This is a preferred alternative. As with other aspects of this amendment, this alternative is intended to apply to Mid-Atlantic Federal waters. It is not intended to apply to vessels fishing only in state waters.

Federal permits are typically required to fish for, possess, or land managed species. Federal permits also typically require that vessels sell their landings to a federally-permitted dealer. In this way, alternative 3.C.ii could help improve data on how many vessels are harvesting chub mackerel and/or ECs, and the volumes landed.

Alternative 3.C.ii could be implemented in combination with any other alternative, except alternative 3.C.i (no action on permits).

5.3.4. Alternative Set 3.D: Notification of Landings

The Council considered two alternatives related to notification of landings of unmanaged forage species. The following sections describe these alternatives.

5.3.4.1. Alternative 3.D.i: No Action on Notification of Landings (Preferred)

Under alternative 3.D.i, the Council would take no action related to notification of landings of unmanaged forage species. This is a preferred alternative.

Alternative 3.D.i could be implemented in combination with any other alternative, except alternative 3.D.ii (described in the next section).

5.3.4.2. Alternative 3.D.ii: Request Regular Updates from GARFO on Landings of Unmanaged Forage Species

Under alternative 3.D.ii, the Council would request that GARFO staff provide the Council with information on landings of unmanaged forage species in the Mid-Atlantic on a regular basis. GARFO staff agreed to provide the Council with regular updates on landings of all unmanaged species in the Mid-Atlantic, whether or not this is a preferred alternative.

Alternative 3.D.ii could be implemented in combination with any other alternative, except alternative 3.D.i (no action on notification of landings).

5.3.5. Alternative 3.E: Reporting Systems

The Council considered two alternatives related to reporting of catch and landings of the taxa included in this amendment. The following sections describe these alternatives.

5.3.5.1. Alternative 3.E.i: No Action on Reporting Systems

Under alternative 3.E.i, the Council would take no action related to reporting of catch and landings of the taxa included in this amendment. This alternative could be selected in combination with any of the other alternatives, except alternative 3.E.ii (described in the next section).

5.3.5.2. Alternative 3.E.ii: Add Codes for Taxa Included in Amendment to Reporting Mechanisms (Preferred)

Federally-permitted commercial fishermen are required to report everything they catch and federally-permitted dealers are required to report everything they purchase (50 CFR §648.7). A few commercial fishermen informed the Council that the codes used for reporting some of the taxa included in this amendment (Table 4) are not available when using electronic reporting systems such as SAFIS (an online system used to fulfill state and Federal reporting requirements) and electronic VTRs. The codes used in these systems are based on a taxonomic identification system. Codes exist for every taxon; however, not all codes are available in the correct format to be used in all of these systems at this time.

Under alternative 3.E.ii, the Council would work with GARFO and the other offices which maintain these systems to ensure that the codes for all taxa included in this amendment are added to all electronic reporting mechanisms. This is a preferred alternative.

Alternative 3.E.ii could be implemented in combination with any other alternative, except alternative 3.E.i (no action on reporting).

5.3.6. Alternative Set 3.F: Management Unit

The Council agreed to limit the management unit of this amendment to Mid-Atlantic Federal waters. They considered two alternative ways of defining the boundaries of Mid-Atlantic Federal waters. The following sections describe these alternatives. The two alternatives differ only in the southern border.

5.3.6.1. Alternative 3.F.i: No Action/Southern Boundary of Management Unit Defined by Virginia/North Carolina Border

Under alternative 3.F.i, the management unit for this amendment would be bounded by the seaward boundary of the Exclusive Economic Zone (EEZ) to the east, the state line separating New York and Connecticut (extended seaward) to the north, the state line separating Virginia and North Carolina (extended seaward) to the south, and the boundary of state waters (3 miles from shore) to the west. This is the jurisdiction of the Mid-Atlantic Fishery Management Council, as defined in MSA section 302(a)(1)(B); thus, this can also be considered a no action alternative for the management unit. If the Council chose not to define the management unit for the amendment (i.e. took no action), it would be defined based on the Council's jurisdiction as defined in the MSA.

Alternative 3.F.i could be implemented in combination with any other alternative, except alternative 3.F.iii (southern boundary at Cape Hatteras).

5.3.6.2. Alternative 3.F.iii: Southern Boundary of Management Unit at Cape Hatteras

Under alternative 3.F.iii, the management unit for this amendment would be bounded by the seaward boundary of the EEZ to the east; the state line separating New York and Connecticut (extended seaward) to the north; Cape Hatteras, North Carolina to the south; and the boundary of state waters (3 miles from shore) to the west. Cape Hatteras is the southern extent of the management units for scup and black sea bass.

Alternative 3.F.iii could be implemented in combination with any other alternative, except alternative 3.F.i (no action on the management unit) or alternative 3.F.ii (southern boundary at the Virginia/North Carolina border).

5.3.7. Alternative Set 3.G: Frameworkable Items

Framework actions facilitate expedient modifications to certain management measures. Framework actions can modify existing measures and/or those that have been previously considered and analyzed in an FMP or an FMP amendment. While amendments may take several years to complete and can address a variety of issues, frameworks can usually be completed in 6-8 months and typically address one or a few issues in a fishery. Omnibus frameworks address similar issues across multiple FMPs.

In most FMPs, the Council has identified which items may be modified through framework actions. Most of the Council's FMPs (i.e. Mackerel, Squid Butterfish; Summer Flounder, Scup, Black Sea Bass; Bluefish; Spiny Dogfish; and Monkfish) also state that any other management measures currently included in the FMP may be modified through a framework action. If the measures proposed through a framework action represent significant departures from previously contemplated measures (i.e. measures analyzed through previous FMP actions), or if they could have significant impacts, then an FMP amendment may be required, even if the action was previously identified as a frameworkable item.

The Council considered two alternatives for framework actions related to this amendment. Those alternatives are described in the following sections.

5.3.7.1. Alternative 3.G.i: No Action/Nothing Identified as Frameworkable

Under alternative 3.G.i, the Council would not identify any measures implemented through this amendment as frameworkable (i.e. able to be modified through a framework action). This alternative could be implemented in combination with any of the other alternatives, except alternative 3.G.ii (described in the next section).

As described in the previous section, most of the Council's FMPs include lists of measures which may be modified through framework actions and also state that, in addition to the list, any other management measures currently included in the FMP may be modified through a framework action. This amendment is an omnibus amendment to all the Council's FMPs; therefore, this language in the other FMPs could provide justification for future framework actions to modify the measures implemented through this amendment, even if none of those measures are explicitly listed as frameworkable. As with all frameworks, the Council would still need to provide evidence that the modification proposed in the framework does not represent a significant departure from previously considered measures.

5.3.7.2. Alternative 3.G.ii: One or More Items Listed as Frameworkable

Alternative set 3.G.ii contains items considered by the Council for possible modification or implementation through future framework actions.

Any of the sub-alternatives in alternative set 3.G.ii could be implemented in combination with one another. They could also be implemented in combination with any of the other alternatives, except alternative 3.G.i (no action on frameworks).

5.3.7.2.1. Alternative 3.G.ii.a: List of Ecosystem Components (Preferred)

Alternative 3.G.ii.a would identify the list of ECs included in this amendment as a frameworkable item. This is a preferred alternative.

Future framework actions to modify the list of ECs would allow the Council to react to changing species distributions, changing fish abundances, and emerging fisheries in the Mid-Atlantic.

Early in the development of this amendment, the Council expressed a desire to include a relatively concise list of ECs in the amendment to minimize unintended negative impacts to existing managed fisheries which incidentally catch unmanaged forage species. By allowing future framework actions to modify the list of ECs in the amendment, the Council will have the option of adding and removing ECs through framework actions in response to new information on fish abundances, emerging fisheries, and impacts to existing managed fisheries.

5.3.7.2.2. Alternative 3.G.ii.b: Possession Limits and Landings Limits (Preferred)

Alternative 3.G.ii.b would identify the possession and landings limits implemented through this amendment as items that can potentially be modified through future frameworks. This is a preferred alternative.

5.3.7.2.3. Alternative 3.G.ii.c: Spatial and Seasonal Closures

Alternative 3.G.ii.c would identify spatial and seasonal closures for the taxa included in this amendment as measures that could potentially be implemented through future framework actions.

Spatial and seasonal closures were discussed as a way to manage the spatial and temporal overlap of and potential conflicts between the commercial chub mackerel fishery and recreational fisheries for billfish such as white marlin. Both fisheries take place in the summer months in offshore canyons in the Mid-Atlantic. Chub mackerel are an important food source for white marlin and other predatory species which support recreational fisheries, including economically important fishing tournaments such as the White Marlin Open out of Ocean City, Maryland.

Spatial and seasonal closures are not associated with a standalone alternative; therefore, the expected impacts have not been analyzed in this document or elsewhere. It is unlikely that the Council would be able to implement spatial and seasonal closures through future framework actions given this lack of supporting analysis. Implementation of such measures would likely require an FMP amendment.

5.3.7.2.4. Alternative 3.G.ii.d: Recreational Fishing Regulations

The Council agreed that the intent of this amendment is to address the potential threat of unregulated large-scale commercial harvest of currently unmanaged forage species. The Council did not consider recreational management measures through this amendment, but considered the possibility of implementing recreational measures through future frameworks actions, if needed. Alternative 3.G.ii.d would identify recreational fishing regulations for unmanaged forage species as measures which could potentially be implemented through future framework actions.

Recreational management measures for unmanaged forage species are not associated with a standalone alternative; therefore, the expected impacts have not been analyzed in this document or elsewhere. It is unlikely that the Council would be able to implement recreational management measures through future framework actions given this lack of supporting analysis. Implementation of such measures would likely require an FMP amendment.

5.3.8. Alternative Set 3.H: Transit Provisions

The Council considered two alternatives for situations in which vessels harvest the taxa included in this amendment outside of the Mid-Atlantic, but transit through the Mid-Atlantic with those taxa on board. These alternatives are described in the following sections.

5.3.8.1. Alternative 3.H.i: No Transit Provisions

Under alternative 3.H.i vessels would not be allowed to transit through Mid-Atlantic Federal waters if they have any of the taxa included in this amendment on board, even if those taxa were harvested outside of Mid-Atlantic Federal waters.

5.3.8.2. Alternative 3.H.ii: Allow Vessels to Transit Through the Mid-Atlantic with Forage Species Caught Outside of the Mid-Atlantic (Preferred)

Under alternative 3.H.ii vessels would be able to transit through the Mid-Atlantic with the forage taxa included in the amendment on board, provided that those taxa were harvested outside of Mid-Atlantic Federal waters. This is a preferred alternative. Transit provisions typically require that fishing gear be stored and not available for immediate use.

5.4. Alternatives Considered but Rejected from Further Analysis

Early in the development of this amendment, the Council considered three types of alternatives which were later rejected from further analysis. These alternatives were thought to be difficult to enforce or could result in complications for existing managed fisheries, which the Council wished to minimize. These alternatives are described in more detail in the following sections. They are not analyzed in this document in terms of their impacts on the VECs.

5.4.1. Prohibit Possession of Some ECs and Implement an Incidental Possession Limit for Others

Early in the development of this amendment, the Council considered an alternative that would prohibit possession of some taxa and implement an incidental possession limit for others. The Council ultimately removed this alternative from consideration due to enforcement concerns. There was concern that if possession of some taxa were prohibited and possession of others were allowed, it would require more time to be spent sorting the catch during Coast Guard boardings and greater knowledge of species identification among fishermen and enforcement officers than would be necessary if possession of all the taxa (except chub mackerel) were treated in a similar

manner (i.e. all prohibited or all allowed with the same possession limit). The Council wished to minimize the burden of these new regulations on existing managed fisheries and treating all taxa (besides chub mackerel) the same way was seen as one way to achieve that goal. Under alternative 1.B possession of all taxa included in the amendment (except chub mackerel) would be prohibited; therefore, identification of these taxa would rarely be necessary. Under alternative set 1.C, the catch would only need to be sorted and identified if a vessel retained more than 1,500 pounds (alternative 1.C.i) or more than 1,700 pounds (alternative 1.C.ii).

5.4.2. Spatial and Seasonal Closures

Spatial and seasonal closures were previously considered as a standalone alternative in the amendment. In April 2016, the Council decided to retain spatial and seasonal closures as a frameworkable alternative, but remove them from consideration as a full alternative. The Council removed them from consideration as a standalone alternative due to the potential for negative impacts to existing managed fisheries, which they wished to minimize. Compared to spatial and seasonal closures, the remaining alternatives for landings and possession limits are simpler to analyze, implement, and enforce, and have would likely have fewer negative consequences for existing managed fisheries.

5.4.3. Gear Regulations

The Council previously considered using gear regulations to restrict catch of forage species. They removed gear regulations from further consideration in April 2016. Fishermen already catch several of the species included in the amendment while using gear allowed for in managed fisheries (Table 7). The Council removed gear regulations from consideration because they wished to minimize negative impacts of this amendment on existing managed fisheries.

6. Description of the Affected Environment

The affected environment consists of those physical, biological, and human components of the environment expected to experience impacts if any of the actions considered in this amendment were to be implemented. This document focuses on six aspects of the affected environment, which are defined as valued ecosystem components (VECs) for the purposes of this action.

The VECs include:

- The unmanaged forage taxa included in this amendment (section 6.1)
- Species managed by the Mid-Atlantic Council (section 6.2.1)
- Large tuna, billfish, shark, and sea bird predators of unmanaged forage species (referred to as “other predators” and grouped with Council managed predators for the purposes of impact analysis; section 6.2.1.13)
- Protected species (i.e. species protected under the Endangered Species Act and/or the Marine Mammal Protection Act; section 6.3)

- The socioeconomic environment (section 6.4)
- Physical marine habitats (section 6.5)

The following sections describe the recent condition of the VECs.

6.1. Forage Taxa Included in Amendment

The following sections summarize the biology and life history of the taxa included in this amendment, as well as the Council's justification for including each taxon in the amendment. As described in more detail in section 4.2, the Council sought to prioritize those taxa which are important prey for socially or economically important predators (with an emphasis on Council-managed predators), as well as those unmanaged forage taxa with the potential to be targeted by large-scale commercial fisheries.

Most of these taxa have not been assessed with quantitative stock assessments. Many forage species are short-lived and undergo substantial cyclic fluctuations in abundance. Abundance of many of these species is sensitive to environmental factors, and for many there is no relationship between biomass and recruitment. All of these factors pose challenges for traditional stock assessment approaches (Essington et al. 2015, Ihde et al. 2015).

Table 7: Summary of predators, interactions with Council managed fisheries, and landings of taxa included in this amendment.

Taxa	Council managed Predators ^{xvi}	Catch in Council Managed Fisheries ^{xvii}	HMS & Seabird Predators	Protected Species Predators ^{xviii}	Landings 1996-2015 ^{xix}
Anchovies (family Engraulidae)	Bluefish, summer flounder, Atlantic mackerel, spiny dogfish	<u>Species:</u> black sea bass, bluefish, butterfish, <i>Illex</i> squid, longfin squid, monkfish, scup, spiny dogfish, summer flounder <u>Gears:</u> bottom trawl, gillnet	Atlantic sharpnose shark, common terns, ospreys, cormorants, pelicans	Bottlenose dolphin; blue and dusky sharks	10,154 lb
Argentines (family Argentinidae)	Monkfish	<u>Species:</u> longfin squid, summer flounder <u>Gears:</u> bottom trawl			30,901 lb
Greeneyes (family Chlorophthalmidae)	Monkfish, Atlantic mackerel, spiny dogfish	None reported			None reported
Halfbeaks (family Hemiramphidae)	Bluefish ^{xx}	None reported	Bluefin and yellowfin tunas; blue marlin; scalloped hammerhead; seabirds		None reported
Unmanaged herrings and sardines (family Clupeidae)	Monkfish, bluefish, summer flounder, black sea bass, spiny dogfish	<u>Species:</u> black sea bass, bluefish, blueline tilefish, butterfish, <i>Illex</i> squid, longfin squid, monkfish, scup, spiny dogfish, summer flounder, surf clam <u>Gears:</u> bottom trawl	Bluefin tuna; white marlin; swordfish; common thresher, dusky, porbeagle, and Atlantic sharpnose sharks; ospreys; cormorants; pelicans	Atlantic white-sided and bottlenose dolphins; harbor porpoise; pilot, minke, sei, fin, and humpback whales; harbor and gray seals	None reported

^{xvi} Unless otherwise noted, Council managed predators are those species for which the forage taxa in question were identified in at least two stomachs sampled in NEFSC spring and fall bottom trawl surveys in Mid-Atlantic and/or southern New England offshore strata (strata 01010-01120 and 01610-01760) during 1973-2015. This low threshold for presence in the diet was chosen because most Council-managed species consume a variety of prey species throughout the year. Higher thresholds identified very few prey taxa. For example, a threshold of 5% relative mean stomach weight for any predator (as recommended by the SSC's definition of forage fish; Table 5) identified only four forage taxa (mackerels, comb jellies, rock crabs, and octopods).

^{xvii} Forage taxa were identified as catch in Council managed fisheries if they were reported in NEFOP data for sets or tows of all gear types which resulted in landings of a Council-managed species, 1996 through March 2016.

^{xviii} More information, including the sources of the information presented in this column, can be found in sections 6.3 of this document.

^{xix} As shown in reports from commercial fish dealers in the northeast.

^{xx} Based on Collette and Klien-MacPhee (2002). Halfbeaks were not identified as prey for Council-managed species based on NEFSC trawl survey data.

Table 7, continued (see page 46 for further explanation):

Taxa	Council managed Predators	Catch in Council Managed Fisheries	HMS & Seabird Predators	Protected Species Predators	Landings 1996-2015
Lanternfish (family Myctophidae)	Black sea bass, monkfish, spiny dogfish, summer flounder, bluefish	<i>Species:</i> butterfish, <i>Illex</i> squid, longfin squid <i>Gears:</i> bottom trawl	Swordfish, bluefin tuna	Common, bottlenose dolphin, and Atlantic white-sided dolphins; fin, sei, pilot, and Cuvier's beaked whales; harbor porpoise	None reported
Pearlsides (family Sternoptychidae)	Spiny dogfish	None reported		Harbor porpoise, common dolphin	None reported
Sand lances (family Ammodytidae)	Monkfish, bluefish, summer flounder, Atlantic mackerel, black sea bass, spiny dogfish	<i>Species:</i> Atlantic mackerel, black sea bass, bluefish, blueline tilefish, butterfish, golden tilefish, longfin squid, monkfish, scup, spiny dogfish, summer flounder <i>Gears:</i> bottom trawl, dredge	Bluefin tuna; common thresher, inshore blue, and inshore shortfin mako sharks; shearwaters; terns; double crested cormorants; roseate tern	Harbor and gray seals; Atlantic white-sided, bottlenose, and common dolphins; harbor porpoise; minke, sei, fin, and humpback whales	81,034 lb
Silversides (family Atherinopsidae)	Monkfish, Atlantic mackerel, spiny dogfish	<i>Species:</i> Atlantic mackerel, black sea bass, bluefish, butterfish, longfin squid, scup, summer flounder <i>Gears:</i> bottom trawl	Sea birds	Dolphins	482,372 lb
Cusk-eels (order Ophidiiformes)	Monkfish, summer flounder, black sea bass, spiny dogfish	<i>Species:</i> Atlantic mackerel, black sea bass, bluefish, blueline tilefish, butterfish, golden tilefish, <i>Illex</i> squid, longfin squid, monkfish, scup, spiny dogfish, summer flounder <i>Gears:</i> bottom trawl, dredge, gillnet	Blue and dusky sharks		None reported
Atlantic saury (<i>Scomberosox saurus</i>)	Bluefish	<i>Species:</i> Atlantic mackerel, black sea bass, bluefish, butterfish, longfin squid, scup, spiny dogfish, summer flounder <i>Gears:</i> bottom trawl	Swordfish; common thresher and inshore shortfin mako sharks; shearwaters; gannets		

Table 7, continued (see page 46 for further explanation):

Taxa	Council managed Predators	Catch in Council Managed Fisheries	HMS & Seabird Predators	Protected Species Predators	Landings 1996-2015
Atlantic chub mackerel (<i>Scomber colias</i>)	None identified in NEFSC trawl survey; however spiny dogfish, monkfish, and summer flounder were identified as predators of “mackerels”	<i>Species:</i> Atlantic mackerel, black sea bass, bluefish, blueline tilefish, butterflyfish, golden tilefish, <i>Illex</i> squid, longfin squid, monkfish, scup, spiny dogfish, summer flounder <i>Gears:</i> bottom trawl, gillnet	Tunas, billfishes	Several marine mammal, tuna, and shark predators of “scombrids” and/or “mackerels” (likely including chub mackerel)	9,581,508 lb
Bullet mackerel (<i>Auxis rochei</i>)	None identified in NEFSC trawl survey; however spiny dogfish, monkfish, and summer flounder were identified as predators of “mackerels”	<i>Species:</i> black sea bass, longfin squid, summer flounder <i>Gears:</i> bottom trawl	Blue marlin, yellowfin tuna		None reported
Frigate mackerel (<i>Auxis thazard</i>)	None identified in NEFSC trawl survey; however spiny dogfish, monkfish, and summer flounder were identified as predators of “mackerels”	None reported; however similar in appearance to bullet mackerel	Blue marlin, yellowfin tuna		98,331 lb
Unmanaged pelagic mollusks except sharptail shortfin squid	Monkfish, bluefish, butterflyfish, summer flounder, Atlantic mackerel, scup, black sea bass, spiny dogfish, longfin squid, <i>Illex</i> squid	<i>Species:</i> All 14 Council managed species <i>Gears:</i> bottom trawl, dredge, gill net, midwater trawl ^{xxi}	Swordfish; blue and white marlin; longbill spearfish; bluefin and yellowfin tunas; common thresher, blue, inshore shortfin mako, tiger, dusky, porbeagle, Atlantic sharpnose, chain catshark, black dogfish, kitefin, sand tiger, and scalloped hammerhead sharks; shearwaters; fulmars	Pilot, fin, humpback, and sei whales; bottlenose, Atlantic white-sided, and common dolphins; harbor porpoise; harbor and gray seals	None reported in a way to distinguish managed from unmanaged species
Copepods, krill, amphipods, and other species <1 inch as adults	Bluefish, butterflyfish, summer flounder, Atlantic mackerel, scup, black sea bass, spiny dogfish, longfin squid, <i>Illex</i> squid, monkfish	None reported	Whale, basking, kitefin, and black dogfish sharks; gulls; fulmars; petrels; phalaropes; red knot; piping plover	Minke, right, sei, fin, and humpback whales; bottlenose dolphin	None reported

^{xxi} Based on records of unclassified mollusks, unclassified squids, and octopods, likely containing managed species of squid.

6.1.1. Anchovies (Family Engraulidae)

Four unmanaged species in the Engraulidae family are found in Federal waters in the Mid-Atlantic: striped anchovy (*Anchoa hepsetus*) Dusky anchovy (*Anchoa lyolepis*), Bay anchovy, (*Anchoa mitchilli*), and Silver anchovy (*Engraulis eurystole*).

Anchovies are small, schooling species found mostly found in bays, estuaries, and near-shore marine waters. They rarely inhabit depths greater than 200 feet. Some species, including striped anchovy and bay anchovy, can tolerate a wide range of salinities (Collette and Klein-MacPhee 2002, Kells and Carpenter 2011). Bay anchovy abundance in Chesapeake Bay has been linked to mean dissolved oxygen (Jung and Houde 2004).

All four anchovy species in the Mid-Atlantic are widely distributed throughout the Atlantic coast of the U.S. They generally reach four to six inches in length, depending on the species. They form schools and mostly feed on plankton (Collette and Klein-MacPhee 2002, Kells and Carpenter 2011).

NEFSC trawl survey data indicate that anchovies are prey for bluefish, summer flounder, Atlantic mackerel, and spiny dogfish in Mid-Atlantic Federal waters. They are also prey for inshore blue shark (personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), dusky shark, Atlantic sharpnose shark (Collette and Klien-MacPhee 2002), bottlenose dolphins (Smith et al. 2015), and a variety of sea birds (Clay et al. 2014).

Justification for Inclusion in Amendment

As previously stated, anchovies are prey for a variety of predators, including many Council managed species. They are also caught in several Council managed fisheries, including bottom trawl fisheries for black sea bass, butterfish, *Illex* squid, longfin squid, monkfish, scup, spiny dogfish, and summer flounder. Small amounts of anchovies have also been documented in gillnet fisheries for spiny dogfish.^{xxii} Bay anchovies have been sold to commercial fish dealers in the northeast (section 6.4.1), indicating some level of demand, which could encourage future directed fisheries. This combination of documentation as prey, catch in Council managed fisheries, and existing market demand provided strong rationale for including anchovies in this amendment.

6.1.2. Argentines (Family Argentinidae)

Argentines are found on the outer shelves and upper slopes of tropical and warm temperate seas throughout the world. Two species are found in Mid-Atlantic Federal waters: striated argentine (*Argentina striata*) and pygmy argentine (*Glossanodon pygmaeus*). Neither species is managed.

^{xxii} Based on NEFOP data for sets or tows of all gear types which resulted in landings of a Council-managed species, 1996 through March 2016.

Striated argentine are found from Nova Scotia to Florida in depths of about 300 to 2,000 feet. They commonly reach six inches in length as adults (Froese and Pauly 2016).

Pygmy argentine are a marine, bathypelagic species found at depths of 300 to 1,500 feet. They are most commonly found south of Cape Hatteras, but can also be found in the Mid-Atlantic and off southern New England (Froese and Pauly 2016).

Justification for Inclusion in Amendment

The Council included argentinines in this amendment because they are prey for monkfish (a Council managed species)^{xxiii} and have been landed and sold in the northeast in recent years (section 6.4.1.2), indicating some level of demand which could encourage the development of directed fisheries in the future. Additionally, argentinines have been reported through NEFOP as bycatch in trawl tows which resulted in landings of longfin squid and summer flounder.

6.1.3. Greeneyes (Family Chlorophthalmidae)

Greeneyes are found worldwide in moderately deep marine waters. Two greeneye species are found in Mid-Atlantic Federal waters: Shortnose greeneye (*Chlorophthalmus agassizi*) and Longnose greeneye (*Parasudis truculenta*). No greeneye species are managed.

Shortnose greeneyes inhabit the continental slope and deep coastal waters from Nova Scotia to the Gulf of Mexico. They can reach six inches in length and prey on small benthic invertebrates (Collette and Klein-MacPhee 2002).

Longnose greeneyes are found from southern New England to Brazil. They are mostly found in depths of 400-600 feet. They reach about nine inches in length and prey mostly on other fish (Froese and Pauly 2016).

Justification for Inclusion in Amendment

The Council included greeneyes in the amendment because they are they are prey for monkfish, Atlantic mackerel, and spiny dogfish (all Council managed species)^{xxiv}.

6.1.4. Halfbeaks (Family Hemiramphidae)

Members of the family hemiramphidae inhabit warm temperate and tropical waters. They are called halfbeaks due to their elongated lower jaw. At least four halfbeak species are found in Mid-Atlantic Federal waters: flying halfbeak (*Euleptorhamphus velox*), balao (*Hemiramphus balao*), ballyhoo (*Hemiramphus brasiliensis*), and false silverstripe halfbeak (also known as American halfbeak or Meek's halfbeak, *Hyporhamphus meeki*). None of these species are

^{xxiii} As shown in diet data collected from NEFSC bottom trawl survey tows in Mid-Atlantic or southern New England offshore strata from 1973 through 2015.

^{xxiv} Ibid

managed by the Mid-Atlantic, New England, or South Atlantic Fishery Management Councils, or by the ASMFC. There are some regulations in Florida state waters.

Halfbeaks are generally distributed from southern New England to Florida, though some species can be found beyond that range. Most species migrate seasonally between inshore and offshore waters. They can reach 11 to 14 inches in length, depending on the species. They often form large schools and are prey for seabirds (Kells and Carpenter 2011) and a variety of fish species including bluefish, bluefin tuna, blue marlin, and yellowfin tuna (Chase 2002, Collette and Klein-MacPhee 2002, Rundershausen et al. 2010). Most halfbeak species feed on sea grasses, as well as small invertebrates and fish (Kells and Carpenter 2011).

Justification for Inclusion in Amendment

The Council included halfbeaks in the amendment due to their role as prey for a variety of predators, including bluefish (a Council managed species; Collette and Klein-MacPhee 2002), a variety of seabirds (Kells and Carpenter 2011), and highly migratory species (Chase 2002, Collette and Klein-MacPhee 2002, Rundershausen et al. 2010).

NEFOP data, VTR data, and advisor and public comments indicate that halfbeaks are rarely caught in the Mid-Atlantic; however, they are harvested in Florida and are a popular bait for recreational fisheries in the Mid-Atlantic (section 6.4.1.3). This existing market demand, coupled with the schooling behavior of halfbeaks, could encourage the development of directed commercial fisheries in the Mid-Atlantic in the future.

6.1.5. Herrings and Sardines (Family Clupeidae)

The family Clupeidae contains managed species such as Atlantic menhaden (*Brevoortia harengus*) and Atlantic herring (*Clupea harengus*), as well as several unmanaged species. Most species in this family are coastal marine schooling fishes, though some are anadromous. The Clupeidae family is important as prey for a variety of predators, including many Council managed species. For example, the NEFSC trawl survey found unclassified herrings in the stomachs of monkfish, bluefish, summer flounder, black sea bass, and spiny dogfish. Herrings and sardines are also prey for many marine mammals, including a variety of large whales, as well as white-sided and bottlenose dolphins, harbor porpoises, harbor seals, and gray seals (Smith et al. 2015). They are also prey for large tunas and billfish (Chase 2002, Collette and Klein-MacPhee 2002, Rundershausen et al. 2010), several shark species (Collette and Klein-MacPhee 2002; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), and sea birds (Clay et al. 2014).

At least four unmanaged species in this family are commonly found in Mid-Atlantic Federal waters. These species are briefly described below.

Round herring (*Etrumeus teres*) are a marine, pelagic, schooling species. They are commonly found in deep waters along the continental shelf and slope. They are distributed from the Bay of

Fundy to Florida, but are rarely seen north of Cape Cod. They are typically eight to ten inches long as adults. They feed mostly on zooplankton and larval fish. They are prey for a wide variety of fish, including monkfish, bluefish, summer flounder, and spiny dogfish (all Council managed species).^{xxv} They are also prey for sea birds and marine mammals.

Scaled sardine (*Harengula jaguana*) are a schooling, pelagic species, found along the coast and in bays and estuaries from New Jersey to Florida. They are typically about seven inches long as adults.

Atlantic thread herring (*Opisthonema oglinum*) are named for the long, thin ray that extends from their dorsal fin. They are a coastal, pelagic, migratory, schooling species and can reach twelve inches in length. They are filter feeders and mostly consume plankton. They are mostly a tropical and subtropical species and are not common north of Cape Hatteras (Collette and Klein-MacPhee 2002).

Spanish sardine (*Sardinella aurita*) are a migratory, schooling, pelagic species found from Massachusetts to Florida. They are distributed from inshore waters to the edge of the continental shelf. They can reach fifteen inches in length (Kells and Carpenter 2011).

Justification for Inclusion in Amendment

Unmanaged herrings and sardines are prey for a variety of predators, including many Council managed species. They are also caught in bottom trawl fisheries for several Council managed species (Table 7).^{xxvi} Commercial fish dealer data show no landings of unmanaged herrings and sardines in the northeast during 1996-2015; however, there were landings of unclassified herrings (likely containing landings of Atlantic herring, a managed species). These species have been harvested in other regions and other parts of the world (section 6.4.1.4), indicating some level of demand and the potential for future directed commercial fisheries in the Mid-Atlantic. This combination of documentation as prey, catch in Council managed fisheries, and existing market demand provided strong rationale for including unmanaged herrings and sardines in this amendment.

6.1.6. Lanternfish (Family Myctophidae)

Lanternfish are small, deep-sea fish named for their light-producing organs. They are found throughout the world. As a group, they are considered deep water species, though many species migrate to shallower depths at night. In general, they are found at depths of 160 to 4,000 feet, depending on the species and the time of day. They vary in size from less than two inches in length to over twelve inches, depending on the species. They mostly feed on small fish and invertebrates (Collette and Klein-MacPhee 2002, Froese and Pauly 2016).

^{xxv} Ibid

^{xxvi} Based on NEFOP data for sets or tows of all gear types which resulted in landings of a Council-managed species, 1996 through March 2016.

Lanternfish are “among the most numerous fishes on the high seas” (Froese and Pauly 2016) and are preyed upon by many fish and marine mammal species (Smith et al. 2015, Froese and Pauly 2016). They have been documented in the stomachs of several Council managed species, including black sea bass, monkfish, spiny dogfish, summer flounder, and bluefish.^{xxvii} They are also prey for several cetacean species (Smith et al. 2015), swordfish, and bluefin tuna (Chase 2002, Collette and Klien-MacPhee 2002).

No species of lanternfish are managed. At least five species are found in Mid-Atlantic Federal waters: horned lanternfish (*Ceratoscopelus maderensis*), Dumril’s headlightfish (*Diaphus dumerilii*), crocodile lanternfish (*Lampanyctus crocodilus*), Doflein’s false headlightfish (*Lobianchia dofleini*), and spotted lanternfish (*Myctophum punctatum*; Collette and Klein-MacPhee 2002, Froese and Pauly 2016).

Justification for Inclusion in Amendment

The Council included lanternfish in this amendment due to their role as prey for a variety of predators, including many Council managed species (Table 7).

NEFOP data include some records of lanternfish caught in bottom trawl tows which resulted in landings of *Illex* squid and longfin squid. Lanternfish fisheries have been explored in other parts of the world (e.g. Valinassab et al. 2007); therefore, there may be some potential (albeit limited due to their small size and depth range) for development of directed lanternfish fisheries in the Mid-Atlantic in the future.

6.1.7. Pearlsides (Family Sternoptychidae)

The Sternoptychidae family is known as the pearlside or hatchetfish family. Members of this family resemble lanternfish. Like lanternfish, they have bioluminescent organs. They are mostly found in the open ocean and are rarely seen in nearshore areas. No pearlside species are managed. At least four species are found in Mid-Atlantic Federal waters: silver hatchetfish, (*Argyropelecus aculeatus*), Muller's pearlside (*Maurolicus muelleri*), Weizman's pearlside (*Maurolicus weitzmani*), and slope hatchetfish (*Polyipnus clarus*). These species are generally less than 2.5 inches in length. They are all found in deep water (up to 2,000 feet). They typically move closer to the surface at night and to greater depths during the day. They are widely distributed throughout the Atlantic and mostly feed on zooplankton (Collette and Klein-MacPhee 2002).

Pearlsides are prey for a variety of groundfish species, harbor porpoise, common dolphins (Collette and Klein-MacPhee 2002), and spiny dogfish.^{xxviii}

^{xxvii} As shown in diet data collected from NEFSC bottom trawl survey tows in Mid-Atlantic or southern New England offshore strata from 1973 through 2015.

^{xxviii} Ibid

Justification for Inclusion in Amendment

The Council included pearlides in this amendment due to their role as prey for a variety of predators, including spiny dogfish, a Council managed species.

6.1.8. Sand Lances (Family Ammodytidae)

Sand lances are sometimes called sand eels due to their eel-like appearance. Two species of sand lance, American/inshore sand lance (*Ammodytes americanus*) and northern/offshore sand lance (*A. dubius*), are found in the Mid-Atlantic Federal waters.

American sand lance are generally found along the shore between the high and low water marks and on the shallower portions of offshore banks. They are distributed from Newfoundland and northern Labrador to Chesapeake Bay. They are occasionally found as far south as North Carolina. They reach four to six inches in length as adults, can form dense schools, and burrow in sand. They mostly feed on crustaceans, but consume a variety of small marine animals. They are important prey for many species of fish, marine mammals, sharks, and sea birds (Table 7; Collette and Klein-MacPhee 2002; Chase 2002; Kells and Carpenter 2011; Smith et al. 2015; Clay et al. 2014; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015).

Northern sand lance are mostly found in areas further offshore than American sand lance. They are found on the shallower areas of offshore banks and over soft substrates that are conducive to burrowing. They are distributed from Greenland to Cape Hatteras, North Carolina. They can reach up to twelve inches in length and feed mostly on macrozooplankton, especially copepods. They form dense schools and are important prey for a variety of fish and marine mammal species. Fin and humpback whales can consume large quantities of northern sand lance (Collette and Klein-MacPhee 2002).

Sand lances made up almost 6% of the relative mean weight of stomach contents of bluefish, based on samples from NEFSC trawl survey stations in Mid-Atlantic and southern New England offshore strata from 1973-2015. They were also present in the diets of monkfish, summer flounder, Atlantic mackerel, black sea bass, and spiny dogfish at lower levels. Their abundance may be partly regulated by the abundance of Atlantic mackerel and Atlantic herring, which prey upon sand lances (Collette and Klein-MacPhee 2002).

Both American sand lance and northern sand lance have been commercially harvested in New England in the past. Sand lances have also been harvested for fishmeal in the North Sea (Collette and Klein-MacPhee 2002).

Justification for Inclusion in Amendment

The Council included sand lances in this amendment in part due to their importance as prey for Council managed species, large whales, and other predators. In addition, the Council saw the potential for future targeted commercial sand lance fisheries. Sand lances have been harvested in

commercial fisheries in the past (section 6.4.1.5) and they are caught in existing fisheries in the Mid-Atlantic. For example, NEFOP data includes records of unclassified sand lances caught in bottom trawl tows which resulted in landings of butterfish, summer flounder, scup, golden tilefish, longfin squid, and other Council managed species. They have also been caught in scallop dredge tows which resulted in landings of Council managed species.^{xxix} This combination of importance as prey and potential for commercial harvest in the Mid-Atlantic provided strong justification for including sand lances in this amendment.

6.1.9. Silversides (Family Atherinopsidae)

The family atherinopsidae includes several marine and freshwater species. None of these species are managed by the New England, Mid-Atlantic, or South Atlantic Fishery Management Councils or by the ASMFC. At least three species are found in Mid-Atlantic Federal waters: rough silverside (*Membras martinica*), inland silverside (*Menidia beryllina*), and Atlantic silverside (*M. menidia*). All three species inhabit fresh and brackish coastal and marine waters and are widely distributed throughout the U.S. east coast. They reach three to five inches in length, depending on the species. They form schools and are prey for a variety of fish and sea bird species, as well as dolphins (Collette and Klein-MacPhee 2002, Kells and Carpenter 2011). They are prey for several Council managed species, including monkfish, Atlantic mackerel, and spiny dogfish.^{xxx}

Justification for Inclusion in Amendment

The Council included silversides in this amendment due to their role as prey for several species (including Council-managed species) and the potential for directed commercial fisheries in the Mid-Atlantic. They are caught in bottom trawl fisheries for several Council managed fisheries, including Atlantic mackerel, black sea bass, butterfish, longfin squid, scup, and summer flounder.^{xxxi} They have been harvested in the past for human consumption and have been harvested in recent years for bait and feed for aquariums (section 6.4.1.6).

6.1.10. Cusk-Eels (Order Ophidiiformes)

The Ophidiiformes order contains two families which are found in the Mid-Atlantic: the Ophidiidae, or cusk-eel family, and the Carapidae, or pearlfish family (not to be confused with the pearlside family, section 6.1.7). Members of the Ophidiiformes resemble true eels but can be distinguished by the presence of pelvic fins and a large opercular opening (Collette and Klein-MacPhee 2002). At least three Ophidiiformes species are found in Mid-Atlantic Federal waters: chain pearlfish (*Echiodon dawsoni*, family Carapidae), fawn cusk-eel (*Lepophidium*

^{xxix} The scallop fishery is managed by the New England Fishery Management Council, but interacts with several species managed by the Mid-Atlantic Council.

^{xxx} Ibid

^{xxxi} Based on NEFOP data for sets or tows of all gear types which resulted in landings of a Council-managed species, 1996 through March 2016.

profundorum, family Ophidiidae), and striped cusk-eel (*Ophidion marginatum*, family Ophidiidae). None of these species are managed.

Chain pearlfish are a marine, demersal species, found in depths of about 200 to 600 feet. They are present, but rare in the Mid-Atlantic (Froese and Pauly 2016).

Fawn cusk-eels are mostly found on the outer continental shelf between Cape Cod and Cape Hatteras, North Carolina. They can grow to about ten inches in length and feed mostly on polychaete worms, amphipods, decapods, and fish (Collette and Klein-MacPhee 2002). Fawn cusk-eels are prey for monkfish, bluefish, summer flounder, black sea bass, spiny dogfish,^{xxxii} dusky shark (personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), and other predators.

Striped cusk-eels can grow to about ten inches in length and are found in bays, estuaries, and nearshore marine environments from New York to Florida. They burrow in soft substrates. They are most active at night and mostly feed on crustaceans and fish (Collette and Klein-MacPhee 2002). Striped cusk-eels are prey for monkfish, summer flounder, spiny dogfish,^{xxxiii} blue sharks (personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), and other predators.

Cusk-eels in the family Ophidiidae resemble cusk (*Brosme brosme*) in both name and appearance; however, cusk is a member of the Gadidae family and is not included in this amendment.

Justification for Inclusion in Amendment

The Council included cusk-eels in the amendment due to their role as prey for several Council managed species. There may be some potential for development of a cusk-eel fishery in the Mid-Atlantic, though they were not found in dealer data during 1996-2015. They are caught in existing commercial fisheries in the Mid-Atlantic, including bottom trawl fisheries for Atlantic mackerel, black sea bass, bluefish, butterfish, *Illex* squid, longfin squid, monkfish, scup, spiny dogfish, and summer flounder. Small amounts were observed in gillnet fisheries for spiny dogfish and in scallop dredge tows which resulted in landings of summer flounder.^{xxxiv}

6.1.11. Atlantic Saury (*Scomberesox saurus*)

Atlantic saury are sometimes called halfbeaks due to their elongated jaws, the bottom of which is longer than the top. They can be distinguished from halfbeaks in the family Hemiramphidae

^{xxxii} As shown in diet data collected from NEFSC bottom trawl survey tows in Mid-Atlantic or southern New England offshore strata from 1973 through 2015.

^{xxxiii} Ibid

^{xxxiv} The scallop fishery is managed by the New England Fishery Management Council, but interacts with several species managed by the Mid-Atlantic Council.

(section 6.1.4) by their top jaw; in Hemiramphidae species, only the bottom jaw is elongated. Atlantic saury are also called skippers because they can leap above the surface to escape predation. They are widely distributed on both sides of the Atlantic. In the western North Atlantic they range from the Gulf of St. Lawrence to Cape Hatteras. They are a migratory, oceanic, schooling species. They often form large schools close to the surface. They are omnivorous, feeding on algae, zooplankton, and fish larvae. Schools of Atlantic saury are preyed upon by many fish and marine mammal species (Collette and Klien-MacPhee 2002). They are also prey for swordfish (Runderhausen et al. 2010), thresher and shortfin mako sharks (personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), and sea birds (Clay et al. 2014).

Justification for Inclusion in Amendment

The Council included Atlantic saury in the amendment due to their role as prey for a variety of species, including bluefish (a Council managed species).^{xxxv}

There is likely limited potential for development of directed Atlantic saury commercial fisheries in the Mid-Atlantic in the near future because they appear to be rarely caught in existing fisheries (as shown in NEFOP and VTR data; Table 7) and they were not found in commercial fish dealer data from the northeast during 1996-2015. However, despite this limited potential, the Council wished to take proactive action against development of new fisheries due to their importance in the ecosystem.

6.1.12. Atlantic Chub Mackerel (*Scomber colias*)

Chub mackerel are a schooling, migratory, pelagic species. They resemble Atlantic mackerel, but are slightly smaller, generally reaching 8-14 inches in length, and have a more mottled coloration than Atlantic mackerel. Their distribution is more southerly than that of Atlantic mackerel, spanning from Nova Scotia and the Gulf of St. Lawrence to Florida, the Bahamas, and Venezuela. They are found on both sides of the Atlantic, as well as in the Mediterranean and the southern Black Sea. They are replaced by a closely related species, *Scomber japonicus*, in the Indian and Pacific Oceans (Collette and Klein-MacPhee 2002, Froese and Pauly 2016).

Chub mackerel are frequent prey for tunas and billfishes in the Mid-Atlantic (personal communication, Dr. John Graves, Virginia Institute of Marine Science, July 2016). Scombrids made up 7% of the relative mean weight of stomach contents of spiny dogfish, based on samples from NEFSC trawl survey stations in Mid-Atlantic and southern New England offshore strata from 1973-2015. This likely includes managed species such as Atlantic mackerel as well as chub mackerel. Scombrids were also present in the diets of monkfish and summer flounder, though at levels below 5%. Scombrids are also prey for a variety of shark and marine mammal species (Table 7; Smith et al. 2015; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015).

^{xxxv} Ibid

Justification for Inclusion in Amendment

The Council included chub mackerel in this amendment because of their importance as prey for a number of predators in the Mid-Atlantic, especially for tuna and billfish species which support important recreational fisheries (section 6.4.3). In recent years, a directed chub mackerel fishery developed in the absence of regulations. This fishery landed at least one million pounds per year during 2013-2015 (section 6.4.1.8). The Council agreed that this fishery should be regulated to prevent possible negative ecosystem and socioeconomic impacts.

Chub mackerel are largely landed by vessels which also participate in the *Illex* squid fishery.^{xxxvi} They are also caught in Council managed bottom trawl fisheries for black sea bass, butterfish, longfin squid, scup, summer flounder, and other Council managed species. They have been recorded in gillnet sets which resulted in landings of Atlantic mackerel, black sea bass, butterfish, monkfish, and spiny dogfish.^{xxxvii}

6.1.13. Bullet Mackerel (*Auxis rochei*)

Bullet mackerel are also called bullet tuna. They can reach about 20 inches in length and resemble frigate mackerel (*Auxis thazard*). They feed on a variety of prey, especially clupeoids (i.e. herrings and sardines), crustaceans, and squids. Bullet mackerel are found nearly world-wide in warm waters. In the western Atlantic, they are found from Cape Cod to the Gulf of Mexico and the Caribbean (Collette and Klein-MacPhee 2002). They form schools (Froese and Pauly 2016). Bullet mackerel are a dominant prey for tunas and billfish sampled from fishing tournaments in the Mid-Atlantic (personal communication, Dr. John Graves, Virginia Institute of Marine Science, July 2016). They are also prey for blue marlin and yellowfin tuna (Runderhausen et al. 2010).

Justification for Inclusion in Amendment

The Council included bullet mackerel in this amendment due to their importance in the diet of tunas and billfishes, which support important recreational fisheries in the Mid-Atlantic (section 6.4.3). In addition, their schooling behavior could lend them to capture in commercial fisheries. There were no dealer-reported landings of bullet mackerel in the northeast during 1996-2015; however, there were dealer-reported landings of frigate mackerel, which resemble bullet mackerel (section 6.4.1.7). Some landings of bullet mackerel may have been reported as frigate mackerel. NEFOP data includes records of small amounts of bullet mackerel caught in bottom trawl tows which resulted in landings of longfin squid, black sea bass, and summer flounder.

^{xxxvi} Based on commercial fish dealer data and supported by public comments.

^{xxxvii} These statements are based on NEFOP data for sets or tows of all gear types which resulted in landings of a Council-managed species, 1996 through March 2016.

6.1.14. Frigate Mackerel (*Auxis thazard*)

Frigate mackerel are also called frigate tuna. They can reach two feet in length and form schools. They feed on a variety of fish, squids, and small crustaceans. In the western North Atlantic they are mostly found from North Carolina to Florida (Kells and Carpenter 2011, Froese and Pauly 2016). They are a dominant prey item for tunas and billfish sampled from fishing tournaments in the Mid-Atlantic (personal communication, Dr. John Graves, Virginia Institute of Marine Science, July 2016). They are also prey for blue marlin and yellowfin tuna (Runderhausen et al. 2010).

Justification for Inclusion in Amendment

The Council included frigate mackerel in this amendment due to their importance in the diet of tunas and billfishes, which support important recreational fisheries in the Mid-Atlantic (section 6.4.3). In addition, frigate mackerel have been sold to federally-permitted dealers in recent years (section 6.4.1.7), indicating some level of demand and thus the potential for development of a directed commercial fishery.

6.1.15. Pelagic Mollusks Except Sharptail Shortfin Squid

The molluscan phylum is extremely large, containing at least 50,000 extant species (Pechenik 2005). Pelagic members of this phylum include squids, some species of octopus, and pteropods.^{xxxviii}

Illex squid (*Illex illecebrosus*) and longfin squid (*Doryteuthis [Amerigo] pealeii*) are managed by the Mid-Atlantic Council and are thus not included in this amendment. Sharptail shortfin squid (*I. oxygonius*) are not managed, but are not included in this amendment because their range overlaps with that of *Illex* squid and the two species can be difficult to distinguish. This could pose challenges for enforcement of different sets of regulations for the two species.

Other examples of unmanaged pelagic mollusks found in Mid-Atlantic Federal waters include: neon flying squid (*Ommastrephes bartramii*), oceanic squid (*Todarodes sagittatus*), Atlantic brief squid (*Lolliguncula brevis*), five species of bobtail squid (*Heteroteuthis dispar*, *Rossia megaptera*, *R. palpebroso*, *Semirossia tenera*, *Stoloteuthis leucoptera*), and pteropods (orders Gymnosomata and Thecosomata).

Most octopod species are benthic, and thus would not fall into the category of “pelagic mollusks”. At least one pelagic mollusk is found in Mid-Atlantic Federal waters: the tuberculate pelagic octopus (*Ocythoe tuberculata*). Pelagic tuberculate octopus are the only cephalopods known to have a gas bladder for buoyancy regulation, like fish. This bladder is found only in the female of the species (Pechenik 2005). Fisheries in the Mid-Atlantic likely rarely encounter pelagic octopods.

^{xxxviii} Cuttlefish are also pelagic members of the molluscan phylum (class Cephalopoda, order Sepiida); however, they are not found in the Mid-Atlantic (Young et al. 1998).

Cephalopods (i.e. squids and octopods)^{xxxix} are important prey for many Council managed species. For example, they made up 51% of the relative mean weight of stomach contents of *Illex* squid, 20% of the stomach contents of longfin squid, and about 9% of the stomach contents of bluefish, based on samples from NEFSC trawl survey stations in Mid-Atlantic and southern New England offshore strata from 1973-2015. They were also present in the diets of monkfish, butterfish, summer flounder, Atlantic mackerel, scup, black sea bass, and spiny dogfish, though at lesser amounts. They are also important prey for many marine mammals (Smith et al. 2015), sharks (personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015), and highly migratory species (Rundershausen et al. 2010; Table 7).

It can be difficult to identify cephalopods to the species level in stomach contents because they degenerate much faster than bony fish. For this reason, it is common for diet studies to list prey items such as “cephalopods” or “squid”, rather than identifying them to the species level. Diet data from the NEFSC trawl survey include some examples of pelagic mollusks identified to the species or family level. For example, Atlantic brief squid were identified in the stomachs of summer flounder and spiny dogfish. Bobtail squids (family Sepiolidae) were identified in the stomachs of monkfish, summer flounder, black sea bass, and spiny dogfish. Shelled pteropods (order Thecosomata) were found in the stomachs of Atlantic mackerel, black sea bass, and spiny dogfish.^{xl}

Justification for Inclusion in Amendment

The Council included unmanaged pelagic mollusks in the amendment in recognition of their importance as prey for many predators, including several Council managed species (Table 7), and also in recognition of the large-scale commercial fisheries for various squid species throughout the world, including in the Mid-Atlantic. Some unmanaged pelagic mollusks have been commercially harvested in other parts of the world (e.g. DFO 1999). Unclassified mollusks, unclassified squids (likely including managed species), and unclassified octopods have been caught in bottom trawl tows which resulted in landings of every Council managed species, as well as scallop dredge tows, gillnet sets, and midwater trawl tows which resulted in landings of some Council managed species (based on NEFOP data; Table 7). For these reasons, the Council saw the potential for development of directed commercial fisheries for unmanaged pelagic mollusks in the Mid-Atlantic.

6.1.16. Copepods, Krill, Amphipods, and Other Species Under One Inch as Adults

The category of “copepods, krill, amphipods, and any other species under one inch as adults” contains a very diverse group of species and is not defined by a single taxonomic group. Some species are planktonic, some are free-swimming, others are benthic, and some are parasitic.

^{xxxix} Ibid.

^{xl} As shown in diet data collected from NEFSC bottom trawl survey tows in Mid-Atlantic or southern New England offshore strata from 1973 through 2015.

Copepods (subclass Copepoda) are very abundant, small marine crustaceans. They are usually less than a tenth of an inch in length. Most copepod species are free-swimming and feed on phytoplankton. Some species are parasitic. Copepods form a major component of the zooplankton in some areas. They are a major prey item for many species (Pechenik 2005). They are prey for several Council managed species. For example, copepods made up 24% of the relative mean weight of stomach contents of Atlantic mackerel and were also present at lower frequencies in the diets of summer flounder, scup, black sea bass, butterfish, and longfin squid, based on samples from NEFSC trawl survey stations in Mid-Atlantic and southern New England offshore strata from 1973-2015.

Krill (order Euphausiacea) are small, marine crustaceans. They are found throughout the world and make up a major component of the diet of several whale, fish, squid, shrimp, and seabird species (Pechenik 2005). They are prey for several Council managed species. Krill made up almost 19% of the stomach contents of Atlantic mackerel. They are also prey for longfin squid, *Illex* squid, butterfish, summer flounder, scup, black sea bass, bluefish, spiny dogfish, and monkfish.^{xli}

There are approximately 6,000 species of amphipods. The order Amphipoda contains several sub-orders, which include gammarid amphipods, hyperiid amphipods, capprellid amphipods, and others. They are small crustaceans and can be found in fresh, brackish, and marine waters. Some species are parasitic. Some species are important prey for marine fish and marine mammals (Pechenik 2005). Based on diet data from NEFSC trawl survey stations in offshore waters of the Mid-Atlantic and southern New England, gammarid amphipods made up 9% of the stomach contents of scup and hyperiid amphipods made up 10% of the stomach contents of Atlantic mackerel. Amphipods were also identified in the stomachs of black sea bass, summer flounder, bluefish, butterfish, monkfish, longfin squid, *Illex* squid, and spiny dogfish.

The category of “other species under one inch as adults” contains a variety of other organisms, including, but not limited to, ostracods (subclass Ostracoda), isopods (order Isopoda), some species of shrimp, and pteropods. Ostracods, isopods, and shrimp are small crustaceans. Ostracods and isopods are found in marine, brackish, and freshwater environments. Most ostracod species are benthic, though some are planktonic. Some isopod species are parasitic (Pechenik 2005). Ostracods are prey for bluefish. Isopods are prey for summer flounder, scup, black sea bass, Atlantic mackerel, butterfish, spiny dogfish, and monkfish.^{xlii}

The term “shrimp” refers to several types of decapod crustaceans (a classification which also includes crabs and lobsters). Most shrimp species in the Mid-Atlantic reach lengths greater than one inch. Some shrimp species, including, mysid shrimp (order Mysidacea) do not typically exceed one inch in length. Mysid shrimp are heavily preyed upon by some fish species (Pechenik

^{xli} Ibid

^{xlii} Ibid

2005). They are prey for summer flounder, scup, black sea bass, spiny dogfish, monkfish, and longfin squid.^{xliii} The South Atlantic Fishery Management Council manages five shrimp species (white shrimp, *Litopenaeus setiferus*; pink shrimp, *Farfantepenaeus duorarum*, brown shrimp, *Farfantepenaeus aztecus*, rock shrimp, *Sicyonia brevirostris*, and royal red shrimp, *Pleoticus robustus*). The ASMFC manages one shrimp species (northern shrimp, *Pandalus borealis*). None of these managed species will be regulated by this amendment.

Pteropods fit into two classifications in the list of taxa approved by the Council (Table 4): they are pelagic mollusks (section 6.1.15) and they do not exceed one inch in length as adults. Pteropods are very small pelagic gastropods which use a modified “foot” to swim. Pteropods in the order Gymnosomata are known as sea angels and do not have a shell, while pteropods in the order Thecosomata, also known as sea butterflies, do have shells. Pteropods are prey for black sea bass and spiny dogfish.^{xliv}

Many species in the category of “copepods, krill, amphipods, and any other species under one inch as adults” are prey for marine mammals. For example, krill and copepods are important prey for humpback whales in certain areas at certain times of the year. Zooplankton are a component of the diet of several large whale species, including fin, humpback, right, sei, and minke whales (Smith et al. 2015).

Justification for Inclusion in Amendment

The Council included copepods, krill, amphipods, and other species under one inch as adults in this amendment due to their importance as prey for a variety of Council managed species and marine mammals. Fisheries for some of these species, including krill and copepods, have been pursued or explored in other parts of the world (e.g. 80 *Federal Register* 9314, February 20, 2015). Due to their small size, these species are not caught with the gears used in existing fisheries in the Mid-Atlantic, as shown in NEFOP data, VTR records, and public comments.

6.2. Council Managed Species and Other Predators of Forage Species

The following sections briefly describe the recent biological conditions of Council managed species and a few key other predators of forage species, namely large tunas, billfish, sharks, and seabirds. Many marine mammals are also predators of forage species. Marine mammal predators are described in the section 6.3.

6.2.1. Council managed Species

The Council develops regulations for commercial and recreational fisheries for fourteen fish and invertebrate species. The following sections briefly summarize the recent biological conditions of these species. More information can be found on the Council’s website (www.mafmc.org).

^{xliii} Ibid

^{xliv} Ibid

6.2.1.1. Summer Flounder

Summer flounder (*Paralichthys dentatus*) are a demersal flatfish species which inhabit shallow coastal and estuarine waters during the warmer months of the year and offshore waters during the cooler months. Summer flounder habitat includes pelagic waters, demersal waters, saltmarsh creeks, seagrass beds, mudflats, and open bay areas from the Gulf of Maine through North Carolina. Summer flounder are opportunistic feeders, feeding on a variety of fish and crustaceans (Packer et al. 1999), including some of the forage taxa included in this amendment (Table 7). According to the most recent stock assessment information, summer flounder were not overfished, but overfishing was occurring in 2015 (NEFSC 2016).

6.2.1.2. Scup

Scup (*Stenotomus chrysops*) are a schooling, demersal species. They are found in a variety of habitats from the Gulf of Maine through Cape Hatteras, North Carolina. Scup are found in estuaries and coastal waters during the spring and summer. In the fall and winter they move offshore and to the south, to outer continental shelf waters south of New Jersey. Adult scup are benthic feeders. They consume a variety of prey, including small crustaceans (including zooplankton), polychaetes, mollusks, small squid, vegetable detritus, insect larvae, hydroids, sand dollars, and small fish (Steimle et al. 1999) , including some of the forage taxa included in this amendment (Table 7). According to the most recent stock assessment information, scup were not overfished and overfishing was not occurring in 2014 (NEFSC 2015A).

6.2.1.3. Black Sea Bass

Black sea bass (*Centropristis striata*) are distributed from the Gulf of Maine through the Gulf of Mexico. Adults and juveniles are mostly found on the continental shelf, but young of the year can be found in estuaries. Adults prefer to be near structures such as rocky reefs, coral patches, cobble and rock fields, mussel beds, and shipwrecks. Adults in the Mid-Atlantic show strong site fidelity during the summer but migrate to offshore wintering areas south of New Jersey when water temperatures decrease in the fall. Black sea bass are protogynous hermaphrodites, meaning that they are born female but some later transition to males, usually around 2-5 years of age. Juvenile and adult black sea bass mostly feed on crustaceans, small fish, and squid (Drohan et al. 2007) , including some of the forage taxa included in this amendment (Table 7). According to the most recent stock assessment, black sea bass are not overfished and overfishing is not occurring (NEFSC 2017).

6.2.1.4. Atlantic Mackerel

Atlantic mackerel (*Scomber scombus*) are a pelagic, schooling species distributed between Labrador and North Carolina. They are primarily found on the continental shelf during the winter and in coastal areas in the warmer months when they spawn. Atlantic mackerel are opportunistic feeders. As adults, they feed mostly on small crustaceans and small pelagic mollusks, including

some of the forage taxa included in this amendment (Table 7). Mackerel are important prey for many fish, marine mammal, and sea bird species.

The most recent benchmark assessment for Atlantic mackerel was completed in 2010. The assessment was not able to determine current exploitation rates or stock biomass; therefore, it is not known if the stock is overfished or experiencing overfishing (TRAC 2010).

6.2.1.5. *Illex* Squid

Illex squid (*Illex illecebrosus*) in U.S. waters have a maximum lifespan of about 7 months (Hendrickson 2004). They feed primarily on fish, cephalopods, and crustaceans. Their diet includes some of the forage taxa included in this amendment (Table 7). They are prey for many fish, sea bird, and marine mammal species, as well as for some other squids.

Due in part to their short lifespan, *Illex* squid have proven difficult to assess with traditional stock assessment models. The most recent *Illex* squid benchmark stock assessment took place in 2006 and not able to determine current exploitation rates or stock biomass; therefore, the overfished and overfishing status of *Illex* squid is unknown (NEFSC 2006).

6.2.1.6. Longfin Squid

In the northwest Atlantic Ocean, longfin squid (*Doryteuthis pealeii*) are most abundant in the waters between Georges Bank and Cape Hatteras. Longfin squid migrate offshore during late autumn to overwinter in warmer waters along the shelf edge and slope and then return inshore during the spring where they remain until late autumn (Jacobson 2005). Longfin squid migrate long distances during their short lifespan. Environmental factors largely drive recruitment (Dawe et al. 2007). Their diet includes some of the forage taxa included in this amendment (Table 7). Longfin squid are a key prey species for a variety of marine mammals, diving birds, and finfish species (Clarke 1996, Overholtz et al. 2000, Jacobson 2005).

Due mostly to their short lifespan and dramatic annual fluctuations in abundance, longfin squid have proven difficult to assess with traditional stock assessment models. The most recent stock assessment indicated that the longfin stock was not overfished in 2009. Overfishing status could not be determined; however, the assessment and reviewers concluded that the stock appears to be lightly exploited (NEFSC 2010).

6.2.1.7. Atlantic Butterfish

Butterfish (*Peprilus triacanthus*) are a fast-growing species that seldom attains ages greater than three years. They form schools of similarly-sized individuals and move seasonally between inshore and offshore waters. They feed on some small squids and small crustaceans (Table 7). They are prey for many fish species (Collette and Klein-MacPhee 2002).

Based on the most recent benchmark stock assessment, butterfish are not overfished and overfishing is not occurring (NEFSC 2014).

6.2.1.8. Bluefish

Bluefish (*Pomatomus saltatrix*) are a migratory species found in temperate and tropical coastal oceans worldwide. In the United States, bluefish are found along the entire east coast from Maine through Florida. They eat a wide variety of prey (including several taxa included in this amendment; Table 7) and are known for a feeding behavior called the "bluefish blitz" where large schools of bluefish attack small fish near the surface. According to the most recent benchmark assessment, bluefish were not overfished and overfishing was not occurring in 2014 (NEFSC 2015A).

6.2.1.9. Golden Tilefish

Golden tilefish (*Lopholatilus chamaelonticeps*) are slow-growing and can reach sizes of almost four feet in length, although the average size harvested is 2 feet. They typically live at depths of 250-1,500 feet. They are found in and around submarine canyons where they burrow in mud or sand.

Based on the most recent benchmark stock assessment, golden tilefish were not overfished and overfishing was not occurring in 2013 (NEFSC 2014).

6.2.1.10. Blueline Tilefish

Blueline tilefish (*Caulolatilus microps*) typically reach about 32 inches in length and live for about 15 years. They construct burrows in sand, usually near rocky outcroppings. They are relatively sedentary. They are mostly distributed from Virginia south to the Gulf of Mexico in depths of 98-775 feet (Kells and Carpenter 2011).

The most recent stock assessment for blueline tilefish indicated that the stock was overfished and overfishing was occurring in 2011 (SEDAR 2013).

6.2.1.11. Spiny Dogfish

Spiny dogfish (*Squalus acanthias*) are a small shark species found in the North Atlantic and North Pacific Oceans, mostly in the temperate and subarctic areas. They are a high trophic-level species and feed on a wide variety of fish and invertebrate species, including some of the forage taxa included in this amendment (Table 7). They are found both inshore and offshore, usually near the bottom but also in mid-water and at the surface.

According to the most recent assessment update, spiny dogfish were not overfished and overfishing was not occurring in 2014 (NEFSC 2015B).

6.2.1.12. Monkfish

Monkfish (also known as goosfish; *Lophius piscatorius*) are a demersal marine species. They are typically found at depths of about 80-650 feet. Their diet includes some of the forage taxa

included in this amendment (Table 7). According to the most recent assessment update, monkfish were not overfished and overfishing was not occurring in 2012 (NEFSC 2013c).

6.2.1.13. Surf Clams

Atlantic surf clams (*Spisula solidissima*) are distributed along the western North Atlantic Ocean from the southern Gulf of St. Lawrence to Cape Hatteras. High concentrations are found primarily off New Jersey, the Delmarva Peninsula, and on Georges Bank. The maximum size of surf clams is about 9 inches shell length, but surf clams larger than 8 inches are rare. The maximum age exceeds 30 years and individuals of 15-20 years of age are common in many areas. Atlantic surf clams are filter feeders. Predators of surf clams include certain species of crabs and other crustaceans, sea stars, snails, as well as fish predators such cod and haddock.

According to the most recent benchmark assessment, surf clams were not overfished and overfishing was not occurring in 2012 (NEFSC 2013a).

Of the 14 species managed by the Mid-Atlantic Council, only surf clams and ocean quahogs do not have a nexus with the forage species included in this amendment either through predator/prey relationships or catch in the same fisheries (Table 7). For this reason, surf clams and ocean quahogs are not expected to be impacted by the alternatives described in this document.

6.2.1.14. Ocean Quahogs

Ocean quahogs (*Arctica islandica*) are distributed in temperate and boreal waters on both sides of the North Atlantic Ocean. In the Northeast Atlantic, they are found from Newfoundland to Cape Hatteras. The US stock is almost entirely within the EEZ, outside of state waters, and at depths between 20 and 80 meters. Ocean quahogs burrow in a variety of substrates and are often associated with fine sand. They are one of the longest-living, slowest growing marine bivalves in the world. Under normal circumstances, they live to more than 100 years old. They have been aged in excess of 200 years.

According to the most recent stock assessment update, ocean quahogs are not overfished and overfishing is not occurring (NEFSC 2013b).

Of the 14 species managed by the Mid-Atlantic Council, only surf clams and ocean quahogs do not have a nexus with the forage species included in this amendment either through predator/prey relationships or catch in the same fisheries (Table 7). For this reason, surf clams and ocean quahogs are not expected to be impacted by the alternatives described in this document.

6.2.2. Other Predators of Forage Species

The following sections briefly summarize the recent conditions of a few key predators of unmanaged forage species, specifically, large tunas and billfish, sharks, and seabirds. This document does not include a comprehensive list of all predators of unmanaged forage species but

rather focuses on a few key predators to examine the potential ecological impacts of the management alternatives.

6.2.2.1. Large Tunas, Billfish, and Swordfish

Several large tuna and billfish species can be found in the Mid-Atlantic, including yellowfin tuna (*Thunnus albacares*), bigeye tuna (*Thunnus obesus*), Atlantic bluefin tuna (*Thunnus thynnus*), swordfish (*Xiphias gladius*), sailfish (*Istiophorus platypterus*), blue marlin (*Makaira nigricans*), white marlin (*Kajikia albida*), roundscale spearfish (*Tetrapturus georgii*), and longbill spearfish (*Tetrapturus pfluegeri*). They are all widely distributed, highly migratory, and are fast swimmers. They range from 6 to 15 feet in length and are all high trophic level species (Kells and Carpenter 2011).

The diets of these species are, in general, not as well documented as those of managed species surveyed with state and Federal trawl surveys. Their relatively low abundance (compared to lower trophic level species), fast swimming speed, and various harvest restrictions pose challenges for obtaining diet samples (Rundershausen et al. 2010). They all prey on a variety of fish species, many of which are not included in this amendment due to their high trophic level and/or status as a managed species. This section summarizes only those prey species which are included in this amendment (Table 4).

Tunas and billfish are widely distributed and highly migratory; thus, their diet composition can vary greatly by season and location (Collette and Klien-MacPhee 2002). For example, swordfish are opportunistic feeders with a varied diet that includes squids, mackerels, herrings, sauries, and argentines. Lanternfish have been found in the stomachs of swordfish caught in offshore waters (Collette and Klein-MacPhee 2002). Bluefin tuna have a similarly varied diet, which includes squids, herrings, mackerels, sand lances, halfbeaks, krill, and lanternfish (Chase 2002, Collette and Klien-MacPhee 2002).

Cephalopods, especially squids, are widely preyed upon by a variety of large tunas and billfish, including swordfish, bluefin tuna, blue marlin, white marlin, longbill spearfish, bluefin tuna, and yellowfin tuna (Collette and Klein-MacPhee 2002, Rundershausen et al. 2010, Kells and Carpenter 2011).

Bullet and frigate mackerel are a dominant prey item for tunas and billfish sampled from fishing tournaments in the Mid-Atlantic (personal communication, Dr. John Graves, Virginia Institute of Marine Science, July 2016). They are prey for blue marlins, yellowfin tuna, and other species (Rundershausen et al. 2010). In addition, mackerels (not identified to the species level) are prey for swordfish, bluefin tuna, white marlin, and other species (Chase 2002, Collette and Klien-MacPhee 2002).

Halfbeaks are prey for bluefin tuna, yellowfin tuna, and blue marlin (Chase 2010, Rundershausen et al. 2010).

The stock status of large tunas and billfish in the Mid-Atlantic varies by species. As of November 2015, Atlantic yellowfin tuna and swordfish were not overfished and overfishing was not occurring within the United States. Blue marlin, white marlin, roundscale spearfish, and sailfish were overfished and overfishing was occurring. Bigeye tuna was not overfished, but overfishing was occurring. The overfished and overfishing status of longbill spearfish was unknown. Atlantic bluefin tuna were either overfished or not overfished and overfishing either was or was not occurring depending on the recruitment scenario used (NMFS 2015).

6.2.2.2. Sharks

Most shark species are highly migratory and have varied diets. Many of the forage taxa included in this amendment are prey for several shark species in the Mid-Atlantic (Table 7).

Of all the taxa included in the amendment, cephalopods (“pelagic mollusks”, Table 4) are the most widely preyed upon by a variety of shark species, including common thresher (*Alopias vulpinus*), bigeye thresher (*Alopias superciliosus*), blue shark (*Prionace glauca*), inshore shortfin mako (*Isurus oxyrinchus*), tiger shark (*Galeocerdo cuvier*), dusky shark (*Carcharhinus obscurus*), porbeagle (*Lamna nasus*), Atlantic sharpnose shark (*Rhizoprionodon terraenovae*), chain catshark (*Scyliorhinus rotifer*), black dogfish (*Centroscyllium fabricii*), kitefin shark (*Dalatias licha*), sand tiger shark (*Carcharias taurus*), and others (Collette and Klein-MacPhee 2002; Kells and Carpenter 2011; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015).

Mackerels (likely including chub mackerel) are prey for common thresher sharks, scalloped hammerheads (*Sphyrna lewini*), blue sharks, dusky shark, and porbeagles (Collette and Klein-MacPhee 2002; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015).

Herrings (likely including managed and unmanaged species) are prey for common thresher, dusky, porbeagle, and Atlantic sharpnose sharks. Sand lances are prey for common thresher, blue, shortfin mako, and dusky sharks. Anchovies are prey for blue, dusky, and Atlantic sharpnose sharks. Atlantic saury are prey for common thresher sharks and inshore shortfin makos. Cusk-eels are prey for blue and dusky sharks. Halfbeaks are prey for scalloped hammerheads (Collette and Klein-MacPhee 2002; Kells and Carpenter 2011; personal communication, Nancy Kohler, Apex Predators Program, NEFSC, Narragansett Laboratory, December 2015).

Whale sharks (*Rhincodon typus*) and basking sharks (*Cetorhinus maximus*) largely feed on plankton, including a variety of species which fall under the category of “copepods, krill, amphipods, and any other species under one inch as adults” (Table 4; Kells and Carpenter 2011). Black dogfish consume krill. Kitefin shark consume isopods and amphipods (Collette and Klein-MacPhee 2002).

As of November 2015, none of the shark species managed under the Consolidated Atlantic HMS FMP, including common thresher, bigeye thresher, blue, shortfin mako, tiger, dusky, Atlantic sharpnose, and sand tiger sharks, were experiencing overfishing within U.S. waters. Blue, shortfin mako, and sharpnose sharks were not overfished. Porbeagle, sandbar, dusky, and scalloped hammerheads were overfished (NMFS 2015).

6.2.2.3. Sea birds

Forage species are prey for a variety of seabirds in the Mid-Atlantic. For example, anchovies are prey for common terns, ospreys, cormorants, and pelicans. Herrings, including unmanaged species such as round herring, are prey for ospreys, cormorants, pelicans, and other sea birds. Sand lances are prey for shearwaters, terns, double crested cormorants, and other seabirds. Atlantic saury are prey for shearwaters and gannets. Krill are prey for gulls and fulmars. Squids are prey for shearwaters and fulmars. Zooplankton (likely including some “species under one inch as adults”; Table 4) are prey for storm petrels and phalaropes (Collette and Klein-MacPhee 2002, Clay et al. 2014).

Cury et al. (2011) examined seven ecosystems throughout the world’s oceans (not including the western North Atlantic) and found that seabird breeding success decreased and became more variable when forage fish abundances fell below one third of the species’ unfished biomass. Seabird fledging success is determined not only by the abundance of forage species, but also by the availability of forage species near breeding colonies during the breeding season (Clay et al. 2014).

6.2.2.3.1. ESA-Listed Seabirds and Seabirds of Conservation Concern

Some of the taxa included in this amendment (e.g. amphipods, isopods, sand lances) are prey for seabirds listed as under the Endangered Species Act (ESA), including red knot (*Calidris canutus*; threatened), piping plover (*Charadrius melodus*; threatened), and roseate tern (*Sterna dougallii*; endangered; personal communication, Dr. Peter Paton, University of Rhode Island). These seabirds largely consume these forage species along the shore, outside of the scope of this amendment, which will only regulate fishing activities in Federal waters.

The U.S. Fish and Wildlife Service (USFWS) identifies “birds of conservation concern”, which are species of migratory nongame birds that, without conservation measures, are likely to become candidates for listing under the ESA (USFWS 2008). Multiple birds of conservation concern are found in Mid-Atlantic Federal waters and likely feed on at least one of the forage taxa included in this amendment. These species include greater shearwaters (*Puffinus gravis*), Audubon’s shearwaters (*P. lherminieri*), least tern (*Sternula antillarum*), and black skimmers (*Rynchops niger*).

Greater shearwaters are found over the open ocean throughout the EEZ off the east coast and rarely come close to shore, except during storms. They mostly feed on small schooling fish and squid near the surface (Kaufman 1996).

Audubon's shearwaters are found in the open ocean over warm waters. They have been documented off southern New England in periods of especially high water temperatures; however, they are usually found off Delmarva and farther south. They rarely come close to shore in North America. Their diets are not well documented, but they feed on squid and small fish, including sardines (Kaufman 1996).

Least terns are found along the east coast on beaches, bays, large rivers, and sand flats. They nest on the shore, which makes them vulnerable to human disturbances. Their diet varies seasonally. They mostly feed on small fish, crustaceans, and insects (Kaufman 1996).

Black skimmers are found on Mid-Atlantic beaches during their breeding season. They have large bills, the bottom of which is longer than the top. They feed by "skimming" the water with their lower mandible while in flight, closing their beaks when they touch a fish (Kaufman 1996).

6.3. Protected Species of Fish, Sea Turtles, and Marine Mammal

Protected species are those afforded protections under the ESA (i.e. species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Multiple protected species occur in Mid-Atlantic Federal waters; however, only some of those species are expected to be impacted by the alternatives described in this document, either through their interactions with the fishing gears used to catch unmanaged forage species or through their role as predators for the forage taxa included in this amendment (Table 8).

NEFOP data and VTR data, supported by comments from AP members and members of the public, indicate that bottom otter trawls account for 90% or more of catch and landings of the taxa included in this amendment. Lesser amounts (10% or less) are caught with midwater trawls. Very small amounts are caught with other gear types, including gill nets, pots, traps, and dredges. Because these other gear types account for such a small amount of recent catches of these taxa, and because the alternatives described in this document are not expected to result in a notable change in fishing effort using these gear types (section 7.1), this section focuses on protected species that are found in Mid-Atlantic Federal waters and are known to interact with bottom or midwater trawls and/or are predators of the taxa included in this amendment. Other protected species are not expected to be impacted by the alternatives described in this document.

Thorny skate are 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. NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed action. Candidate species will not be discussed further in this and the following sections. Additional information on thorny skate can be found at <http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm>

Table 8: Species protected under the ESA and/or MMPA that may occur in the affected environment of this action.

<i>Species</i>	<i>Status</i> ¹	<i>Potentially affected by this action via:</i>	
		Gear Interactions	Predator of forage species
Cetaceans			
North Atlantic right whale (<i>Eubalaena glacialis</i>)	Endangered	No	Yes
Humpback whale (<i>Megaptera novaeangliae</i>) ²	Protected (MMPA)	No	Yes
Fin whale (<i>Balaenoptera physalus</i>)	Endangered	No	Yes
Sei whale (<i>Balaenoptera borealis</i>)	Endangered	No	Yes
Blue whale (<i>Balaenoptera musculus</i>)	Endangered	No	No
Sperm whale (<i>Physeter macrocephalus</i>)	Endangered	No	Yes
Minke whale (<i>Balaenoptera acutorostrata</i>)	Protected (MMPA)	Yes	Yes
Pilot whale (<i>Globicephala spp.</i>) ³	Protected (MMPA)	Yes	Yes
Pygmy sperm whale (<i>Kogia breviceps</i>)	Protected (MMPA)	No	Yes
Dwarf sperm whale (<i>Kogia sima</i>)	Protected (MMPA)	No	Yes
Risso's dolphin (<i>Grampus griseus</i>)	Protected (MMPA)	Yes	Yes
Atlantic white-sided dolphin (<i>Lagenorhynchus acutus</i>)	Protected (MMPA)	Yes	Yes
Short Beaked Common dolphin (<i>Delphinus delphis</i>) ⁴	Protected (MMPA)	Yes	Yes
Atlantic Spotted dolphin (<i>Stenella frontalis</i>)	Protected (MMPA)	No	Yes
Striped dolphin (<i>Stenella coeruleoalba</i>)	Protected (MMPA)	No	Yes
Beaked whales (<i>Ziphius and Mesoplodon spp</i>) ⁵	Protected (MMPA)	No	Yes
Bottlenose dolphin (<i>Tursiops truncatus</i>) ⁶	Protected (MMPA)	Yes	Yes
Harbor porpoise (<i>Phocoena phocoena</i>)	Protected (MMPA)	Yes	Yes
Pinnipeds			
Harbor seal (<i>Phoca vitulina</i>)	Protected (MMPA)	Yes	Yes
Gray seal (<i>Halichoerus grypus</i>)	Protected (MMPA)	Yes	Yes
Harp seal (<i>Phoca groenlandicus</i>)	Protected (MMPA)	Yes	Yes
Hooded seal (<i>Cystophora cristata</i>)	Protected (MMPA)	Yes	Yes
Sea Turtles			
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	Endangered	Yes	Yes

<i>Species</i>	<i>Status</i> ¹	<i>Potentially affected by this action via:</i>	
		Gear Interactions	Predator of forage species
Kemp's ridley sea turtle (<i>Lepidochelys kempii</i>)	Endangered	Yes	No
Green sea turtle, North Atlantic DPS (<i>Chelonia mydas</i>) ⁷	Threatened	Yes	No
Loggerhead sea turtle (<i>Caretta caretta</i>), Northwest Atlantic Ocean DPS	Threatened	Yes	No
Hawksbill sea turtle (<i>Eretmochelys imbricate</i>)	Endangered	No	No
Fish			
Thorny skate (<i>Amblyraja radiate</i>)	Candidate	Yes	Yes
Atlantic sturgeon (<i>Acipenser oxyrinchus</i>)			
<i>Gulf of Maine DPS</i>	Threatened	Yes	Yes
<i>New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS</i>	Endangered	Yes	Yes
Critical Habitat			
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA-listed	No	No
<p>¹ Status is defined by whether the species is listed under the ESA as endangered (i.e. at risk of extinction) or 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.</p> <p>² On September 8, 2016, a final rule was issued revising the ESA listing status of humpback whales (81 FR 62259). Fourteen DPSs were designated: one as threatened, four as endangered, and nine as not warranting listing. The DPS in U.S. Atlantic waters is delisted under the ESA; however, it is still protected under the MMPA.</p> <p>³ There are two species of pilot whales: short finned (<i>G. melas melas</i>) and long finned (<i>G. macrorhynchus</i>). Due to the difficulties in identifying the species at sea, they are often referred to as <i>Globicephala spp.</i></p> <p>⁴ Prior to 2008, this species was called “common dolphin.”</p> <p>⁵ There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier’s (<i>Ziphius cavirostris</i>), blainville’s (<i>Mesoplodon densirostris</i>), gervais’ (<i>M. europaeus</i>), sowerbys’ (<i>M. bidens</i>), and trues’ (<i>M. mirus</i>) beaked whales. Species of <i>Mesoplodon</i> are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.</p> <p>⁶ Includes only the Western North Atlantic Offshore stock of bottlenose dolphins.</p> <p>⁷ On April 6, 2016, a final rule was issued removing the current range-wide listing of green sea turtles and, in its place, listing eight green sea turtle DPSs as threatened and three as endangered (81 FR 20057). The green sea turtle DPS located in the Northwest Atlantic is considered threatened under the ESA.</p>			

6.3.1. Protected Species and Critical Habitat Not Likely to be Affected by the Proposed Action

Blue whales and hawksbill sea turtles are the only protected species within the affected environment that are not likely to be affected by the alternatives described in this document (Table 8). Hawksbill sea turtles are uncommon in the northern waters of the continental United States, but are widely distributed throughout the Caribbean Sea, off the coasts of Florida and Texas, in the Greater and Lesser Antilles, and along the mainland of Central America south to Brazil (Lund 1985; Plotkin and Amos 1988; Amos 1989; Groombridge and Luxmoore 1989;

Plotkin and Amos 1990; NMFS and USFWS 1993, 2013; Meylan and Donnelly 1999). There are accounts of hawksbills in south Florida and individuals have been sighted along the U.S. east coast as far north as Massachusetts, although sightings north of Florida are rare and in general, are animals observed stranded after hurricanes or offshore storms. The operation of fisheries considered in this amendment will not occur in waters that are typically used by hawksbill sea turtles and therefore, the alternatives are not likely to impact this species.

Blue whales do not regularly occur in waters of the U.S. EEZ and are most frequently sighted in the waters off eastern Canada, with most recent records from the Gulf of St. Lawrence where they are present throughout most of the year (Waring et al. 2010). No blue whales were observed during the Cetacean and Turtle Assessment Program (CeTAP) surveys of the mid- and North Atlantic areas of the outer continental shelf (CeTAP 1982). The operation of fisheries considered in this amendment will not occur in waters that are typically used by blue whales and therefore, the alternatives are not likely to impact this species.

The alternatives will not adversely modify or destroy critical habitat designated for the Northwest Atlantic DPS of loggerhead sea turtles. The fisheries considered in this action will not affect the essential physical and biological features of loggerhead critical habitat (NMFS 2014a).

6.3.2. Protected Species Potentially Affected by the Proposed Action

6.3.2.1. Sea Turtles

Hard-Shelled Sea Turtles

In U.S. northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida to Cape Cod, Massachusetts. Their presence varies with the seasons due to changes in water temperature (Braun-McNeill et al. 2008; Braun and Epperly 1996; Epperly et al. 1995A,B; Mitchell et al. 2003; Shoop and Kenney 1992; TEWG 1998, 2000, 2009; Blumenthal et al. 2006; Braun-McNeill and Epperly 2004; Griffin et al. 2013; Hawkes et al. 2006; Hawkes et al. 2011; Mansfield et al. 2009; McClellan and Read 2007; Morreale & Standora 2005).

As coastal water temperatures warm in the spring, loggerheads migrate to inshore waters of the southeast United States and move up the Atlantic coast (Braun-McNeill and Epperly 2004; Epperly et al. 1995A, B, C; Griffin et al. 2013; Morreale and Standora 2005). They arrive in Virginia foraging areas as early as late April and on the most northern foraging grounds in the Gulf of Maine in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by September, but some remain in Mid-Atlantic and Northeast areas until November. By December, sea turtles have migrated south to waters off North Carolina and further south. Hard-shelled sea turtles can occur year-round off Cape Hatteras, North Carolina and south of this area (Epperly et al. 1995B; Griffin et al. 2013; Hawkes et al. 2011; Shoop and Kenney 1992).

Leatherback Sea Turtles

Leatherback sea turtles migrate between northern temperate and tropical waters. They are known to use coastal waters of the U.S. continental shelf. Leatherbacks have a greater tolerance for colder water than hard-shelled sea turtles and are found in more northern waters later in the year, with most leaving the Northwest Atlantic shelves by mid-November (NMFS & USFWS 1992, James et al. 2005, James et al. 2006, Eckert et al. 2006, Murphy et al. 2006, Dodge et al. 2014).

6.3.2.2. Large Whales

Several large whales, including North Atlantic right whales, humpback, fin, sei, sperm, and minke whales occur within the affected environment of this amendment (Table 8).^{xiv} Humpback, North Atlantic right, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35°N) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41°N; Waring et al. 2015; NMFS 1991, 2005, 2010a,b, 2011, 2012a). It is unknown if all individuals of a population migrate to low latitudes in the winter, though increasing evidence suggests that some portion of the populations of some species (e.g. right and humpback whales) remains in higher latitudes throughout the winter (Brown et al. 2002; Clapham et al. 1993; Cole et al. 2013; Khan et al. 2009, 2010, 2011, 2012; NOAA 2008; Swingle et al. 1993; Vu et al. 2012; Waring et al. 2014, 2015). Although large whale movements and distribution in the winter are not well understood, their distribution and movements to foraging grounds in the spring/summer are well understood (Baumgartner et al. 2003; Baumgartner and Mate 2003; Brown et al. 2002; Kenney and Hartley 2001; Kenney et al. 1986; Kenney et al. 1995; Mayo and Marx 1990; Payne et al. 1986, 1990; Schilling et al. 1992)

Less is known about sperm whales. Sperm whales are known to occur on the continental shelf edge, over the continental slope, and into mid-ocean regions of the U.S. EEZ (Waring et al. 2015). A distinct seasonal cycle in distribution appears to be present in the U.S. Atlantic EEZ waters (CeTAP 1982; Scott and Sadove 1997). In winter, sperm whales are concentrated east and northeast of Cape Hatteras, North Carolina. In spring, their distribution shifts northward to east of Delaware and Virginia and is widespread throughout the central portion of the mid-Atlantic bight and the southern portion of Georges Bank. Their distribution is similar in the summer, but also includes the area east and north of Georges Bank and into the Northeast Channel region, as well as the continental shelf (inshore of the 100-meter isobath) south of New England. In the fall, sperm whales occur at high levels on the continental shelf south of New England and also occur on the continental shelf edge in the mid-Atlantic bight (Waring et al. 2015).

A general overview of species occurrence and distribution in the affected environment of this amendment is provided in Table 9.

^{xiv} For additional information on the biology, status, and range wide distribution of each whale species see Waring et al. 2014; Waring et al. 2015; NMFS 1991, 2005, 2010a,b, 2011, 2012a.

Table 9: Large whale occurrence in the affected environment of this amendment.

Species	Prevalence and Approximate Months of Occurrence
North Atlantic Right Whale	<ul style="list-style-type: none"> • Distributed throughout all continental shelf waters from the Gulf of Maine to the South Atlantic Bight throughout the year. • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern calving grounds (primarily November-April).
Humpback Whale	<ul style="list-style-type: none"> • Distributed throughout all continental shelf waters of the Mid-Atlantic, southern New England, Gulf of Maine, and Georges Bank throughout the year. • Mid-Atlantic waters: <ul style="list-style-type: none"> ○ Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds. ○ Increasing evidence of wintering areas for juveniles in Mid-Atlantic (e.g., in the vicinity of Chesapeake and Delaware Bays; peak presence approximately January through March) and Southeastern coastal waters.
Fin Whale	<ul style="list-style-type: none"> • Distributed throughout all continental shelf waters of the Mid-Atlantic, southern New England, Gulf of Maine, and Georges Bank throughout the year. • Mid-Atlantic waters: <ul style="list-style-type: none"> ○ Migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds. ○ Possible offshore calving area (October-January). ○ Mid-shelf area off the east end of Long Island is identified as an important foraging ground; others exist in New England waters. ○ Evidence of wintering areas in mid-shelf areas east of New Jersey, Stellwagen Bank, and eastern perimeter of Georges Bank.
Sei Whale	<ul style="list-style-type: none"> • Uncommon in shallow, inshore waters of the Mid-Atlantic, southern New England, Gulf of Maine, and Georges Bank; however, occasional incursions during peak prey availability and abundance. • Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks. • During spring through summer, found in greatest densities in offshore waters of the Gulf of Maine and Georges Bank (eastern margin into the Northeast Channel area; along the southwestern edge in the area of Hydrographer Canyon).
Minke Whale	<ul style="list-style-type: none"> • Widely distributed throughout continental shelf waters of the Mid-Atlantic, southern New England, Gulf of Maine, and Georges Bank during the spring, summer and fall; however, found in greatest densities in spring through summer in the Gulf of Maine and Georges Bank.
Sperm Whale	<ul style="list-style-type: none"> • Occur in U.S. EEZ continental shelf edge, slope, and mid-ocean regions. • Concentrated east and northeast of Cape Hatteras, North Carolina during the winter. • During the spring, distributed northward to east of Delaware and Virginia; widespread throughout the central portion of the mid-Atlantic bight and the southern portion of Georges Bank. • Summer distribution is similar to spring, but also includes the area east and north of Georges Bank and into the Northeast Channel region, as well as the continental shelf (inshore of the 100-meter isobath) south of New England. • In the fall, distributed south of New England on the continental shelf; continental shelf edge occurrence in the mid-Atlantic bight.
<p>Sources: NMFS 1991, 2005, 2010a,b, 2011, 2012a; Hain <i>et al.</i> 1992; Payne 1984; Good 2008; McLellan <i>et al.</i> 2004; Hamilton and Mayo 1990; Schevill <i>et al.</i> 1986; Watkins and Schevill 1982; Payne <i>et al.</i> 1990; Winn <i>et al.</i> 1986; Kenney <i>et al.</i> 1986, 1995; Khan <i>et al.</i> 2009, 2010, 2011, 2012; Brown <i>et al.</i> 2002; NOAA 2008; 50 CFR 224.105; CETAP 1982; Clapham <i>et al.</i> 1993; Swingle <i>et al.</i> 1993; Vu <i>et al.</i> 2012; Baumgartner <i>et al.</i> 2011; Cole <i>et al.</i> 2013; Risch <i>et al.</i> 2013; Waring <i>et al.</i> 2014; Waring <i>et al.</i> 2015; 81 FR 4837(January 27, 2016).</p>	

6.3.2.3. Small Cetaceans and Pinnipeds

Small cetaceans are found throughout the year in the northwest Atlantic Ocean. Within this range, there are seasonal shifts in species distribution and abundance. Pinnipeds are primarily found throughout the year or seasonally from New Jersey to Maine. Increasing evidence indicates that some species (e.g. harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35°N; Waring et al. 2014, 2015).

A general overview of species occurrence and distribution in the affected environment of this amendment is provided in Table 10.

Table 10: Small cetacean and pinniped occurrence in the affected environment of the proposed action.

<i>Species</i>	<i>Prevalence and Approximate Months of Occurrence</i>
Atlantic White Sided Dolphin	<ul style="list-style-type: none"> • Distributed throughout the continental shelf waters (primarily to 100 meter isobath) of the Mid-Atlantic (north of 35°N), Southern New England, Georges Bank, and the Gulf of Maine. Most common in continental shelf waters from Hudson Canyon (~ 39°N) onto Georges Bank, and into the Gulf of Maine. • January-May: low densities found from Georges Bank to Jeffrey’s Ledge. • June-September: Large densities found from Georges Bank, through the Gulf of Maine. • October-December: intermediate densities found from southern Georges Bank to southern Gulf of Maine. • South of Georges Bank (Southern New England and Mid-Atlantic), low densities found year-round, with waters off Virginia and North Carolina representing southern extent of species range during winter months.
Short Beaked Common Dolphin	<ul style="list-style-type: none"> • Regularly found throughout the continental shelf-edge-slope waters (primarily between the 100-2,000 meter isobaths) of the Mid-Atlantic, Southern New England, and Georges Bank (especially in Oceanographer, Hydrographer, Block, and Hudson Canyons). • Less common south of Cape Hatteras, North Carolina, although schools have been reported as far south as the Georgia/South Carolina border. • January-May: occur from waters off Cape Hatteras, North Carolina, to Georges Bank (35° to 42°N). • Mid-summer-autumn: Occur primarily on Georges Bank with small numbers present in the Gulf of Maine. Peak abundance found on Georges Bank in the autumn.
Risso’s Dolphin	<ul style="list-style-type: none"> • Common in the continental shelf edge waters from Florida to eastern Newfoundland; low numbers found in the Gulf of Maine. • March-November: distributed along continental shelf edge from Cape Hatteras, North Carolina to Georges Bank. • December-February: primarily distributed in continental shelf edge of the Mid-Atlantic (including Southern New England), though can be found in the Mid-Atlantic year round.
Harbor Porpoise	<ul style="list-style-type: none"> • Distributed throughout the continental shelf waters of the Mid-Atlantic (north of 35°N), Southern New England, Georges Bank, and the Gulf of Maine. • July-September: Concentrated in the northern Gulf of Maine (generally in waters

<i>Species</i>	<i>Prevalence and Approximate Months of Occurrence</i>
	<p>less than 150 meters); low numbers can be found on Georges Bank.</p> <ul style="list-style-type: none"> • October-December: widely dispersed in waters from New Jersey to Maine; seen from the coastline to deep waters (>1,800 meters). • January-March: intermediate densities in waters off New Jersey to North Carolina; low densities found in waters off New York to Gulf of Maine. • April-June: widely dispersed from New Jersey to Maine; seen from the coastline to deep waters (>1,800 meters).
Bottlenose Dolphin	<p><u>Western North Atlantic Offshore Stock</u> Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from Georges Bank to Florida. Depths of occurrence: ≥ 40 meters.</p>
Pilot Whales: Short- and Long-Finned	<p><u>Short-Finned Pilot Whales</u></p> <ul style="list-style-type: none"> • Primarily occur south of 40°N (Mid-Atlantic and Southern New England waters); although low numbers have been found along the southern flank of Georges Bank, but no further than 41°N. • May through December (approximately): distributed primarily near the continental shelf break of the Mid-Atlantic and Southern New England. Individuals begin shifting to southern waters (35°N and south) beginning in the fall. <p><u>Long-Finned Pilot Whales</u></p> <ul style="list-style-type: none"> • Range from 35°N to 44°N • Winter to early spring (November through April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, Southern New England, and Georges Bank. • Late spring through fall (May through October): movements and distribution shift onto/within Georges Bank, the Great South Channel, and the Gulf of Maine. <p><u>Area of Species Overlap:</u> between 38°N and 41°N</p>
Dwarf and Pygmy Sperm Whales	<ul style="list-style-type: none"> • Sightings observed in oceanic waters of the western North Atlantic. • Stranding records from ME to FL.
Atlantic Spotted Dolphin	<ul style="list-style-type: none"> • Distributed from Southern New England, south. • Regularly occur in continental shelf edge and continental slope waters north of Cape Hatteras, North Carolina.
Striped Dolphin	<ul style="list-style-type: none"> • Found throughout the Northwest Atlantic. • Distributed along the continental shelf edge (along 1,000 meter depth contour) from Cape Hatteras to the southern margin of Georges Bank, and also occur offshore over the continental slope and rise in the mid-Atlantic region.
Beaked Whales	<ul style="list-style-type: none"> • Off the U.S. Atlantic coast, sightings of beaked whales have occurred principally along the shelf-edge and deeper oceanic waters.
Harbor Seal	<ul style="list-style-type: none"> • Primarily distributed in waters from New Jersey to Maine; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, North Carolina (35°N). • Year round in the waters off Maine. • September-May: Waters from New England to New Jersey.

<i>Species</i>	<i>Prevalence and Approximate Months of Occurrence</i>
Gray Seal	<ul style="list-style-type: none"> • Distributed in waters from New Jersey to Maine. • Year round in waters off Maine through Massachusetts. • September-May: Waters from Rhode Island to New Jersey.
Harp Seal	<ul style="list-style-type: none"> • Winter-Spring (approximately January-May): Waters from Maine to New Jersey.
Hooded Seal	<ul style="list-style-type: none"> • Winter-Spring (approximately January-May): Waters off New England.
Information presented in this table is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to the 2,000 meter isobath.	
<i>Sources:</i> Waring et al. 1992, 2007, 2014, 2015; Payne and Heinemann 1993; Payne et al. 1984; Jefferson et al. 2009.	

6.3.2.4. Atlantic Sturgeon

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five Distinct Population Segments (DPSs) of Atlantic sturgeon have the potential to be located anywhere in this marine range (ASSRT 2007; Dovel and Berggren 1983; Dadswell et al. 1984; Kynard et al. 2000; Stein et al. 2004a; Dadswell 2006; Laney et al. 2007; Dunton et al. 2010; Dunton et al. 2012; Dunton et al. 2015; Erickson et al. 2011; Wirgin et al. 2012; Waldman et al. 2013; O’Leary et al. 2014; Wirgin et al. 2015). Based on fishery-independent and dependent data, including data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein et al. 2004 a,b; Erickson et al. 2011; Dunton et al. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein et al. 2004a,b; Dunton et al. 2010; Erickson et al. 2011). Data from fishery-independent surveys and tagging and tracking studies indicate that Atlantic sturgeon may undertake seasonal movements along the coast (Dunton et al. 2010, Erickson et al. 2011); however, there is no evidence to date that all Atlantic sturgeon make these seasonal movements. Atlantic sturgeon therefore may be present throughout the marine environment throughout the year.^{xlvi}

6.3.3. Gear Interactions with Protected Species

Several protected species are vulnerable to interactions with various types of fishing gear. Interaction risks vary by gear type, quantity, and soak or tow time. Available information on gear interactions with a given protected species (or species group) is provided in the sections below. Focus is placed on interaction risks associated with bottom or midwater trawls, the primary gear types used in landing the species included in this amendment. As previously stated, NEFOP data, VTR data, and input from advisors and members of the public indicate that bottom otter trawls account for 90% or more of catch and landings of the forage taxa included in this amendment.

^{xlvi} For additional information on the biology, status, and range wide distribution of each DPS of Atlantic sturgeon see 77 Federal Register 5880 and 77 Federal Register 5914, as well as the Atlantic Sturgeon Status Review Team’s (ASSRT) 2007 status review of Atlantic sturgeon (ASSRT 2007).

Lesser amounts (approximately 7-10%) are caught with midwater trawls. Very small amounts (1-3%) are caught with other gear types, including gillnets, pots, traps, and dredges. The alternatives in this document are not expected to result in a notable change in fishing effort using these other gear types (section 7.1). The alternatives considered in this document thus have a low likelihood of changing the interaction rates between protected species and any of these other gear types. Therefore, the following sections describe interactions associated with bottom and mid-water trawl gear. For information on interactions risks with other gear types, see NMFS 2013, NMFS 2012b, and NMFS 2014b.

6.3.3.1. Gear Interactions with Sea Turtles

Bottom Otter Trawl

Interactions have been documented between green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles and bottom trawl gear. Estimates of the number of interactions are only available for loggerhead sea turtles. Due to the predominance of sea turtle interactions with bottom trawls in the Mid-Atlantic, estimates of interactions are based only on those observed in the Mid-Atlantic.

Warden (2011) estimated that from 2005-2008, an average of 292 loggerhead interactions per year occurred in bottom trawl gear in the Mid-Atlantic, of which approximately 44 were adult equivalents.^{xlvi} Warden (2011) estimated that an additional 61 loggerheads per year interacted with trawls but were released through a Turtle Excluder Device.^{xlvi} Murray (2015) estimated an average of 231 loggerhead interactions with bottom trawl gear in the Mid-Atlantic per year from 2009-2013, of which approximately 33 were adult equivalents. Estimates of interactions from Warden (2011) and Murray (2015) represent a decrease from 1996-2004, which Murray (2008) estimated at 616 sea turtles. This decrease is likely due to decreased fishing effort in high-interaction areas (Warden 2011).

Mid-Water Trawl

NEFOP and the At-Sea Monitoring Program recorded five sea turtle interactions with mid-water trawl gear from 1989-2013. Tuna were the primary species landed during these interactions (NEFSC FSB 2015). These takes were in an experimental HMS fishery that no longer operates. No takes have been documented in other mid-water trawl fisheries. Based on the best available information, sea turtle interactions in mid-water trawl gear are expected to be rare.

^{xlvi} Adult equivalence considers the reproductive value (i.e. expected reproductive output) of the animal (Warden 2011, Murray 2013, Wallace et al. 2008).

^{xlvi} Turtle Excluder Devices allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net (50 CFR 223.206 and 68 *Federal Register* 8456, February 21, 2003 (amended regulations)).

6.3.3.2. Gear Interactions with Atlantic Sturgeon

Bottom Otter Trawl

Sturgeon bycatch occurs in bottom otter trawl gear (Miller and Shepard 2011, Stein *et al.* 2004b; and ASMFC 2007). The most recent estimate of Atlantic sturgeon bycatch in bottom otter trawl gear is from 2006-2010, with approximately 1,239 animals bycaught annually (Miller and Shepard 2011). Atlantic sturgeon interactions have been observed in trawl gear with small (< 5.5 inches) and large (\geq 5.5 inches) mesh sizes; however, based on the best available information, it appears that trawl gear may pose less of a mortality risk to Atlantic sturgeon than gillnet gear (i.e. estimated mortality rates: gillnet gear= 20.0%, otter trawl gear=5.0%; Miller and Shepard 2011; Stein *et al.* 2004b; ASMFC 2007). Although Atlantic sturgeon deaths have rarely been reported in otter trawl gear (ASMFC 2007; Dunton *et al.* 2015; NEFSC FSB 2015), effects of an interaction may occur long after the interaction (Davis 2002; Broadhurst *et al.* 2006; Beardsall *et al.* 2013). Thus, trawls should not be completely discounted as a form of gear that poses a mortality risk to Atlantic sturgeon. Further, even if an animal is released alive, pursuant to the ESA, any Atlantic sturgeon interaction with fishing gear is considered take.

Mid-Water Trawl

To date, there have been no observed/documented interactions with Atlantic sturgeon in mid-water trawl gear (NEFSC FSB 2015). Mid-water trawl gear is not expected to pose a significant interaction risk to any Atlantic sturgeon and therefore, is not expected to be source of serious injury or mortality to this species.

6.3.3.3. Gear Interactions with Marine Mammals

Some marine mammals have been observed seriously injured or killed in bottom or mid-water trawl gear (Table 8). Pursuant to the MMPA, NMFS publishes a List of Fisheries 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. Mid-Atlantic bottom and mid-water trawl fisheries are classified as category II fisheries, meaning that they result in occasional incidental mortality or serious injury of marine mammals (Table 11).

Table 11: Commercial fisheries classification based on MMPA 2016 List of Fisheries (81 Federal Register 20550, April 8, 2016).

Gears	MMPA List of Fisheries	Species Observed Seriously Injured/Killed ^a
Mid-Atlantic bottom trawl fishery	Category II ^b	Bottlenose (offshore stock), short beaked common, white-sided, and Risso’s dolphins; pilot whales (unknown species); gray seal and harbor seals.
Mid-Atlantic Mid-Water Trawl (including pair trawl)	Category II	Risso’s and white-sided dolphins; pilot whales (unknown species); harbor and gray seals.
<p><i>Notes:</i> ^a Sources: Waring <i>et al.</i> 2014; Waring <i>et al.</i> 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Lyssikatos 2015; MMPA 2016 LOF (81 Federal Register 20550). ^b Category II fishery= occasional incidental mortality or serious injury of marine mammals.</p>		

6.3.3.3.1. Large Whales

Bottom Otter and Mid-Water Trawls

Apart from minke whales, there have been no observed interactions with large whales and bottom or mid-water trawl gear (Table 8). Minke whales have been observed seriously injured and killed in both types of trawl gear. These interactions have only been observed in New England.^{xlix} Over the past 10 years there have been two minke whales observed incidentally taken in mid-water trawl gear. These incidences were observed in 2009 and 2013. The 2009 incidence resulted from entanglement in NOAA research mid-water trawl gear. The whale was released alive, but seriously injured. The 2013 incidence resulted from entanglement in a New England mid-water trawl fishery. The whale was dead and moderately decomposed (http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Waring et al. 2015; Henry et al. 2015).

To date, interactions with bottom trawl gear have only been observed in New England bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008 and zero minke whales from 2009-2012. No serious injuries were reported during this time. Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the New England bottom trawl fishery was 1.6 (CV=0.69) whales (Waring et al. 2015). Lyssikatos (2015)

^{xlix} Marine Mammal Stock Assessment Reports and the List of Fisheries, both published pursuant to the MMPA, use the term “northeast” to refer to New England, per the MMPA. Other sources of information referenced in this document (e.g. VTR, NEFOP, dealer data) use the term “northeast” to refer to both New England and the Mid-Atlantic. To avoid confusion, when associated with an MMPA reference, the term “northeast” has been replaced with “New England”.

estimated that from 2008-2013, mean annual serious injuries and mortalities from the New England bottom trawl fishery were 1.40 (CV=0.58) minke whales.

Based on above information, mid-water or bottom otter trawl gear is likely to pose a low interaction risk to any large whale species and therefore, is expected to be a low source of serious injury or mortality to any large whale.

6.3.3.3.2. Small Cetaceans and Pinnipeds

Bottom Trawl Gear

Multiple small cetacean and pinniped species have been observed seriously injured or killed in bottom trawl gear (Table 8; Waring et al. 2014; Waring et al. 2015; Lyssikatos 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). There have been no observed/documentated interactions with pygmy and dwarf sperm whales, Atlantic spotted dolphins, striped dolphins, or beaked whales in bottom otter trawl gear (Waring et al. 2014; Waring et al. 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). Bottom otter trawl gear, therefore, is not expected to pose a significant interaction risk to these marine mammal species, and therefore, is not expected to be source of serious injury or mortality to any of these species. Most recently, Lyssikatos (2015) provided total annual bycatch mortality in New England and Mid-Atlantic commercial bottom trawl trips (considering all FMPs) from 2008-2013.¹ The highest average annual bycatch mortality in Mid-Atlantic bottom trawl gear was observed for short beaked common dolphins (179.81, CV=0.14), followed by Risso's dolphins (38.28, CV=0.28), gray seals (28.06, CV=0.39), offshore bottlenose dolphins (15.71, CV=0.42), and harbor seals (11.40, CV=0.50). Pilot whale and white-sided dolphin interactions with bottom trawl gear were observed in 2008-2013; however, all interactions were observed in New England. No annual bycatch mortality estimates are provided during this time frame for the Mid-Atlantic (Lyssikatos 2015). See Waring et al. (2014) for information Mid-Atlantic trawl (bottom otter or mid-water) interactions with these species from 2007-2011. For further information on these interactions and bycatch rates, see Lyssikatos (2015).

Mid-Water Trawl

Several small cetacean and pinniped species have been observed seriously injured or killed in Mid-Atlantic mid-water trawl gear. Incidences of interactions have primarily been observed on Mid-Atlantic mid-water trawl vessels targeting herring or mackerel. Species that have been observed seriously injured or killed by this gear type include Atlantic white sided dolphins, Risso's dolphins, harbor seals, gray seals, and pilot whales. None of the other small cetacean or pinniped species within the affected environment of this amendment (Table 8) have been

¹ Lyssikatos (2015) defines 'bycatch mortality' as any observed interaction where the animal's condition was recorded as either fresh dead or alive with a serious injury.

observed/documented bycaught in this gear type (Waring et. al 2014; Waring et al. 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html).

Atlantic Trawl Gear Take Reduction Team

In 2006, based on observed mid-water trawl 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 mid-water trawl fisheries operating in both the New England and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a “strategic stock”,^{li} nor do they currently interact with a Category I fishery,^{liii} it was determined that development of a take reduction plan was not necessary. In lieu of a take reduction 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 the ATGTRT believes are necessary 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 can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.^{liii}

6.3.4. Protected Species Predators of Unmanaged Forage Species

6.3.4.1. Marine Mammal Predators of Unmanaged Forage Species

Many marine mammal species prey upon forage taxa included in this amendment (Table 8). Marine mammal diet data are primarily compiled from scat and stomach contents of bycaught and stranded animals. Other means of compiling dietary data have included biochemical analysis of tissue samples and observation of animals in aquaria. These data may not be representative of the foraging ecology of the species or the entire population under consideration (e.g. these samples may be biased towards prey with hard parts that break down slowly; Smith et al. 2015).

Despite these data limitations; it is clear that some of the taxa included in this amendment are important prey items for a variety of marine mammals. For example, Smith et al. (2015) found that shrimp, primarily euphausiid shrimp (which fall under the category of “copepods, krill, amphipods, and other species under 1 inch as adults”; Table 4) made up 63% of the diet of fin whales and 32% of the diet of minke whales on the Northeast U.S. continental shelf.

Zooplankton made up 85% of right whale diets and 42% of sei whale diets. Sand lances made up 20% of the diet of humpack whales, 34% of the diet of gray seals, and 25% of the diet of harbor

^{li} Marine mammal stocks are “strategic” if human caused mortality or serious injury exceeds potential biological removal (as defined in the MMPA), if the stock is declining and likely to be listed as threatened under the ESA, if the stock is already listed as endangered or threatened under the ESA, or if the stock is depleted.

^{liii} Category I fisheries have frequent incidental mortality and serious injury of marine mammals.

^{liii} For additional details on the ATGTRS, visit: <http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/>

seals. Squids (both managed and unmanaged) made up 72% of the diet of pilot whales. Clupeids, which includes managed species and some unmanaged species included in this amendment, made up 30% of the diet of minke whales, 13% of the diet of harbor seals, and 10% of the diet of gray seals. Scombrids, including managed species such as Atlantic mackerel and currently unmanaged species such as chub mackerel, made up 21% of the diets of both pilot whales and common dolphins. Smith et al. (2015) concluded that “the majority of the total [marine mammal] consumption occurs on prey not targeted by commercial fishing... such as euphausiids and sandlance, or on prey groups that are abundant, such as squid and, in some years, clupeids.” Hammill and Stenson (2000), Kaschner (2004), and Savenkoff et al. (2008) reached similar conclusions. Further, because marine mammals tend to consume smaller sizes of prey than are targeted by commercial fisheries (Bowen et al. 1993, Gannon et al. 1998), Smith et al. (2015) also concluded that “direct and indirect interactions between marine mammal consumption and commercial fishing may be lower than expected from total consumption estimates.”

Smith et al. (2015) did not address the diets of sperm whales, pygmy sperm whales, dwarf sperm whales, Atlantic spotted dolphins, Atlantic striped dolphins, and beaked whales, all of which are found within the affected environment of this amendment (Table 8). The limited available information on the food habits of these species indicates that they prey on some forage taxa included in this amendment. They thus have the potential to be affected by the management alternatives. A general list of known prey species is provided below. ^{liv}

- *Sperm whale*: giant squid comprise about 80% of the sperm whale diet. The remaining 20% is comprised of octopus, fish, shrimp, crab and small bottom-living sharks.^{liv}
- *Pygmy and dwarf sperm whales*: cephalopods (e.g. squid and octopus), crustaceans (e.g. crabs and shrimp), and fish. Based on the structure of their lower jaw and analysis of stomach contents, this species feeds in mostly mid- and deep water environments, as well as near the ocean bottom.
- *Atlantic spotted dolphins*: small fish, benthic invertebrates, and cephalopods (e.g. squid and octopus).
- *Striped dolphin*: various species of relatively small, closely-packed, midwater, benthopelagic and/or pelagic schooling fish (e.g. myctophids and cod) and cephalopods (e.g. squid and octopus) throughout the water column.
- *Beaked whales*: primarily cephalopods (e.g. squid and octopus) and to a lesser extent, fish and crustaceans.
- *Harp seal*: various species of fish and invertebrates, but primarily smaller fish such as capelin, arctic and polar cod, and invertebrates including krill.
- *Hooded seal*: crustaceans, squid, starfish, mussels, and fish (such as Greenland halibut, redfish, cod, capelin, and herring).

^{liv} For additional information, visit: <http://www.nmfs.noaa.gov/pr/species/mammals/>

^{lv} <http://www.afsc.noaa.gov/nmml/education/cetaceans/sperm.php#eat>

6.3.4.2. Sea Turtle Predators of Unmanaged Forage Species

Multiple sea turtle species occur in the affected environment of this action (Table 8). Not all sea turtle species are known predators of the forage taxa included in this amendment. Kemp's ridley sea turtles are carnivorous (i.e. feeding primarily on crabs; Hildebrand 1982; Shaver 1991; Burke et al. 1993, 1994; Marquez 1994; Seney and Musick 2005; Ogren 1989). Loggerhead sea turtles, depending on life stage, are carnivorous to omnivorous. During their neritic life phase, they forage primarily on benthic invertebrates (Dodd 1988; Burke et al. 1993; Youngkin 2001; Seney 2003; Seney and Musick 2007; NMFS and USFWS 2008). During their oceanic phase, they prey largely on pelagic and epipelagic organisms (e.g. coelenterates, salps, pelagic snails; Bjorndal 1997). Green sea turtles are primarily herbivorous (Bjorndal 1997, Jones and Seminoff 2013). None of the prey species consumed by these sea turtle species are included in this amendment. Thus, no further information is provided on these sea turtle species and their roles as predators.

Leatherback sea turtles and loggerhead sea turtles are the only sea turtle species that prey upon some of the forage fish species included in this amendment. Throughout every life phase, leatherback sea turtles feed primarily on gelatinous zooplankton (Salmon *et al.* 2004; Bjorndal 1997). Leatherbacks primarily consume Scyphozoan jellyfish (phylum Cnidaria, class Scyphozoa, i.e. true jellies) including: *Aurelia spp.*, *Catostylus spp.*, *Chrysaora spp.*, *Cyanea spp.*, *Pelagia spp.*, *Rhizostoma spp.*, and *Stomolophus spp.* (Bjorndal 1997, Davenport 1998, James and Herman 2001, Salmon et al. 2004). Leatherbacks have been reported foraging on other gelatinous zooplankton, including hydrozoans, holoplanktonic salps (i.e. tunicates), siphonophores, and sea butterflies (family Cymbuliidae; Den Hartog 1980, Den Hartog and Van Nierop 1984, Bjorndal 1997, Dodge et al. 2011). In an assessment of the foraging ecology of leatherback sea turtles in the Western North Atlantic, Dodge et al. (2011) found that leatherbacks primarily consumed lion's mane (*C. capillata*), sea nettles (*C. quinquecirrha*) (95th% confidence interval (CI): 5–59%) and ctenophores (*B. ovata*, *M. leidy*, and *P. pileus*; 95th% CI: 0.4–61%) and foraged to a lesser extent on mauve stingers (*P. noctiluca*; 95th% CI: 0–38%), salps (*T. democratica*), and sea butterflies (family Cymbuliidae, a species “under 1 inch as adults”; Table 4; 95th% CI: 0–36%). The gelatinous diet of leatherbacks varies across phyla; however, based on data obtained from feeding observations, gut content analysis, and use of stable isotope analysis, the class Scyphozoa comprises the main component of the diet of leatherback sea turtles (Jones and Seminoff 2013).

Loggerhead sea turtles have a varied diet, which includes gelatinous zooplankton (including some species “under 1 inch as adults”; Table 4; Smolowitz et al. 2015, Patel et al. 2016).

6.3.4.3. Atlantic Sturgeon

Atlantic sturgeon are benthic foragers, consuming various species of invertebrates. Based on available research done in coastal waters, estuaries, bays, and rivers, the diet of Atlantic sturgeon

is comprised of species of polychaetes, isopods, oligochaetes, amphipods, shrimp (mysid or sand), gastropods, and bivalves (Johnson et al. 1997, Guilbard et al. 2007, Savoy 2007, Dzaugis 2013, McLean et al. 2013). Polychaetes appear to be the primary prey species consumed, with consumption of other prey species varying in importance based on season, geographical location, and substrate (Johnson et al. 1997, Guilbard et al. 2007, Savoy 2007, Dzaugis 2013, McLean et al. 2013).

6.4. The Socioeconomic Environment

The taxa included in this amendment vary in importance for commercial and recreational fisheries. Several of these taxa have been landed and sold in the northeast during 1996-2015, some in greater quantities than others, and some for higher prices than others. Some of these landings were likely the result of directed targeting, and others the result of incidental catch. Some of the taxa included in the amendment appear to have been landed and sold very rarely, if at all. The following sections contain descriptions of recent catch and landings based on public comments, commercial fish dealer data, NEFOP data, and VTR data.

This amendment also has implications for commercial and recreational fisheries for species which prey upon forage species. For this reason, brief summaries of the social and economic aspects of fisheries for a few key predators are also provided in sections 6.4.2 and 6.4.3.

6.4.1. Fisheries for Unmanaged Forage Species

The following sections briefly summarize fisheries for the unmanaged forage taxa included in the amendment, with an emphasis on 1996-2015.

6.4.1.1. Anchovy Fisheries

Four anchovy species can be found in Mid-Atlantic Federal waters (section 6.1.1). Of these four species, only bay anchovy is included in dealer data in the northeast region from 1996 through 2015. If other species were commercially landed, they were not reported as anchovies in dealer data. Ten federally-permitted dealers purchased bay anchovies in the northeast over this time period; however, fewer than three dealers purchased bay anchovies in any given year. These ten dealers were located in the states of New York, Rhode Island, and other states.^{lvi} In most years between 1996 and 2015, fewer than three vessels were responsible for all dealer-reported landings of bay anchovy.

Bay anchovy landings in the northeast averaged 634 pounds per year during 1996-2015.^{lvii} The average price per pound fluctuated greatly over that time period and was generally less than

^{lvi} Other states are not identified because they included fewer than three dealers that purchased bay anchovy. Information representing fewer than three dealers or vessels is considered confidential.

^{lvii} These data include all landings sold to federally-permitted dealers in the northeast, as well as some landings sold to other dealers.

\$0.70 per pound (Table 12). As described in section 6.1.6, bay anchovies are largely found within state waters. It is likely that some of the landings shown in Table 12 were caught in state waters.

NEFOP data show records of striped anchovy caught in bottom otter trawls and gillnets; however, there were no dealer-reported landings of striped anchovy in the northeast during 1996-2015. There were also no dealer-reported landings of dusky anchovy or silver anchovy. Dusky anchovies and silver anchovies were also not recorded in NEFOP data. Based on this information, it can be assumed that dusky and silver anchovy are rarely encountered in commercial fishing operations in the northeast.

NEFOP and VTR data show that the vast majority of reported anchovy catches were from bottom otter trawls. Very small amounts were caught with other gears including gill nets, scallop dredges, and fish pots/traps.

Table 12: Dealer-reported landings and value of bay anchovy in the northeast region, 1996-2015. Landings in some years are combined to protect confidential information (i.e. information representing fewer than three vessels or dealers). Prices are adjusted to 2015 dollars to account for inflation.

Year	Landings (pounds)	Revenue	Average price per pound
1996-1997	1,769	\$164	\$0.09
1998	5,451	\$4,191	\$0.77
1999-2002	148	\$71	\$0.48
2003-2007	1,293	\$599	\$0.46
2008	82	\$104	\$1.27
2009-2010	224	\$221	\$0.99
2011-2012	467	\$303	\$0.65
2013-2015	716	\$450	\$0.63

6.4.1.2. Argentine Fisheries

Dealer data do not differentiate between the different species of argentines but list all landings under the family name “argentine”. Landings of argentines were not reported in every year between 1996 and 2015. Over the entire 20-year period, eight dealers, most located in the state of New York, reported purchases of argentines from ten different vessels. Landings in several years were associated with fewer than three fishing permits and are therefore considered confidential. Landings averaged 1,545 pounds per year between 1996 and 2015. The price per pound was generally \$0.42 or less (Table 13).

NEFOP and VTR data in the northeast do not include catches or landings of argentines.

Table 13: Dealer-reported landings and value of argentine in the northeast region, 1996-2015. No landings were reported in several years between 1996 and 2015. Landings in some years are combined to protect confidential information (i.e. information representing fewer than three vessels or dealers). Prices are adjusted to 2015 dollars to account for inflation.

Year	Landings (pounds)	Revenue	Average price per pound
1996-1998	0	\$0	--
1999-2004	2,797	\$1,176	\$0.42
2005-2006	5,300	\$1,718	\$0.32
2007	18,905	\$7,810	\$0.41
2008	2,404	\$1,679	\$0.70
2009-2015	1,495	\$575	\$0.38

6.4.1.3. Halfbeak Fisheries

Ballyhoos (*Hemiramphus brasiliensis*) commonly used as bait in recreational fishing, especially for HMS (Rundershausen et al. 2010, Kells and Carpenter 2011). According to several comments received during public comment periods for this amendment, ballyhoos are mostly harvested in Florida, but are sold throughout the Mid-Atlantic for use as bait in recreational fisheries.

Dealer, NEFOP, and VTR data do not include catches or landings of halfbeaks in the northeast; thus, it can be assumed that halfbeaks are rarely encountered in commercial fisheries in the Mid-Atlantic.

6.4.1.4. Unmanaged Herring and Sardine Fisheries

Between 1996 and 2015, there were no dealer-reported landings of unmanaged herrings and sardines in the northeast (section 6.1.5). It is not clear if there were no reported landings of these species because they truly were not landed, because they were landed but not reported, or because they were landed but reported under a different name or under a general category such as “herring NK” or “other fish”.

There were many instances of landings of “herring NK” and catch of unclassified herrings with a variety of gear types (Table 7) during 1996-2015; however, this information is not summarized in further detail here because it is impossible to separate these landings into managed (i.e. Atlantic herring) and unmanaged species.

Although there are no records of landings in the Mid-Atlantic, round herring, scaled sardine, thread herring, and Spanish sardine are the target of directed fisheries in other parts of the world (Houde 1977, Collette and Klein-MacPhee 2002, Kells and Carpenter 2011). Thread herring are the target of commercial and recreational fisheries in the South Atlantic and Gulf of Mexico (FL FWCC 2010a). Spanish sardine are harvested for bait in the South Atlantic and in the Gulf of Mexico (FL FWCC 2010b).

6.4.1.5. Sand Lance Fisheries

Two species of sand lance are found in Mid-Atlantic Federal waters (section 6.1.8). Dealer-reported landings are listed under “eel, sand (launce)” and do not differentiate between the two species. According to these data, 81,034 pounds of sand lance were landed in the northeast between 1996 and 2015.

The price for sand lance was notably higher than the price of other taxa included in the amendment. The average price during 1996-2015 was \$3.64 per pound (adjusted to 2015 dollars) and showed an increasing trend over time. The average price per pound during 2006-2015 was \$5.24 (adjusted to 2015 dollars). This is much higher than the average price per pound of the other taxa included in the amendment. In most years, landings were associated with fewer than three dealers and/or permit holders and are thus considered confidential.

About 96% of dealer-reported landings of sand lance were not associated with GARFO permits. These landings likely came from state waters. During public scoping hearings for this amendment, the Council received comments from a few individuals who said they commercially harvest sand lances and sell them for bait and to zoos and aquariums.

NEFOP data include records of sand lances caught with bottom otter trawls, midwater trawls, sink gill nets, scallop dredges, and hydraulic clam dredges. Sand lances were not reported in VTR data in the northeast between 1996 and 2015.

6.4.1.6. Silverside Fisheries

In the early 20th century, inland silversides were marketed for human consumption as “whitebait”. Atlantic silversides were commercially harvested at a small scale in the Gulf of Maine for human consumption in the 19th and early 20th centuries. For a brief period, ending in the 1980s, they were harvested in Canada, canned, and exported to Japan (Collette and Klein-MacPhee 2002).

Dealer-reported landings in the northeast for 1996-2015 include landings of Atlantic silverside and unclassified silversides. Landings averaged 31,298 pounds per year between 1996 and 2015 (Table 14). Over this 20-year period, 32 federally-permitted dealers in New York and five other states^{lviii} purchased silversides. Twenty-one vessels contributed to these landings.

About 99.6% of dealer-reported landings of Atlantic silverside during 1996-2015 were associated with vessels which did not have GARFO permits. These landings likely came from state waters.

^{lviii} Other states are not identified because fewer than three dealers in those states purchased silversides. Information associated with fewer than three dealers or vessels is considered confidential.

During 2011-2015, the average price for silversides was \$1.75 per pound (adjusted to 2015 dollars), which is high compared to the prices of the other taxa included in this amendment (except for sand lances, described in the previous section). During public scoping hearings for this amendment, the Council received comments from a few individuals who said they commercially harvest silversides and sell them to bait markets and to zoos and aquariums.

NEFOP data includes records of Atlantic silversides and unclassified silversides caught with bottom otter trawls, sink gill nets, and scallop dredges. VTR data includes records of unclassified silversides caught with stop seines, purse seines, haul seines, sink gill nets, otter trawls, and cast nets. There are no dealer, NEFOP, or VTR records of catch or landings of rough silversides or inland silversides in the northeast for 1996-2015. Some landings of these taxa may have been reported as unclassified silversides.

Table 14: Dealer-reported landings and value of Atlantic silversides and unclassified silversides in the northeast region, 1996-2015. Data in some years are combined to protect confidential information (i.e. information representing fewer than three vessels and/or dealers). Prices are adjusted to 2015 dollars to account for inflation.

Year	Landings (pounds)	Revenue	Average price per pound
1996-1997	41,421	\$87,906	\$1.01
1997	45,278	\$49,799	\$1.10
1998	52,432	\$48,930	\$0.93
1999	54,650	\$66,807	\$1.22
2000	33,019	\$39,929	\$1.21
2001-2002	55,879	\$61,532	\$1.10
2003	71,321	\$55,119	\$0.77
2004-2005	6,480	\$7,738	\$1.19
2006-2008	46,311	\$46,922	\$1.01
2009-2010	16,177	\$14,351	\$0.89
2011-2012	55,587	\$72,805	\$1.31
2013-2015	147,414	\$362,819	\$2.46

6.4.1.7. Bullet Mackerel and Frigate Mackerel Fisheries

Dealer-reported landings of frigate mackerel in the northeast averaged about 182,000 pounds per year between 1996 and 2015. Seventy-eight vessels contributed to these landings. Price fluctuated and averaged \$0.95 per pound (adjusted to 2015 dollars; Table 15). Twenty-five Federally permitted dealers in New Jersey, Rhode Island, and other states^{lix} purchased frigate mackerel from 1996 through 2015.

^{lix} Other states are not identified because fewer than three dealers in those states purchased frigate mackerel. Information associated with fewer than three dealers or vessels is considered confidential.

From 2006 through 2015, frigate mackerel were commonly landed on trips which also landed larger scombrid species such as false albacore (*Euthynnus alletteratus*) and Atlantic bonito (*Sarda sarda*). On trips which landed at least 100 pounds of frigate mackerel, bonito tended to be landed in higher quantities than frigate mackerel. Frigate mackerel were landed on very few trips which also landed Atlantic mackerel or chub mackerel, suggesting that frigate mackerel may not mix with these species.

VTR data from the northeast region includes records of frigate mackerel caught with traps, sink gill nets, drift gill nets, runaround gill nets, and otter trawls. VTR data do not include records of bullet mackerel in the northeast. NEFOP data include records of both bullet and frigate mackerel caught with sink gill nets, drift gill nets, and bottom otter trawls.

There were no dealer-reported landings of bullet mackerel between 1996 and 2015. Bullet mackerel and frigate mackerel are similar in appearance. It is possible that some landings of bullet mackerel may have been reported as frigate mackerel.

Table 15: Dealer-reported landings and value of frigate mackerel in the northeast region, 1996-2015. Landings in some years are combined to protect confidential information (i.e. information representing fewer than three vessels or dealers). Prices are adjusted to 2015 dollars to account for inflation.

Year	Landings (pounds)	Revenue	Average price per pound
1996-1997	5,724	\$1,556	\$0.27
1998	2,989	\$707	\$0.24
1999	36,485	\$6,301	\$0.17
2000	19,682	\$10,090	\$0.51
2001	6,344	\$7,005	\$1.10
2002	1,714	\$1,920	\$1.12
2003	9,260	\$4,740	\$0.51
2004-2005	982	\$1,072	\$1.09
2006-2007	1,184	\$977	\$0.82
2008-2010	4,292	\$3,455	\$0.81
2011	3,467	\$2,640	\$0.76
2012-2013	342	\$356	\$1.04
2014-2015	5,866	\$5,940	\$1.01

6.4.1.8. Chub Mackerel Fisheries

Of all the taxa included in this amendment, chub mackerel had by far the highest dealer-reported landings in the northeast from 1996 through 2015. Chub mackerel also had the highest reported revenues of all the taxa. Chub mackerel landings averaged about 172,000 pounds per year between 1996 and 2015 and reached a peak of 5.25 million pounds in 2013. Price averaged \$0.45 per pound (adjusted to 2015 dollars) over 1996-2015, making chub mackerel one of the lower valued taxa included in the amendment (Table 16).

In recent years (e.g. 2006-2015) chub mackerel were mostly landed on trips which also landed *Illex* squid, longfin squid, and/or butterfish, all of which are managed by the Mid-Atlantic Council under the Mackerel, Squid, and Butterfish FMP. On trips which landed at least 10,000 pounds of chub mackerel, the majority of landings were *Illex* squid.

During 1996-2015, 79 vessels contributed to landings of chub mackerel and 22 federally-permitted dealers in five states purchased chub mackerel. However, only a few vessels and dealers were responsible for the vast majority of chub mackerel landings.

Chub mackerel landings in the northeast region increased notably in recent years. A few relatively large vessels (by Mid-Atlantic standards; i.e. greater than 140 feet in length) which also participate in the *Illex* squid fishery targeted chub mackerel in recent years. These vessels and a few dealers worked to build a market for chub mackerel. During public hearings for this amendment, one vessel owner reported that chub mackerel has become an important part of his business, especially in years when *Illex* squid are not available. According to this and other vessel owners, only a few large, fast vessels in the Mid-Atlantic are capable of harvesting chub mackerel in large quantities. These vessels are capable of retaining, and have on occasion landed, a few hundred thousand pounds of chub mackerel at a time

Over 90% of the chub mackerel (by weight) reported in NEFOP data were caught with bottom otter trawls. About 7% were caught with mid-water trawl trawls. VTR data show a similar pattern.

Table 16: Dealer-reported landings and value of chub mackerel in the northeast region, 1996-2015. Data from 2004 through 2011 are combined to protect confidential information (i.e. information representing fewer than three vessels or dealers). Prices are adjusted to 2015 dollars to account for inflation.

Year	Landings (pounds)	Revenue	Average price per pound
1996-1997	24,064	\$7,395	\$0.31
1998	40,219	\$11,256	\$0.28
1999	6,443	\$3,476	\$0.54
2000	16,246	\$7,487	\$0.46
2001	4,384	\$6,156	\$1.40
2002	471	\$298	\$0.63
2003	488,316	\$33,681	\$0.07
2004-2012	412,836	\$107,229	\$0.26
2013	5,249,686	\$933,632	\$0.18
2014	1,230,411	\$309,872	\$0.25
2015	2,108,337	\$485,472	\$0.23

6.4.1.9. Fisheries for Unmanaged Pelagic Mollusks

Dealer data from the northeast include landings of unidentified squids; however, these data likely include landings of managed species such as *Illex* and longfin squid. Because it is not possible to separate these landings into managed and unmanaged species, they are not summarized here. NEFOP and VTR data include records of unclassified squids. Bottom otter trawls accounted for the vast majority of these catches. It is likely that managed squid species are included in these records.

There are dealer-reported landings of unclassified octopods in the northeast; however, it is unlikely that these landings include pelagic octopods. As described in section 6.1.15, only one pelagic species of octopod is found in the Mid-Atlantic and it is assumed to be rarely caught in existing fisheries. The reported landings of octopus are assumed to be predominantly of benthic species and are therefore not summarized here.

NEFOP data includes records of unclassified octopods caught with bottom otter trawls, scallop dredges, and a variety of other gear types. VTR data includes records of octopods caught with bottom otter trawls, fish pots, lobster pots, conch pots, and a variety of other gear types. It is likely that most of the octopods reported in NEFOP and VTR data are benthic species.

In summary, there may be some level of harvest of unmanaged pelagic mollusks in the Mid-Atlantic, particularly for unmanaged squid species; however, there are no data on such fisheries which could distinguish landings of unmanaged from managed species. During public hearings and scoping hearings, the Council received no comments describing existing targeted fisheries for unmanaged pelagic mollusks.

6.4.1.10. Unmanaged Forage Taxa Rarely Caught in Existing Fisheries

Several of the forage taxa included in this amendment appear to be rarely, if ever, caught in existing fisheries in the northeast. For example, between 1996 and 2015, there were no dealer-reported landings, or NEFOP or VTR records of catch of greeneyes (family Chlorophthalmidae), pearlsides (family Sternoptychidae), or copepods, krill, amphipods, and other species under one inch in length as adults. These species are likely rarely caught in existing fisheries in the Mid-Atlantic. For example, greeneyes and pearlsides are found at greater depths than most existing fisheries. Species under 1 inch as adults are unlikely to be retained with the gear types used in existing fisheries due to their small size.

Cusk-eels, lanternfish, and Atlantic saury were not recorded in dealer or VTR data from 1996-2015; however, they were recorded in NEFOP data. Unclassified cusk-eels were observed as catch with a variety of gear types, including bottom otter trawls, sink gill nets, scallop dredges, and other gear types. Very small amounts of lanternfish (i.e. 233 pounds total from 1989 through early 2016) were observed in tows of bottom otter trawls, midwater trawls, and scallop dredges in the northeast. A few commercial fishing industry advisors stated that lanternfish are virtually

never caught in commercial fisheries in the Mid-Atlantic because they are found at depths beyond where the fisheries operate. Atlantic saury were observed as catch in bottom otter trawl tows and small amounts were observed in scallop dredge catches. Atlantic saury have been targeted both for bait and human consumption in other parts of the world, including the Mediterranean; however, they are not known to be targeted in the northwest Atlantic (Collette and Klein-MacPhee 2002, Froese and Pauly 2016).

6.4.2. Fisheries for Council Managed Species

Council-managed species support socially and economically important fisheries. Summaries of the landings, value, and participation in these fisheries are provided in fishery information reports which are updated annually and are available on the Council's website (www.mafmc.org).

Table 17 summarizes the landings and value of Council-managed fisheries in 2015. In total, these fisheries resulted in about 190 million pounds of landings and about \$175 million in value. Some of these fisheries are either entirely or predominantly commercial fisheries (e.g. *Illex* squid, longfin squid, butterfish, monkfish, surf clams, and ocean quahogs), while others support sizeable recreational fisheries, as well as commercial fisheries (e.g. summer flounder, scup, black sea bass, and bluefish).

Bottom otter trawls are a dominant gear type in the commercial fisheries for summer flounder, scup, black sea bass, Atlantic mackerel, *Illex* squid, longfin squid, butterfish, and monkfish. In some years, mid-water trawls are the dominant gear for Atlantic mackerel. Gillnets are the primary gear used in commercial fisheries for bluefish and spiny dogfish fisheries and are also used in the monkfish and bluefish fisheries. Bottom longlines are used to harvest golden and blueline tilefish. Other gear types contribute to smaller amounts of the commercial harvest, including pots/traps (scup, black sea bass), floating traps (scup), and hook and line (scup, black sea bass, bluefish). Hook and line is the dominant gear type in all the recreational fisheries managed by the Council.

Table 17: Landings and value of species managed by the Mid-Atlantic Council in 2015.

Species	Commercial Landings (lb, millions)	Commercial Value	Recreational Landings (lb, millions)	Total Landings (lb, millions)
Summer flounder (ME-NC)	10.674	\$31,616,753	4.721	15.395
Scup (ME-NC)	17.030	\$11,347,812	4.620	21.650
Black sea bass (ME-NC)	2.353	\$7,945,829	3.887	6.239
Atlantic mackerel	12.382	\$3,722,005	2.552	14.934
<i>Illex</i> squid	5.339	\$1,589,066	0.000	5.339
Longfin squid	26.351	\$31,208,254	0.000	26.351
Butterfish	4.638	\$3,063,583	0.000	4.638
Bluefish	4.025	\$2,966,732	11.673	15.698
Golden tilefish (ME-VA)	1.320	\$5,159,259	0.017	1.337
Blueline tilefish (ME-VA)	0.099	\$220,426	0.004	0.103
Spiny dogfish	19.069	\$3,001,714	0.839	19.908
Monkfish	19.041	\$19,057,872	0.000	19.041
Surf clams (meats)	38.277	\$30,498,383	0.000	38.277
Ocean quahogs (meats)	29.743	\$23,669,614	0.000	29.743
Total	190.34	\$175,067,302	28.31	218.65

Note: Surf clam and ocean quahog landings are preliminary and are from NMFS clam vessel logbook reports (personal communication, Dan Hennen, NEFSC). All other commercial landings and values are from dealer reports. Recreational landings are from the Marine Recreational Information Program (estimates downloaded 11/16/2016). Landings and value are summed for the entire east coast unless otherwise noted (for species managed over a more restricted range).

6.4.3. Fisheries for Large Tunas, Billfish, Swordfish, and Sharks

Yellowfin tuna, bigeye tuna, Atlantic bluefin tuna, swordfish, sailfish, blue marlin, white marlin, roundscale spearfish, and longbill spearfish, as well as a few smaller tuna species, are managed by the NMFS Atlantic Highly Migratory Species (HMS) Management Division under the Consolidated Atlantic HMS FMP. Forty-two shark species, including forage predators such as common thresher, bigeye thresher, blue, shortfin mako, tiger, dusky, Atlantic sharpnose, and sand tiger sharks are also managed under this FMP. Several of these species are also subject to various regulations in state waters. Some shark species are also managed under the ASMFC's Coastal Sharks FMP.

HMS Stock Assessment and Fisheries Evaluation (SAFE) Reports, published annually by NMFS, contain details on fisheries for these species. The 2015 SAFE report (NMFS 2015) includes information on the stocks and the fisheries through 2014. The information is not reported in such a way as to distinguish catches and landings in the Mid-Atlantic from other areas.

The SAFE report summarizes landings by gear type. In some cases, these landings are reported in numbers of fish and in others they are reported in weight. For example, 110,477 tunas, swordfish, and sharks were landed in the commercial pelagic longline fishery in 2014. About

82,894 pounds of bluefin tuna landings came from purse seines. Commercial hand gear (i.e. rod and reel, hand line, harpoon, and troll) permits resulted in 1,478,817 pounds of landings of tunas, swordfish, and sharks in 2014. Commercial landings of the species managed under the Consolidated HMS FMP generated about \$38.61 million in revenue in 2014 (NMFS 2015).

HMS species support important recreational fisheries. According to the SAFE report, 3.71 million pounds of tunas and swordfish were landed by recreational fishermen using rod and reel gear in 2014. Recreational landings of sharks are less well understood because recreational anglers are not required to report shark landings to NMFS. Recreational shark landings are estimated based on data from the Marine Recreational Information Program and the Large Pelagic Survey.

Tournaments are important and unique aspects of some of these fisheries. In 2014, 274 tournaments were registered with NMFS for the species managed under the Consolidated Atlantic HMS FMP. About two thirds of these tournaments took place along the east coast and the remaining third took place in the Gulf of Mexico or the Caribbean. Sailfish, blue marlin, yellowfin tuna, and white marlin were the predominant species in the tournaments. Of all the blue marlin landed in recreational fisheries in 2014, 91% were landed in tournaments. About 86% of the white marlin landed in recreational fisheries in 2014 were landed in tournaments (NMFS 2015). The information summarized above only includes landings; however, catch and release is practiced by many anglers targeting tunas and billfish

In 2011, HMS angling permit holders spent an estimated \$23 million on private boat trips targeting HMS in New England and the Mid-Atlantic. An economic input-output model estimated that these expenditures generated \$266 in total economic outputs and \$96 million in labor income and generated 1,824 full or part time jobs from Maine to North Carolina (Hutt et al. 2014).

6.5. Physical Habitat

The physical, chemical, biological, and geological components of benthic and pelagic environments are important aspects of habitat for marine species and have implications for reproduction, growth, and survival of marine species. The following sections briefly describe key aspects of physical habitats in the Mid-Atlantic which may be impacted by the alternatives considered in this document. This information is largely drawn from Stevenson et al. (2004), unless otherwise noted.

6.5.1. Physical Environment

This amendment applies to Mid-Atlantic Federal waters. As described in section 5.3.6, the Council considered two different boundaries to define Mid-Atlantic Federal waters. From an ecological perspective, the Mid-Atlantic is generally defined as the area between southern New England and Cape Hatteras, North Carolina and is also referred to as the Mid-Atlantic Bight.

This area is dominated by the sandy, relatively flat, gently sloping continental shelf. The continental slope begins at the continental shelf break and continues eastward with increasing depth until it becomes the continental rise. It is fairly homogenous, with exceptions at the shelf break, some of the canyons, the Hudson Shelf Valley, and in areas of glacially rafted hard bottom.

Like the rest of the continental shelf, the topography of the Mid-Atlantic Bight was shaped largely by sea level fluctuations caused by past ice ages. The shelf's basic morphology and sediments derive from the retreat of the last ice sheet and the subsequent rise in sea level. Currents and waves have since modified this basic structure.

Shelf and slope waters of the Mid-Atlantic Bight have a slow southwestward flow that is occasionally interrupted by warm core rings or meanders from the Gulf Stream. On average, shelf water moves parallel to bathymetry isobars at speeds of 5 - 10 cm/s at the surface and 2 cm/s or less at the bottom. Storm events can cause much more energetic variations in flow. Tidal currents on the inner shelf have a higher flow rate of 20 cm/s that increases to 100 cm/s near inlets.

The shelf slopes gently from shore out to between 100 and 200 km offshore where it transforms to the slope (100 - 200 m water depth) at the shelf break. Numerous canyons incise the slope and some cut up onto the shelf itself. The primary morphological features of the shelf include shelf valleys and channels, shoal massifs, scarps, and sand ridges and swales. Most of these structures are relic except for some sand ridges and smaller sand-formed features. Shelf valleys and slope canyons were formed by rivers of glacier outwash that deposited sediments on the outer shelf edge as they entered the ocean. Most valleys cut about 10 m into the shelf; however, the Hudson Shelf Valley is about 35 m deep. The valleys were partially filled as the glacier melted and retreated across the shelf. The glacier also left behind a lengthy scarp near the shelf break from Chesapeake Bay north to the eastern end of Long Island. Shoal retreat massifs were produced by extensive deposition at a cape or estuary mouth. Massifs were also formed as estuaries retreated across the shelf.

Some sand ridges are more modern in origin than the shelf's glaciated morphology. Their formation is not well understood; however, they appear to develop from the sediments that erode from the shore face. They maintain their shape, so it is assumed that they are in equilibrium with modern current and storm regimes. They are usually grouped, with heights of about 10 m, lengths of 10 - 50 km and spacing of 2 km. Ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. The seaward face usually has the steepest slope. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Swales occur between sand ridges. Since ridges are higher than the adjacent swales, they are exposed to more energy from water currents and experience more sediment mobility than swales. Ridges tend to contain less fine sand, silt and clay while relatively sheltered swales contain more of the finer particles. Swales have greater benthic macrofaunal density, species

richness and biomass, due in part to the increased abundance of detrital food and the less physically rigorous conditions.

Sand waves are usually found in patches of 5 - 10 with heights of about 2 m, lengths of 50 - 100 m and 1 - 2 km between patches. Sand waves are primarily found on the inner shelf, and often observed on sides of sand ridges. They may remain intact over several seasons. Megaripples occur on sand waves or separately on the inner or central shelf. During the winter storm season, they may cover as much as 15% of the inner shelf. They tend to form in large patches and usually have lengths of 3 - 5 m with heights of 0.5 - 1 m. Megaripples tend to survive for less than a season. They can form during a storm and reshape the upper 50 - 100 cm of the sediments within a few hours. Ripples are also found everywhere on the shelf and appear or disappear within hours or days, depending upon storms and currents. Ripples usually have lengths of about 1 - 150 cm and heights of a few centimeters.

Sediments are uniformly distributed over the shelf in this region. A sheet of sand and gravel varying in thickness from 0 - 10 m covers most of the shelf. The mean bottom flow from the constant southwesterly current is not fast enough to move sand, so sediment transport must be episodic. Net sediment movement is in the same southwesterly direction as the current. The sands are mostly medium to coarse grains, with finer sand in the Hudson Shelf Valley and on the outer shelf. Mud is rare over most of the shelf, but is common in the Hudson Shelf Valley. Occasionally relic estuarine mud deposits are re-exposed in the swales between sand ridges. Fine sediment content increases rapidly at the shelf break, which is sometimes called the “mud line,” and sediments are 70 - 100% fine on the slope. On the slope, silty sand, silt, and clay predominate (Stevenson et al. 2004).

Greene et al. (2010) identified and described Ecological Marine Units (EMUs) in New England and the Mid-Atlantic based on sediment type, seabed form (a combination of slope and relative depth)^{lx}, and benthic organisms.^{lxi} According to this classification scheme, the sediment composition in Mid-Atlantic Federal waters is about 76% sand, 17% gravel, and 7% silt/mud. The seafloor in Mid-Atlantic Federal waters is classified as about 57% flat, about 20% depression, 14% side slope, 5% slope, and 4% steep (Table 18).

Artificial reefs are another significant Mid-Atlantic habitat. These localized areas of hard structure were formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). While some of these materials were deposited specifically for use as fish habitat, most have an alternative primary purpose; however, they have all become an integral part of the coastal and shelf ecosystem. In general, reefs are important for attachment sites, shelter, and food for many

^{lx} Seabed form contains the categories of depression, mid flat, high flat, low slope, side slope, high slope, and steep slope.

^{lxi} See Greene et al. 2010 for a description of the methodology used to define EMUs.

species, and fish predators such as tunas may be attracted by prey aggregations, or may be behaviorally attracted to the reef structure.

Like all of the world’s oceans, the Mid-Atlantic is experiencing changes to the physical environment as a result of global climate change. These changes include warming temperatures; sea level rise; ocean acidification; changes in stream flow, ocean circulation, and sediment deposition; mobilization and input of contaminants to the marine ecosystem; and increased frequency, intensity and duration of extreme climate events. These changes in physical habitat can impact behavior, spawning, metabolic rate, and other biological processes of marine species, particularly in important spawning and feeding areas. As such, these changes have implications for the distribution and productivity of many marine species. Several studies demonstrate that the distribution and productivity of several species in the Mid-Atlantic have changed over time, likely because of changes in physical habitat conditions such as temperature (e.g. Weinberg 2005, Lucey and Nye 2010, Nye et al. 2011, Pinsky et al. 2013, Gaichas et al. 2015).

Table 18: Composition of Ecological Marine Units (EMUs) in Mid-Atlantic Federal waters (Greene et al. 2010). EMUs which account for less than 1% of Mid-Atlantic Federal waters are not shown.

Ecological Marine Unit	Percent of Mid-Atlantic Federal Waters
Moderate Flat Sand	19%
High Flat Sand	14%
Side Slope Sand	8%
Moderate Depression Sand	7%
Somewhat Deep Flat Sand	6%
Moderate Flat Gravel	6%
Side Slope Silt/Mud	6%
Low Slope Sand	5%
High Flat Gravel	4%
Steep Sand	3%
Shallow Depression Sand	3%
Somewhat Deep Depression Sand	3%
Moderate Depression Gravel	3%
Shallow Flat Sand	2%
Very Shallow Flat Sand	1%
Somewhat Deep Flat Gravel	1%
Very Shallow Depression Sand	1%
Shallow Flat Gravel	1%
High Flat Silt/Mud	1%
Deep Depression Sand	1%
Deepest Depression Sand	1%
Shallow Depression Gravel	1%
Steep Silt/Mud	1%
Somewhat Deep Depression Gravel	1%

6.5.2. Essential Fish Habitat (EFH)

The MSA defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (MSA section 3). The MSA requires that Councils describe and identify EFH for managed species and “minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat” (MSA section 303 (a)(7)).

The broad definition of EFH has led the Mid-Atlantic and the New England Fishery Management Councils to identify EFH throughout most of the Northeast U.S. Shelf Ecosystem, ranging from areas out to the shelf break to wetlands, streams, and rivers. Mid-Atlantic Federal waters include EFH for 65 federally-managed species during at least one life stage (Table 19 and Table 20).

Table 19: Essential Fish Habitat within Mid-Atlantic Federal waters for species managed by the Mid-Atlantic and New England Fishery Management Councils (David Stevenson, personal communication; Stevenson et al. 2004). EFH that is vulnerable to impacts from bottom trawl gear is shaded in gray.

Species	Life Stage	Depth (Meters)	Description of EFH in Mid-Atlantic	Vulnerability to Bottom Trawls ^{lxii}
American plaice	Larvae	30-130	Surface waters	NA
Atlantic butterfish	Adult and juvenile	10-365	Pelagic waters (schools form over sandy, sandy silt, and muddy substrates)	NA
	Eggs	0-1829	Pelagic waters	NA
	Larvae	10-1829	Pelagic waters	NA
Atlantic cod	Adult	10-150	Rocks, pebbles, or gravel	M
	Juvenile	25-75	Cobble or gravel substrates	H
	Eggs	<110	Surface waters	NA
	Larvae	30-70	Pelagic waters	NA
Atlantic herring	Adult	20-130	Pelagic waters and bottom habitats	NA
	Juvenile	15-135	Pelagic waters and bottom habitats	NA
	Larvae	50-90	Pelagic waters	NA
Atlantic mackerel	Adult	0-380	Pelagic waters	NA
	Eggs	0-15	Pelagic waters	NA
	Juvenile	0-320	Pelagic waters	NA
	Larvae	10-130	Pelagic waters	NA
Atlantic surfclam	Adult	0-60, low density beyond 38	Throughout substrate to a depth of 3 ft	L
	Juvenile	0-60, low density beyond 38	Throughout substrate to a depth of 3 ft	L

^{lxii} NA= Not applicable, L = low vulnerability, M = moderate vulnerability, H = high vulnerability (Stevenson et al. 2004).

Table 19, continued:

Species	Life Stage	Depth (Meters)	Description of EFH in Mid-Atlantic	Vulnerability to Bottom Trawls
Black sea bass	Adult	20-50	Structured habitats (natural and manmade), sand and shell substrates preferred	H
	Juvenile	1-38	Rough bottom, shellfish/eelgrass beds, manmade structures, offshore clam beds, and shell patches	H
	Larvae	<100	Estuaries, structured inshore habitat	H
Bluefish	Adult		Pelagic waters	NA
	Eggs	Mid-shelf depths	Pelagic waters	NA
	Juvenile		Pelagic waters	NA
	Larvae	>15	Pelagic waters	NA
Clearnose skate	Adult and juvenile	0-500, most <111	Soft bottom and rocky or gravelly bottom	M
Golden tilefish		76-365	Rough bottom, small burrows, and sheltered areas; substrate rocky, stiff clay, human debris	H
Haddock	Juvenile	35-100	Pebble and gravel	H
	Larvae	30-90	Surface waters	NA
	Eggs	50-90	Surface waters	NA
Little skate	Adult and juvenile	0-137, most 73 - 91	Sandy or gravelly substrate or mud	M
Longfin inshore squid	Adult	0-305	Pelagic waters	NA
	Eggs		Pelagic waters	NA
	Juvenile	0-213	Pelagic waters	NA
Monkfish	Adult and juvenile	25-200	Substrates of a sand-shell mix, algae-covered rocks, hard sand, pebbly gravel, or mud	L
	Eggs	15-1000	Surface waters	NA
	Larvae	25-1000	Pelagic waters	NA
Northern shortfin squid	Adult and juvenile	0-182	Pelagic waters	NA
	Eggs		Pelagic waters	NA
Ocean pout	Eggs	<50	Generally sheltered nests in hard bottom in holes or crevices	H
	Juvenile	< 80	Bottom habitats, often smooth bottom near rocks or algae	H
	Adult	< 110	Bottom habitats; dig depressions in soft sediments	H
	Larvae	<50	Close proximity to hard bottom nesting areas	H

Table 19, continued:

Species	Life Stage	Depth (Meters)	Description of EFH in Mid-Atlantic	Vulnerability to Bottom Trawls
Ocean quahog	Adult and juvenile	8-245	Throughout substrate to a depth of 3 ft within federal waters	L
Offshore hake	Adult	150-380	Bottom habitats	L
	Eggs	<1250	Pelagic waters	NA
	Juvenile	170-350	Bottom habitats	L
	Larvae	<1250	Pelagic waters	NA
Pollock	Adult	15- 65	Hard bottom habitats including artificial reefs	M
Red crab	Adult	200-1300	Continental slope substrates of silts, clays, and all silt-clay-sand composites	L
	Eggs	200-400	Attached to the underside of the female crab until hatched (see adults)	NA
	Juvenile	700-1800	Continental slope substrates of silts, clays, and all silt-clay-sand composites	L
	Larvae	200-1800	Water column from surface to seafloor	NA
Red hake	Juvenile	< 100	Shell fragments, including areas with an abundance of live scallops	H
	Adult	10-130	In sand and mud, in depressions	M
	Eggs	--	Surface waters	NA
	Larvae	<200	Surface waters	NA
Rosette skate	Adult and juvenile	33-530, most 74-274	Soft substrate, including sand/mud bottoms	M
Scup	Adult	2-185	Demersal waters, inshore estuaries on various substrate types	L
	Juvenile	0-38	Demersal waters, inshore on various sand, mud, mussel, and eelgrass bed substrates	M
Sea scallop		18-110	Cobble, shells, coarse/gravelly sand, and sand	L
Silver hake	Juvenile	20-270	All substrate types	M
	Adult	30-325	All substrate types	L
	Eggs	50-150	Surface waters	NA
	Larvae	50-130	Surface waters	NA
Spiny dogfish	Adult	10-450	Continental shelf waters and estuaries	L
	Juvenile	10-390	Continental shelf waters and estuaries	L

Table 19, continued:

Species	Life Stage	Depth (Meters)	Description of EFH in Mid-Atlantic	Vulnerability to Bottom Trawls
Summer Flounder	Adult and juvenile	0-25	Demersal/estuarine waters, varied substrates. Mostly inshore in summer and offshore in winter.	L
	Larvae	10-70	Pelagic waters	NA
White hake	Juvenile	5-225	Seagrass beds, mud, or fine grained sand	M
	Adult	5-325	Mud or fine grained sand	L
	Eggs		Surface waters	NA
	Larvae		Pelagic waters	NA
Windowpane flounder	Adult	1-75	Mud or fine-grained sand	L
	Eggs	<70	Surface waters	NA
	Juvenile	1-100	Mud or fine-grained sand	L
	Larvae	<70	Pelagic waters	NA
Winter flounder	Adult	1-100	Mud, sand, and gravel	M
	Eggs	<5	Sand, muddy sand, mud, and gravel	L
	Juvenile	0-50	Mud or fine grained sand	L
	Larvae	<6	Pelagic and bottom waters	L
Winter skate	Adult and juvenile	0-371, most <111	Sand and gravel or mud	M
Witch flounder	Juvenile	50-450 to 1500	Fine grained substrate	M
	Adult	25-300	Fine grained substrate	M
	Eggs and larvae		Surface waters	NA
Yellowtail flounder	Adult and juveniles	20-50	Sand or sand and mud	M
	Eggs	30-90	Surface waters	NA
	Larvae	10-90	Surface waters	NA

Table 20: EFH within the Mid-Atlantic for species managed under the Consolidated HMS FMP (NMFS 2009).

Species	Life Stage	Description of EFH in Mid-Atlantic
Albacore tuna	Adult	Atlantic east coast from North Carolina, south of Cape Hatteras to Cape Cod
	Juvenile	Offshore the U.S. east coast from north of Cape Hatteras to Cape Cod.
Angel shark	Adult and juvenile	Cape Lookout, NC to mid-New Jersey
Atlantic sharpnose shark	Adult	Mid-coast of Florida to Maryland
	Juvenile	Cape Hatteras and a localized area off Delaware
Basking shark	Adult and juvenile	Northern Outer Banks of North Carolina to the Gulf of Maine
Bigeye thresher shark	All	Georgia to southern New England
Bigeye tuna	Adult	Cape Hatteras, NC to Cape Cod
	Juvenile	North Carolina to Cape Cod
Bignose shark	Adult and juvenile	North Carolina to New Jersey
Blacktip shark	Adult	Cape Hatteras
	Juvenile	Cape Hatteras
Blue marlin	Adult	Florida Keys to southern Cape Cod
	Juvenile	Florida Keys to southern Cape Cod
Blue shark	Adult	South Carolina to Gulf of Maine
	Juvenile	Cape Hatteras, NC to New England; localized areas in the Gulf of Maine
	Neonate	New Jersey through Cape Cod
Bluefin tuna	Adult	Pelagic waters off North Carolina from Cape Lookout to Cape Hatteras, and New England from Connecticut to the mid-coast of Maine
	Juvenile	Waters off North Carolina, south of Cape Hatteras, to Cape Cod
Common thresher shark	All	North Carolina through Cape Cod
Dusky shark	Adult and juvenile	South Carolina to southern Cape Cod
	Neonate	South Carolina to southern Cape Cod
Great hammerhead shark	All	Florida Keys to New Jersey
Longbill spearfish	Adult and juvenile/ subadult	Localized areas from northern Florida to Cape Cod, with concentrations from North Carolina to Delaware
Longfin mako shark	All	Cape Hatteras to Cape Cod
Night shark	All	South Carolina to Delaware
Oceanic whitetip shark	All	Florida through southern New England

Table 20, continued:

Species	Life Stage	Description of EFH in Mid-Atlantic
Porbeagle shark	Adult	Localized areas off northern North Carolina, Delaware, and New Jersey. Southern New England through the Gulf of Maine.
Sailfish	Adult	Off Cape Hatteras
	Juvenile	Outer banks of North Carolina and Maryland
Sand tiger shark	Adult	Cape Lookout, NC to southern New Jersey
	Juvenile	North Carolina to mid-New Jersey
	Neonate	Northern Florida to Cape Cod
Sandbar shark	Adult	Florida to southern New England
	Juvenile	Cape Lookout, NC to southern New England
	Neonate	Cape Lookout, NC to Long Island, NY
Scalloped hammerhead shark	Adult	Florida to Long Island, NY
	Juvenile	Florida through New Jersey
Shortfin mako	All	Cape Lookout, NC through southern New England; localized areas off Maine
Silky shark	All	Florida to New Jersey, localized areas in southern New England
Skipjack tuna	Adult	Localized areas from Cape Hatteras to Cape Cod
	Juvenile	Localized areas off North Carolina to Maryland, and from Delaware to Cape Cod
Spinner shark	Adult	Localized areas from South Carolina to Virginia
	Juvenile	North Carolina
Swordfish	Adult	Georgia to Cape Cod
	Juvenile	South Florida to Cape Cod
Tiger shark	Adult	Florida to southern New England
	Juvenile	Florida to New England
	Neonate	Mid-east coast of Florida through Virginia
White marlin	Adult	South Carolina to Cape Cod
	Juvenile	Georgia to Cape Cod
White shark	All	North Carolina to Cape Cod
Yellowfin tuna	Adult	Mid-east coast of Florida and Georgia to Cape Cod
	Juvenile	Mid-east coast of Florida and Georgia to Cape Cod

6.5.3. Fishery Impact Considerations

This document includes alternatives which would regulate commercial harvest of over 50 species (Table 4) in Mid-Atlantic Federal waters using all gear types. According to NEFOP and VTR data, about 90% of the reported catch of these species between 1996 and 2015 was caught using bottom-tending gear types, including otter trawls, scallop dredges, sink gillnets, and traps. The remaining 10% were caught with gear that does not contact the bottom, including midwater

trawls and floating gillnets. Only those gear types which contact the bottom impact physical habitat. These gears have a variety of impacts on habitat. Stevenson et al. (2004) compiled a detailed summary of several studies of the impacts of a variety of gear types on marine habitats. Conclusions relevant for this amendment are briefly summarized below.

Otter trawl doors can create furrows in sand, mud, and gravel/rocky substrates. Studies have found furrow depths that range from 2 to 10 cm. Bottom trawl gear can also re-suspend and disperse surface sediments and can smooth topographic features. It can also result in reduced abundance, and in some cases reduced diversity, of benthic species (e.g. nematodes, polychaetes, bivalves). It can also have short-term positive ecological impacts such as increased food value and increased chlorophyll production in surface sediments. The duration of these impacts varies by sediment type, depth, and frequency of the impact (e.g. a single trawl tow vs. repeated tows). Some studies recorded effects that lasted only a few months. Other studies found effects that lasted up to 18 months. Impacts tend to have shorter durations in dynamic environments with less structured bottom composition compared to less dynamic environments with structured bottom. Shallower water, stronger bottom currents, more wave action, finer grained sediments, and higher frequencies of natural disturbance are characteristics that make environments more dynamic (Stevenson et al. 2004).

Scallop dredges can have similar physical and biological impacts. Dredges can smooth topographic features such as sand ripples and waves, can result in the loss of fine surficial sediment, and can disturb other habitat features such as shell deposits and amphipod tube mats. Scallop dredges can result in temporary reductions in abundance of some species and reduced species diversity in some areas. As with otter trawls, the severity and duration of these impacts varies based on factors such as the frequency of the impact, the physical complexity of the benthic habitat, and the frequency and strength of naturally occurring disturbances (Stevenson et al. 2004).

Compared to otter trawls and dredges, Stevenson et al. (2004) summarized fewer studies on other bottom tending gears such as sink gillnets and traps. Morgan and Chuenpagdee (2003) found that the impacts of bottom gill nets, traps, and longlines were generally limited to warm or shallow-water environments with rooted aquatic vegetation or “live bottom” environments (e.g. coral reefs). These impacts were of a lesser degree than those from bottom trawls and dredges. Eno et al. (2001) found that traps can bend, smother, and uproot sea pens in soft sediments; however, sea pen communities were largely able to recover within a few days of the impact.

The Mid-Atlantic Council developed some fishery management actions with the sole intent of protecting marine habitats. For example, in Amendment 9 to the Mackerel, Squids, and Butterfish FMP, the Council determined that bottom trawls used in Atlantic mackerel, squid, and butterfish fisheries have the potential to adversely affect EFH for some federally-managed fisheries (MAFMC 2008). As a result of Amendment 9, closures to squid trawling were developed for portions of Lydonia and Oceanographer Canyons. Subsequent closures were

implemented in these and Veatch and Norfolk Canyons to protect tilefish EFH by prohibiting all bottom trawling activity. In addition, amendment 16 to the Mackerel, Squid, and Butterfish FMP prohibits the use of all bottom-tending gear in fifteen discrete zones and one broad zone where deep sea corals are known or highly likely to occur. A proposed rule for this amendment published in September 2016 (81 Federal Register 66245, September 27, 2016).

7. Environmental Consequences of Alternatives

This section summarizes the expected impacts of each management alternative (section 5) on the five VECs:

- The forage taxa included in this amendment (section 7.1)
- Species managed by the Mid-Atlantic Council and other predators of forage species (section 7.2)
- Protected species (section 7.3)
- The socioeconomic environment (section 7.4)
- Physical habitat (section 7.5)

This section is organized by VEC. The expected impacts of the alternatives on the VECs are described in terms of direction (i.e. negative, neutral, or positive) and magnitude (i.e. slight, moderate, or high). Both short and long term impacts are considered. As described in more detail in the following sections, the greatest impacts are generally expected to occur over the long-term due to the proactive nature of this amendment.

When considering impacts on the VECs, the action alternatives (i.e. the alternatives which are not “no action” alternatives) are evaluated compared to each other and to the no action alternatives in terms of how they are likely to impact current environmental and socioeconomic conditions (summarized in section 6). It is not possible to quantify with confidence how fishing behavior, prey availability, and other important factors will change under each alternative; therefore, expected changes and resulting impacts are described qualitatively.

The no action alternatives assume that current management regimes and fishery operations will continue into the future. As described in section 6, many of the taxa included in this amendment have been landed and sold over the past 20 years. The no action alternatives assume that similar levels of landings will continue into the near future; however, they could change over the longer-term. The impacts of the no action alternatives are evaluated based on their expected impacts on recent environmental and socioeconomic conditions. The no action alternatives serve as a useful comparison for evaluating the impacts of the other alternatives; however, the no action alternatives do not necessarily imply no impact. The affected environment is not static; therefore, impacts to the VECs could still occur if no action is taken, as is explained in more detail in the following sections.

Impacts to the forage taxa included in this amendment (Table 4) are described in relation to expected changes in fishing effort and fishing mortality under each of the alternatives (section 7.1). In general, alternatives which may result in an increase in fishing effort could lead to an increase in fishing mortality for target and non-target species and therefore may have negative biological impacts for those species, compared to the no action alternatives. Conversely, alternatives which may result in a decrease in fishing effort may result in positive impacts for those species by resulting in a decrease in fishing mortality.

Impacts to Council-managed species, other predators, and protected species (sections 7.2 and 0) are also described in relation to changes in fishing effort and fishing mortality for unmanaged forage species under each of the alternatives. Impacts to predators, including predators managed by the Council, predators protected by the ESA and/or MMPA, and other predators such as large tunas, billfish, sharks, and sea birds, derive partly from potential changes in the abundance of forage prey species. Alternatives which could cause an increase in fishing mortality for forage species could cause a decrease in their abundance and thus could have negative impacts for their predators. This is a simplistic approach that does not acknowledge other interactions which affect the productivity and abundance of predatory species. For example, several forage species may consume larval stages of their predators. Predator productivity and abundance are also influenced by environmental conditions, habitat quality, and habitat availability, as well as by competition with other species, and by disease, parasites, and other interactions. Many of these environmental and species interactions are variable and will likely be impacted by climate change. These numerous levels of interactions between species and between species and their environment are complex and our scientific understanding of them is limited. Given this complexity, the effects of the management alternatives on these interactions cannot be rigorously assessed. The following sections summarize expected impacts due to simplistic predator/prey relationships (e.g. an increase in prey abundance is beneficial for predators); however, in reality, the impacts are more complex and may be different than as summarized in this document.

Alternatives which may result in a reduction in fishing effort may have positive impacts for habitat (section 7.5), protected species (section 7.3), and other species which are caught in fisheries for forage species (section 7.2). A reduction in fishing effort would lead to a decrease in the amount of time that fishing gear is in the water and would thus reduce the potential for interactions between fishing gear and habitat and fishing gear and protected and other species. Alternatives which may result in an increase in fishing effort may result in negative impacts to habitat, protected species, and other species due to an increased potential for interactions with fishing gear. A neutral impact could result from negligible or no changes in effort.

Socioeconomic impacts (section 7.4) are considered in relation to potential changes in landings, prices, and revenues under each alternative compared to the no action alternatives. Alternatives which could lead to increased availability of landed species and/or an increase in catch per unit effort (CPUE) could lead to increased landings. Increases in landings are generally considered to

have positive socioeconomic impacts because they are likely to result in increased revenues; however, if an increase in landings leads to a decrease in price or a decrease in the abundance of any of the landed species, then negative socioeconomic impacts could occur.

Socioeconomic impacts are also considered in relation to indirect impacts on commercially and recreationally important predators of forage species, which may be impacted by changes in the abundance of forage prey under some alternatives. Alternatives which may lead to an increase in the abundance of forage prey may lead to increased abundance of commercially and recreationally important predators and may thus have positive socioeconomic impacts due to the potential for increased revenues and increased opportunities for recreational fishing, whale watching, and birding. However, as previously stated, this simplistic focus on predator/prey relationships (e.g. increases in prey abundance will lead to an increase in predator abundance) ignores other interactions that influence the abundance of commercially and recreationally important species. The abundance of any species is influenced by a variety of complex, interacting factors including predator/prey interactions, competitive interactions, interactions with the environment and habitat, and other factors. Given this complexity, the effects of the management alternatives on these interactions cannot be rigorously assessed. The following sections summarize expected impacts due to simplistic predator/prey relationships; however, in reality, the impacts are more complex and may be different than as summarized in this document.

7.1. Impacts of the Alternatives on Unmanaged Forage Species

The expected impacts of each alternative on unmanaged forage species are described in the following sections.

7.1.1. Impacts of Alternative Set 1 (Alternatives for Taxa Besides Chub Mackerel) on Unmanaged Forage Species

Alternative set 1 contains alternatives for the taxa included in this amendment, except chub mackerel. The impacts of these alternatives on unmanaged forage species are summarized in the following sections.

7.1.1.1. Impacts of Alternative 1.A (No Action on Taxa Besides Chub Mackerel) on Unmanaged Forage Species

Under alternative 1.A the Council would take no action on commercial fisheries for unmanaged forage taxa (besides chub mackerel; section 5.1.1). There appears to be low demand for these taxa, as illustrated by the low landings and generally low prices over 1996-2015 (section 6.4.1). Demand and fishing effort are not expected to change over the short-term if no action is taken. Recent levels of fishing mortality are presumed to have had slight negative impacts on unmanaged forage species; however, these impacts are not well understood. As stated in section 6.1, there are no quantitative stock assessments for these species. There have been no precipitous

declines in landings and no other indications of substantial negative impacts to these species from fisheries over the past 20 years. For these reasons, the short-term impacts of alternative 1.A on unmanaged forage species are expected to be slight negative (though not more negative than the impacts which occurred over 1996-2015).

Landings and fishing mortality for these taxa could increase over the longer-term if demand and/or prices were to increase. This could encourage increased fishing effort and could lead to increased fishing mortality for unmanaged forage species. Alternatively, market demand and prices could remain unchanged over the longer-term, which would likely result in *status quo* levels of fishing effort and fishing mortality. It is also possible that demand for these species could decrease in the future. This is not likely given the growth of aquaculture and the continued global demand for fish-based products for bait, livestock feed, and pet food (section 4.2). For these reasons, the long-term impacts of alternative 1.A on unmanaged forage species could range from slight negative (if fishing mortality does not change) to moderate negative (if fishing effort increases).

Of all the alternatives considered for taxa besides chub mackerel (alternatives 1.A-1.C), alternative 1.A is expected to have the most negative impacts on unmanaged forage species, especially over the long term.

7.1.1.2. Impacts of Alternative 1.B (Prohibit Possession of Taxa Except Chub Mackerel) on Unmanaged Forage Species

Alternative 1.B would prohibit possession of the taxa included in this amendment (except chub mackerel) by commercial vessels fishing in Mid-Atlantic Federal waters (section 5.1.2). Many of these taxa are caught in existing commercial fisheries in the Mid-Atlantic. Several of these taxa were sold to commercial fish dealers in the northeast during 1996-2015 (section 6.4, Table 7). Landings fluctuated considerably, but averaged roughly 35,000 pounds per year. Most of these landings were likely the result of incidental catch. The volume of landings attributable to directed fishing is unknown, but is likely quite low (based on public comments, as well as NEFOP, observer, and VTR data). Alternative 1.B would not change the amount of these taxa caught incidentally. Any amount caught incidentally while targeting other species in Mid-Atlantic Federal waters would have to be discarded at sea under alternative 1.B. Alternative 1.B would essentially prohibit directed fishing on these taxa in Mid-Atlantic Federal waters.

Recent levels of directed fishing effort for these taxa in Mid-Atlantic Federal waters are assumed to be low; therefore, alternative 1.B would likely lead to only a slight decrease in fishing effort compared to recent levels. By slightly reducing fishing effort, it would also slightly reduce fishing mortality for these taxa. As described in the previous section, the no action alternative (alternative 1.A) is expected to result in *status quo* levels of fishing effort and fishing mortality over the short-term. Thus, alternative 1.B is expected to have slight positive short-term impacts

on the taxa included in this amendment compared to the no action alternative (alternative 1.A) due to a slight decrease in fishing mortality.

Alternative 1.B would place a restriction on harvest of several taxa which are currently not regulated in Mid-Atlantic Federal waters. Large-scale commercial fisheries for these taxa are not likely to develop in the near future given the limited existing market demand in the Mid-Atlantic (section 6.4.1). However, new markets could develop over the longer-term under the no action alternative (alternative 1.A). Alternative 1.B would prevent commercial fisheries in the Mid-Atlantic from supplying those markets. Because alternative 1.B would limit the potential for development of future markets and would prevent large-scale commercial harvest of these taxa in the Mid-Atlantic in the future, it is expected to have long-term moderate positive impacts on unmanaged forage species, compared to the no action alternative.

Of all the alternatives considered for taxa besides chub mackerel (alternatives 1.A-1.C), alternative 1.B is expected to have the most positive impacts on unmanaged forage species, in both the short and long-term.

7.1.1.3. Impacts of Alternative 1.C (Incidental Possession Limit for Taxa Except Chub Mackerel) on Unmanaged Forage Species

Alternative 1.C contains two sub-alternatives for a possession limit for the taxa included in the amendment (except chub mackerel). The expected impacts of these alternatives on unmanaged forage species are described in the following sections.

7.1.1.3.1. Impacts of Alternative 1.C.i (Incidental Possession Limit of 1,500 Pounds Per Species) on Unmanaged Forage Species

Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species for all the taxa included in the amendment, except chub mackerel (section 5.1.3.1).

Using a combination of the date of landings and vessel identification information (i.e. fishing permit number and/or hull number), it was determined that a total of 2,546 trips resulted in landings of these taxa in the northeast between 1996 and 2015. These trips do not account for all landings of these taxa as only those records associated with a fishing permit number or a hull number could be associated with individual trips. Additionally, within this data set it is not possible to differentiate between catch in state waters and catch in Federal waters. Catch in state waters by state-only permitted fishermen will not be addressed by any of the alternatives in this document.

Of the 2,546 trips which landed the taxa addressed by alternative 1.C.i, 21 trips (0.8%) resulted in landings of more than 1,500 pounds of any of these taxa (identified to the species level where possible). No trips resulted in combined landings of two or more of these taxa in excess of 1,500 pounds. These may be underestimates, as they do not account for landings of unclassified

herrings and unclassified squids as those landings presumably include unknown amounts of managed species. In addition, they do not account for landings that could not be associated with a permit number or hull number. Despite this uncertainty, it is assumed that a 1,500 pound per species possession limit would have impacted very few trips during 1996-2015. Alternative 1.C.i is thus not expected to result in a change in fishing effort or a change in fishing mortality for unmanaged forage species compared to recent levels. As previously stated (section 7.1.1.1), recent levels of fishing mortality are presumed to have had slight negative impacts on unmanaged forage species. Although there are no quantitative stock assessments for these species in the Mid-Atlantic, there have been no indications of substantial declines in abundance due to fishing pressure. Because alternative 1.C.i is not expected to result in a change in fishing mortality, it is expected to have the same short-term impacts on unmanaged forage species as the no action alternative (alternative 1.A; i.e. slight negative impacts).

Fishing effort could increase beyond recent levels under alternative 1.C.i if more vessels were to land amounts closer to 1,500 pounds in the future. This could lead to increased fishing mortality for unmanaged forage species. In this way, alternative 1.C.i could have slight negative long-term impacts on unmanaged forage species, compared to recent levels of impacts. This possible increase in fishing mortality is not expected to be large enough to have substantial negative impacts, given that a 1,500 pound possession limit would prevent large-scale targeted fishing.

Although large-scale commercial fisheries for these species are not likely to develop in the near future given the limited existing demand in the Mid-Atlantic (section 6.4.1), new markets could develop in the future, which could lead to increased fishing effort and fishing mortality under the no action alternative (alternative 1.A). Alternative 1.C.i would prevent large increases in fishing effort by limiting possession to 1,500 pounds. In this way, alternative 1.C.i could have moderate positive long-term impacts compared to the no action alternative. Thus, the long-term impacts of alternative 1.C.i on unmanaged forage species range from slight negative (compared to recent impacts, if fishing mortality increases) to moderate positive (compared to the potential long-term impacts of the no action alternative).

The impacts of alternative 1.C.i on unmanaged forage species are expected to be more positive than the impacts of the no action alternative (alternative 1.A), but less positive compared to alternatives 1.B (prohibit possession) and 1.C.ii (possession limit of 1,700 pounds for all species combined).

7.1.1.3.2. Impacts of Alternative 1.C.ii (Incidental Possession Limit of 1,700 Pounds for all Species Combined; Preferred) on Unmanaged Forage Species

Alternative 1.C.ii would implement an incidental possession limit of 1,700 pounds combined weight of all the taxa included in the amendment, except chub mackerel (section 5.1.3.2). Alternative 1.C.ii is a preferred alternative.

Using a combination of the date of landings and vessel identification information, it was determined that a total of 2,546 trips resulted in landings of these taxa in the northeast between 1996 and 2015. These trips do not account for all landings of these species as only those records associated with a fishing permit number or a hull number could be associated with individual trips. Additionally, these data include an unknown amount of landings from state-only permitted fishermen fishing in state waters, which will not be impacted by alternative 1.C.ii. Of these 2,546 trips, 14 (0.05%) resulted in landings in excess of 1,700 pounds. These may be underestimates, as they do not account for landings of unclassified herrings and unclassified squids as those landings presumably include unknown amounts of managed species. Despite this uncertainty, it is assumed that a 1,700 pound combined possession would have impacted very few trips during 1996-2015. Alternative 1.C.ii is thus not expected to result in a change in fishing effort or a change in fishing mortality for unmanaged forage species in the near future compare to recent levels. As previously stated (section 7.1.1.1), recent levels of fishing mortality are presumed to have had slight negative impacts on unmanaged forage species. Although there are no quantitative stock assessments for these species in the Mid-Atlantic, there have been no indications of substantial declines in abundance due to fishing pressure. Because alternative 1.C.ii is not expected to result in a change in fishing mortality, it is expected to have the same short-term impacts on unmanaged forage species as the no action alternative (alternative 1.A; i.e. slight negative impacts).

Fishing effort could increase beyond recent levels under alternative 1.C.ii if more vessels were to land amounts closer to 1,700 pounds in the future. This could lead to an increase in fishing mortality for unmanaged forage species. In this way, alternative 1.C.ii could have slight negative long-term impacts on unmanaged forage species, compared to recent conditions. The increase is not expected to be great enough to have substantial negative impacts on unmanaged forage species, given that a 1,700 pound possession limit would prevent large-scale targeted fishing.

Alternative 1.C.ii would prevent large-scale fisheries, which could develop under the no action alternative over the longer-term. In doing so, alternative 1.C.ii, could have moderate positive long-term impacts on unmanaged forage species compared to the no action alternative. Thus, the long-term impacts of alternative 1.C.ii on unmanaged forage species range from slight negative (compared to recent impacts, if fishing mortality increases) to moderate positive (compared to the potential long-term impacts of the no action alternative).

The impacts of alternative 1.C.ii on unmanaged forage species are expected to be more positive than the impacts of alternatives 1.A (no action) and 1.C.i (1,500 pound per species possession limit), but less positive than alternative 1.B (prohibit possession).

7.1.2. Impacts of Alternative Set 2 (Alternatives for Chub Mackerel) on Unmanaged Forage Species

Alternative set 2 contains sub alternatives for chub mackerel. The expected impacts of these alternatives on unmanaged forage species are described in the following sections.

7.1.2.1. Impacts of Alternative 2.A (No Action on Chub Mackerel) on Unmanaged Forage Species)

Under alternative 2.A, the Council would take no action on chub mackerel as part of this amendment and the chub mackerel fishery would remain unregulated (section 5.2.1).

Chub mackerel landings increased substantially over the past several years (Table 16). A few fishermen and dealers worked to build a market for chub mackerel caught in the Mid-Atlantic. One captain reported that chub mackerel is now an important source of his income, especially in years when availability of *Illex* squid is low (section 6.4.1.8). For these reasons, chub mackerel landings would likely remain high under the no action alternative. A small number of vessels were responsible for most chub mackerel landings over 2013-2015. One of those vessels was sold to a west coast fishery in 2016; therefore, landings are not likely to exceed their historical high of 5.25 million pounds in the near future if no action is taken. However, given the recent successful growth of the fishery, landings may increase over the longer-term under the no action alternative.

There are no quantitative stock assessments for chub mackerel in the Mid-Atlantic; therefore, it is not known how recent levels of fishing mortality have impacted the chub mackerel stock. These impacts are presumed to be slight (as opposed to moderate or high) negative because there have been no indications of substantial declines in chub mackerel abundance since the fishery has expanded. If the fishery continues to expand, impacts could become moderate negative. As fishing effort for chub mackerel increases, incidental catches of other forage species may also increase. Thus, the short-term impacts of alternative 2.A on unmanaged forage species are expected to be slight negative. The long-term impacts range from slight negative (if fishing mortality remains similar to recent levels) to moderate negative (if fishing mortality increases).

Of all the alternatives for chub mackerel, alternative 2.A is expected to have the most negative impacts on unmanaged forage species, in both the short and long-term.

7.1.2.2. Impacts of Alternative Set 2.B (Chub Mackerel Designation) on Unmanaged Forage Species

Alternative set 2.B contains three sub alternatives for the designation which would be used to manage chub mackerel. The expected impacts of these alternatives are summarized in the following sections. These alternatives are largely administrative in nature as they do not imply any specific level of catch or landings limits.

7.1.2.2.1. Impacts of Alternative 2.B.i (Manage Chub Mackerel as an EC) on Unmanaged Forage Species

Under alternative 2.B.i chub mackerel would be managed as an EC (section 5.2.2.1). The EC designation does not require any specific management measures and implies no particular level of catch or landings limits. The National Standards Guidelines state that ECs may be included in FMPs “in order to achieve ecosystem management objectives” (50 CFR 600.305(d)(13)) and that management measures may be implemented for ECs for a variety of reasons (50 CFR 600.305(c)(5)). If chub mackerel were designated as an EC, the National Standard Guidelines, in combination with the MSA, would provide the framework and legal basis for implementing management measures. Although the impacts of this designation would largely derive from the measures implemented, the designation itself could have slight positive impacts for chub mackerel because it would establish the foundation for management measures.

The legal requirements for ECs are not as strong as those for stocks in the fishery; therefore the impacts of alternative 2.B.i may not be as positive as those of alternative 2.B.ii (described in the next section), which would manage chub mackerel as a stock in the fishery. The impacts may be more positive than those under alternative 2.B.iii, which would use neither designation and thus has a weaker legal basis and no requirements for management measures.

7.1.2.2.2. Impacts of Alternative 2.B.ii (Manage Chub Mackerel as a Stock in the Fishery) on Unmanaged Forage Species

Under alternative 2.B.ii chub mackerel would be managed as a stock in the fishery (section 5.2.2.2). The MSA lists several required provisions of FMPs for stocks that are in the fishery (MSA section 303(a)). These provisions include measures to restrict catch to biologically acceptable levels to ensure sustainability of the fishery (i.e. ABCs, ACLs, AMs). Because these measures have not yet been developed, it is not known how they would impact the chub mackerel stock. They could result in a decrease in fishing mortality, or, if it is determined that recent levels of catch are sustainable, they could result in no changes in fishing mortality. Although the impacts of alternative 2.B.ii on chub mackerel would largely derive from the management measures implemented, the stock in the fishery designation would establish a legal basis and a legal requirement for those measures. This could be considered a slight positive impact on the chub mackerel stock, compared to the no action alternative (alternative 2.A), under which there would be no management measures for chub mackerel.

Of all the designations considered for chub mackerel (alternatives 2.B.i – 2.B.iii), the stock in the fishery designation has the strongest legal requirements. Therefore, alternative 2.B.ii may have greater positive impacts for chub mackerel than alternatives 2.B.i and 2.B.iii.

7.1.2.2.3. Impacts of Alternative 2.B.iii (Manage Chub Mackerel as neither an Ecosystem Component nor a Stock in the Fishery; Preferred) on Unmanaged Forage Species

Under alternative 2.B.iii chub mackerel would be designated as neither an EC nor a stock in the fishery. Management measures would be implemented using the discretionary authority allowed for under section 303(b)(12) of the MSA (section 5.2.2.3). This is the preferred alternative for the designation of chub mackerel. The impacts of this alternative would derive solely from the management measures implemented. Unlike alternatives 2.B.i and 2.B.ii, there would be no legal framework or requirement for any particular management measures under this alternative. For these reasons, when considered separately from the management measures, the impacts of alternative 2.B.ii on unmanaged forage species are expected to be neutral (compared to slight positive impacts expected under alternatives 2.B.i and 2.B.ii).

7.1.2.3. Impacts of Alternative Set 2.C (Chub Mackerel Management Measures) on Unmanaged Forage Species

Alternative set 2.C contains alternatives for chub mackerel management measures. The expected impacts of these alternatives on unmanaged forage species are summarized in the following sections.

7.1.2.3.1. Impacts of Alternative Set 2.C.i (Chub Mackerel Landings Limit) on Unmanaged Forage Species

Alternative set 2.C.i contains four sub-alternatives for an annual chub mackerel landings limit. The expected impacts of these alternatives on unmanaged forage species are summarized in the following sections.

7.1.2.3.1.1. Impacts of Alternative 2.C.i.a (900,127 Pound Chub Mackerel Landings Limit) on Unmanaged Forage Species

Alternative 2.C.i.a would implement a 900,127 pound annual landings limit for chub mackerel (section 5.2.3.1.1). This limit is equivalent to the average annual landings of chub mackerel in the northeast over 1996-2015. Chub mackerel landings over 2013-2015 averaged 2.86 million pounds per year, more than three times the landings limit under this alternative. This increase in landings was driven by a handful of vessels which targeted chub mackerel and a few dealers who worked to develop a market for chub mackerel caught in the Mid-Atlantic. Based on these recent trends, and on public comments, it is assumed that 2013-2015 levels of landings would continue into the near future under the no action alternative (alternative 2.A). An annual landings limit of 900,127 pounds would require considerably reduced landings compared to 2013-2015 levels. A reduction of this magnitude could lead to a notable reduction in fishing mortality for chub mackerel, and potentially for other unmanaged forage species caught incidentally when chub mackerel are targeted. For these reasons, alternative 2.C.i.a is expected to have moderate positive

impacts on unmanaged forage species compared to the no action alternative, in both the long and short term.

Because there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic, it is not known how a 900,127 pound landings limit, or any of the other landings limits under consideration, would impact the status of the chub mackerel stock. There have been no indications of a decline in chub mackerel abundance over the past 20 years, which implies that a 900,127 pound landings limit would not likely have major impacts on the stock; however, chub mackerel abundances in the Mid-Atlantic are variable, which poses difficulties for detecting both increases and decreases in abundance.

Alternative 2.C.i.a includes the lowest chub mackerel landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the most positive impacts on unmanaged forage species.

7.1.2.3.1.2. Impacts of Alternative 2.C.i.b (1.75 Million Pound Chub Mackerel Landings Limit) on Unmanaged Forage Species

Alternative 2.C.i.b would implement a 1.75 million-pound annual landings limit for chub mackerel (section 5.2.3.1.2). This is equivalent to the average annual chub mackerel landings in the northeast over 2011-2015 (section 6.4.1.8).

When compared to average landings over 2013-2015 (i.e. 2.86 million pounds), a 1.75 million pound landings limit represents about a 39% decrease. As described in the previous section, it is assumed that under the no action alternative landings would remain similar to 2013-2015 levels into the near future. Alternative 2.C.i.b is therefore expected to have moderate positive impacts on chub mackerel compared to the no action alternative (alternative 2.A) because it would constrain landings to a lower level than 2013-2015 levels. In doing so, it could result in a decrease in fishing effort and fishing mortality, and thus moderate positive impacts for chub mackerel over both the short and long-term compared to the no action alternative. It may also cause a slight reduction in fishing mortality for other forage species caught incidentally when chub mackerel are targeted and thus could have slight positive impacts for those species.

Because there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic, it is not known how a 1.75 million pound landings limit, or any of the other landings limits under consideration, would impact the status of the chub mackerel stock. There have been no indications of a decline in chub mackerel abundance in the Mid-Atlantic over the past 20 years; however, chub mackerel abundance is variable, which poses challenges for detecting increases and decreases in abundance.

Alternative 2.C.i.b includes a higher landings limit than alternative 2.C.i.a; therefore, the impacts would be of a lesser magnitude than those under alternative 2.C.i.a. It includes a lower landings

limit than alternatives 2.C.i.c and 2.C.i.d; therefore, it is expected to have greater positive impacts than those alternatives.

7.1.2.3.1.3. Impacts of Alternative 2.C.i.c (2.86 Million Pound Chub Mackerel Landings Limit; Preferred) on Unmanaged Forage Species

Alternative 2.C.i.c would implement a 2.86 million pound annual landings limit for chub mackerel (section 5.2.3.1.3). This is a preferred alternative.

2.86 million pounds is equivalent to average annual chub mackerel landings in the northeast over 2013-2015. This time frame encompasses the recent chub mackerel fishery, which is quite different from the fishery in previous years in terms of fishing effort and landings (section 6.4.1.8). Chub mackerel landings exceeded 2.86 million pounds per year only once over 1996-2015 (in 2013). Alternative 2.C.i.c would allow the chub mackerel fishery to continue at a level comparable to recent years, but would not allow the fishery to reach its historic high.

As previously stated, there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic; therefore, it is not known how a 2.86 million pound landings limit, or any of the other landings limits under consideration, would impact the status of the chub mackerel stock.

Overall, because landings are expected to continue at 2013-2015 levels under the no action alternative (section 7.1.2.1), a landings limit based on average 2013-2015 landings is not expected to result in a change in fishing effort in the near future. Thus, the short-term impacts of alternative 2.C.i.c on unmanaged forage species are expected to be the same as the short-term impacts of the no action alternative (alternative 2.A; i.e. slight negative impacts).

If fishermen and dealers continue their efforts to build a market for chub mackerel caught in the Mid-Atlantic, landings could increase beyond 2013-2015 levels over the longer term under the no action alternative. By restricting landings to 2013-2015 levels, alternative 2.C.i.c would ensure that fishing mortality for chub mackerel and non-target forage species remains lower than it could be under the no action alternative. Therefore, the long-term impacts of alternative 2.C.i.c on unmanaged forage species are expected to be moderate positive compared to the no action alternative.

Alternative 2.C.i.c includes a higher landings limit than alternatives 2.C.i.a and 2.C.i.b; therefore, the impacts would be less positive than those under alternatives 2.C.i.a and 2.C.i.b. Alternative 2.C.i.c includes a lower landings limit than alternative 2.C.i.d; therefore, impacts would be more positive than under alternative 2.C.i.d.

7.1.2.3.1.4. Impacts of Alternative 2.C.i.d (5.25 Million Pound Chub Mackerel Landings Limit) on Unmanaged Forage Species

Alternative 2.C.i.d would implement a 5.25 million pound annual landings limit for chub mackerel (section 5.2.3.1.4). This is equivalent to the highest amount of chub mackerel landed in a single year (2013) in the northeast during 1996-2015 (Table 16).

Alternative 2.C.i.d would allow up to 5.25 million pounds of chub mackerel to be landed in multiple consecutive years, which would represent an increase in landings (and presumably in fishing mortality) compared to recent years. However, chub mackerel landings are variable and influenced by a variety of factors (including environmental conditions and by the availability and price of other target species); therefore, landings could remain, for the most part, below 5.25 million pounds per year under this alternative.

Because there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic, it is not known if 5.25 million pounds per year is a sustainable level of harvest. If unsustainable, it could have moderate negative impacts on the chub mackerel stock. Given that 5.25 million pounds were landed in 2013 and no subsequent negative impacts were noted, it is assumed that impacts would not be highly negative. If sustainable, it could have only slight negative impacts. Given this uncertainty, the likely short-term impacts of alternative 2.C.i.d on chub mackerel and other unmanaged forage species caught incidentally in chub mackerel fisheries range from slight to moderate negative.

Alternative 2.C.i.d would place a restriction on landings which would be absent under the no action alternative (alternative 2.A). Given that landings only reached 5.25 million pounds once over 1996-2015, and given that one of the four vessels which landed large volumes of chub mackerel was sold to a west coast fishery in 2016, an increase beyond this level is not likely to occur in the near future; however, it could occur over the longer term. Alternative 2.C.i.d would prevent such an increase and thus could have slight to moderate positive long-term impacts on chub mackerel and non-target species compared to the no action alternative, depending on potential future changes in landings.

Alternative 2.C.i.d includes the highest chub mackerel landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the most negative impacts on unmanaged forage species.

7.1.2.4. Impacts of Alternative Set 2.C.ii (Chub Mackerel Possession Limit) on Unmanaged Forage Species

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the landings limit is reached. These possession limits are intended to be used in combination with one of the landings limit alternatives in alternative set 2.C.i. The impacts of the possession limits depend in large part on which landings limit is chosen. The two measures together would

determine the overall allowable landings of (and, by extension, fishing effort and fishing mortality for) chub mackerel in a given year. To the extent that the impacts of the possession limits on unmanaged forage species can be considered separately from the landings limits, these impacts are summarized in the following sections.

7.1.2.4.1. Impacts of Alternative 2.C.ii.a (No Possession of Chub Mackerel After Landings Limit is Reached) on Unmanaged Forage Species

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is reached (section 5.2.3.2.1). This alternative would prohibit directed fishing for chub mackerel after the landings limit is met and would require any chub mackerel caught incidentally to be discarded at sea. This could encourage vessels to avoid chub mackerel after the landings limit is met.

Alternative 2.C.ii.a would increase the effectiveness of the annual landings limit in constraining landings to a given target. In this way, it could have slight positive impacts on the chub mackerel stock because it would limit fishing mortality, compared to the no action alternative. Depending on which landings limit is used, the expected impacts would be of a greater (e.g. with alternative 2.C.i.a, 900,127 pound landings limit) or lesser (e.g. with alternative 2.C.i.d, 5.25 million pound landings limit) degree.

Alternative 2.C.ii.a is the most restrictive of the three possession limit alternatives; therefore, it is expected to have the most positive impacts on unmanaged forage species.

7.1.2.4.2. Impacts of Alternative 2.C.ii.b (10,000 Pound Chub Mackerel Possession Limit After Landings Limit is Met) on Unmanaged Forage Species

Under alternative 2.C.ii.b a 10,000-pound possession limit would be enforced after the annual chub mackerel landings limit is met (section 5.2.3.2.2). This alternative is intended to allow some amount of incidental catch to be landed after the annual landings limit is met, thus reducing discards. From a biological perspective, incidental catch in trawl fisheries like those which catch chub mackerel in the Mid-Atlantic results in similar levels of fishing mortality whether the catch is discarded or landed. Under this alternative, fishermen would not have a strong incentive to avoid chub mackerel after the landings limit is met, as they would have under alternative 2.C.ii.a, which would prohibit possession of chub mackerel after the landings limit is met.

Ten thousand pounds of chub mackerel is a large volume of landings for many of the smaller vessels which landed chub mackerel in the past. Alternative 2.C.ii.b would not provide these smaller vessels with an incentive to avoid chub mackerel. Small-scale directed harvest could continue after the landings limit is met under this alternative.

Alternative 2.C.ii.b could prove restrictive for the handful of larger vessels which landed higher volumes of chub mackerel in the past. As many as four vessels per year landed volumes much higher than 10,000 pounds per trip on several occasions in the recent past.^{lxiii}

This possession limit would come into effect after the annual landings limit is met; therefore, the landings limit could be exceeded under alternative 2.C.ii.b. The possession limit would restrict the pace of landings after the limit is met, especially for the larger vessels.

Alternative 2.C.ii.b would implement a restriction on possession of chub mackerel that would be absent under the no action alternative; therefore, it could result in lower levels of fishing effort than would be possible under the no action alternative. When considered separately from the landings limit, it is expected to have slight positive impacts for unmanaged forage species because it would only prove restrictive for a few larger vessels and would only come into effect after the annual landings limit is met.

The impacts of alternative 2.C.ii.b are expected to be less positive than those of alternative 2.C.ii.a (prohibit possession of chub mackerel after the landings limit is met) and more positive than those of alternative 2.C.ii.c (40,000 pound possession limit).

7.1.2.4.3. Impacts of Alternative 2.C.ii.c (40,000 Pound Chub Mackerel Possession Limit After Landings Limit is Reached; Preferred) on Unmanaged Forage Species

Under alternative 2.C.ii.c a 40,000 pound possession limit would be enforced after the chub mackerel landings limit is fully harvested (section 5.2.3.2.3). This is a preferred alternative. This alternative is intended to provide vessels with an incentive to land any chub mackerel they catch incidentally after the landings limit is met. From a biological impact perspective, incidental catch in trawl fisheries like those which catch chub mackerel in the Mid-Atlantic results in similar levels of fishing mortality whether that catch is landed or discarded.

Alternative 2.C.ii.c would place a limitation on only those vessels which are capable of retaining more than 40,000 pounds of chub mackerel at a time. About four vessels landed volumes higher than 40,000 pounds per trip in the past.^{lxiv} One of these vessels was sold to the west coast in 2016; therefore, it is not likely that fishing effort for chub mackerel will exceed recent levels in the near future under alternative 2.C.ii.c, regardless of which landings limit alternative is used.

Alternative 2.C.ii.c may have only a minor impact on landings and could allow landings to substantially exceed the annual landings limit, especially if coupled with one of the lower landings limit alternatives (e.g. alternative 2.C.i.a). Alternative 2.C.ii.c could minimize the effectiveness of the landings limit and could allow landings (and, by extension, fishing mortality)

^{lxiii} Details about the volume of landings from these vessels are considered confidential because in all years there were fewer than three vessels which landed more than 10,000 pounds per trips and/or fewer than three dealers which purchased these landings.

^{lxiv} Ibid.

to continue at levels similar to or slightly lower than recent levels (in that it will restrict a few vessels) after the landings limit is met. For this reason, alternative 2.C.ii.c is expected to have neutral (if fishing effort remains similar to recent levels) to slight positive (if fishing effort is slightly reduced) short term impacts on the chub mackerel stock, compared to the no action alternative.

Under the no action alternative, there would be no restrictions on landings of chub mackerel. As previously stated, a few vessels landed volumes higher than 40,000 pounds in the past. They would be able to continue to do so under the no action alternative. Fishing effort for chub mackerel is not expected to increase in the near future, but it could do so over the longer-term under the no action alternative. By restricting landings to 40,000 pounds per trip, alternative 2.C.ii.c could have slight positive long-term impacts on chub mackerel compared to the no action alternative.

Alternative 2.C.ii.c is the least restrictive of the three chub mackerel possession limit alternatives (alternatives 2.C.ii.a – 2.C.ii.c); therefore, it is expected to have the least positive impacts on chub mackerel and non-target unmanaged forage species.

7.1.2.5. Impacts of Alternative Set 2.C.iii (Chub Mackerel Sunset Provisions) on Unmanaged Forage Species

Alternative set 2.C.iii contains alternatives related to sunset provisions for chub mackerel management measures. The expected impacts of these alternatives on unmanaged forage species are summarized in the following sections.

7.1.2.5.1. Impacts of Alternative 2.C.iii.a (No Sunset for Chub Mackerel Management Measures) on Unmanaged Forage Species

Under alternative 2.C.iii.a any management measures implemented for chub mackerel as part of this amendment would remain in place unchanged until they are modified by future amendments or framework actions. This alternative would not have any impacts on unmanaged forage species beyond the impacts of the management measures themselves. When considered independently from the management measures, the impacts of this alternative on unmanaged forage species are expected to be neutral.

7.1.2.5.2. Impacts of Alternative 2.C.iii.b (3 Year Sunset for Chub Mackerel Management Measures; Preferred) on Unmanaged Forage Species

Under alternative 2.C.iii.b, any management measures implemented for chub mackerel as part of this amendment would expire three years after implementation (section 5.2.3.3.2). This is a preferred alternative. Under this alternative, if the Council does not take additional action, there would be no management measures for chub mackerel in the Mid-Atlantic after three years. This alternative presumes that management measures would be implemented through this amendment

(i.e. alternative 2.A, the no action alternative, is not chosen) and those measures would be in place for at least three years. For this reason, alternative 2.C.iii.b would have the same short-term impacts as whichever alternative is implemented. Over the longer term (i.e. after three years when the measures expire), alternative 2.C.iii.b would have the same impacts as the no action alternative (i.e. moderate to slight negative impacts), unless the Council takes future action to implement new management measures.

7.1.3. Impacts of Alternative Set 3 (Administrative Alternatives) on Unmanaged Forage Species

All the alternatives in alternative set 3 are administrative in nature and are therefore not expected to have direct impacts on the forage species included in this amendment.

The no action alternatives in alternative set 3 (i.e. alternatives 3.A.i, 3.B.i, 3.C.i, 3.D.i, 3.E.i, 3.F.i, 3.G.i, and 3.H.i; section 5.3) are all expected to have neutral impacts on unmanaged forage species because they are not expected to change fishing effort or fishing mortality, compared to recent levels.

The action alternatives (i.e. the alternatives which are not “no action” alternatives) relating to the process for considering new fisheries and expansion of existing fisheries (alternatives 3.A.ii – 3.A.iv, section 5.3.1) may have indirect positive impacts for the species included in this amendment. These alternatives would place additional constraints on the expansion of fisheries for those species by either prohibiting expansion altogether (alternative 3.A.ii), requiring specific steps for collecting data to better understand the impacts of those fisheries (alternative 3.A.iii), or requiring consideration of certain management measures for those fisheries (alternative 3.A.iv). Alternatives 3.B.ii (update the list of fisheries and gear at 50 CFR 600.725), 3.C.ii (require a GARFO permit), and 3.D.ii (add species codes to required reporting mechanisms) are also aimed at gaining a better understanding of fisheries for these species and thus could lead to indirect slight positive impacts if they lead to better-informed management decisions in the future.

The framework alternatives (alternative set 3.G.ii) are intended to allow for efficient changes to the regulations in response to new information. The impacts of any future framework actions will be analyzed through an additional NEPA process. Because the framework alternatives are administrative in nature, they are not expected to result in any direct impacts on unmanaged forage species. Some indirect slight positive impacts may occur if the framework provisions allow for more efficient responses to immediate threats to unmanaged forage species.

Overall, the administrative alternatives which are expected to have indirect impacts on unmanaged forage species (i.e. alternatives 3.A.ii, 3.A.iii, 3.A.iv, 3.B.ii, 3.C.ii, 3.D.ii, 3.E.ii, and 3.G.ii) are expected to have slight positive impacts in both the short and long-term. The other administrative alternatives are not expected to impact unmanaged forage species.

7.2. Impacts of the Alternatives on Council Managed Species and Other Predators

Council managed species and other predators of forage species (i.e. large tunas, billfish, swordfish, sharks, and seabirds) are grouped together for impact analysis because they are expected to experience similar impacts from each of the alternatives considered in this document. These impacts are described in the following sections.

7.2.1. Impacts of Alternative Set 1 (Alternatives for Taxa Besides Chub Mackerel) on Council Managed Species and Other Predators

Alternative set 1 contains alternatives for taxa other than chub mackerel. The following sections describe the expected impacts of these alternatives on Council managed species and other predators (specifically, large tunas, billfish, sharks, and seabirds; section 7.3.1 describes the impacts of alternative set 1 on protected species predators).

7.2.1.1. Impacts of Alternative 1.A (No Action on Taxa Besides Chub Mackerel) on Council Managed Species and Other Predators

Under alternative 1.A the Council would take no action on commercial fisheries for unmanaged forage taxa (besides chub mackerel; section 5.1.1). For the reasons described in section 7.1.1.1, alternative 1.A is not expected to result in a substantial change in fishing effort and fishing mortality for unmanaged forage species in the short-term. By extension, it is not expected to result in short term changes in the abundance of forage prey in the Mid-Atlantic. It is also not expected to change bycatch rates for other species caught incidentally in fisheries targeting unmanaged forage species.

Harvest of these unmanaged forage species over 1996-2015 is presumed to have had slight negative impacts on Council managed species and other predators by slightly reducing prey abundances and leading to small amounts of bycatch of Council managed species and other predators. These impacts were likely slight (as opposed to moderate or high) negative because most Council managed species and other predators consume a variety of prey species throughout the year and none are known to rely on the taxa addressed by this amendment for the majority of their diet (sections 6.1 and 6.2). For these reasons, reductions in prey availability resulting from *status quo* levels harvest of unmanaged forage species will likely have slight negative impacts on Council managed species and other predators. In addition, impacts from bycatch in fisheries which landed unmanaged forage species (besides chub mackerel) are assumed to have been slight negative because these fisheries resulted in relatively low amounts of landings, especially compared to managed fisheries (sections 6.4.1 and 6.4.2). These impacts are expected to remain unchanged in the near future under the no action alternative; thus, alternative 1.A is expected to have slight negative short-term impacts on Council managed species and other predators.

As described in section 7.1.1.1, fishing effort for unmanaged forage species could increase over the long-term under alternative 1.A. If this were to occur, negative impacts to Council managed

species and other predators could result due to decreased availability of forage prey and increased incidental catches of Council managed species and other predators. Alternatively, fishing effort could remain unchanged over the long-term under alternative 1.A. This would result in continued slight negative impacts. For these reasons, the long-term impacts of alternative 1.A on Council managed species and other predators range from moderate negative (if fishing effort and mortality increases) to slight negative (if fishing effort and mortality remains unchanged).

Of all the alternatives considered for taxa besides chub mackerel (alternatives 1.A - 1.C), alternative 1.A is expected to have the most negative impacts on Council managed species and other predators, especially over the long term.

7.2.1.2. Impacts of Alternative 1.B (Prohibit Possession) on Council Managed Species and Other Predators

Alternative 1.B would prohibit commercial vessels fishing in Mid-Atlantic Federal waters from possessing over 50 previously unmanaged species (section 5.1.1). It would essentially prohibit directed fishing for these species in Mid-Atlantic Federal waters. For the reasons described in section 7.1.1.2, it is expected to lead to a slight reduction in fishing effort and fishing mortality for unmanaged forage species. In doing so, it could lead to a slight increase in their abundance. Many of these species are prey for one or more Council managed species and/or other predators (Table 7).

By slightly reducing fishing mortality for, and thus potentially slightly increasing abundances of several prey species, alternative 1.B is expected to have slight positive short-term impacts for Council managed species and other predators. Slight positive impacts could also occur if alternative 1.B results in a slight decrease in fishing effort, which could lead to reduced incidental catches of Council managed species and other predators.

Long-term impacts are expected to be greater in magnitude because alternative 1.B would prevent future increases in fishing mortality beyond *status quo* levels, which could occur under the no action alternative (alternative 1.A). By preventing such an expansion, alternative 1.B could have long-term moderate positive impacts for Council managed species, compared to the no action alternative.

Of all the alternatives considered for taxa besides chub mackerel (alternatives 1.A – 1.C), alternative 1.B is expected to have the most positive impacts on Council managed species and other predators, in both the short and long-term.

7.2.1.3. Impacts of Alternative 1.C (Incidental Possession Limit) on Council Managed Species and Other Predators

Alternative 1.C contains two sub-alternatives for a possession limit for the forage taxa included in this amendment (except chub mackerel). The expected impacts of these alternatives on Council managed species and other predators are described in the following sections.

7.2.1.3.1. Impacts of Alternative 1.C.i (Incidental Possession Limit of 1,500 Pounds Per Species) on Council Managed Species and Other Predators

Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species for all the taxa included in the amendment, except chub mackerel (section 5.1.3.1).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i is not expected to result in a short-term change in fishing effort or mortality for unmanaged forage species. It is therefore not expected to result in a change in the abundance of prey for Council managed species and other predators or in the amount of bycatch in fisheries targeting those species. The short-term impacts of alternative 1.C.i on Council managed species and other predators are thus expected to be similar to the impacts of the no action alternative (alternative 1.A; i.e. slight negative impacts).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i could result in a slight increase in fishing effort and fishing mortality for forage species over the long-term. If this were to occur, alternative 1.C.i could result in slight negative long-term impacts to Council managed species and other predators due to the potential for decreased abundances of forage prey and increased incidental catches of Council managed species and other predators. These impacts are expected to be slight (as opposed to moderate or high) negative because fishing effort would still be limited by a 1,500 pound possession limit and because most Council managed and other predators feed on a variety of prey species, including many species not included in this amendment (section 7.2.1.2).

Alternative 1.C.i would prevent greater future increases in fishing effort and fishing mortality which would be possible under the no action alternative. In this way, alternative 1.C.i could have slight positive long-term impacts for Council managed species and other predators compared to the no action alternative. These long-term impacts are expected to be slight (as opposed to moderate or high) positive due to the varied diets of most Council managed species and other predators (section 6.2) and because some level of fishing effort would still be allowed under alternative 1.C.i .

The impacts of alternative 1.C.i on Council managed species and other predators are expected to be more positive than the impacts of the no action alternative (alternative 1.A), but less positive compared to alternatives 1.B (prohibit possession) and 1.C.ii (possession limit of 1,700 pounds for all species combined).

7.2.1.3.2. Impacts of Alternative 1.C.ii (Incidental Possession Limit of 1,700 Pounds for all Species Combined; Preferred) on Council Managed Species and Other Predators

Alternative 1.C.ii would implement an incidental possession limit of 1,700 pounds combined weight of all the taxa included in the amendment, except chub mackerel (section 5.1.3.2). Alternative 1.C.ii is a preferred alternative.

For the reasons described in section 7.1.1.3.2, alternative 1.C.ii is not expected to result in a short-term change in fishing effort or fishing mortality for unmanaged forage species. It is therefore not expected to result in a change in the abundance of forage prey or in the amount of Council managed species and other predators caught incidentally in fisheries targeting unmanaged forage species. It is thus expected to have similar short-term impacts on Council managed species and other predators as the no action alternative (alternative 1.A; i.e. slight negative impacts).

For the reasons described in section 7.1.1.3.2, alternative 1.C.ii could result in a slight increase in fishing effort and fishing mortality for forage species over the long-term. If this were to occur, it could result in slight negative long-term impacts to Council managed species and other predators due to the potential for decreased abundances of forage prey and increased incidental catches of Council managed species and other predators. These impacts are expected to be slight (as opposed to moderate or high) negative because fishing effort would still be limited by a 1,700 pound possession limit and because most Council managed species and other predators feed on a variety of prey species, including many species not included in this amendment (section 6.2).

Alternative 1.C.ii would prevent greater future increases in fishing mortality which would be possible under the no action alternative (alternative 1.A). In this way, it could have slight positive long-term impacts for Council managed species and other predators compared to the no action alternative. These long-term impacts are expected to be slight (as opposed to moderate or high) positive due to the varied diets of most Council managed species and other predators (section 6.2) and because some level of fishing effort would still be allowed.

The impacts of alternative 1.C.ii on Council managed species and other predators are expected to be more positive than the impacts of alternatives 1.A (no action) and 1.C.i (1,500 pound per species possession limit), but less positive compared to alternative 1.B (prohibit possession).

7.2.2. Impacts of Alternative Set 2 (Alternatives for Chub Mackerel) on Council Managed Species and Other Predators

Alternative set 2 contains sub alternatives for the designation of chub mackerel and for chub mackerel management measures. The following sections describe the expected impacts of these alternatives on Council managed species and other predators (specifically, large tunas, billfish,

sharks, and seabirds; section 7.3.2 describes the impacts of alternative set 2 on protected species predators).

7.2.2.1. Impacts of Alternative 2.A (No Action on Chub Mackerel) on Council Managed Species and Other Predators

Under alternative 2.A the Council would take no action on chub mackerel as part of this amendment and the chub mackerel fishery would remain unregulated (section 5.2.1). Chub mackerel landings increased substantially over the past several years (Table 16). For the reasons described in section 7.1.2.1, landings are expected to remain at or slightly below 2013-2015 levels in the near future, but may increase over the longer term under the no action alternative.

As previously described, chub mackerel are prey for tunas and billfish. “Mackerels” (potentially including chub mackerel) have been identified as prey for some Council-managed species and other predators. These predators feed on a variety of prey species (Table 7); therefore, a decline in chub mackerel abundances due to fishing mortality would likely have only slight negative impacts on these predators.

Council managed species and other predators may be caught to some extent in fisheries targeting chub mackerel. If fishing effort for chub mackerel were to increase under alternative 2.A, then incidental catches of these species could increase.

Because fishing effort is not expected to increase beyond 2013-2015 levels in the near future under alternative 2.A (section 7.1.2.1), slight negative short-term impacts on Council managed species and other predators are expected. Long-term impacts range from slight negative (if fishing effort and fishing mortality remain similar to recent levels) to moderate negative (if fishing effort and fishing mortality increase).

Of all the alternatives for chub mackerel (alternatives 2.A – 2.C), alternative 2.A is expected to have the most negative impacts on Council managed species and other predators, especially over the long-term.

7.2.2.2. Impacts of Alternative Set 2.B (Chub Mackerel Designation) on Council Managed Species and Other Predators

Alternative set 2.B contains three sub alternatives for the designation of chub mackerel. These alternatives are largely administrative in nature as they do not imply any specific level of catch or landings limits. The following sections summarize the expected impacts of these alternatives on Council managed species and other predators.

7.2.2.2.1. Impacts of Alternative 2.B.i (Manage Chub Mackerel as an EC) on Council Managed Species and Other Predators

Under alternative 2.B.i chub mackerel would be managed as an EC (section 5.2.2.1). As described in section 7.1.2.2.1, although the impacts of this designation would largely derive from the measures implemented, the designation itself would establish the foundation for chub mackerel management measures. Assuming that these measures would regulate chub mackerel fisheries to ensure sustainability, this would have slight positive impacts on Council managed species and other predators by helping to maintain abundances of one of their prey species and by regulating fishing effort, thus limiting the potential for bycatch of Council managed species and other predators.

The legal requirements for ECs are not as strong as those for stocks in the fishery (section 5.2.2); therefore the impacts of alternative 2.B.i may not be as positive as those of alternative 2.B.ii, which would manage chub mackerel as a stock in the fishery. The impacts may be more positive than those under alternative 2.B.iii, which would use neither designation and thus has a weaker legal basis. The actual impacts would derive largely from the management measures implemented under any of these alternatives.

7.2.2.2.2. Impacts of Alternative 2.B.ii (Manage Chub Mackerel as a Stock in the Fishery) on Council Managed Species and Other Predators

Under alternative 2.B.ii chub mackerel would be managed as a stock in the fishery (section 5.2.2.2). As described in section 7.1.2.2.2, although the impacts of alternative 2.B.ii would largely derive from the management measures implemented, the stock in the fishery designation would establish a legal basis and a legal requirement for those measures. The MSA requires that Councils implement measures to ensure sustainability of fisheries for stocks that are in the fishery. Thus, alternative 2.B.ii would help to maintain abundances of one prey species for Council managed and other predators. It would also regulate fishing effort and would thus limit the potential for bycatch of Council managed species and other predators. For these reasons, alternative 2.B.ii is expected to have slight positive impacts on Council managed species and other predators.

Of all the designations considered for chub mackerel, the stock in the fishery designation has the strongest legal requirements. Therefore, alternative 2.B.ii may have greater positive impacts for Council managed species and other predators than alternatives 2.B.i and 2.B.iii; however, the actual impacts would derive largely from the management measures implemented under any of these alternatives.

7.2.2.2.3. Impacts of Alternative 2.B.iii (Manage Chub Mackerel as Neither an EC nor a Stock in the Fishery; Preferred) on Council Managed Species and Other Predators

Under alternative 2.B.iii chub mackerel would be designated as neither an EC nor a stock in the fishery. Management measures would be implemented using the discretionary authority allowed for under section 303(b)(12) of the MSA (section 5.2.2.3). This is the preferred alternative for the designation of chub mackerel. The impacts of this alternative would derive solely from the management measures implemented. Unlike alternatives 2.B.i and 2.B.ii, there would be no legal framework or requirement for any particular management measures under this alternative. For these reasons, when considered separately from the management measures, the impacts of alternative 2.B.ii on Council managed species and other predators are expected to be neutral (compared to slight positive impacts expected under alternatives 2.B.i and 2.B.ii).

7.2.2.3. Impacts of Alternative Set 2.C (Chub Mackerel Management Measures) on Council Managed Species and Other Predators

Alternative set 2.C contains alternatives for chub mackerel management measures. The following sections summarize the expected impacts of these alternatives on Council managed species and other predators.

7.2.2.3.1. Impacts of Alternative Set 2.C.i (Chub Mackerel Landings Limit) on Council Managed Species and Other Predators

Alternative set 2.C.i contains four alternatives for an annual chub mackerel landings limit. The expected impacts of these alternatives on Council managed species and other predators are summarized in the following sections.

7.2.2.3.1.1. Impacts of Alternative 2.C.i.a (900,127 Pound Chub Mackerel Landings Limit) on Council Managed Species and Other Predators

Alternative 2.C.i.a would implement a 900,127 pound annual landings limit for chub mackerel (section 5.2.3.1.1). For the reasons described in section 7.1.2.3.1.1, this alternative is expected to result in a decrease in fishing effort and fishing mortality for chub mackerel, compared to recent levels. In doing so, it could result in an increase in chub mackerel abundances in the Mid-Atlantic. It could also result in a decrease in the amount of bycatch in fisheries targeting chub mackerel. For these reasons, alternative 2.C.i.a is expected to have slight to moderate positive short and long-term impacts for Council managed species and other predators which are predators of chub mackerel or may be caught incidentally in fisheries targeting chub mackerel.

Alternative 2.C.i.a includes the lowest landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the most positive impacts on Council managed species and other predators.

7.2.2.3.1.2. Impacts of Alternative 2.C.i.b (1.75 Million Pound Chub Mackerel Landings Limit) on Council Managed Species and Other Predators

Alternative 2.C.i.b would implement a 1.75 million pound annual landings limit for chub mackerel (section 5.2.3.1.2). For the reasons described in section 7.1.2.3.1.2, this alternative is expected to result in a decrease in fishing effort and fishing mortality for chub mackerel, compared to recent levels. In doing so, it could result in an increase in chub mackerel abundances in the Mid-Atlantic. It could also result in a decrease in the amount of bycatch in fisheries targeting chub mackerel. For these reasons, alternative 2.C.i.b is expected to have slight to moderate positive impacts for Council managed species and other predators which are predators of chub mackerel or may be caught incidentally in fisheries targeting chub mackerel.

Alternative 2.C.i.b includes a higher landings limit than alternative 2.C.i.a; therefore, the positive impacts would be lesser in magnitude than those under alternative 2.C.i.a. Alternative 2.C.i.b includes a lower landings limit than alternatives 2.C.i.c and 2.C.i.d; therefore, it is expected to have greater positive impacts than those alternatives.

7.2.2.3.1.3. Impacts of Alternative 2.C.i.c (2.86 Million Pound Chub Mackerel Landings Limit; Preferred) on Council Managed Species and Other Predators

Alternative 2.C.i.c would implement a 2.86 million-pound annual landings limit for chub mackerel (section 5.2.3.1.3). This is a preferred alternative.

For the reasons described in section 7.1.2.3.1.4, alternative 2.C.i.c is expected to result in similar levels of fishing effort and fishing mortality as the no action alternative (alternative 2.A) over the short term. For this reason, alternative 2.C.i.c is expected to have the same short term impacts on Council managed species and other predators as the no action alternative (i.e. slight negative impacts).

For the reasons described in section 7.1.2.1, fishing effort and fishing mortality for chub mackerel could increase over the longer-term under the no action alternative. Alternative 2.C.i.c would prevent such an increase and would restrict fishing effort and mortality to recent levels. In this way, abundance of chub mackerel prey for some Council managed species and other predators could be higher over the long-term under alternative 2.C.i.c than under the no action alternative. Bycatch of non-target species (potentially including some Council-managed species and other predators) could be lower under alternative 2.C.i.c than the under the no action alternative. For these reasons, alternative 2.C.i.c is expected to have slight to moderate positive long-term impacts on Council managed species and other predators, compared to the no action alternative. Impacts may be slight (as opposed to moderate) positive because Council managed species and other predators feed on a variety of prey items (Table 7); therefore, maintenance of chub mackerel abundances may not result in substantial benefits. In addition, any increase in chub mackerel fishing effort which could occur over the long-term under the no action alternative and would be prevented by alternative 2.C.i.c would exist alongside fishing effort in

several other fisheries in the region which also result in bycatch of Council managed species and other predators (e.g. 6.4.2).

Alternative 2.C.i.c includes a higher landings limit than alternatives 2.C.i.a and 2.C.i.b; therefore, the impacts on Council managed species and other predators would be less positive than those under alternatives 2.C.i.a and 2.C.i.b. Alternative 2.C.i.c includes a lower landings limit than alternative 2.C.i.d; therefore, impacts would be more positive than under alternative 2.C.i.d.

7.2.2.3.1.4. Impacts of Alternative 2.C.i.d (5.25 Million Pound Chub Mackerel Landings Limit) on Council Managed Species and Other Predators

Alternative 2.C.i.d would implement a 5.25 million pound annual landings limit for chub mackerel (section 5.2.3.1.4). For the reasons described in section 7.1.2.3.1.4, fishing effort and fishing mortality for chub mackerel are expected to remain similar to recent levels in the near future under this alternative. Thus, short term impacts on Council managed species and other predators are expected to be the same as under the no action alternative (i.e. slight negative impacts).

For the reasons described in section 7.1.2.1, fishing effort and fishing mortality for chub mackerel could increase over the longer-term under the no action alternative. Alternative 2.C.i.d would prevent such an increase and would restrict fishing effort and mortality to recent levels. In this way, abundance of chub mackerel prey for some Council managed species and other predators could be higher over the long-term under alternative 2.C.i.d than under the no action alternative. Bycatch of non-target species (potentially including some Council-managed species and other predators) could be lower under alternative 2.C.i.d than the under the no action alternative. For these reasons, alternative 2.C.i.d is expected to have slight to moderate positive long-term impacts on Council managed species and other predators, compared to the no action alternative. Impacts may be slight (as opposed to moderate) positive because Council managed species and other predators feed on a variety of prey items (Table 7); therefore, maintenance of chub mackerel abundances may not result in substantial benefits. In addition, any increase in chub mackerel fishing effort which could occur over the long-term under the no action alternative and would be prevented by alternative 2.C.i.d would exist alongside fishing effort in several other fisheries in the region which also result in bycatch of Council managed species and other predators (e.g. 6.4.2).

Alternative 2.C.i.d includes the highest chub mackerel landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the least positive impacts on Council managed species and other predators.

7.2.2.3.2. Impacts of Alternative Set 2.C.ii (Chub Mackerel Possession Limit) on Council Managed Species and Other Predators

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the landings limit is reached. These possession limits are intended to be used in combination with one of the landings limit alternatives in alternative set 2.C.i. The impacts of the possession limits on Council managed species and other predators depend, in large part, on which landings limit is chosen. The two measures together (the possession and landings limit) would determine the overall allowable landings of (and, by extension, fishing effort and fishing mortality for) chub mackerel in a given year. To the extent that the expected impacts of the possession limits on Council managed species and other predators can be considered separately from the landings limits, these impacts are summarized in the following sections.

7.2.2.3.2.1. Impacts of Alternative 2.C.ii.a (No Possession of Chub Mackerel after the Landings Limit is Reached) on Council Managed Species and Other Predators

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is reached (section 5.2.3.2.1). As described in section 7.1.2.4.1, the impacts of alternative 2.C.ii.a on fishing effort and fishing mortality would vary based on the landings limit used (alternative set 2.C.i). To the extent that alternative 2.C.ii.a limits fishing effort and fishing mortality for chub mackerel, it would also limit fishing mortality for non-target species and would limit the potential for a decrease in chub mackerel abundances. In this way, it is expected to have slight positive short and long-term impacts for predators of chub mackerel and non-target species (including Council managed species and other predators), compared to the no action alternative.

Of the three possession limit alternatives considered for chub mackerel (alternatives 2.C.ii.a – 2.C.ii.c), alternative 2.C.ii.a is the most restrictive; therefore, it is expected to have the most positive impacts on Council managed species and other predators.

7.2.2.3.2.2. Impacts of Alternative 2.C.ii.b (10,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Reached) on Council Managed Species and Other Predators

Under alternative 2.C.ii.b a 10,000-pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.2). For the reasons described in section 7.1.2.4.2, this is expected to prove restrictive for only a few larger vessels. When considered separately from the landings limit alternatives, it is expected to slightly reduce fishing effort and fishing mortality for chub mackerel, compared to the no action alternative. It could thus lead to a slight increase in chub mackerel abundances and a slight decrease in fishing mortality for non-target species. In this way, it could have slight positive impacts for Council managed species and other predators of chub mackerel (compared to the no action alternative) because it could lead to a slight increase in the abundance of one of their food sources. It could also lead to a slight

decrease in the amount of Council managed species and other predators caught incidentally in fisheries targeting chub mackerel.

The impacts of alternative 2.C.ii.b are expected to be less positive than those of alternative 2.C.ii.a (prohibit possession of chub mackerel after the landings limit is met) and more positive than those of alternative 2.C.ii.c (40,000 pound possession limit).

7.2.2.3.2.3. Impacts of Alternative 2.C.ii.c (40,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Reached; Preferred) on Council Managed Species and Other Predators

Under alternative 2.C.ii.c a 40,000 pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.3). This is a preferred alternative.

When considered separately from the landings limit alternatives, alternative 2.C.ii.c is expected to slightly reduce fishing effort and fishing mortality for chub mackerel, compared to the no action alternative. It could thus lead to a slight increase in chub mackerel abundances and a slight decrease in fishing mortality for non-target species. In this way, it could have slight positive short and long-term impacts for Council managed species and other predators of chub mackerel (compared to the no action alternative) because it could lead to a slight increase in the abundance of one of their food sources, especially over the longer-term. It could also lead to a slight decrease in the amount of Council managed species and other predators caught incidentally in fisheries targeting chub mackerel, compared to the no action alternative.

Alternative 2.C.ii.c is the least restrictive of the three possession limit alternatives considered for chub mackerel (alternatives 2.C.ii.a – 2.C.ii.c); therefore, it is expected to have the least positive impacts on Council managed species and other predators.

7.2.2.4. Impacts of Alternative Set 2.C.iii (Chub Mackerel Sunset Provisions) on Council Managed Species and Other Predators

Alternative set 2.C.iii contains alternatives related to sunset provisions for chub mackerel management measures. The expected impacts of these alternatives on Council managed species and other predators are summarized in the following sections.

7.2.2.4.1. Impacts of Alternative 2.C.iii.a (No Sunset for Chub Mackerel Management Measures) on Council Managed Species and Other Predators

Under alternative 2.C.ii.a any management measures implemented for chub mackerel as part of this amendment would remain in place unchanged until they are modified by future amendments or framework actions. This alternative would not have any impacts on Council managed species and other predators, beyond the impacts of the management measures themselves. The impacts of alternative 2.C.iii.a on Council managed species and other predators, when considered

independently from the management measures, are thus expected to be neutral in both the short and long-term.

7.2.2.4.2. Impacts of Alternative 2.C.iii.b (3 Year Sunset for Chub Mackerel Management Measures; Preferred) on Council Managed Species and Other Predators

Under alternative 2.C.iii.b, any management measures implemented for chub mackerel as part of this amendment would expire three years after implementation (section 5.2.3.3.2). This is a preferred alternative. Under this alternative, if the Council does not take additional action, there would be no management measures for chub mackerel in the Mid-Atlantic after three years. This alternative presumes that management measures would be implemented through this amendment (i.e. it assumes that alternative 2.A, no action on chub mackerel, is not chosen) and those measures would be in place for at least three years. For this reason, alternative 2.C.iii.b would have the same short-term impacts as whichever alternative is implemented. Over the longer term (i.e. after three years, when the measures expire), alternative 2.C.iii.b would have the same impacts on Council managed species and other predators as the no action alternative (i.e. moderate to slight negative impacts), unless the Council takes future action to implement new management measures.

7.2.3. Impacts of Alternative Set 3 (Administrative Alternatives) on Council Managed Species and Other Predators

All the alternatives in alternative set 3 are administrative in nature and are therefore not expected to have direct impacts on Council managed species and other predators.

The no action alternatives in alternative set 3 (i.e. alternatives 3.A.i, 3.B.i, 3.C.i, 3.D.i, 3.E.i, 3.F.i, 3.G.i, and 3.H.i; section 5.3) are all expected to have neutral impacts on Council managed species and other predators because they are not expected to change fishing effort or fishing mortality, compared to recent levels.

The action alternatives (i.e. the alternatives which are not “no action” alternatives) relating to the process for considering new fisheries and expansion of existing fisheries for unmanaged forage species (alternatives 3.A.ii – 3.A.iv, section 5.3.1) may have indirect positive impacts for Council managed species and other predators. These alternatives would place additional constraints on the expansion of fisheries for forage species, which are prey for several Council managed species and other predators, by either prohibiting expansion altogether (alternative 3.A.ii), requiring specific steps for collecting data to better understand the impacts of those fisheries (alternative 3.A.iii), or requiring consideration of certain management measures for those fisheries (alternative 3.A.iv). Alternatives 3.B.ii (update the list of fisheries and gear at 50 CFR 600.725), 3.C.ii (require a GARFO permit), and 3.D.ii (add species codes to required reporting mechanisms) are also aimed at gaining a better understanding of fisheries for unmanaged forage species and thus could lead to indirect slight positive impacts for Council

managed species and other predators if they help ensure sustainable management of fisheries for forage prey.

The framework alternatives (alternative set 3.G.ii) are intended to allow for efficient changes to certain regulations in response to new information. The impacts of any future framework actions will be analyzed through an additional NEPA process. Because the framework alternatives are administrative in nature, they are not expected to result in any direct impacts on Council managed species and other predators. Some indirect slight positive impacts may occur if the framework provisions allow for more efficient responses to immediate threats to unmanaged forage prey.

Overall, the administrative alternatives which are expected to have indirect impacts on Council manages species and other predators (i.e. alternatives 3.A.ii, 3.A.iii, 3.A.iv, 3.B.ii, 3.C.ii, 3.D.ii, 3.E.ii, and 3.G.ii) are expected to have slight positive impacts in both the short and long-term. The other administrative alternatives are not expected to impact Council manages species and other predators.

7.3. Impacts of the Alternatives on Protected Species

The expected impacts of each alternative on protected species are described in the following sections.

7.3.1. Impacts of Alternative Set 1 (Alternatives for Taxa Besides Chub Mackerel) on Protected Species

Alternative set 1 contains alternatives for taxa other than chub mackerel. The expected impacts of these alternatives on protected species are described in the following sections.

7.3.1.1. Impacts of Alternative 1.A (No Action on Taxa Besides Chub Mackerel) on Protected Species

Under alternative 1.A the Council would take no action on commercial fisheries for unmanaged forage taxa (besides chub mackerel; section 5.1.1).

Several protected species are known to interact with gear types used by the fisheries which land the unmanaged forage taxa included in this amendment (section 6.3.3). Unmanaged forage species are also prey for several protected species (Table 7; section 6.3.4). As described in section 7.1.1.1, due to the apparent low demand for unmanaged forage species, alternative 1.A is not expected to result in a substantial change in fishing effort or fishing mortality for unmanaged forage species over the short term. As a result, under alternative 1.A, interaction risks to protected species in the Mid-Atlantic are not expected to change significantly from what has been observed and considered by NMFS and the Council to date (Waring et al. 2014, Waring et al. 2015, Waring et al. 2016, NMFS 2001, NMFS 2013, NMFS 2014c, NMFS NEFSC FSB 2015, http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). Specifically, as fishing behavior

and effort are not expected to change significantly from current conditions, the presence, quantity, or degree of bottom trawl or other gear types used in these areas are also not expected to change significantly. As interactions risks with protected species are strongly associated with amount, time, and location of gear in the water, continuation of *status quo* fishing behavior/effort are not expected to change any of these operating conditions and therefore, are not expected to introduce any new interaction risks to protected species that would result in elevated levels of interactions. Thus, in terms of interaction risks to protected species, alternative 1.A is expected to result in slight negative short-term impacts to protected species.

Because significant changes in fishing effort are not expected under alternative 1.A, fishing mortality for unmanaged forage species is not expected to increase beyond recent levels. Any loss of potential forage prey for protected species (specifically, marine mammals and leatherback sea turtles; section 6.3.4) is not expected to change the forage base for these species to extent that prey availability is limited. Over the past 20 years, there have been no indications that prey availability for protected species has been limited (Waring et al. 2014, Waring et al. 2015, Waring et al. 2016, www.nmfs.noaa.gov/pr/recovery/plans.htm, www.nmfs.noaa.gov/pr/listing/reviews.htm). Thus, although removal of potential prey for protected species is expected under alternative 1.A over the short-term, the removal is not expected to be such that the forage base for these species will significantly different from current levels; therefore, alternative 1.A is expected to have slight negative short-term impacts on protected species.

As described in section 7.1.1.1, fishing effort and fishing mortality for unmanaged forage species could increase over the long-term under alternative 1.A. If this were to occur, relative to the short-term impacts described above, long-term impacts to protected species could be more negative (e.g. more prey removed; potential for increased interactions). Specifically, with no constraints on the fisheries (i.e. no landing or possession limits for unmanaged forage species) fishing effort could increase, resulting in greater removals of potential prey for protected species from the ecosystem. Further, if fishing effort for unmanaged forage species were to increase under alternative 1.A over the longer-term such that the number of vessels, amount of gear, and/or duration of time gear is in the water increases, then interactions between fishing gear and protected species could increase (see section 6.3.3). Alternatively, fishing effort could remain unchanged over the long-term under alternative 1.A, which would result in similar impacts to protected species as provided above for the short term (i.e. slight negative impacts). For these reasons, the long-term impacts of alternative 1.A on protected species range from moderate negative (if fishing effort were to increase) to slight negative (if fishing effort were to remain unchanged).

Relative to alternatives 1.B and 1.C (the other alternatives for taxa besides chub mackerel), alternative 1.A is expected to have the most negative impacts on protected species, especially over the long term.

7.3.1.2. Impacts of Alternative 1.B (Prohibit Possession of Taxa Besides Chub Mackerel) on Protected Species

Alternative 1.B would prohibit commercial vessels fishing in Mid-Atlantic Federal waters from possessing over 50 previously unmanaged forage species (section 5.1.1). Alternative 1.B would essentially prohibit directed fishing on these species in Mid-Atlantic Federal waters. For the reasons described in section 7.1.1.2, alternative 1.B is expected to lead to a slight reduction in fishing effort and fishing mortality for unmanaged forage species, relative to the no action (alternative 1.A). Much of the recent landings of these species were likely the result of incidental catch or small-scale directed harvest (section 6.4.1). The slight decrease in fishing effort under alternative 1.B is not expected to change the number of boats in the water, but will likely lead to a decrease in the amount of time that fishing gear is in the water as it will provide an incentive for fishermen to attempt to avoid catching several species.

By slightly reducing fishing mortality for several prey species, alternative 1.B is expected to have slight positive short term impacts for protected species by potentially increasing the availability of potential prey. It is also expected to have slight positive short term impacts due to a slight reduction in fishing effort. Interactions risks with protected species are strongly associated with the amount, time, and location of gear in the water. Alternative 1.B is expected to decrease the amount of time that gear is in the water; therefore, a reduction in interactions with protected species would be expected. Therefore, relative to the no action alternative (alternative 1.A), short-term impacts of alternative 1.B are expected to be slight (as opposed to moderate or high) positive because fishing effort and fishing mortality are only expected to decrease slightly compared to recent levels (section 7.1.1.2).

As previously described, alternative 1.B would prevent increases in fishing effort and fishing mortality beyond recent levels which could occur over the longer-term under the no action alternative (alternative 1.A). In this way, it would also prevent increases in potential interactions between fishing gear and protected species and decreases in the abundance of potential forage prey for protected species. By preventing such an expansion, alternative 1.B could have long-term moderate positive impacts for protected species relative to the no action alternative.

Relative to alternatives 1.A and 1.C (the other alternatives for taxa besides chub mackerel), alternative 1.B is expected to have the greatest positive impacts on protected species.

7.3.1.3. Impacts of Alternative 1.C (Incidental Possession Limit for Taxa Besides Chub Mackerel) on Protected Species

Alternative set 1.C contains two sub-alternatives for a possession limit for the forage taxa included in the amendment (except chub mackerel). The expected impacts of these alternatives on protected species are described in the following sections.

7.3.1.3.1. Impacts of Alternative 1.C.i (Incidental Possession Limit of 1,500 Pounds Per Species) on Protected Species

Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species for all the taxa included in the amendment, except chub mackerel (section 5.1.3.1).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i is not expected to result in a short-term change in fishing effort or fishing mortality for unmanaged forage species. It is therefore not expected to result in a change in the abundance of forage prey for protected species. Over the short-term, it is also not expected to introduce any new gear interaction risks to protected species that would result in elevated levels of interactions beyond what has been observed and considered by NMFS and the Council to date (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NMFS 2001; NMFS 2013; NMFS 2014; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; NMFS NEFSC FSB 2015). For these reasons, alternative 1.C.i is expected to have similar short-term impacts on protected species as the no action alternative (alternative 1.A; i.e. slight negative impacts).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i could result in a slight increase in fishing effort and fishing mortality for forage species over the long-term. If this were to occur, it could result in slight negative long-term impacts to protected species due to the potential for decreased abundances of forage prey and an increase in potential interactions between fishing gear and protected species. In terms of forage impacts to protected species, these impacts are expected to be slight (as opposed to moderate or high) negative as alternative 1.C.i. would limit the amount of unmanaged forage species that could be taken. As most protected species feed on a variety of prey species throughout the year (including species not addressed by this amendment) and throughout their range (see section 6.3.4), it is unlikely that the limited (i.e. 1,500 pounds per species per trip) removal of unmanaged forage species will equate to a significant deficit in the forage base for protected resources in the Mid-Atlantic such that food resources become limited in this region. Suitable and sufficient prey species will still be available for protected species such that any protected species of marine mammal, sea turtle, or fish will still be able to sustain itself. However, as any removal of forage species from the ecosystem equates to the removal of prey that could have been eaten, but is now unavailable to the predator, this equates to a slight negative long-term impact to the affected species.

In terms of interaction risks to protected species, long-term impacts could also be slight (as opposed to moderate) negative as any increase in effort will be constrained by the 1,500 pound per species possession limit. The possession limit is expected to disincentivize any substantial increase in effort (e.g. more gear, longer soak/tow times, new areas fished, all of which could result in new risks and additional takes of protected species). As a result, interaction risks to protected species are unlikely to increase beyond that which has already been considered and/or authorized by NMFS to date (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NMFS

2001; NMFS 2013; NMFS 2014; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; NMFS NEFSC FSB 2015).

Relative to the no action alternative (alternative 1.A), alternative 1.C.i would prevent greater increases in fishing effort and fishing mortality, which would be possible under the no action alternative. In this way, relative to the no action alternative, alternative 1.C.i could have slight positive long-term impacts for protected species. Overall, the long-term impacts of alternative 1.C.i range from slight negative (if fishing effort and mortality increase slightly compared to recent levels) to slight positive (compared to the no action alternative).

Compared to the other alternatives for unmanaged forage taxa besides chub mackerel, the impacts of alternative 1.C.i on protected species are expected to be more positive than the impacts of the no action alternative (alternative 1.A), but less positive compared to alternatives 1.B (prohibit possession) and 1.C.ii (possession limit of 1,700 pounds for all species combined).

7.3.1.3.2. Impacts of Alternative 1.C.ii (Incidental Possession Limit of 1,700 Pounds for all Species Combined; Preferred) on Protected Species

Alternative 1.C.ii would implement an incidental possession limit of 1,700 pounds combined weight of all the taxa included in the amendment, except chub mackerel (section 5.1.3.2). Alternative 1.C.ii is a preferred alternative.

For the reasons described in section 7.1.1.3.2, alternative 1.C.ii is not expected to result in a short-term change in fishing effort or fishing mortality for unmanaged forage species. It is therefore not expected to result in a short-term change in the abundance of forage prey for protected species. Over the short-term, it is also not expected to introduce any new gear interaction risks to protected species that would result in elevated levels of interactions above and beyond what has been observed and considered by NMFS and the Council to date (Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NMFS 2001; NMFS 2013; NMFS 2014; NMFS NEFSC FSB 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). For these reasons, alternative 1.C.ii is expected to have similar short-term impacts on protected species as the no action alternative (alternative 1.A; i.e. slight negative impacts).

As described in section 7.1.1.3.2, alternative 1.C.ii could result in a slight increase in fishing effort and fishing mortality for unmanaged forage species over the long-term. If this were to occur, it could result in slight negative long-term impacts to protected species due to the potential for decreased abundances of forage prey and a potential increase in interactions between fishing gear and protected species. In terms of forage impacts to protected species, these impacts are expected to be slight (as opposed to moderate or high) negative as the amount of unmanaged forage species that could be taken would be limited by a 1,700 pound combined possession limit. As most protected species feed on a variety of prey species throughout the year (including species not addressed by this amendment) and throughout their range (see section 6.3.4), it is unlikely that the limited (i.e. 1,700 pounds per trip) removal of unmanaged forage species would

equate to a significant deficit in forage base for protected resources in the Mid-Atlantic such that food resources become limited in this region. Suitable and sufficient prey species would still be available for protected species such that any protected species of marine mammal, sea turtle, or fish will still be able to sustain itself. However, any removal of forage species from the ecosystem equates to the removal of prey that could have been eaten, but is now unavailable to the predator; therefore, this equates to a slight negative impact to the affected species. In terms of interaction risks to protected species, impacts are also expected to be slight (as opposed to moderate) negative as any increase in effort will be constrained by the possession limit. With the possession limit constraining effort, any substantial increase in effort (e.g. more gear, longer soak/tow times, new areas fished) which could result in new risks and additional takes of protected species will be disincentivized. As a result, interaction risks to protected species in the short-term are unlikely to increase beyond that which has already been considered and/or authorized by NMFS to date (http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; Waring et al. 2014; Waring et al. 2015; Waring et al. 2016; NMFS 2001; NMFS 2013; NMFS 2014; NMFS NEFSC FSB 2015).

Alternative 1.C.ii would prevent greater increases in fishing effort and fishing mortality, which would be possible under the no action alternative (alternative 1.A), especially over the long-term. In this way, alternative 1.C.ii could have slight positive long-term impacts for protected species compared to the no action alternative. Overall, the long-term impacts of alternative 1.C.ii range from slight negative (if fishing effort and mortality increase slightly compared to recent levels) to slight positive (compared to the no action alternative).

Compared to the other alternatives for unmanaged forage taxa besides chub mackerel, the impacts of alternative 1.C.ii on protected species are expected to be more positive than the impacts of alternatives 1.A (no action) and 1.C.i (1,500 pound per species possession limit), but less positive compared to alternative 1.B (prohibit possession).

7.3.2. Impacts of Alternative Set 2 (Alternatives for Chub Mackerel) on Protected Species

Alternative set 2 contains sub alternatives for the designation of and management measures for chub mackerel. The following sections describe the expected impacts of these alternatives on protected species.

7.3.2.1. Impacts of Alternative 2.A (No Action on Chub Mackerel) on Protected Species

Under alternative 2.A, the Council would take no action on chub mackerel as part of this amendment and the chub mackerel fishery would remain unregulated (section 5.2.1). Chub mackerel landings increased substantially over the past several years (Table 16) and some vessels have been targeting this species.

Based on the information provided in section 7.1.2.1, over the short term, it is expected that landings of chub mackerel will remain close to 2013-2015 levels (i.e. about 2.86 million pounds per year in the northeast). This equates to the removal of potential prey for protected species from the ecosystem. As most protected species feed on a variety of prey species throughout the year (including species not addressed by this amendment) and throughout their range (Table 7; section 6.3.4), it is unlikely that this level of removals of chub mackerel from the ecosystem would equate to a significant deficit in the forage base for protected resource in the Mid-Atlantic such that food resources become limited in this region. Specifically, as chub mackerel is not known to be a primary prey item of any one protected species, and other preferable prey resources would still be available for protected species, any protected species of marine mammal, sea turtle, or fish would still be able to sustain itself. However, as a component of the forage base for some protected species (e.g. marine mammals), any removal of chub mackerel from the ecosystem equates to the removal of prey that could have been eaten, but is now unavailable to the predator; this equates to a slight negative impact to the affected species. Based on this, a decline in chub mackerel abundances due to fishing mortality, as could occur under alternative 2.A, would likely have slight negative impacts on particular protected species over the short term.

Several protected species are known to interact with the fishing gears used in the chub mackerel fishery (mostly bottom trawls; section 6.3.3). Based on information provided in section 7.1.2.1, fishing effort is not expected to increase beyond 2013-2015 levels in the short term under alternative 2.A. Although increased landings of, and directed effort on chub mackerel have been observed over this time frame, there is no indication that protected species interactions in the fisheries that landed chub mackerel have increased beyond levels previously considered and/or authorized by NMFS for these fisheries. Specifically, there has been no indication that the continued existence of any of any marine mammal species has been threatened (aside from already designated MMPA strategic stocks, potential biological removal levels have not been exceeded for specific species of marine mammals) and no indication that the continued existence of any ESA listed species has been jeopardized (i.e. authorized levels of take have not been exceeded). Based on this, in the short term, impacts to protected species from alternative 2.A are expected to be slight negative.

As described in section 7.1.1.1, with an increasing interest in targeting chub mackerel, fishing effort and fishing mortality for chub mackerel could increase over the longer-term under alternative 2.A. If this were to occur, relative to the short-term impacts considered above, impacts to protected species could become moderate negative. Specifically, with no constraints on the fishery (i.e. no landing or possession limits) fishing effort could increase, resulting in a higher level of potential prey for protected species being removed from the ecosystem. Further, if fishing effort for chub mackerel were to increase over the long-term under alternative 2.A such that the number of vessels, amount of gear, and/or duration of time gear is in the water increases, then interactions between fishing gear and protected species could increase (section 6.3.3).

Alternatively, fishing effort could remain unchanged over the long-term under alternative 2.A. This could result in similar impacts to protected species as provided above for the short term (i.e. slight negative impacts). For these reasons, the long-term impacts of alternative 1.A on protected species range from moderate negative (if fishing effort were to increase) to slight negative (if fishing effort were to remain unchanged).

Of all the alternatives for chub mackerel, alternative 2.A is expected to have the most negative impacts to protected species, in both the short and long-term.

7.3.2.2. Impacts of Alternative Set 2.B (Chub Mackerel Designation) on Protected Species

Alternative set 2.B contains three sub alternatives for the designation of chub mackerel. The expected impacts of these alternatives on protected species are summarized in the following sections. These alternatives are largely administrative in nature as they do not imply any specific level of catch or landings limits. As a result, the alternatives in alternative set 2.B are not expected to have direct impacts on protected species because the designations themselves will not change fishing effort or fishing behavior

7.3.2.2.1. Impacts of Alternative 2.B.i (Manage Chub Mackerel as an EC) on Protected Species

Under alternative 2.B.i chub mackerel would be managed as an EC (section 5.2.2.1). As described in section 7.1.2.2.1, although the impacts of this designation would largely derive from the measures implemented, the designation itself would establish the foundation for chub mackerel management measures. Assuming that these measures would regulate chub mackerel fisheries to ensure sustainability, this could lead to slight positive impacts on protected species by helping to maintain an abundance of one of their prey species and regulating fishing effort and thus limiting the potential for interactions between fishing gear and protected species.

The legal requirements for ECs are not as strong as those for stocks in the fishery (section 5.2.2); therefore the impacts of alternative 2.B.i may not be as positive as those of alternative 2.B.ii, which would manage chub mackerel as a stock in the fishery. The impacts may be more positive than those under alternative 2.B.iii, which would use neither designation and thus has a weaker legal basis.

7.3.2.2.2. Impacts of Alternative 2.B.ii (Manage Chub Mackerel as a Stock in the Fishery) on Protected Species

Under alternative 2.B.ii chub mackerel would be managed as a stock in the fishery (section 5.2.2.2). As described in section 7.1.2.2.2, although the impacts of alternative 2.B.ii would largely derive from the management measures implemented, the stock in the fishery designation would establish a legal basis and a legal requirement for those measures. The MSA requires that

Councils implement measures to ensure sustainability of fisheries for stocks that are in the fishery. Thus, alternative 2.B.ii could help to maintain an abundance of one prey species for some protected species. It would also regulate fishing effort and would thus limit the potential for interactions between fishing gear and protected species. For these reasons, alternative 2.B.ii could have slight positive impacts on protected species in both the short and long-term.

Of all the designations considered for chub mackerel, the stock in the fishery designation has the strongest legal requirements. Therefore, alternative 2.B.ii may have greater positive impacts for protected species than alternatives 2.B.i and 2.B.iii.

7.3.2.2.3. Impacts of Alternative 2.B.iii (Manage Chub Mackerel as Neither an EC nor a Stock in the Fishery; Preferred) on Protected Species

Under alternative 2.B.iii chub mackerel would be designated as neither an EC nor a stock in the fishery. Management measures would be implemented using the discretionary authority allowed for under section 303(b)(12) of the MSA (section 5.2.2.3). This is the preferred alternative for the designation of chub mackerel. The impacts of this alternative would derive solely from the management measures implemented. Unlike alternatives 2.B.i and 2.B.ii, there would be no legal framework or requirement for any particular management measures under this alternative. For these reasons, when considered separately from any management measures that would be implemented, the impacts of alternative 2.B.ii on protected species are expected to be neutral in both the short and long-term (compared to slight positive impacts for alternatives 2.B.i and 2.B.ii).

7.3.2.3. Impacts of Alternative Set 2.C (Chub Mackerel Management Measures) on Protected Species

Alternative set 2.C contains alternatives for chub mackerel management measures. The expected impacts of these alternatives on protected species are summarized in the following sections.

7.3.2.3.1. Impacts of Alternative Set 2.C.i (Chub Mackerel Landings Limit) on Protected Species

Alternative set 2.C.i contains alternatives for chub mackerel landings limits. The following sections summarize the expected impacts of these alternatives on protected species.

7.3.2.3.1.1. Impacts of Alternative 2.C.i.a (900,127 Pound Chub Mackerel Landings Limit) on Protected Species

Alternative 2.C.i.a would implement a 900,127 pound annual landings limit for chub mackerel (section 5.2.3.1.1). As described in section 7.1.2.3.1.1, this alternative would result in a considerable reduction in landings and a notable reduction in fishing mortality for chub mackerel relative to recent levels. This could result in an increase in chub mackerel abundance and thus greater availability of chub mackerel as prey for marine mammals. In addition, with an expected

decline in fishing effort (likely in the form of less time that bottom trawl gear is in the water), alternative 2.C.i.a could also result in a decrease in the potential for interactions between fishing gear and protected species. For these reasons, relative to the no action alternative (alternative 2.A), alternative 2.C.i.a is expected to have slight to moderate positive short and long-term impacts for protected species which are predators of chub mackerel or are known to interact with the bottom trawl gear used in chub mackerel fisheries (Table 8). Impacts may be slight (as opposed to moderate) positive because protected species feed on a variety of prey items throughout the year and throughout different regions (section 6.3); therefore, an increase in chub mackerel abundance may not translate into a substantial benefit for protected species in terms of overall increased prey availability. In addition, though the reduction in fishing effort for chub mackerel is expected to be notable, when compared to the scale of other fisheries in the Mid-Atlantic which interact with protected species (e.g. 6.4.2); this reduction may not have a large impact.

Alternative 2.C.i.a contains the lowest landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the greatest positive impacts on protected species.

7.3.2.3.1.2. Impacts of Alternative 2.C.i.b (1.75 Million Pound Chub Mackerel Landings Limit) on Protected Species

Alternative 2.C.i.b would implement a 1.75 million pound annual landings limit for chub mackerel (section 5.2.3.1.2). For the reasons described in section 7.1.2.3.1.2, this alternative is expected to result in a decrease in fishing effort and fishing mortality for chub mackerel. In doing so, it could result in an increase in chub mackerel abundance. It could also result in a decrease in the potential for interactions between fishing gear and protected species, due to a decrease in the amount of time that fishing gear is in the water. For these reasons, alternative 2.C.i.b is expected to have slight to moderate positive short and long-term impacts for protected species which are predators of chub mackerel or are known to interact with the bottom trawl gear used in chub mackerel fisheries (Table 8). Impacts may be slight (as opposed to moderate) positive because protected species feed on a variety of prey items throughout the year and throughout different regions (section 6.3); therefore, an increase in chub mackerel abundance may not translate into a substantial benefit for protected species in terms of overall increased prey availability. In addition, though the reduction in fishing effort for chub mackerel is expected to be notable, when compared to the scale of other fisheries in the Mid-Atlantic which interact with protected species (e.g. 6.4.2); this reduction may not have a large impact.

Alternative 2.C.i.b includes a higher landings limit than alternative 2.C.i.a; therefore, the positive impacts for protected species would be of a lesser magnitude than those under alternative 2.C.i.a. Alternative 2.C.i.b includes a lower landings limit than alternatives 2.C.i.c and 2.C.i.d; therefore, it is expected to have greater positive impacts for protected species than those alternatives.

7.3.2.3.1.3. Impacts of Alternative 2.C.i.c (2.86 Million Pound Chub Mackerel Landings Limit; Preferred) on Protected Species

Alternative 2.C.i.c would implement a 2.86 million-pound annual landings limit for chub mackerel (section 5.2.3.1.3). This is a preferred alternative.

For the reasons described in section 7.1.2.3.1.4, alternative 2.C.i.c is expected to result in similar levels of fishing effort and fishing mortality as the no action alternative (alternative 2.A) over the short term. Thus, alternative 2.C.i.c is expected to have the same short term impacts on protected species as the no action alternative (i.e. slight negative impacts).

For the reasons described in section 7.1.2.1, fishing effort and fishing mortality for chub mackerel could increase over the longer-term under the no action alternative. Alternative 2.C.i.c would prevent such an increase and would restrict fishing effort and mortality to recent levels. In this way, abundance of chub mackerel prey for some protected species could be higher over the long-term under alternative 2.C.i.c than under the no action alternative. The potential for interactions between fishing gear and protected species could be lower (due to less time that fishing gear is in the water) under alternative 2.C.i.c than the under the no action alternative. For these reasons, alternative 2.C.i.c is expected to have slight to moderate positive long-term impacts on protected species, compared to the no action alternative. Impacts may be slight (as opposed to moderate) positive because protected species feed on a variety of prey items throughout the year and throughout different regions (section 6.3); therefore, maintenance of chub mackerel abundances may not substantially benefit protected species. In addition, any increase in chub mackerel fishing effort which could occur over the long-term under the no action alternative and would be prevented by alternative 2.C.i.c would exist alongside fishing effort in several other fisheries in the region which also interact with protected species (e.g. 6.4.2).

Alternative 2.C.i.c includes a higher landings limit than alternatives 2.C.i.a and 2.C.i.b; therefore, the impacts to protected species would be less positive than those under alternatives 2.C.i.a and 2.C.i.b. It includes a lower landings limit than alternative 2.C.i.d; therefore, impacts would be more positive than under alternative 2.C.i.d.

7.3.2.3.1.4. Impacts of Alternative 2.C.i.d (5.25 Million Pound Chub Mackerel Landings Limit) on Protected Species

Alternative 2.C.i.d would implement a 5.25 million pound annual landings limit for chub mackerel (section 5.2.3.1.4). For the reasons described in section 7.1.2.3.1.4, this alternative could allow landings of and fishing effort for chub mackerel to increase compared to recent levels. It could, therefore, lead to an increase in fishing mortality for and potentially a decrease in abundance of chub mackerel. It could also lead to increased potential for interactions between fishing gear and protected species. For the reasons described in section 7.1.2.3.1.4, this may not occur in the near future, but could occur over the longer term. Thus, short term impacts on

protected species may be the same as under the no action alternative (i.e. slight negative impacts).

For the reasons described in section 7.1.2.1, fishing effort and fishing mortality for chub mackerel could increase over the longer-term under the no action alternative. Alternative 2.C.i.d would prevent such an increase and would restrict fishing effort and mortality. In this way, abundance of chub mackerel prey for some protected species could be higher over the long-term under alternative 2.C.i.d than under the no action alternative. The potential for interactions between fishing gear and protected species could be lower (due to less time that fishing gear is in the water) under alternative 2.C.i.d than under the no action alternative. For these reasons, alternative 2.C.i.d is expected to have slight to moderate positive long-term impacts on protected species, compared to the no action alternative. Impacts may be slight (as opposed to moderate) positive because protected species feed on a variety of prey items throughout the year and throughout different regions (section 6.3); therefore, maintenance of chub mackerel abundances may not substantially benefit protected species. In addition, any increase in chub mackerel fishing effort which could occur over the long-term under the no action alternative and would be prevented by alternative 2.C.i.c would exist alongside fishing effort in several other fisheries in the region which also interact with protected species (e.g. 6.4.2).

Alternative 2.C.i.d includes the highest chub mackerel landings limit of all the alternatives in alternative set 2.C.i; therefore, it is expected to have the least positive impacts on protected species.

7.3.2.3.2. Impacts of Alternative Set 2.C.ii (Chub Mackerel Possession Limit) on Protected Species

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the landings limit is reached. These possession limits are intended to be used in combination with one of the four annual landings limit alternatives included in alternative set 2.C.i. The impacts of the possession limits on protected species depend, in large part, on which landings limit is chosen. The two measures together (the possession and landings limit) would determine the overall allowable landings of (and, by extension, fishing effort and fishing mortality for) chub mackerel in a given year. To the extent that the expected impacts of the possession limits on protected species can be considered separately from the landings limits, these impacts are summarized in the following sections.

7.3.2.3.2.1. Impacts of Alternative 2.C.ii.a (No Possession of Chub Mackerel after Landings Limit is Reached) on Protected Species

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is reached (section 5.2.3.2.1). As described in section 7.1.2.4.1, the impacts on fishing effort and fishing mortality would vary based on the landings limit used (alternative set 2.C.i). To the extent that alternative 2.C.ii.a limits fishing effort (e.g. vessels try to avoid chub

mackerel after the landings limit is met) and fishing mortality for chub mackerel, it would also limit the potential for interactions between fishing gear and protected species and would limit the potential for a decrease in chub mackerel abundances. In this way, compared to the no action alternative (alternative 2.A; section 7.3.2.1), it is expected to have slight positive short and long-term impacts for protected species which interact with the gear used in chub mackerel fisheries and/or are predators of chub mackerel (section 6.3).

Alternative 2.C.ii.a is the most restrictive of the chub mackerel possession limit alternatives; therefore, of those alternatives, it is expected to have the greatest positive impacts on protected species.

7.3.2.3.2.2. Impacts of Alternative 2.C.ii.b (10,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Met) on Protected Species

Under alternative 2.C.ii.b a 10,000-pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.2). For the reasons described in section 7.1.2.4.2, this would likely only prove restrictive for a few larger vessels. When considered separately from the landings limit alternatives, it is expected to slightly reduce fishing effort and fishing mortality for chub mackerel, compared to the no action alternative. It is expected to only slightly reduce fishing effort because only a few vessels would likely take measures to avoid catching large volumes of chub mackerel, as 10,000 pounds of chub mackerel would be a large catch for most of the vessels which landed chub mackerel in the past; thus, catch of this volume would presumably be easy to avoid for most vessels (section 7.1.2.4.2). This slight reduction in fishing effort is expected to take the form of a slight decrease in the amount of time that fishing gear is in the water.

In slightly reducing fishing effort and fishing mortality for chub mackerel, alternative 2.C.ii.b could lead to a slight increase in chub mackerel abundances and a slight decrease in potential interactions between fishing gear and protected species. In this way, compared to the no action alternative (alternative 2.A; section 7.3.2.1), it could have slight positive short and long-term impacts for those protected species which are predators of chub mackerel and/or interact with the gear used in chub mackerel fisheries (section 6.3).

The impacts of alternative 2.C.ii.b are expected to be less positive than those of alternative 2.C.ii.a (prohibit possession of chub mackerel after the landings limit is met) and more positive than those of alternative 2.C.ii.c (40,000 pound possession limit).

7.3.2.3.2.3. Impacts of Alternative 2.C.ii.c (40,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Reached; Preferred) on Protected Species

Under alternative 2.C.ii.c a 40,000 pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.3). This is a preferred alternative.

When considered separately from the landings limit alternatives, alternative 2.C.ii.d is expected to slightly reduce fishing effort and fishing mortality for chub mackerel, compared to the no action alternative. It is expected to only slightly reduce fishing effort because very few vessels would likely take measures to avoid catching large volumes of chub mackerel, as 40,000 pounds of chub mackerel is an extremely large catch for most of the vessels which landed chub mackerel in the past; thus, catch of this volume would presumably be easy to avoid for most vessels (section 7.1.2.4.3). This slight reduction in fishing effort is expected to take the form of a slight decrease in the amount of time that fishing gear is in the water.

In slightly reducing fishing effort and fishing mortality for chub mackerel, alternative 2.C.ii.c could lead to a slight increase in chub mackerel abundances and a slight decrease in potential interactions between fishing gear and protected species, compared to the no action alternative. In this way, compared to the no action alternative (alternative 2.A; section 7.3.2.1), it could have slight positive short and long-term impacts for those protected species which are predators of chub mackerel and/or interact with the gear used in chub mackerel fisheries (section 6.3).

Alternative 2.C.ii.c is the least restrictive of the three chub mackerel possession limit alternatives; therefore, it is expected to have the least positive impacts on protected species.

7.3.2.4. Impacts of Alternative Set 2.C.iii (Chub Mackerel Sunset Provisions) on Protected Species

Alternative set 2.C.iii contains alternatives related to sunset provisions for chub mackerel management measures. The following sections summarize the expected impacts of these alternatives on protected species.

7.3.2.4.1. Impacts of Alternative 2.C.iii.a (No Sunset for Chub Mackerel Management Measures) on Protected Species

Under alternative 2.C.ii.a any management measures implemented for chub mackerel as part of this amendment would remain in place unchanged until they are modified by future amendments or framework actions. This alternative would not have any impacts for protected species, beyond the impacts of the management measures themselves. The impacts of alternative 2.C.iii.a on protected species, when considered independently from the management measures, are thus expected to be neutral in both the short and long-term.

7.3.2.4.2. Impacts of Alternative 2.C.iii.b (3 Year Sunset for Chub Mackerel Management Measures; Preferred) on Protected Species

Under alternative 2.C.iii.b, any management measures implemented for chub mackerel as part of this amendment would expire three years after implementation (section 5.2.3.3.2). This is a preferred alternative. Under this alternative, if the Council does not take additional action, there would be no management measures for chub mackerel in the Mid-Atlantic after three years. For

this reason, alternative 2.C.iii.b would have the same short-term impacts as whichever alternative is implemented. Over the longer term (i.e. after three years, when the measures expire), alternative 2.C.iii.b would have the same impacts on protected species as the no action alternative (i.e. moderate to slight negative impacts), unless the Council takes future action to implement new management measures.

7.3.3. Impacts of Alternative Set 3 (Administrative Alternatives) on Protected Species

All the alternatives in alternative set 3 are administrative in nature and are therefore not expected to have direct impacts on protected species.

The no action alternatives in alternative set 3 (i.e. alternatives 3.A.i, 3.B.i, 3.C.i, 3.D.i, 3.E.i, 3.F.i, 3.G.i, and 3.H.i; section 5.3) are all expected to have neutral impacts on protected species because they are not expected to change fishing effort or fishing mortality, compared to recent levels. Thus they are not expected to result in changes in the potential for interactions between fishing gear and protected species or in the abundance of forage prey for protected species.

The action alternatives (i.e. the alternatives which are not “no action” alternatives) relating to the process for considering new fisheries and expansion of existing fisheries (alternatives 3.A.ii – 3.A.iv, section 5.3.1) may have indirect positive impacts for protected species. These alternatives would place additional constraints on the expansion of fisheries for unmanaged forage species by either prohibiting expansion altogether (alternative 3.A.ii), requiring specific steps for collecting data to better understand the impacts of those fisheries (alternative 3.A.iii), or requiring consideration of certain management measures for those fisheries (alternative 3.A.iv). Alternatives 3.B.ii (update the list of fisheries and gear at 50 CFR 600.725), 3.C.ii (require a GARFO permit), and 3.D.ii (add species codes to required reporting mechanisms) are also aimed at gaining a better understanding of fisheries for these species and thus could lead to indirect slight positive impacts if they lead to better-informed management decisions in the future.

The framework alternatives (alternative set 3.G.ii) are intended to allow for efficient changes to the regulations in response to new information. The impacts of any future framework actions will be analyzed through an additional NEPA process. Because the framework alternatives are administrative in nature, they are not expected to result in any direct impacts on protected species. Some indirect slight positive impacts may occur if the framework provisions allow for more efficient responses to immediate threats to forage prey for protected species.

Overall, the administrative alternatives which are expected to have indirect impacts on protected species (i.e. alternatives 3.A.ii, 3.A.iii, 3.A.iv, 3.B.ii, 3.C.ii, 3.D.ii, 3.E.ii, and 3.G.ii) are expected to have slight positive impacts. The other administrative alternatives are not expected to impact protected species.

7.4. Socioeconomic Impacts of the Alternatives

The alternatives considered in this document are expected to have both direct and indirect socioeconomic impacts. Direct impacts stem from restrictions on landings, which could have implications for revenues. Indirect impacts stem from potential changes in the abundance of target species due to potential changes in the abundance of forage prey. The following sections summarize the expected socioeconomic impacts of the alternatives.

7.4.1. Socioeconomic Impacts of Alternative Set 1 (Alternatives for Taxa Besides Chub Mackerel)

Alternative set 1 contains alternatives for taxa other than chub mackerel. The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.1.1. Socioeconomic Impacts of Alternative 1.A (No Action on Taxa Besides Chub Mackerel)

Under alternative 1.A, no new regulations on commercial fisheries for unmanaged forage species would be implemented. For the reasons described in section 7.1.1.1, alternative 1.A is not expected to result in a change in fishing effort in the near future. Alternative 1.A is therefore not expected to result in short-term changes in landings or revenues.

Landings of unmanaged forage species (besides chub mackerel) generated relatively low amounts of revenue during 1996-2015, especially compared to landings of managed species (section 6.4). These revenues may have been important for some individuals; however, when considered in the context of all commercial fisheries in the Mid-Atlantic, the economic importance of these species was low. Because landings are expected to remain unchanged in the short-term if no action is taken, these fisheries are expected to continue to generate slight positive short-term socioeconomic impacts under alternative 1.A.

Landings of unmanaged forage species could increase over the longer-term under alternative 1.A. This could occur if a new market develops, existing demand increases, and/or price for any of these species increases. An increase in landings could lead to an increase in revenues and thus positive socioeconomic impacts. These are expected to be long-term impacts because they are not likely to occur in the near future for the reasons previously stated. If landings of unmanaged forage species were to increase to the extent that their abundances decline and socially and economically important predators of those species were negatively impacted due to reduced prey availability, then indirect negative socioeconomic impacts could occur. A reduced population of predators could lead to reduced commercial and recreational activities that rely on those predators. Alternative 1.A is thus expected to have mixed (i.e. both positive and negative) long-term socioeconomic impacts.

Compared to the other alternatives in alternative set 1, alternative 1.A has the greatest potential for positive socioeconomic impacts due to continued profits from landings of these species, and the greatest potential for negative socioeconomic impacts due to the potential for reduced populations of socially and economically important predators.

7.4.1.2. Socioeconomic Impacts of Alternative 1.B (Prohibit Possession of Taxa Other Than Chub Mackerel)

Alternative 1.B would prohibit possession of over 50 previously unmanaged forage species by commercial vessels fishing in Mid-Atlantic Federal waters (section 5.1.1).

According to commercial fish dealer data, 62 federally-permitted dealers in the northeast paid a total of \$842,460 to 120 vessels for landings of these species during 1996 – 2015. Total sales of these species averaged \$54,911 per year. On average, 11 dealers purchased and 13 vessels landed these species per year. Annual revenues per vessel thus averaged about \$4,224 (in 2015 dollars).^{lxv} Alternative 1.B would essentially prohibit revenues gained from landings of these species for vessels fishing in Mid-Atlantic Federal waters. When considered in context with other commercial fisheries operating in the Mid-Atlantic (e.g. section 6.2.1), this could be considered a slight negative short-term economic impact. Impacts would be more severe for vessels which landed higher amounts than the average.

Alternative 1.B could result in indirect long-term positive socioeconomic impacts if it prevents decreases in the abundance of prey for socially and economically important predators due to increases in fishing mortality which could occur under the no action alternative (alternative 1.A). By precluding the possibility of such negative impacts, alternative 1.B could have indirect moderate positive long-term socioeconomic impacts.

Overall, long-term socioeconomic impacts are expected to be mixed, including slight negative impacts due to a loss of revenues from landings of unmanaged forage species and moderate positive impacts deriving from the maintenance of prey abundances for socially and economically important predators.

Compared to the other alternatives in alternative set 1, alternative 1.B has the greatest potential for negative socioeconomic impacts due to reduced profits from landings of these species, and the greatest potential for positive socioeconomic impacts due to the potential for increased populations of socially and economically important predators.

^{lxv} These numbers do not reflect the substantial variation in landings by vessel and by year. They may be under-estimates given that they do not account for landings of unclassified herrings or unclassified squids (not included in the calculations because they presumably contain an unknown amount of landings of managed species).

7.4.1.3. Socioeconomic Impacts of Alternative 1.C (Incidental Possession Limit for Taxa Other Than Chub Mackerel)

Alternative 1.C contains two sub-alternatives for a possession limit for the forage taxa included in the amendment (except chub mackerel). The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.1.3.1. Socioeconomic Impacts of Alternative 1.C.i (Incidental Possession Limit of 1,500 Pounds Per Species)

Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species for all the taxa included in the amendment, except chub mackerel (section 5.1.3.1).

As described in section 7.1.1.3.1, commercial fish dealer data show only 21 trips throughout the northeast which resulted in landings of at least 1,500 pounds of these species during 1996-2015 (equivalent to about one trip per year). The price received for these species tended to be less than \$1.00 per pound (section 6.4.1). Alternative 1.C.i is thus expected to impact very few vessels and is expected to have minor economic impacts for those vessels which would be impacted. The short-term socioeconomic impacts of alternative 1.C.i are thus expected to be slight negative.

Because so few trips resulted in landings of 1,500 pounds or more over the past 20 years, a 1,500 pound possession limit could allow an increase in landings and revenues if more vessels were to land volumes close to 1,500 pounds at a time. If this were to occur, revenues generated from these landings could increase, which would lead to slight positive socioeconomic impacts. This is assumed to be a long-term possibility as the price and demand for these species are generally low and unlikely to increase substantially in the near future (section 6.4.1).

Although alternative 1.C.i could allow an increase in landings (and thus revenues), it would not allow very large increases, as would be possible under the no action alternative (alternative 1.A). For this reason, it could have long-term moderate negative socioeconomic impacts compared to the no action alternative. However, by preventing substantial increases in landings, alternative 1.C.i could prevent potential future declines in the abundance of unmanaged forage species. It could thus have indirect slight positive long-term socioeconomic impacts by helping to maintain an abundance of forage prey for socially and economically important predators. Overall, the long-term socioeconomic impacts of alternative 1.C.i are mixed (i.e. both positive and negative).

Compared to the other alternatives in alternative set 1, alternative 1.C.i has greater potential for negative socioeconomic impacts due to reduced profits than alternative 1.A (no action) but a lesser potential for such negative impacts than alternatives 1.B (no possession) and 1.C.ii (possession limit of 1,700 pounds combined). It has greater potential for positive socioeconomic impacts due to the potential for increased populations of socially and economically important predators compared to alternative 1.A, but lesser potential for such positive impacts compared to alternatives 1.B and 1.C.ii.

7.4.1.3.2. Socioeconomic Impacts of Alternative 1.C.ii (Incidental Possession Limit of 1,700 Pounds for all Taxa Combined; Preferred)

Alternative 1.C.ii would prohibit commercial vessels fishing in Mid-Atlantic Federal waters from possessing more than 1,700 pounds of the taxa included in the amendment, except chub mackerel (section 5.1.3.1). This possession limit is intended to apply to the combined weight of all these taxa, as opposed to alternative 1.C.i, which would implement a possession limit per species. Alternative 1.C.ii is a preferred alternative.

As described in section 7.2.1.3.2, dealer data show only 14 trips throughout the northeast which resulted in landings of at least 1,700 pounds (combined) of these taxa during 1996-2015 (equivalent to about one trip every two years). In addition, the price received for these landings tended to be less than \$1.00 per pound (section 6.4.1). For these reasons, alternative 1.C.ii is expected to impact very few vessels and is expected to have minor economic impacts for those vessels which would be impacted. The short-term socioeconomic impacts of alternative 1.C.ii are thus expected to be slight negative.

Because so few trips resulted in landings of 1,700 pounds or more over 1996-2015, a 1,700 pound possession limit could allow an increase in landings if more vessels were to land volumes close to 1,700 pounds. If this were to occur, revenues generated from these landings could increase, which could lead to slight positive socioeconomic impacts. This is assumed to be a long-term possibility as the price and demand for these species have been generally low and are unlikely to increase substantially in the near future (section 6.4.1).

Although alternative 1.C.ii could allow an increase in landings (and thus revenues), it would not allow very large increases, as would be possible under the no action alternative (alternative 1.A). For this reason, it could have long-term moderate negative socioeconomic impacts compared to the no action alternative. However, by preventing substantial increases in landings, alternative 1.C.ii could prevent potential future declines in the abundance of unmanaged forage species. It could thus have indirect slight positive long-term socioeconomic impacts by helping to maintain abundances of forage prey for socially and economically important predators. Overall, the long-term socioeconomic impacts of alternative 1.C.ii are mixed (i.e. both positive and negative).

Compared to the other alternatives in alternative set 1, alternative 1.C.ii has greater potential for negative socioeconomic impacts due to reduced profits from landings of these species than alternatives 1.A (no action) and 1.C.i (possession limit of 1,500 pounds per species) but a lesser potential for such negative impacts than alternative 1.B (no possession). It has greater potential for positive socioeconomic impacts due to the potential for increased populations of socially and economically important predators compared to alternatives 1.A and 1.C.i, but lesser potential for such positive impacts compared to alternative 1.B.

7.4.2. Socioeconomic Impacts of Alternative Set 2 (Alternatives for Chub Mackerel)

Alternative set 2 contains sub alternatives for the designation of and management measures for chub mackerel. The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.2.1. Socioeconomic Impacts of Alternative 2.A (No Action on Chub Mackerel)

Under alternative 2.A, the Council would take no action on chub mackerel as part of this amendment and the chub mackerel fishery would remain unregulated (section 5.2.1).

For the reasons described in section 7.1.2.1, chub mackerel landings are expected to remain at or slightly below 2013-2015 levels (i.e. approximately 2.86 million pounds per year) in the short-term under alternative 2.A. Alternative 2.A is expected to have slight positive short-term socioeconomic impacts due to expected continued 2013-2015 levels of revenue (Table 16).

Long-term socioeconomic impacts of alternative 2.A are expected to be mixed, though generally positive. Given the recent successful growth of the chub mackerel fishery, landings and revenues may increase beyond recent levels over the longer term under the no action alternative. This could result in slight to moderate positive socioeconomic impacts, depending on the scale of the increase. Slight negative long-term socioeconomic impacts could occur if fishing mortality for chub mackerel increases to the extent that their abundance decreases. This could lead to a decrease in prey availability for commercially and recreationally important predators. If this leads to a decline in abundance of these predators, slight negative socioeconomic impacts could occur. These impacts are expected to be slight (as opposed to moderate or high) negative because these predators feed on a variety of prey species; therefore, a decline in chub mackerel abundances is not likely to have substantial negative impacts.

Compared to the other alternatives in alternative set 2, alternative 2.A has the greatest potential for positive socioeconomic impacts due to continued profits from landings of chub mackerel, and the greatest potential for negative socioeconomic impacts due to the potential for reduced populations of socially and economically important predators of chub mackerel, especially over the long-term.

7.4.2.2. Socioeconomic Impacts of Alternative Set 2.B (Chub Mackerel Designation)

Alternative set 2.B contains three sub alternatives for the designation of chub mackerel. The following sections summarize the expected socioeconomic impacts of these alternatives.

These alternatives are largely administrative in nature as they do not imply any specific level of catch or landings limits. The management measures which would be implemented under any of these alternatives are included in alternative set 2.C, the expected impacts of which are summarized in section 7.4.2.2.1.

7.4.2.2.1. Socioeconomic Impacts of Alternative 2.B.i (Manage Chub Mackerel as an EC)

Under alternative 2.B.i chub mackerel would be managed as an EC (section 5.2.2.1). For the reasons described in section 7.1.2.2.1, although the impacts of this designation would largely derive from the measures implemented, the designation itself would establish the foundation for chub mackerel management measures. Assuming that these measures would regulate chub mackerel fisheries to ensure sustainability, alternative 2.B.i is could have slight positive socioeconomic impacts in both the short and long-term.

The legal requirements for ECs are not as strong as those for stocks in the fishery (section 5.2.2); therefore the impacts of alternative 2.B.i may not be as positive as those of alternative 2.B.ii, which would manage chub mackerel as a stock in the fishery. The impacts may be more positive than those under alternative 2.B.iii, which would use neither designation and thus has a weaker legal basis.

7.4.2.2.2. Socioeconomic Impacts of Alternative 2.B.ii (Manage Chub Mackerel as a Stock in the Fishery)

Under alternative 2.B.ii chub mackerel would be managed as a stock in the fishery (section 5.2.2.2). The MSA lists several required provisions of FMPs for stocks that are in the fishery (MSA section 303(a)). These provisions include measures to restrict catch to biologically acceptable levels to ensure sustainability of the fishery (i.e. ABCs, ACLs, AMs). Because these measures have not yet been developed, it is not known how they would impact landings of and revenues from chub mackerel. They could require a decrease in landings (and thus revenues), or, if it is determined that recent levels are sustainable, they could result in no changes. Because the MSA requires measures to ensure sustainability of the fishery, alternative 2.B.ii is expected to have slight positive socioeconomic impacts, especially over the long-term. The impacts would be of a greater or lesser degree depending on the measures implemented.

Of all the designations considered for chub mackerel, the stock in the fishery designation has the strongest legal requirements. Therefore, alternative 2.B.ii may have greater positive impacts than alternatives 2.B.i and 2.B.iii.

7.4.2.2.3. Socioeconomic Impacts of Alternative 2.B.iii (Manage Chub Mackerel as Neither and EC nor a Stock in the Fishery; Preferred)

Under alternative 2.B.iii chub mackerel would be designated as neither an EC nor a stock in the fishery. Management measures would be implemented using the discretionary authority allowed for under section 303(b)(12) of the MSA (section 5.2.2.3). This is the preferred alternative for the designation of chub mackerel. The impacts of this alternative would derive solely from the management measures implemented. Unlike alternatives 2.B.i and 2.B.ii, there would be no legal framework or requirement for any particular management measures under this alternative. For

these reasons, the socioeconomic impacts of alternative 2.B.ii are expected to be neutral in both the short and long-term (compared to slight positive for alternatives 2.B.i and 2.B.ii), when considered separately from the management measures that would be implemented.

7.4.2.3. Socioeconomic Impacts of Alternative Set 2.C (Chub Mackerel Management Measures)

Alternative set 2.C contains alternatives for chub mackerel management measures. The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.2.3.1. Socioeconomic Impacts of Alternative Set 2.C.i (Chub Mackerel Landings Limit)

Alternative set 2.C.i contains four alternatives for an annual chub mackerel landings limit. The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.2.3.1.1. Socioeconomic Impacts of Alternative 2.C.i.a (900,127 Pound Chub Mackerel Landings Limit)

Alternative 2.C.i.a would implement a 900,127 pound annual landings limit for chub mackerel (section 5.2.3.1.1). Alternative 2.C.i.a would require a reduction in landings on the order of 1.96 million pounds compared to the 2013-2015 average. As described in section 7.4.2.1, landings are expected to continue at 2013-2015 levels under the no action alternative. Considering that commercial fish dealers paid an average of \$0.22 (in 2015 dollars) per pound for chub mackerel during 2013-2015, a decrease in landings on this scale could result in revenue losses of about \$431,172 per year. Given that a small number of vessels and dealers were responsible for most of the landings of chub mackerel in recent years, a loss of this magnitude could have moderate negative impacts for these individual vessels and dealers. These vessels and dealers also generate revenues from other species; however, chub mackerel can be an important part of those revenues in some years (section 6.4.1.8).

As previously stated, because there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic, it is not known how any of the landings limit alternatives would impact the chub mackerel stock; however, it is assumed that a 900,127 pound annual landings limit is low enough to have minor, if any, impacts on chub mackerel abundance. Landings averaged this level over 2006-2015 and there have been no indications of a decline in chub mackerel abundance. If this landings limit results in an increase in chub mackerel abundances, then it could result in positive impacts for predators of chub mackerel, including recreationally important tuna and billfish species. In this way, alternative 2.C.i.a could have indirect slight positive long-term socioeconomic impacts compared to the no action alternative. However, the loss of revenue described above is expected to outweigh these slight positive benefits. Thus, the long-term socioeconomic impacts of alternative 2.C.i.a are expected to be mixed (i.e. both positive and negative), but largely moderate negative overall.

Alternative 2.C.i.a contains the lowest landings limit considered for chub mackerel; therefore, of the alternatives in alternative set 2.C.i, it has the greatest potential for negative socioeconomic impacts due to decreased revenues.

7.4.2.3.1.2. Socioeconomic Impacts of Alternative 2.C.i.b (1.75 Million Pound Chub Mackerel Landings Limit)

Alternative 2.C.i.b would implement a 1.75-million-pound annual landings limit for chub mackerel (section 5.2.3.1.2). As described in section 7.4.2.1, landings are expected to continue at 2013-2015 levels under the no action alternative. Alternative 2.C.i.b would require a reduction of 1.11 million pounds compared to the average annual landings during 2013-2015. With an average price of \$0.22 (in 2015 dollars) per pound during 2013-2015, alternative 2.C.i.b. would represent a revenue loss of about \$244,200 per year. Given that a small number of vessels and dealers were responsible for most chub mackerel landings during 2013-2015, a revenue reduction of this magnitude could have moderate negative economic impacts for individual vessels and dealers. These vessels and dealers rely on other species for most of their annual income; however, chub mackerel can be an important part of that income in some years (section 6.4.1.8).

As previously stated, because there is no quantitative stock assessment for chub mackerel in the Mid-Atlantic, it is not known how any of the landings limit alternatives would impact the chub mackerel stock. If a 1.75 million pound annual landings limit is low enough to allow chub mackerel abundances in the Mid-Atlantic to increase, it could have positive impacts for predators of chub mackerel, including recreationally important tuna and billfish species. In this way, alternative 2.C.i.b could have indirect slight positive long-term socioeconomic impacts compared to the no action alternative. However, these potential slight positive benefits may be outweighed by the loss of revenue described above. Thus, the long-term socioeconomic impacts of alternative 2.C.i.b are expected to be mixed (i.e. both positive and negative), but largely moderate negative overall.

Compared to the other alternatives in alternative set 2.C, alternative 2.C.i.b has greater potential for negative socioeconomic impacts due to reduced profits from landings of chub mackerel than alternatives 2.A (no action), 2.C.i.c (2.86 million pound landings limit) and 2.C.i.d (5.25 million pound landings limit). It has a lesser potential for such negative impacts than alternative 2.C.i.a (900,127 pound landings limit). It has greater potential for positive socioeconomic impacts due to the potential for increased populations of socially and economically important predators compared to alternatives 2.A, 2.C.i.c, and 2.C.i.d, but lesser potential for such positive impacts compared to alternative 2.C.i.a.

7.4.2.3.1.3. Socioeconomic Impacts of Alternative 2.C.i.c (2.86 Million Pound Chub Mackerel Landings Limit; Preferred)

Alternative 2.C.i.c would implement a 2.86 million pound annual landings limit for chub mackerel (section 5.2.3.1.3). This is the preferred alternative for the chub mackerel landings limit. For the reasons described in section 7.1.2.3.1.3, alternative 2.C.i.c is not expected to result in a short-term change chub mackerel landings compared to recent levels. It is thus expected to have similar short-term socioeconomic impacts as the no action alternative (alternative 2.B; i.e. slight positive impacts).

If fishermen and dealers continue their efforts to build a market for chub mackerel caught in the Mid-Atlantic, landings and revenues could increase beyond recent levels over the longer term under the no action alternative. By restricting landings to 2.86 million pounds per year, alternative 2.C.i.c could have slight to moderate negative long-term socioeconomic impacts, compared to the no action alternative (depending on the scale of the possible increase under the no action alternative). However, it could also have long-term indirect slight positive socioeconomic impacts if it prevents declines in the abundance of socially and economically important predators of chub mackerel, which could occur under the no action alternative if fishing mortality increased to the extent that chub mackerel abundances decreased. Thus, the long-term socioeconomic impacts of alternative 2.C.i.c are mixed (i.e. both positive and negative).

Compared to the other alternatives in alternative set 2.C, alternative 2.C.i.c has greater potential for negative socioeconomic impacts due to reduced profits from landings of chub mackerel than alternatives 2.A (no action) and 2.C.i.d (5.25 million pound landings limit). It has a lesser potential for such negative impacts than alternatives 2.C.i.a (900,127 pound landings limit) and 2.C.i.b (1.75 million pound landings limit). It has greater potential for positive socioeconomic impacts due to the potential for increased populations of socially and economically important predators than to alternatives 2.A and 2.C.i.d, but lesser potential for such positive impacts than to alternatives 2.C.i.a and 2.C.i.b.

7.4.2.3.1.4. Socioeconomic Impacts of Alternative 2.C.i.d (5.25 Million Pound Chub Mackerel Landings Limit)

Alternative 2.C.i.d would implement a 5.25 million pound annual landings limit for chub mackerel (section 5.2.3.1.4). For the reasons described in section 7.1.2.3.1.4, alternative 2.C.i.d is not expected to result in a short-term change in landings of and revenues from chub mackerel compared to recent levels. It is thus expected to have similar short-term socioeconomic impacts as the no action alternative (alternative 2.B; i.e. slight positive impacts).

If fishermen and dealers continue their efforts to build a market for chub mackerel caught in the Mid-Atlantic, landings and revenues could increase beyond recent levels over the longer term under the no action alternative. By restricting landings to 5.25 million pounds per year,

alternative 2.C.i.d could have slight to moderate negative long-term socioeconomic impacts, compared to the no action alternative (depending on the scale of the possible increase under the no action alternative). However, it could also have indirect long-term slight positive socioeconomic impacts if it prevents declines in the abundance of socially and economically important predators of chub mackerel, which could occur under the no action alternative if fishing mortality increased to the extent that chub mackerel abundances decrease. Thus, the long-term socioeconomic impacts of alternative 2.C.i.d are mixed (i.e. both positive and negative).

Alternative 2.C.i.d contains the highest landings limit considered for chub mackerel; therefore, of the alternatives in alternative set 2.C.i, it has the greatest potential for positive socioeconomic impacts due to increased revenues.

7.4.2.3.2. Socioeconomic Impacts of Alternative Set 2.C.ii (Chub Mackerel Possession Limit)

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the annual landings limit is met. These possession limits are intended to be used in combination with one of the four annual landings limit alternatives included in alternative set 2.C.i. The socioeconomic impacts of the possession limits depend, in part, on which landings limit is chosen. The two measures together (the possession and landings limit) would determine the overall allowable amount of landings of (and, by extension, revenues from) chub mackerel in a given year. To the extent that the socioeconomic impacts of the possession limits can be considered separately from the landings limits, these impacts are summarized in the following sections.

7.4.2.3.2.1. Socioeconomic Impacts of Alternative 2.C.ii.a (No Possession of Chub Mackerel after the Landings Limit is Met)

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is met (section 5.2.3.2.1). This alternative would require that any chub mackerel caught incidentally while pursuing other species be discarded at sea after the landings limit is met. The level of chub mackerel catch that is truly incidental is poorly understood and likely varies by year, season, size of vessel, and fishing practices. By prohibiting retention of incidental catch after the landings limit is met, this alternative could cause slight negative economic impacts by preventing vessels from generating income from their incidental chub mackerel catch as they may have done in the past. These negative impacts are expected to be minor as they would only occur after the landings limit is met. The impact of this alternative on revenues would depend on the landings limit alternative with which it is coupled. If coupled with a lower landings limit (e.g. alternative 2.C.i.a or 2.C.i.b), it would result in a reduction in revenues compared to recent (i.e. 2013-2015) levels, and thus moderate negative impacts. If coupled with a higher landings limit (e.g. alternative 2.C.i.c or 2.C.i.d), it may not result in a change in

revenues and thus could have neutral economic impacts. Thus the short and long-term impacts of alternative 2.C.ii.a range from neutral to moderate negative, depending on the landings limit.

Alternative 2.C.ii.a is the most restrictive of the possession limit alternatives for chub mackerel; therefore, it is expected to have the greatest negative socioeconomic impacts of those alternatives.

7.4.2.3.2.2. Socioeconomic Impacts of Alternative 2.C.ii.b (10,000 Pound Chub Mackerel Possession Limit after Landings Limit is Reached)

Under alternative 2.C.ii.b a 10,000 pound chub mackerel possession limit would be enforced after the annual landings limit is reached (section 5.2.3.2.2).

The level of chub mackerel catch that is truly incidental is poorly understood and likely varies by year, season, vessel size, and fishing practices. Nonetheless, it is assumed that incidental catches above 10,000 pounds would be a rare occurrence; therefore, this alternative would likely require minimal discarding of chub mackerel after the landings limit is reached. This alternative would allow vessels to land up to 10,000 pounds at a time and thus continue to generate up to about \$2,200 per trip from chub mackerel after the landings limit is met (assuming the 2013-2015 average price; Table 16).

The impacts of this alternative on annual revenues would depend on the landings limit alternative with which it is coupled. If coupled with a lower landings limit (e.g. alternative 2.C.i.a or 2.C.i.b), it would result in a reduction in revenues compared to recent (i.e. 2013-2015) levels, and thus slight negative socioeconomic impacts. If coupled with a higher landings limit (e.g. alternative 2.C.i.c or 2.C.i.d), it may not result in a change in revenues and thus could have neutral economic impacts.

This alternative is expected to have minimal, if any, impacts on smaller vessels, for which 10,000 pounds would be an unusually large harvest. The impacts would be much greater for the four or fewer (depending on the year) larger vessels which targeted chub mackerel in recent years and have occasionally landed volumes much higher than 10,000 pounds per trip.

For these reasons, the socioeconomic impacts of alternative 2.C.ii.b are expected to range from neutral (for small vessels and if coupled with a higher landings limit) to slight negative (for larger vessels and if coupled with a lower landings limit) over both the short and long-term.

Compared to the other chub mackerel possession limit alternatives, alternative 2.C.ii.b has a greater potential for positive socioeconomic impacts than alternative 2.C.ii.c (40,000 pound possession limit) and a greater potential for negative socioeconomic impacts than alternative 2.C.ii.a (no possession after the landings limit is met).

7.4.2.3.2.3. Socioeconomic Impacts of Alternative 2.C.ii.c (40,000 Pound Chub Mackerel Possession Limit after Landings Limit is Reached; Preferred)

Under alternative 2.C.ii.c a 40,000 pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.3). This is a preferred alternative.

Assuming that prices remain similar to the 2013-2015 average of \$0.22 per pound, alternative 2.C.ii.c could allow vessels to generate revenues of about \$8,800 per trip from landings of chub mackerel after the annual landings limit is met. Forty thousand pounds is much higher than what most vessels which landed chub mackerel in the past are capable of landing or have typically landed. This alternative is expected to only impact the few large vessels which landed chub mackerel in high volumes in recent years.

The impacts of this alternative on annual revenues depends on the landings limit alternative with which it is coupled. If coupled with a lower landings limit (e.g. alternative 2.C.i.a or 2.C.i.b), it could result in a slight reduction in revenues compared to recent (i.e. 2013-2015) levels, and thus slight negative impacts. If coupled with a higher landings limit (e.g. alternative 2.C.i.c or 2.C.i.d), it may not result in a change in revenues and thus could have neutral economic impacts. For these reasons, the socioeconomic impacts of alternative 2.C.ii.c are expected to range from neutral (for small vessels and if coupled with a higher landings limit) to slight negative (for larger vessels and if coupled with a lower landings limit) in both the short and long-term.

Alternative 2.C.ii.c includes the least restrictive of the chub mackerel possession limit alternatives; therefore, it has the greatest potential for positive socioeconomic impacts of those alternatives.

7.4.2.4. Socioeconomic Impacts of Alternative Set 2.C.iii (Chub Mackerel Sunset Provisions)

Alternative set 2.C.iii contains alternatives related to sunset provisions for chub mackerel management measures. The following sections summarize the expected socioeconomic impacts of these alternatives.

7.4.2.4.1. Socioeconomic Impacts of Alternative 2.C.iii.a (No Sunset for Chub Mackerel Management Measures)

Under alternative 2.C.iii.a any management measures implemented for chub mackerel as part of this amendment would remain in place unchanged until they are modified by future amendments or framework actions. This alternative would not have any socioeconomic impacts beyond the impacts of the management measures themselves. The socioeconomic impacts of alternative 2.C.iii.a, when considered independently from the management measures, are thus expected to be neutral.

7.4.2.4.2. Socioeconomic Impacts of Alternative 2.C.iii.b (3 Year Sunset for Chub Mackerel Management Measures; Preferred)

Under alternative 2.C.iii.b, any management measures implemented for chub mackerel as part of this amendment would expire three years after implementation (section 5.2.3.3.2). This is a preferred alternative. Under this alternative, if the Council does not take additional action, there would be no management measures for chub mackerel in the Mid-Atlantic after three years. This alternative presumes that management measures would be implemented through this amendment and those measures would be in place for at least three years. For this reason, alternative 2.C.iii.b would have the same short-term impacts as whichever alternative is implemented. Over the longer term (i.e. after three years when the measures expire), alternative 2.C.iii.b would have the same impacts as the no action alternative (i.e. moderate to slight negative impacts), unless the Council takes future action to implement new management measures.

7.4.3. Socioeconomic Impacts of Alternative Set 3 (Administrative Alternatives)

When considered independently from the alternatives for management measures for the taxa included in this amendment (i.e. alternative sets 1 and 2), none of the administrative alternatives would regulate landings of unmanaged forage species.

The no action alternatives in alternative set 3 (i.e. alternatives 3.A.i, 3.B.i, 3.C.i, 3.D.i, 3.E.i, 3.F.i, 3.G.i, and 3.H.i; section 5.3) are all expected to have neutral socioeconomic impacts because they are not expected to change landings, and thus revenues, compared to recent levels.

For the reasons described in section 7.1.3, some administrative alternatives may have slight positive impacts on unmanaged forage species (i.e. alternatives 3.A.ii, 3.A.iii, 3.A.iv, 3.B.ii, 3.C.ii, 3.D.ii, 3.E.ii, and 3.G.ii). In doing so, they could help to maintain abundances of unmanaged forage species in the Mid-Atlantic, which could have slight positive impacts for their predators, including socially and economically important predators. This could lead to indirect slight positive socioeconomic impacts if it leads to increased opportunities for commercial and recreational activities which rely on those predators.

Alternative 3.A.ii would require use of an EFP prior to Council consideration of new fisheries or expansion of existing fisheries. Alternative 3.C.ii would require vessels to have a commercial fishing permit from GARFO to possess the taxa included in this amendment. Both alternatives would place additional paperwork and process burdens on commercial fishermen, which could be considered a slight negative socioeconomic impact. However, these alternatives are intended to help gain a better understanding of the impacts of such fisheries to ensure that they can be managed for sustainability. In this way, they would help ensure long-term positive socioeconomic impacts.

Framework actions (alternative 3.G.ii) can have slight positive socioeconomic impacts as they allow the Council to rapidly respond to emerging issues in the fisheries. Transit provisions

(alternative 3.H.ii) are also expected to have slight positive socioeconomic impacts by providing vessels which harvest unmanaged forage species outside of the Mid-Atlantic with more flexibility in where they land their catch and how they bring their catch to port (though they would still be prohibited from landing their catch in the Mid-Atlantic).

The no action alternatives in alternative set 3 (i.e. alternatives 3.A.i, 3.B.i, 3.C.i, 3.D.i, 3.E.i, 3.F.i, 3.G.i, and 3.H.i) are expected to have neutral socioeconomic impacts, when considered separately from the management measures for the taxa included in the amendment (alternative sets 1 and 2).

When considered as a group, the administrative alternatives are expected to have slight positive socioeconomic impacts, though the impacts of the individual alternatives range from slight negative (due to additional paperwork and process burdens) to slight positive (due to potential benefits for commercially and recreationally important predators).

7.5. Impacts of the Alternatives on Physical Habitat

The expected impacts of each alternative on physical habitat are summarized in the following sections. Some alternatives are grouped together because they have similar expected impacts.

The expected impacts to physical habitats derive from potential changes in fishing effort under each alternative. Changes in fishing effort can result in changes in the frequency of interactions between fishing gear and habitat and in the amount of damage caused by those interactions. Impacts can change if different gear types are used, as some gear types cause more damage to physical habitat than others (section 6.5.3).

The alternatives would regulate commercial fishing with all gear types in the Mid-Atlantic for over 50 currently unmanaged species (Table 4). Only those gear types that contact the bottom will impact physical habitat; therefore, the conclusions reached in this section apply only to fishing effort using bottom tending gears such as bottom otter trawls, dredges, traps, and sink gill nets. According to NEFOP and VTR data, about 90% of the catch of the taxa included in the amendment was caught with such bottom tending gears during 2006-2015.^{lxvi} Not all the taxa included in the amendment had records of catch; however, for those that did, at least some catch occurred with bottom tending gears (Table 7).

Impacts to physical habitat can also result from changes in the distribution of fishing effort. For example, impacts to habitat could change if effort shifts from areas with higher sensitivity to impacts from fishing gears to areas with lower sensitivity, or vice versa. Much of the landings of the taxa included in this amendment (except chub mackerel) during 1996-2015 are assumed to have been the result of directed harvest in state waters (which will not be impacted by this

^{lxvi} The percent of catch from bottom tending gears is similar for all the species grouped together, for chub mackerel, and for all species but chub mackerel grouped together.

amendment) or incidental harvest in Federal waters (section 6.4.1). For these reasons, none of the alternatives are expected to result in substantial changes in the distribution of fishing effort for taxa other than chub mackerel. Some alternatives may result in a change in the distribution of effort for chub mackerel; however, it is not known if such changes would result in a change in the types of habitats impacted by the chub mackerel fishery. For these reasons, the conclusions described in the following sections relate only to changes in the amount of fishing effort, and not in the distribution of fishing effort.

7.5.1. Impacts of Alternative Set 1 (Alternatives for Taxa Besides Chub Mackerel) on Physical Habitat

Alternative set 1 contains alternatives for taxa other than chub mackerel. The following sections summarize the expected impacts of these alternatives on physical habitat.

7.5.1.1. Impacts of Alternative 1.A (No Action on Taxa Besides Chub Mackerel) on Physical Habitat

Under alternative 1.A, no new regulations on commercial fisheries for unmanaged forage species would be implemented. For the reasons described in section 7.1.1.1, alternative 1.A is not expected to result in a change in fishing effort in the near future. Recent levels of fishing effort were low (section 6.4.1) and therefore likely resulted in low levels of interaction between fishing gears and physical habitat. Thus, alternative 1.A is expected to have slight negative short-term impacts on physical habitat.

Future fishing effort over the long-term under the no action alternative is uncertain. It could remain similar to recent levels. Alternatively, if demand and price for unmanaged forage species were to increase, fishing effort could increase. This is likely a longer-term possibility, given the low prices and low landings for most species over 1996-2015 (section 6.4.1). If fishing effort increases over the long-term, damage to physical habitat caused by fishing gear could increase. If this were to occur, alternative 1.A could have long-term slight to moderate negative impacts on habitat, compared to recent levels, depending on the scale of the increase in fishing effort. Impacts are expected to be slight to moderate negative (as opposed to highly negative) given that any increase in fishing effort for the taxa in this amendment would occur alongside the number of other fisheries which currently operate in the Mid-Atlantic (and thus currently impact habitat) and are likely to continue to do so into the foreseeable future (e.g. section 6.4.2).

Of all the alternatives for taxa besides chub mackerel (i.e. alternatives 1.A – 1.C), alternative 1.A has the greatest potential for negative impacts to physical habitats.

7.5.1.2. Impacts of Alternative 1.B (Prohibit Possession of Taxa Besides Chub Mackerel) on Physical Habitat

Alternative 2.B.i would prohibit vessels fishing commercially in Mid-Atlantic Federal waters from possessing over 50 previously unmanaged forage species (section 5.1.1). Alternative 2.B.i would essentially prohibit directed fishing on these species in Mid-Atlantic Federal waters.

For the reasons described in section 7.1.1.2, in the short-term alternative 1.B is expected to lead to a slight reduction in fishing effort compared to recent levels. It would prevent substantial increases in fishing effort over the long-term, which could occur under the no action alternative. By reducing fishing effort, alternative 1.B would decrease the potential for interactions between fishing gear and physical habitat. Alternative 1.B is thus expected to have slight positive short-term impacts and slight to moderate positive long-term impacts to habitat (depending on the scale of the increase in fishing effort which could occur under the no action alternative).

Of all the alternatives for taxa besides chub mackerel (alternatives 1.A – 1.C), alternative 1.B has the greatest potential for negative impacts to physical habitats.

7.5.1.3. Impacts of Alternative 1.C (Incidental Possession Limit) on Physical Habitat

Alternative 1.C contains two sub-alternatives for a possession limit for the forage taxa included in the amendment (except chub mackerel). The following sections summarize the expected impacts of these alternatives on physical habitat.

7.5.1.3.1. Impacts of Alternative 1.C.i (Incidental Possession Limit of 1,500 Pounds Per Species) on Physical Habitat

Alternative 1.C.i would implement an incidental possession limit of 1,500 pounds per species for all the taxa included in the amendment, except chub mackerel (section 5.1.3.1).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i is not expected to result in a short-term change in fishing effort. It is therefore not expected to result in a short-term change in interactions between fishing gear and physical habitat. Alternative 1.C.i is thus expected to have similar short-term impacts on physical habitat as the no action alternative (alternative 1.A; i.e. slight negative impacts).

For the reasons described in section 7.1.1.3.1, alternative 1.C.i could result in a slight increase in fishing effort for forage species over the long-term. If this were to occur, it could result in slight negative long-term impacts to physical habitat due to an increase in the amount of interactions between fishing gear and physical habitat. However, alternative 1.C.i would prevent greater future increases in fishing effort and fishing mortality which would be possible under the no action alternative. In this way, alternative 1.C.i could have slight positive long-term impacts for physical habitat compared to the no action alternative. These impacts are expected to be slight (as opposed to moderate or high) because any increase in fishing effort under this alternative

would still be constrained by the 1,500 pound possession limit. Thus, the long-term impacts of alternative 1.C.i range from slight negative (compared to recent impacts) to slight positive (compared to the no action alternative).

When compared to the other alternatives for taxa besides chub mackerel, alternative 1.C.i has a greater potential for positive habitat impacts than alternative 1.A (no action) and a lesser potential for positive habitat impacts than alternatives 1.B (prohibit possession) and 1.C.ii (possession limit of 1,700 pounds for all species combined).

7.5.1.3.2. Impacts of Alternative 1.C.ii (Incidental Possession Limit of 1,700 Pounds for all Species Combined; Preferred) on Physical Habitat

Alternative 1.C.ii would implement an incidental possession limit of 1,700 pounds combined weight of all the taxa included in the amendment, except chub mackerel (section 5.1.3.2). Alternative 1.C.ii is a preferred alternative.

For the reasons described in section 7.1.1.3.2, alternative 1.C.ii is not expected to result in a short-term change in fishing effort. It is therefore not expected to result in a short-term change in interactions between fishing gear and physical habitat. Alternative 1.C.ii is thus expected to have similar short-term impacts on physical habitat as the no action alternative (alternative 1.A; i.e. slight negative impacts).

As described in section 7.1.1.3.2, alternative 1.C.ii could result in a slight increase in fishing effort over the long-term. If this were to occur, it could result in slight negative long-term impacts to physical habitat due to an increase in interactions between fishing gear and physical habitat. However, it would prevent greater future increases in fishing effort which would be possible under the no action alternative. In this way, it could have slight positive long-term impacts for physical habitat compared to the no action alternative. These impacts are expected to be slight (as opposed to moderate or high) because any increase in fishing effort under this alternative would still be constrained by the 1,700 pound possession limit. Thus, the long-term impacts of alternative 1.C.ii range from slight negative (compared to recent impacts) to slight positive (compared to the no action alternative).

When compared to the other alternatives for taxa besides chub mackerel, alternative 1.C.ii has a greater potential for positive habitat impacts than alternatives 1.A (no action) and 1.C.i (1,500 pound per species possession limit) and a lesser potential for positive habitat impacts than alternative 1.B (prohibit possession).

7.5.2. Impacts of Alternative Set 2 (Alternatives for Chub Mackerel) on Physical Habitat

Alternative set 2 contains alternatives for the designation of and management measures for chub mackerel. The following sections summarize the expected impacts of these alternatives on the physical environment.

7.5.2.1. Impacts of Alternative 2.A (No Action on Chub Mackerel) on Physical Habitat

Under alternative 2.A, the Council would take no action on chub mackerel as part of this amendment and the chub mackerel fishery would remain unregulated (section 5.2.1). For the reasons described in section 7.1.2.1, landings would likely remain similar to or slightly below 2013-2015 levels (i.e. an average of 2.86 million pounds per year) over the short-term under alternative 2.A but may increase over the longer term. Alternative 2.A is thus expected to have slight negative impacts on physical habitat, both in the short and long-term. Impacts are expected to be slight (as opposed to moderate or high) negative because the damage to physical habitat resulting from increased fishing effort for chub mackerel is not expected to be substantial when considered in context with all the other commercial fisheries and other activities impacting habitat which are likely to continue into the future.

Of all the chub mackerel alternatives, alternative 2.A has the greatest potential for negative impacts to physical habitat.

7.5.2.2. Impacts of Alternative Set 2.B (Chub Mackerel Designation) on Physical Habitat

Alternative set 2.B contains three sub alternatives for the designation of chub mackerel. The following sections summarize the expected impacts of the alternatives on physical habitat. These alternatives are largely administrative in nature as they do not imply any specific level of catch or landings limits.

7.5.2.2.1. Impacts of Alternative 2.B.i (Manage Chub Mackerel as an EC) on Physical Habitat

Under alternative 2.B.i chub mackerel would be managed as an EC (section 5.2.2.1). For the reasons described in section 7.1.2.2.1, although the impacts of this designation would largely derive from the measures implemented, the designation itself would establish the foundation for chub mackerel management measures. Assuming that these measures would regulate fishing effort, they would limit the potential for interactions between fishing gear and physical habitat. In this way, alternative 2.B.i is could have slight positive impacts on physical habitat in the short and long-term.

The legal requirements for ECs are not as strong as those for stocks in the fishery (section 5.2.2); therefore the impacts of alternative 2.B.i may not be as positive as those of alternative 2.B.ii, which would manage chub mackerel as a stock in the fishery. The impacts may be more positive than those under alternative 2.B.iii, which would use neither designation and has a weaker legal basis.

7.5.2.2.2. Impacts of Alternative 2.B.ii (Manage Chub Mackerel as a Stock in the Fishery) on Physical Habitat

Under alternative 2.B.ii chub mackerel would be managed as a stock in the fishery (section 5.2.2.2). As described in section 7.1.2.2.2, although the impacts of alternative 2.B.ii on chub mackerel would largely derive from the management measures implemented, the stock in the fishery designation would establish a legal basis and legal requirements for those measures. Alternative 2.B.ii would regulate fishing effort and would thus limit the potential for interactions between fishing gear and physical habitat. For these reasons, alternative 2.B.ii is expected to have slight positive impacts on physical habitat in both the short and long-term.

Of all the designations considered for chub mackerel, the stock in the fishery designation has the strongest legal requirements. Therefore, alternative 2.B.ii may have greater positive impacts on physical habitat than alternatives 2.B.i and 2.B.iii.

7.5.2.2.3. Impacts of Alternative 2.B.iii (Manage Chub Mackerel as Neither an EC nor a Stock in the Fishery; Preferred) on Physical Habitat

Under alternative 2.B.iii chub mackerel would be designated as neither an EC nor a stock in the fishery. Management measures would be implemented using the discretionary authority allowed for under section 303(b)(12) of the MSA (section 5.2.2.3). This is the preferred alternative for the designation of chub mackerel. The impacts of this alternative would derive solely from the management measures implemented. Unlike alternatives 2.B.i and 2.B.ii, there would be no legal framework or requirement for any particular management measures under this alternative. For these reasons, the short and long-term impacts of alternative 2.B.iii on physical habitat are expected to be neutral (compared to slight positive for alternatives 2.B.i and 2.B.ii).

7.5.2.3. Impacts of Alternative Set 2.C (Chub Mackerel Management Measures) on Physical Habitat

Alternative set 2.C contains alternatives for chub mackerel management measures. The following sections summarize the expected impacts of these alternatives on the physical environment.

7.5.2.3.1. Impacts of Alternative Set 2.C.i (Chub Mackerel Landings Limit) on Physical Habitat

Alternative set 2.C.i contains alternatives for a chub mackerel landings limit. The following sections summarize the expected impacts of these alternatives on physical habitats.

7.5.2.3.1.1. Impacts of Alternative 2.C.i.a (900,127 Pound Chub Mackerel Landings Limit) on Physical Habitat

Alternative 2.C.i.a would implement a 900,127 pound annual landings limit for chub mackerel (section 5.2.3.1.1). For the reasons described in section 7.3.2.3.1.1, alternative 2.C.i.a is expected to result in a notable decrease in fishing effort in the chub mackerel fishery compared to recent levels. In doing so, alternative 2.C.i.a is expected to result in a decrease in the frequency of interactions between fishing gear and physical habitat. As such, alternative 2.C.i.a is expected to have slight to moderate positive impacts on physical habitat, depending on the degree in the decrease in fishing effort, compared to the no action alternative, in both the short and long-term. Impacts may only be slight positive because the chub mackerel fishery exists alongside several other fisheries in the Mid-Atlantic which are expected to continue to impact physical habitat into the foreseeable future (e.g. section 6.4.2).

Alternative 2.C.i.a contains the lowest chub mackerel landings limit of all the alternatives; therefore, it has the greatest potential for positive impacts to physical habitat.

7.5.2.3.1.2. Impacts of Alternative 2.C.i.b (1.75 Million Pound Chub Mackerel Landings Limit) on Physical Habitat

Alternative 2.C.i.b would implement a 1.75 million pound annual landings limit for chub mackerel (section 5.2.3.1.2). For the reasons described in section 7.2.2.3.1.2, alternative 2.C.i.b is expected to result in a moderate decrease in fishing effort in the chub mackerel fishery compared to recent levels. In doing so, alternative 2.C.i.b is expected to result in a decrease in the frequency of interactions between fishing gear and physical habitat. As such, alternative 2.C.i.b is expected to have slight to moderate positive impacts on physical habitat, depending on the degree in the decrease in fishing effort, compared to the no action alternative in both the short and long-term. Impacts may only be slight positive because the chub mackerel fishery exists alongside several other fisheries in the Mid-Atlantic which are expected to continue to impact physical habitat into the foreseeable future (e.g. section 6.4.2).

Alternative 2.C.i.b includes a higher landings limit than alternative 2.C.i.a; therefore, the impacts on habitat would be of a lesser magnitude than those under alternative 2.C.i.a. Alternative 2.C.i.b includes a lower landings limit than alternatives 2.C.i.c and 2.C.i.d; therefore, it is expected to have greater positive impacts on habitat than those alternatives.

7.5.2.3.1.3. Impacts of Alternative 2.C.i.c (2.86 Million Pound Chub Mackerel Landings Limit; Preferred) on Physical Habitat

Alternative 2.C.i.c would implement a 2.86 million pound annual landings limit for chub mackerel (section 5.2.3.1.3). This is a preferred alternative. For the reasons described in section 7.1.2.3.1.3, alternative 2.C.i.c is not expected to result in a change in fishing effort compared to recent levels over the short term. For this reason, the short term expected impacts of alternative

2.C.i.c on physical habitat are identical to those of the no action alternative (alternative 2.B; i.e. slight negative impacts).

Fishing effort in the chub mackerel fishery, and thus the frequency of interactions between fishing gear and physical habitat, could increase over the longer term under the no action alternative. Because alternative 2.C.i.c would restrict landings compared to the no action alternative, it is expected to have slight to moderate positive long-term impacts on habitat compared to the no action alternative.

Alternative 2.C.i.c includes a higher landings limit than alternatives 2.C.i.a and 2.C.i.b; therefore, the impacts on habitat would be less positive than those under alternatives 2.C.i.a and 2.C.i.b. It includes a lower landings limit than alternative 2.C.i.d; therefore, impacts would be more positive than under alternative 2.C.i.d.

7.5.2.3.1.4. Impacts of Alternative 2.C.i.d (5.25 Million Pound Chub Mackerel Landings Limit) on Physical Habitat

Alternative 2.C.i.d would implement a 5.25 million-pound annual landings limit for chub mackerel (section 5.2.3.1.4). For the reasons described in section 7.1.2.3.1.4, alternative 2.C.i.d is not expected to result in a change in fishing effort over the short term. For this reason, the short term expected impacts of alternative 2.C.i.d on physical habitat are identical to those of the no action alternative (alternative 2.B; i.e. slight negative impacts).

Fishing effort, and thus the amount of interactions between fishing gear and physical habitat, could increase over the longer term under the no action alternative. Because alternative 2.C.i.d would restrict landings compared to the no action alternative (alternative 2.A), it is expected to have slight to moderate positive long-term impacts on habitat, compared to the no action alternative.

Alternative 2.C.i.d contains the highest chub mackerel landings limit of all the alternatives in alternative set 2.C.i; therefore, it has the lowest potential for positive impacts to physical habitat.

7.5.2.3.2. Impacts of Alternative Set 2.C.ii (Chub Mackerel Possession Limit) on Physical Habitat

Alternative set 2.C.ii contains three sub alternatives relating to possession of chub mackerel after the landings limit is met. These possession limits are intended to be used in combination with one of the landings limit alternatives in alternative set 2.C.i. The impacts of the possession limits on habitat depend, in large part, on which landings limit is chosen. The two measures together (the possession and landings limit) would determine the allowable amount of landings of and the amount of fishing effort for chub mackerel in a given year. To the extent that the impacts of the possession limits on habitat can be considered separately from the landings limits, these impacts are summarized in the following sections.

7.5.2.3.2.1. Impacts of Alternative 2.C.ii.a (No Possession of Chub Mackerel after the Landings Limit is Reached) on Physical Habitat

Under alternative 2.C.ii.a possession of chub mackerel would be prohibited after the annual landings limit is reached (section 5.2.3.2.1). As described in section 7.1.2.4.1, the impacts on fishing effort would vary based on the landings limit used (alternative set 2.C.i). To the extent that alternative 2.C.ii.a limits fishing effort, it would also limit the potential for interactions between fishing gear and physical habitat. In this way, it is expected to have slight positive impacts on physical habitat in both the short and long-term, compared to the no action alternative (section 6.3).

Of all the chub mackerel possession limit alternatives, alternative 2.C.ii.a is the most restrictive; therefore, it is expected to have the most positive impacts on physical habitat.

7.5.2.3.2.2. Impacts of Alternative 2.C.ii.b (10,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Reached) on Physical Habitat

Under alternative 2.C.ii.b a 10,000 pound possession limit would be enforced after the chub mackerel landings limit is met (section 5.2.3.2.2). For the reasons described in section 7.1.2.4.2, this would likely only prove restrictive for a few larger vessels. When considered separately from the landings limit alternatives, it is expected to slightly reduce fishing effort, compared to the no action alternative. It could thus lead to a slight decrease in interactions between fishing gear and physical habitat. In this way, it could have slight positive impacts to physical habitats in both the short and long-term, compared to the no action alternative.

The impacts of alternative 2.C.ii.b are expected to be less positive than those of alternative 2.C.ii.a (prohibit possession of chub mackerel after the landings limit is met) and more positive than those of alternative 2.C.ii.c (40,000 pound possession limit).

7.5.2.3.2.3. Impacts of Alternative 2.C.ii.c (40,000 Pound Chub Mackerel Possession Limit after the Landings Limit is Reached; Preferred) on Physical Habitat

Under alternative 2.C.ii.c a 40,000 pound possession limit would be enforced after the chub mackerel landings limit is reached (section 5.2.3.2.3). This is a preferred alternative.

When considered separately from the landings limit alternatives, alternative 2.C.ii.c is expected to slightly reduce fishing effort, compared to the no action alternative. It could thus lead to a slight decrease in interactions between fishing gear and physical habitat. In this way, it could have slight positive impacts to physical habitat compared to the no action alternative in both the short and long-term.

Alternative 2.C.ii.c is the least restrictive of the three possession limit alternatives (alternatives 2.C.ii.a – 2.C.ii.a); therefore, it is expected to have the least positive impacts on physical habitat.

7.5.2.4. Impacts of Alternative Set 2.C.iii (Chub Mackerel Sunset Provisions) on Physical Habitat

Alternative set 2.C.iii contains alternatives related to sunset provisions for chub mackerel management measures. The following sections summarize the expected impacts of these alternatives on physical habitat.

7.5.2.4.1. Impacts of Alternative 2.C.iii.a (No Sunset for Chub Mackerel Management Measures) on Physical Habitat

Under alternative 2.C.ii.a any management measures implemented for chub mackerel as part of this amendment would remain in place unchanged until they are modified by future amendments or framework actions. This alternative would not have any impacts for physical habitat, beyond the impacts of the management measures themselves. The impacts of alternative 2.C.iii.a on physical habitat, when considered independently from the management measures, are thus expected to be neutral in both the short and long-term.

7.5.2.4.2. Impacts of Alternative 2.C.iii.b (3 Year Sunset for Chub Mackerel Management Measures; Preferred) on Physical Habitat

Under alternative 2.C.iii.b, any management measures implemented for chub mackerel as part of this amendment would expire three years after implementation (section 5.2.3.3.2). This is a preferred alternative. Under this alternative, if the Council does not take additional action, there would be no management measures for chub mackerel in the Mid-Atlantic after three years. This alternative presumes that management measures would be implemented through this amendment (i.e. it presumes that alternative 2.A, the no action alternative, is not chosen) and those measures would be in place for at least three years. For this reason, alternative 2.C.iii.b would have the same short-term impacts on habitat as whichever alternative is implemented. Over the longer term (i.e. after three years when the measures expire), alternative 2.C.iii.b would have the same impacts as the no action alternative (i.e. moderate to slight negative impacts), unless the Council takes future action to implement new management measures.

7.5.3. Impacts of Alternative Set 3 (Administrative Alternatives) on Physical Habitat

When considered independently from the alternatives for management measures for the taxa included in this amendment (i.e. alternative sets 1 and 2), none of the administrative alternatives would regulate fishing effort. For this reason, they will not result in any changes in the amount of interactions between fishing gear and physical habitat and are thus expected to have neutral impacts on habitat.

7.6. Cumulative Effects Analysis

A cumulative effects analysis (CEA) is required by the Council on Environmental Quality (CEQ) (40 CFR part 1508.7). The purpose of CEA is to consider the combined effects of many actions

on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective; rather, the intent is to focus on those effects that are truly meaningful. A formal cumulative impact assessment is not required as part of an EA under NEPA if the significance of cumulative impacts have been considered (U.S. EPA 1999). The following sections address the significance of the expected cumulative impacts as they relate to the VECs considered in this document.

7.6.1. Consideration of the VECs

This section describes the significance of cumulative effects on each VEC. The VECs relevant to this action include:

- The forage taxa included in this amendment
- Species managed by the Mid-Atlantic Council
- Other predators of the forage species included in the amendment (specifically, large tunas, billfish, sharks, and seabirds)
- Protected species
- The socioeconomic environment
- Physical habitat

7.6.2. Geographic Boundaries

This amendment will apply to Mid-Atlantic Federal waters. Mid-Atlantic Federal waters represent the core geographic scope of the impacts of the alternatives; however, impacts to forage species, Council-managed species, other predators, and protected species will occur, to some extent, wherever those species are found, as will impacts to habitat for those species. Similarly, the geographic scope of socioeconomic impacts will be centered in the Mid-Atlantic, but socioeconomic impacts may also occur to some degree in any communities that rely on commercial or recreational fishing for the species encompassed by the VECs, or on non-fishing activities that rely on those species, such as whale or bird watching.

7.6.3. Temporal Boundaries

For managed species, the temporal scope of this analysis is focused on actions that have taken place since 1976, when the Council first began managing species under the MSA. For protected species, the scope of past and present actions varies by species but is focused on the 1980s and 1990s, when NMFS began assessing stocks of marine mammals and sea turtles in the U.S. EEZ, through the present. The temporal scope of future actions for all VECs extends about three years into the future (through 2020). The dynamic nature of resource management and lack of information on projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty.

7.6.4. Actions Other Than Those Proposed in this Amendment

The impacts of the alternatives considered in this document are described in sections 7.1 through 7.5. Table 21 summarizes meaningful past, present, or reasonably foreseeable future actions which may impact the VECs in addition to the alternatives considered in this document. Table 21 also includes qualitative descriptions of the impacts of those actions. Impacts of these actions are too complex to be meaningfully quantified.

The MSA is the statutory basis for Federal fisheries management. The past and ongoing management practices of the Mid-Atlantic Council have generally resulted in positive impacts on the health of the managed stocks. The Council has taken numerous actions to manage these fisheries through amendments and framework adjustments, examples of which are listed in Table 21. For example, the specifications process for setting ACLs, as required by the MSA, provides the opportunity for the Council and NMFS to regularly assess the status of managed fisheries and to make necessary adjustments to ensure a reasonable expectation of meeting the objectives of the FMPs.

The cumulative impacts of past, present, and reasonably foreseeable future Federal fishery management actions on the VECs are expected to result in long-term sustainability of the managed stocks. As such, these actions should, in the long-term, promote positive impacts on human communities, especially those communities that are economically dependent on the managed stocks. Many past fishery management actions resulted in reduced fishing effort or reduced impacts of fishing through access limitation, vessel upgrade restrictions, area and gear restrictions, EFH designations, AMs, and other measures. These measures benefitted the managed species, non-target species, protected species, and habitat. Human communities benefited in the long term from the continued productivity of managed stocks; however, some of these measures caused short-term negative economic impacts (Table 21).

Non-fishing activities such as climate change, point and non-point source pollution, shipping, dredging, storm events, and other factors affect the physical and biological dimensions of the environment. Many of these non-fishing activities are widespread, can have localized impacts to habitat, and have resulted in habitat loss for various marine species. Such activities include at-sea disposal of sediments and other materials, oil and mineral resource exploration, aquaculture, installation of wind turbines, bulk transportation of petrochemicals, and other activities, as well as natural events such as storms. Activities that introduce chemical pollutants, sewage, or suspended sediments into the marine environment, or result in changes in water temperature, salinity, or dissolved oxygen all pose risks to the VECs.

Some non-fishing human activities such as agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material tend to be localized in nearshore areas and marine project areas where they occur. Wherever multiple activities co-occur, they can work additively or synergistically to decrease

habitat quality and, as such, may indirectly impact the sustainability of the managed species, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these species to the impacts of fishing effort. Impacts to the affected species and their habitats on a population level are generally neutral to low negative since many of these species have limited or minor exposure to these local non-fishing perturbations. Mitigation through regulations that reduce fishing effort can negatively impact human communities.

Federal agencies wishing to conduct various types of non-fishing activities must examine the potential impacts on the VECs. The MSA (50 CFR 600.930) imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH. The eight Regional Fishery Management Councils are engaged in this review process by submitting comments and recommendations on any Federal or state action that may affect habitat, including EFH, for managed species. NMFS also reviews impacts of certain activities regulated by Federal, state, and local authorities as required by section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act.

In addition, under the Fish and Wildlife Coordination Act (section 662), “whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the U.S., or by any public or private agency under federal permit or license, such department or agency first shall consult with the U.S. Fish and Wildlife Service (USFWS), Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular state wherein the” activity is taking place. This act provides another avenue for review of actions by other Federal and state agencies that may impact species that NMFS and the Councils manage.

NMFS and the USFWS share responsibility for implementing the ESA. The ESA requires NMFS to designate critical habitat and to develop and implement recovery plans for threatened and endangered species. Critical habitat includes areas that contain physical or biological features essential to the conservation of protected species, which may require special management considerations or protection. The ESA provides an avenue for NMFS to review actions by other entities that may impact endangered and protected species whose management units are under the jurisdiction of NMFS.

7.6.4.1. Climate Change

Each VEC is impacted to some degree by global climate change. Climate shifts may alter the pattern and strength of ocean currents, change the rate of freshwater inflows, influence water temperature, acidity, and salinity, and have other impacts. These changes affect the physical environment directly, which in turn may shape the suitability of local habitats for marine species. Changes in the abundance and distribution of marine species will affect fishing communities. For

example, if a species important to a particular community declines in abundance or shifts in distribution due to environmental factors, that community may experience negative socioeconomic impacts. Positive impacts could occur if the abundance of other targeted species increases. The direct impacts to the VECs will vary and are associated with some uncertainty.

NOAA scientists developed an assessment of the climate vulnerability of 82 fish and invertebrate species in the northeast region, including coastal fish, diadromous fish (including protected species such as Atlantic salmon and Atlantic sturgeon), elasmobranchs, pelagic fish and cephalopods (including anchovies, Atlantic saury, and sand lance, all of which are included in this amendment), benthic invertebrates, and groundfish. The authors found that “the overall climate vulnerability is high to very high for approximately half the species assessed; diadromous and benthic invertebrate species exhibit the greatest vulnerability. In addition, the majority of species included in the assessment have a high potential for a change in distribution in response to projected changes in climate. Negative effects of climate change are expected for approximately half of the species assessed, but some species are expected to be positively affected (e.g., increase in productivity or move into the region)” (Hare et al. 2016).

Anchovies and Atlantic saury, two species included in this amendment, were found to have low overall climate vulnerability with high climate exposure and low biological sensitivity. Both are sensitive to changes in ocean surface temperature and ocean acidification during all life stages; however, the effects of ocean acidification over the next 30 years are likely to be minimal. Both species are generalists and have wide distributions. Both species may experience increased productivity and increased habitat availability with warming temperatures (NOAA OST 2016).

Sand lances were found to have moderate overall climate vulnerability with high climate exposure and moderate biological sensitivity. Like anchovies and Atlantic saury, sand lances are sensitive to changes in ocean surface temperature and ocean acidification during all life stages. Sand lances are found in sandy habitats, which limits adult mobility. They also spawn in a distinct season which is defined by temperature. Both of these factors contributed to a moderate biological sensitivity to climate change and limit the ability of sand lances to shift their distribution in response to changing climate conditions. Increased temperatures may decrease productivity and limit habitat availability for sand lances (NOAA OST 2016).

Table 21: Impacts of past (P), present (Pr), and reasonably foreseeable future (RFF) actions, not including those actions considered in this document, on the VECs.

Action	Description	Impacts on Unmanaged Forage Species	Impacts on Council Managed Species and Other Predators	Impacts on Protected Species	Socioeconomic Impacts	Impacts on Physical Habitat
P, Pr FMPs, Amendments, Frameworks	Established commercial and recreational management measures for managed species	Indirect Positive Regulated fishing effort	Indirect Positive Regulatory tool available to rebuild and manage stocks and to regulate fishing effort	Indirect Positive Regulated fishing effort	Indirect Positive Benefited domestic businesses by ensuring sustainable fisheries	Indirect Positive Reduced fishing effort
P, Pr, RFF Annual specifications for managed species	Establish quotas, recreational harvest limits, and other fishery regulations	Indirect Positive Regulated fishing effort; gear requirements	Indirect Positive Regulatory tool to specify catch limits, and other regulations; allows response to annual stock updates	Indirect Positive Regulated fishing effort; gear requirements	Indirect Positive Benefited domestic businesses by ensuring sustainable fisheries	Indirect Positive Reduced effort levels; gear requirements
P, Pr, RFF Standardized Bycatch Reporting Methodology Amendments	Established acceptable level of precision and accuracy for monitoring bycatch in fisheries	Neutral May improve data quality for monitoring total removals	Neutral May improve data quality for monitoring total removals	Neutral May increase observer coverage	Mixed May impose an inconvenience on vessel operations; may improve quality of data used in future management decisions	Neutral Will not affect distribution of effort
P, Pr, RFF Deep Sea Corals Amendment to Mackerel, Squid, and Butterfish FMP	Prohibits use of bottom-tending gear in certain areas known or highly likely to contain deep sea corals.	Direct Positive Reduced fishing mortality in protected areas	Direct Positive Reduced fishing mortality in protected areas	Direct Positive Reduced likelihood of gear interactions in protected areas	Mixed Negative impacts for fishermen who previously used bottom-tending gear in protected areas; positive impacts due to potential increased productivity of some species.	Direct Positive Reduced gear impacts in protected areas

Action	Description	Impacts on Unmanaged Forage Species	Impacts on Council Managed Species and Other Predators	Impacts on Protected Species	Socioeconomic Impacts	Impacts on Physical Habitat
RFF Convening of Take Reduction Teams	Recommend measures to reduce mortality and injury to marine mammals and sea turtles	Indirect Positive Reducing amount of gear in water could reduce bycatch	Indirect Positive Reducing amount of gear in water could reduce bycatch	Direct Positive Reducing amount of gear in water could reduce encounters	Indirect Negative Reducing amount of gear in water could lead to reduced catches and reduced revenues	Indirect Positive Reducing amount of gear in water could reduce gear impacts
P, Pr, RFF Agricultural runoff	Nutrients applied to agricultural land are introduced into aquatic systems	Indirect Negative Reduced habitat quality	Indirect Negative Reduced habitat quality	Indirect Negative Reduced habitat quality	Indirect Negative Reduced habitat quality could result in decreased availability and landings of some species	Direct Negative Reduced habitat quality
P, Pr, RFF Port maintenance	Dredging of coastal, port and harbor areas	Indirect Negative Reduced habitat quality/availability; dependent on mitigation efforts	Indirect Negative Reduced habitat quality/availability; dependent on mitigation efforts	Direct and Indirect Negative Potential interactions with protected species; reduced habitat quality/availability; dependent on mitigation efforts	Mixed Benefits for marine transportation; potential for reduced landings due to reduced availability because of negative habitat impacts; dependent on mitigation effects	Direct Negative Reduced habitat quality/availability; dependent on mitigation efforts
P, Pr, RFF Beach nourishment	Offshore mining of sand and placement of sand on beaches	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Direct and Indirect Negative Reduced habitat quality; dredge interactions; dependent on mitigation efforts	Mixed Positive for mining companies, tourism; possibly negative for fishing industry if reduced landings result from reduced availability because of negative habitat impacts	Direct Negative Reduced habitat quality

Action	Description	Impacts on Unmanaged Forage Species	Impacts on Council Managed Species and Other Predators	Impacts on Protected Species	Socioeconomic Impacts	Impacts on Physical Habitat
P, Pr, RFF Marine transportation	Expansion of port facilities, recreational marinas, and vessel operations	Indirect Negative Reduced habitat quality/availability	Indirect Negative Reduced habitat quality/availability	Direct and Indirect Negative Reduced habitat quality/availability; potential for interactions (ship strikes) with protected species	Mixed Positive for some user groups, potential displacement for others	Direct Negative Reduced habitat quality/availability
P, Pr, RFF Offshore disposal of dredged materials	Disposal of dredged materials	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Indirect Negative Reduced habitat quality negatively affects productivity of marine species, which could negatively impact landings	Direct Negative Reduced habitat quality
P, Pr, RFF Renewable and non-renewable offshore and nearshore energy development	Transportation of oil, gas, & electricity through pipelines & cables; Construction of associated infrastructure	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Indirect Negative Reduced habitat quality; dependent on mitigation efforts	Direct and Indirect Negative Reduced habitat quality; Sound Exposure (physical injury or behavioral harassment); dependent on mitigation efforts	Mixed Positive for energy consumers if results in reduced costs; negative for fishing-dependent communities due to potential loss of access to fishing areas and decreased fish productivity due to reduced habitat quality	Mixed Reduced habitat quality; dependent on mitigation efforts; new offshore infrastructure may create new habitat for structure-orienting species

7.6.5. Magnitude and Significance of Cumulative Effects

In determining the magnitude and significance of the cumulative effects, the additive and synergistic effects of the proposed action, as well as past, present, and future actions, must be considered. The following sections describe the expected effects of these actions on the VECs.

7.6.5.1. Impacts of Past, Present, and Reasonably Foreseeable Future Actions on Unmanaged Forage Species, Council-Managed Species, and Other Predators of Forage Species

Those past, present, and reasonably foreseeable future actions which may impact unmanaged forage species, Council-managed species, and other predators of forage species, and the direction of those impacts are summarized in Table 22. The actions causing direct and indirect negative impacts are localized in nearshore areas and marine project areas where they occur; therefore, the magnitude of those impacts is expected to be limited due to a lack of exposure to the populations at large. Agricultural runoff may be much broader in scope and the impacts of nutrient inputs to the coastal system may be of a larger magnitude; however, the impacts on productivity of unmanaged forage species, Council-managed species, and other predators of forage species, is not quantifiable.

Catch limits, commercial quotas, and recreational harvest limits for the managed species have been specified to ensure these rebuilt stocks are managed in a sustainable manner and that measures are consistent with the objectives of the FMPs under the guidance of the MSA. Past fishery management actions taken through FMPs, amendments, frameworks, and the specifications process have had positive cumulative effects on the managed species and species caught alongside managed species. It is anticipated that the future fishery management actions described in Table 22 will result in additional indirect positive impacts through actions which reduce and monitor bycatch, protect habitat, and protect ecosystem services on which productivity of these species depends.

As described in section 7.6.4, NMFS has several means through which it can review non-fishing actions of other federal and state agencies that may impact NMFS managed species prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on species under NMFS' jurisdiction.

Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to these species have had positive cumulative effects.

Table 22: Summary of the effects of past, present, and reasonably foreseeable future actions on unmanaged forage species, Council-managed species, and other predators of forage species.

Action	Past to Present Impacts	Reasonably Foreseeable Future Impacts
FMPs, amendments, and frameworks	Indirect Positive	
Annual specifications for managed species	Indirect Positive	
Standardized Bycatch Reporting Methodology	Neutral	
Deep Sea Corals Amendment		Direct Positive
Convening Gear Take Reduction Teams		Indirect Positive
Agricultural runoff	Indirect Negative	
Port maintenance	Indirect Negative	
Beach nourishment	Indirect Negative	
Marine transportation	Indirect Negative	
Offshore disposal of dredged materials	Indirect Negative	
Renewable and non-renewable offshore and nearshore energy development	Indirect Negative	
Cumulative impacts	Overall, actions have had, or will have, positive impacts on unmanaged forage species, Council-managed species, and other predators of forage species	

7.6.5.2. Impacts of Past, Present, and Reasonably Foreseeable Future Actions on Protected Species

Those past, present, and reasonably foreseeable future actions which may impact protected species and the direction of those impacts are summarized in Table 23.

Past fishery management actions taken through the FMPs, amendments, frameworks, and the annual specifications process have had generally positive impacts on protected species through the reduction of fishing effort (and thus the reduction of potential interactions with protected species). It is anticipated that future management actions, specifically those recommended by the Atlantic large whale take reduction team and the development of strategies for sea turtle conservation (section 6.3), will result in additional direct positive effects on protected species. These impacts could be broad in scope. Many negative non-fishing impacts on protected species are ongoing.

As described in section 7.6.4, NMFS has several means, including the ESA, through which it can review non-fishing actions of other Federal and state agencies that may impact protected species prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on protected species under NMFS' jurisdiction.

Overall, the past, present, and reasonably foreseeable future actions have had generally positive cumulative effects on protected species (Table 23).

Table 23: Summary of the effects of past, present, and reasonably foreseeable future actions on protected species.

Action	Past to the Present Impacts	Reasonably Foreseeable Future Impacts
FMPs, amendments, and frameworks	Indirect Positive	
Annual specifications for managed species	Indirect Positive	
Standardized Bycatch Reporting Methodology	Neutral	
Deep Sea Corals Amendment		Direct Positive
Convening Gear Take Reduction Teams		Positive
Agricultural runoff	Indirect Negative	
Port maintenance	Direct and Indirect Negative	
Beach nourishment	Direct and Indirect Negative	
Marine transportation	Direct and Indirect Negative	
Offshore disposal of dredged materials	Direct and Indirect Negative	
Renewable and non-renewable offshore and nearshore energy development	Direct and Indirect Negative	
Cumulative impacts	Overall, actions have had, or will have, positive impacts on protected species	

7.6.5.3. Impacts of Past, Present, and Reasonably Foreseeable Future Actions on Human Communities

Those past, present, and reasonably foreseeable future actions which may impact human communities and the direction of those impacts are summarized in Table 24. The actions causing direct and indirect negative impacts are localized in nearshore areas and marine project areas where they occur. These actions may displace fishermen from project areas but the overall magnitude of those impacts on human communities is expected to be limited in scope.

Agricultural runoff may be much broader in scope. The impacts of nutrient inputs to the coastal system may be larger in magnitude. These actions may result in indirect negative impacts to human communities by reducing availability of target species.

Past fishery management actions taken through the FMPs, amendments, frameworks, and the annual specifications process have had both positive and negative cumulative socioeconomic effects. They have benefited domestic fisheries through sustainable fishery management practices while sometimes reducing the availability of the resources to all participants. Sustainable management practices are expected to yield broad positive impacts to fishermen, their communities, businesses, and the nation as a whole over the long-term. It is anticipated that

future fishery management actions will result in positive impacts for human communities due to sustainable management practices; however, additional indirect negative impacts could occur if management actions result in area closures, reduced quotas, and other measures that could lead to reduced revenues.

As described in section 7.6.4, NMFS has several means under which it can review non-fishing actions of other Federal and state agencies prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on human communities.

Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to human communities have had overall positive socioeconomic cumulative effects (Table 24).

Table 24: Summary of the effects of past, present, and reasonably foreseeable future actions on human communities.

Action	Past to the Present Impacts	Reasonably Foreseeable Future Impacts
FMPs, amendments, and frameworks	Indirect Positive	
Annual specifications for managed species	Indirect Positive	
Standardized Bycatch Reporting Methodology	Mixed	
Deep Sea Corals Amendment		Mixed
Convening Gear Take Reduction Teams		Indirect Negative
Agricultural runoff	Indirect Negative	
Port maintenance	Mixed	
Beach nourishment	Mixed	
Marine transportation	Mixed	
Offshore disposal of dredged materials	Indirect Negative	
Renewable and non-renewable offshore and nearshore energy development	Mixed	
Cumulative impacts	Overall, actions have had, or will have, positive impacts on human communities	

7.6.5.4. Impacts of Past, Present, and Reasonably Forseeable Future Actions on Physical Habitat

Those past, present, and reasonably foreseeable future actions which may impact habitat (including EFH) and the direction of those impacts are summarized in Table 25. The actions causing direct and indirect negative impacts are localized in nearshore areas and marine project areas where they occur; therefore, the magnitude of those impacts is expected to be limited due to a lack of exposure to habitat at large. Agricultural runoff may be much broader in scope and

the impacts of nutrient inputs to the coastal system may be of a larger magnitude; however, the impacts of these actions on habitat and EFH are not quantifiable.

Past fishery management actions taken through the various FMPs, amendments, frameworks, and the annual specifications processes have had a positive cumulative effect on physical habitats. These actions constrained fishing effort at a large scale and locally, which likely reduced impacts to habitat. As required under the MSA, EFH was designated for all the managed species. The future fishery management actions described in Table 25 will likely result in additional direct or indirect positive effects on habitat through actions which protect EFH for federally-managed species and protect ecosystem services on which these species' productivity depends. These impacts could be broad in scope.

All the VECs are interrelated; therefore, linkages among habitat quality, target species, and associated fishery yields should be considered. Various actions, including those that are localized and those that are broad in scope, can have direct and indirect negative effects on physical habitat; however, positive actions that have broad implications have been, and are expected to continue to be, taken to improve the condition of habitat. Some actions such as coastal population growth and climate change are beyond the scope of NMFS and Council management but may indirectly impact habitat and ecosystem productivity.

As described in section 7.6.4, NMFS has several means through which it can review non-fishing actions of other Federal and state agencies that may impact managed species and their habitat prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of direct and indirect negative impacts of those actions on habitat utilized by species under NMFS' jurisdiction.

Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to habitat have had neutral to moderate positive cumulative effects (Table 25).

Table 25: Summary of the effects of past, present, and reasonably foreseeable future actions on the habitat, including EFH.

Action	Past to the Present Impacts	Reasonably Foreseeable Future Impacts
FMPs, amendments, and frameworks	Indirect Positive	
Annual specifications for managed species	Indirect Positive	
Standardized Bycatch Reporting Methodology	Neutral	
Deep Sea Corals Amendment		Direct Positive
Convening Gear Take Reduction Teams		Indirect Positive
Agricultural runoff	Direct Negative	
Port maintenance	Direct Negative	
Beach nourishment	Direct Negative	
Marine transportation	Direct Negative	
Offshore disposal of dredged materials	Direct Negative	
Renewable and non-renewable offshore and nearshore energy development	Mixed	
Cumulative impacts	Overall, actions have had, or will have, neutral to positive impacts on habitat	

7.6.5.5. Cumulative Effects of Proposed Action in Combination with Past, Present, and Reasonably Foreseeable Future Actions

As described in section 5, the Council identified the following as preferred alternatives:

- Alternative 2.B.ii: designate the taxa included in the amendment (except chub mackerel) as ECs and implement an incidental possession limit of 1,700 pounds for all of those taxa combined (section 5.1.3.2)
- Alternative 3.A.iii: manage chub mackerel as neither an EC nor a stock in the fishery through the Council’s discretionary authority under MSA section 303(b)(12) (section 5.2.2.3)
- Alternative 3.B.i.c: implement an annual chub mackerel landings limit of 2.86 million pounds (section 5.2.3.1.3)
- Alternative 3.B.ii.c: implement a chub mackerel possession limit of 40,000 pounds after the annual landings limit is reached (section 5.2.3.2.3)
- Alternative 4.A.iii.b: require use of an EFP prior to development of new or expansion of existing fisheries for ECs and adopt a new policy for Council review of EFP applications relating to ECs prior to review by GARFO (section 5.3.1.3.2)
- Alternative 4.A.iv: consider stock in the fishery designation or use of discretionary management measures prior to allowing new fisheries or expansion of existing fisheries for ECs (section 5.3.1.4)

- Alternative 4.C: require commercial vessels which possess ECs in Mid-Atlantic Federal waters to have a commercial fishing permit from GARFO (section 5.3.3)
- Alternative 4.E: add codes for EC species to required catch and landings reporting mechanisms (section 5.3.5)
- Alternative 4.F.ii: management unit for the amendment defined as the EEZ (excluding state waters), bounded by the CT/NY boundary extended seaward to the north and Cape Hatteras, NC to the south (section 5.3.6.2)
- Alternative 4.G.i: identify the list of ECs as a frameworkable item (section 5.3.7.2.1)
- Alternative 4.G.ii: identify possession and landings limits as frameworkable items (section 5.3.7.2.2)

The direct and indirect impacts of the preferred alternatives on the VECs are described in section 7. The magnitude and significance of the cumulative effects, which include the additive and synergistic effects of the proposed action, as well as past, present, and future actions, are summarized here.

The preferred alternatives would place restrictions on commercial fisheries for several previously unmanaged forage species in federal waters. They would restrict fishing mortality for these species and are thus expected to help to maintain these stocks at their current abundances. This should help to maintain an adequate food supply for predators of these forage species, including Council-managed predators, protected species predators, and other predators.

The proposed restrictions on fishing effort would limit incidental catch in fisheries targeting unmanaged forage species. Incidental catch could include Council-managed species, protected species, and others. These restrictions on fishing effort would also limit the potential for interactions between fishing gear and protected species and between fishing gear and physical habitat.

As described in section 5, the preferred alternatives for possession and landings limits were designed with the intent of placing minimal restrictions on existing managed fisheries and allowing existing fisheries for unmanaged forage species to continue at levels close to historical levels. In this way, the preferred alternatives are expected to have minor socioeconomic impacts for those individuals which derive benefits from commercial or recreational use of the species encompassed by the VECs. By maintaining forage populations, they are expected to generate indirect positive socioeconomic impacts.

When the preferred alternatives are considered in conjunction with all the other impacts from past, present, and reasonably foreseeable future actions, they are not expected to result in any significant cumulative effects on the VECs, either positive or negative (Table 26).

Table 26: Magnitude and significance of the cumulative, additive, and synergistic effects of the 2016-2018 preferred alternatives, as well as past (P), present (PR), and reasonably foreseeable future (RFF) actions.

VEC	Status in 2016	Net Impact of P, Pr, and RFF Actions	Impact of the Preferred Alternatives	Significant Cumulative Effects
Unmanaged Forage Species	Complex and variable (section 6.1)	Positive (section 7.6.5.1)	Negative to positive (section 7.1)	None
Council Managed Species & Other Predators of Forage Species	Complex and variable (section 6.2)	Positive (section 7.6.5.1)	Negative to positive (section 7.2)	None
Protected Species	Complex and variable (section 6.3)	Positive (section 7.6.5.2)	Negative to positive (section 7.3)	None
The Socioeconomic Environment	Complex and variable (section 6.4)	Positive (section 7.6.5.3)	Negative to positive (section 7.4)	None
Physical Habitat	Complex and variable (section 6.5)	Neutral to positive (section 7.6.5.4)	Negative to positive (section 7.5)	None

8. Applicable Laws

8.1. Magnuson-Stevens Fishery Conservation and Management Act

Section 301 of the MSA requires that fishery management plans contain conservation and management measures that are consistent with the ten National Standards.

National Standard 1 states: *Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.*

The Council continues to meet the obligations of National Standard 1 by adopting and implementing conservation and management measures that will continue to prevent overfishing, while achieving, on a continuing basis, OY for Council managed fisheries. To achieve OY, scientific and management uncertainty are considered when establishing catch limits. For managed species, the Council develops recommendations for catch limits that do not exceed the ABC recommendations of the SSC which have been developed to explicitly address scientific uncertainty. In addition, the Council considers relevant sources of management uncertainty and other social, economic, and ecological factors, which may result in recommendations for annual catch targets for a given fishing year. The preferred alternatives would not impact the process of setting catch limits to prevent overfishing for managed species, nor are they expected to prevent the fisheries for any managed species from achieving their catch targets.

National Standard 2 states: *Conservation and management measures shall be based upon the best scientific information available.*

Data considered during the development of this action include, but are not limited to: commercial dealer reports, permit data, VTRs, NEFOP data, fishery-independent trawl survey data, peer-reviewed assessments and original literature, internally reviewed NOAA literature, direct communication with subject matter experts, and input from fishing industry advisors and the public. To the best knowledge of the Council, these data sources constitute the best scientific information available.

National Standard 3 states: *To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.*

The stocks managed in the Council's FMPs as "stocks in the fishery" are managed throughout their range within the U.S. EEZ. This amendment includes proactive, discretionary management alternatives to regulate commercial fisheries for several unmanaged forage taxa in Mid-Atlantic Federal waters only. The range of some of these species extends beyond Mid-Atlantic Federal waters (section 6.1). The Council recommended that these taxa not be managed as stocks in the fishery (or, in the language of the revised 2016 National Standard 1 guidelines, "stocks in need of conservation and management"). The Council instead wishes to proactively manage these fisheries under the discretionary provisions of the MSA (section 303(b)(12)).

National Standard 4 states: *Conservation and management measures shall not discriminate between residents of different States. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be (A) fair and equitable to all such fishermen; (B) reasonably calculated to promote conservation; and (C) carried out in such manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.*

The proposed management measures are not expected to discriminate between residents of different States. Although the preferred alternatives include restrictions on landing and possession of some species in the Mid-Atlantic only, they do not allocate or assign fishing privileges.

National Standard 5 states: *Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.*

As described in section 5, when developing the management alternatives, the Council strove to minimize restrictions on existing managed fisheries. The preferred alternatives are intended to allow fisheries for unmanaged forage species to continue at levels similar to historical levels. In this way, the preferred alternatives balance the needs of existing fisheries and fishing communities with the benefits of maintaining forage abundances in the Mid-Atlantic. The

Council also considered ease of enforcement and other factors related to efficient utilization of fishery resources. The preferred alternatives are not expected to substantially impact the overall efficiency of utilization of fishery resources. No measures are proposed regarding economic allocation.

National Standard 6 states: *Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.*

As described in section 7, the preferred alternatives are expected to place minimal restrictions on existing fishing practices in the Mid-Atlantic. The preferred alternatives would allow the various contingencies in the fisheries to, for the most part, continue their current practices. The amendment also includes alternatives which would allow future framework actions to modify the list of taxa included in this amendment, as well as any possession or landings limits implemented through this amendment. These alternatives would allow future actions to address new information on variations among and contingencies in the fisheries.

National Standard 7 states: *Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.*

The Council considered the costs and benefits associated with the management alternatives when developing this action. This action should not create any unnecessary duplication of regulations.

National Standard 8 states: *Conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities.*

The socioeconomic impacts of the alternatives are described in section 7.4. As described in section 5, when developing the management alternatives, the Council strove to minimize restrictions on existing managed fisheries. The preferred alternatives are intended to allow fisheries for unmanaged forage species to continue at levels similar to historical levels.

National Standard 9 states: *Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.*

As described in section 7, the preferred alternatives are not expected to result in a major change in fishing effort. They are thus not expected to change bycatch rates. They will prevent fishing effort for unmanaged forage species from exceeding 1996-2015 levels; therefore, they are expected to prevent bycatch from increasing beyond 1996-20015 levels.

National Standard 10 states: *Conservation and management measures shall, to the extent practicable, promote the safety of human life at sea.*

Fishing is a dangerous occupation; participants must constantly balance the risks imposed by weather against the economic benefits. According to the National Standard guidelines, “safety of human life at sea” encompasses both the safety of the fishing vessel and protection of persons aboard the vessel from injury. The safety of a vessel and the people aboard is ultimately the responsibility of the master of that vessel. This national standard does not replace the judgment or relieve the responsibility of the vessel master related to vessel safety. As described in section 7, the preferred alternatives are not expected to substantially alter fishing practices; therefore, they are not expected to result in any changes relevant to the safety of human life at sea.

8.2. National Environmental Policy Act of 1969 Finding of No Significant Impact

National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6A “Compliance with the National Environmental Policy Act” and its accompanying “Policy and Procedures for Compliance with the National Environmental Policy Act and Related Authorities” (Companion Manual, January 13, 2017) contains criteria for determining the significance of the impacts of a proposed action. The CEQ regulations at 40 C.F.R. §1508.27 also state that the significance of an action should be analyzed both in terms of “context” and “intensity.” Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 A Companion Manual criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

The proposed action is not expected to jeopardize the sustainability of any target species. The proposed action will impose landings and possession limits on over 50 currently unmanaged forage species, some of which have been landed and others of which were not landed and are likely rarely, if ever, encountered by existing fisheries (sections 6.1 and 6.4.1). The proposed landings and possession limits are intended to restrict landings of these taxa to historical levels. In this way, the proposed action is expected to have positive impacts on target species by restricting fishing effort for over 50 forage species which were previously unmanaged. This action is expected to have direct positive impacts for the unmanaged forage taxa included in this amendment. This action will also have indirect positive impacts for those target species not directly addressed by this amendment but which feed on the forage taxa included in the amendment.

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

The proposed action is not expected to jeopardize the sustainability of any non-target species. The proposed action will impose landings and possession limits on over 50 currently unmanaged forage species, most of which are likely non-target species (section 6.4.1). The proposed

landings and possession limits are intended to restrict landings of these taxa to recent levels. In this way, the proposed action is expected to have positive impacts on non-target species by restricting fishing effort and the potential for development of new fisheries for several non-target forage species which were previously unmanaged. This action will also have indirect positive impacts for those non-target species not directly addressed by this amendment but which feed on the forage taxa included in the amendment and which are caught in fisheries which land the forage taxa included in the amendment.

3) *Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?*

This action is not expected to cause substantial damage to the ocean and coastal habitats and/or EFH. This action will place restrictions on fishing effort for over 50 species which are currently unmanaged. This action is not expected to result in a notable change in fishing effort and is intended to prevent expansion of fisheries prior to thorough consideration of potential environmental and socioeconomic impacts. In this way, this action is expected protect ocean and coastal habitats, including EFH, by preventing expansion of fisheries for over 50 species, which could occur over the longer-term if no action is taken.

4) *Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?*

This action is not expected to change the manner in which fishing operations are currently prosecuted; therefore, this action is not expected to have a substantial adverse impact on public health or safety.

5) *Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?*

This action is not expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species. This action was designed to place limits on the expansion of fisheries for over 50 currently unmanaged species and is not expected to change the manner in which fishing operations are currently prosecuted. Many of the taxa included in this amendment are known to be prey for some endangered or threatened species and marine mammals (Table 7). This action is expected to have positive impacts for endangered and threatened species and marine mammals by protecting these prey species.

6) *Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?*

This action was designed to place limits on the expansion of fisheries for over 50 currently unmanaged species and is not expected to change the manner in which fishing operations are currently prosecuted. This action was designed with the explicit intent of protecting ecosystem structure and function in the Mid-Atlantic. This action may also support biodiversity in the region by ensuring that no new fisheries are developed until the Council has considered potential impacts to the ecosystem.

7) *Are significant social or economic impacts interrelated with natural or physical environmental effects?*

The social and economic impacts of this action are expected to be mixed, but positive overall. These impacts are interrelated with environmental effects. Social and economic benefits are expected to result from the protection of over 50 currently unmanaged forage species. This action will protect prey species for a variety of predators, including some predatory species which are socially and economically important in commercial and recreational fisheries in the Mid-Atlantic. This action may have some temporary negative economic impacts by limiting the ability of fisheries to expand in the future; however, the Council only intends to prohibit expansion of these fisheries until they can consider potential impacts of those fisheries; thus, the negative social and economic impacts are expected to be short-term and are expected to lead to long-term positive benefits by helping to ensure sustainable fisheries in the future.

8) *Are the effects on the quality of the human environment likely to be highly controversial?*

The effects on the quality of the human environment are not likely to be highly controversial. This action will limit the potential for expansion of fisheries for over 50 currently unmanaged species by implementing possession and landings limits for those species. These limits are based on historic landings data. These limits will place restrictions on some fishing activities; however, they were intentionally set at levels thought to be high enough to be minimally restrictive on current fishing activities, while still effectively preventing future large-scale commercial fisheries from developing. Because these possession and landings limits were based on historic landings data and were intentionally set at relatively high levels, this action is not expected to have highly controversial effects on the quality of the human environment.

9) *Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?*

This action is not expected to change the manner in which fishing operations are currently prosecuted; therefore, this action is not expected to result in substantial impacts to unique areas.

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Limited information is available on the stock status and biology of many of the taxa included in this amendment; therefore, the effects of this amendment on the biological environment, and by extension on the human environment, have not been well quantified. Although these impacts are somewhat uncertain, they are expected to be positive overall. This action is intended to protect forage species which are prey for a variety of target species, protected species, sea birds, and other marine species. The landings and possession limits implemented through this amendment are based on historic landings data and were intentionally set at levels thought to be high enough to be minimally restrictive on current fishing activities. The impacts to the human environment as a result of these possession and landings limits are, therefore, expected to be minimal. The impacts to the human environment as a result of protection of forage species are less well understood, but are expected to be positive because this should help ensure sustainable populations of predator species targeted by commercial and recreational fisheries, as well as culturally-important non-target species such as large whales.

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

As described in section 7.5.1, the proposed action is not expected to have individually insignificant, but cumulatively significant impacts. The proposed action, together with past, present, and reasonably foreseeable future actions, is not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

This action is not expected to change the manner in which fishing operations are currently prosecuted; therefore, this action is not expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause loss or destruction of significant scientific, cultural, or historical resources.

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

This action is not expected to change the manner in which fisheries currently operate; therefore, it is not expected to result in the introduction or spread of a nonindigenous species. There is no evidence or indication that commercial fisheries in Mid-Atlantic Federal waters have ever resulted in the introduction or spread of nonindigenous species.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

This action will implement possession and landings limits for over 50 forage species which are currently unmanaged. This is a unique type of action for the Mid-Atlantic Council in that it proactively protects a number of species from future large-scale commercial fisheries until the Council has had the opportunity to consider the impacts of such fisheries. Although this action is unique and novel, the goal of the amendment will be met through possession and landings limits which were set based on historic landings data. The Mid-Atlantic Council has used similar methods to set possession and landings limits for other fisheries in the past. This action is not expected to change the manner in which fisheries operate. For these reasons, this amendment is not likely to establish a precedent for future actions with significant effects. This action also does not represent a decision in principle about a future consideration. When new information about forage species or the effects of this amendment become available, the Council may adjust the measures implemented through this amendment, consistent with the FMPs and MSA. The impact of any future changes will be analyzed in the process of developing and implementing them.

15) Can the proposed action reasonably be expected to threaten a violation of federal, State, or local law or requirements imposed for the protection of the environment?

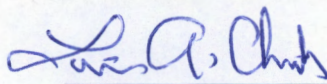
None of the proposed measures are expected to alter fishing methods or activities such that they threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment. The proposed measures have been found to be consistent with other applicable laws as described throughout section 8 of this document.

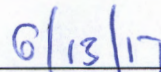
16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

The impacts of the proposed action on the biological, physical, and human environment are described in section 7 of this document. This action is not expected to change the manner in which fisheries currently operate and it is not likely to change the overall amount of fishing effort. For these reasons, the proposed action is unlikely to result in cumulative adverse effects, including any that could have a substantial effect on target or non-target species. Positive (but not significant) impacts are expected for a variety of target and non-target species as the result of this action.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting EA prepared for the Unmanaged Forage Omnibus Amendment, it is hereby determined that the proposed measures will not significantly impact the quality of the human environment as described in this document. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an EIS for this action is not necessary.

 for John Ballard



Regional Administrator for GARFO, NMFS, NOAA

Date

8.3. Marine Mammal Protection Act

The species which inhabit the management unit of this amendment and are afforded protection under the MMPA are described in section 6.3. None of the alternatives considered are expected to significantly alter fishing methods or result in substantially increased fishing effort. The management actions proposed are consistent with the provisions of the MMPA and will not alter existing measures to protect the species likely to inhabit the management units of the subject fisheries. The potential impacts of the preferred alternatives on marine mammals are described in more detail in section 7.3 of this this document.

8.4. Endangered Species Act

Section 7(a)(2) of the ESA requires that each Federal agency ensure that any action authorized, funded, or carried out by that agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency may affect species listed as threatened or endangered, that agency is required to consult with either NMFS or USFWS, depending upon the species that may be affected.

Section 7.3 contains an assessment of the impacts of the proposed action on endangered species and other protected species. This action is not expected to affect endangered or threatened species or critical habitat in any manner not considered in previous consultations on the fisheries.

8.5. Coastal Zone Management Act

The Coastal Zone Management Act of 1972, as amended, provides measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals. The Council developed this document and will submit it to NMFS. NMFS must determine whether

this action is consistent to the maximum extent practicable with the coastal zone management programs for each state.

8.6. Administrative Procedures Act

Section 553 of the Administrative Procedure Act establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process and to give the public adequate notice and opportunity for comment. At this time, the Council is not requesting any abridgement of the rulemaking process for this action.

8.7. Data Quality Act (Section 515)

Pursuant to NOAA guidelines implementing section 515 of Public Law 106-554 (the Data Quality Act), all information products released to the public must first undergo a pre-dissemination review to ensure and maximize the quality, objectivity, utility, and integrity of the information, including statistical information, disseminated by or for Federal agencies. The following section addresses these requirements.

Utility

The information presented in this document includes a description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. The reasons for selecting the preferred alternatives are also included so intended users may have a full understanding of the proposed action and its implications, as well as the Council's rationale.

Until a proposed rule is prepared and published, this document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The development of this document and the decisions made by the Council to propose this action are the result of a multi-stage public process. The information contained in this document has been improved based on comments from the public, the fishing industry, members of the Council, and NMFS.

This document is available as a printed publication and online. The *Federal Register* notice that will announce the proposed rule and the final rule and implementing regulations will be made available in printed publication, on GARFO's website, and through the Regulations.gov website. The *Federal Register* documents will provide metric conversions for all measurements.

Integrity

Prior to dissemination, information associated with this action is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such

information. All electronic information disseminated by NMFS adheres to the standards in Appendix III, “Security of Automated Information Resources,” of the Office Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g. dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the MSA; and NOAA Administrative Order 216-100 (Protection of Confidential Fisheries Statistics).

Objectivity

For purposes of the pre-dissemination review, this document is considered a natural resource plan. Accordingly, the document adheres to the published standards of the MSA; the Operational Guidelines, FMP Process; the EFH Guidelines; the National Standards Guidelines; and NOAA Administrative Order 216-6 (Environmental Review Procedures for Implementing the National Environmental Policy Act).

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass and fishing mortality) reported in this document are based on assessments subject to peer-review through the Stock Assessment Review Committee or on updates of those assessments prepared by scientists at the NEFSC. Landings and revenue information is based on information collected through VTR and commercial dealer databases. Information on catch composition is based on reports collected by the NMFS observer program and incorporated into the sea sampling or observer database systems. These reports are developed using an approved, scientifically valid sampling process. In addition to these sources, additional information is presented that has been accepted and published in peer-reviewed journals or by scientific organizations. Original analyses in this document were prepared using data from accepted sources. These analyses have been reviewed by subject matter experts at the NEFSC and GARFO.

Despite current data limitations, the management alternatives considered were developed based on the best scientific information available. The specialists, including members of the Council’s Unmanaged Forage Fishery Management Action Team, staff at the NEFSC, and Council staff, who worked with these data are familiar with current analytical techniques, the available data, and information relevant to the affected fisheries.

Policy choices and the management alternatives considered in this document are described in sections 4 and 5 of this document. Sections 6 and 7 describe the supporting information on which the policy choices are based. To ensure transparency, all supporting materials, information, data, and analyses within this document have been properly referenced according to commonly accepted standards for scientific literature, to the maximum extent practicable.

Review of this document involved Council, NEFSC, GARFO, and NMFS Headquarters staff. The NEFSC technical review was conducted by senior level scientists with specialties in

population dynamics, stock assessment methods, demersal species, population biology, and social sciences. Review by staff at GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the actions proposed in this document and clearance of any rules prepared to implement resulting regulations will be conducted by staff at NMFS Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. The Council review process involved many public meetings during which affected stakeholders had the opportunity to provide comments on various aspects of the document. These public meetings included eight Council meetings, three advisory panel meetings, three committee meetings, eight scoping meetings, and seven public hearings.

8.8. Paperwork Reduction Act

The purpose of the Paperwork Reduction Act is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by or for the Federal Government. The authority to manage information and recordkeeping requirements is vested with the Director of the Office of Management and Budget. This authority encompasses establishment of guidelines and policies, approval of information collection requests, and reduction of paperwork burdens and duplications.

The preferred alternatives will not result in any new reporting requirements; however, they may increase the number of individuals subject to existing reporting requirements. Specifically, under alternative 3.C.ii, individuals who possess the taxa included in the amendment in Federal waters would be required to have a commercial fishing permit from GARFO (section 5.3.3.2). It is not known how many individuals would need to obtain a new permit to meet this requirement; many of the individuals likely to be affected by this alternative already have commercial permits for other species and would not need to obtain new permits. Individuals who would be required to obtain such permits for the first time under this alternative would also be required to abide by the reporting requirements associated with those permits (e.g. 50 CFR §648.7). These are not new reporting requirements.

8.9. Federalism/Executive Order 13132

Executive Order (E.O.) 13132 established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy-making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications.

No federalism issues or implications have been identified relative to the proposed measures. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected states have been closely involved in the development of the proposed management measures through their representation on the Council.

The Council received no comments from any state officials relative to any federalism implications that may be associated with this action.

8.10. Environmental Justice/Executive Order 12898

E.O. 12898 provides that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” E.O. 12898 directs each Federal agency to analyze the environmental effects, including human health, economic, and social effects of Federal actions on minority populations, low-income populations, and Indian Tribes, when such analysis is required by NEPA. Agencies are further directed to “identify potential effects and mitigation measures in consultation with affected communities, and improve the accessibility of meetings, crucial documents, and notices.”

The proposed actions are intended to prevent the development of new and expansion of existing directed commercial fisheries for currently unmanaged forage species. They were designed with the intent of creating minimal, if any, additional restrictions or burdens on existing managed fisheries. For these reasons, the proposed actions are not expected to notably affect participation in any fisheries in the Mid-Atlantic. Because the proposed action is not expected to change current levels of participation in these fisheries, no negative economic or social effects in the context of E.O. 12898 are anticipated. Therefore, the proposed action is not expected to cause disproportionately high and adverse human health, environmental or economic effects on minority populations, low-income populations, or Indian Tribes.

8.11. Regulatory Impact Review (E.O. 12866) and Regulatory Flexibility Act Analysis

This section provides analysis to address the requirements of E.O. 12866 (Regulatory Planning and Review) and the Regulatory Flexibility Act (RFA). Since many requirements of these mandates duplicate those required under the MSA and NEPA, this section contains references to other sections of this document.

NMFS requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement or significantly amend an FMP. An RIR addresses multiple items in the regulatory philosophy and principles of E.O. 12866. The RFA requires evaluation of the economic impacts of the proposed actions on small business entities. The following sections meet the requirements of E.O. 12866 and the RFA by providing a comprehensive review of the changes in net economic benefits to society associated with the proposed regulatory action (i.e. the set of preferred alternatives). Effects on landings, prices, consumer and producer benefits, harvesting costs, enforcement costs, and distributional effects were all considered (NMFS 2007). Due to the lack of an empirical model for these fisheries and limited knowledge of elasticities of supply and demand, a qualitative approach was used to evaluate the expected impacts. Quantitative measures are provided whenever possible.

8.11.1. Proposed Action

Both E.O. 12866 and the RFA require economic analysis of the set of regulations that will be implemented through the management action. The preferred alternatives are analyzed as a group (defined as the “proposed action”) in the following sections. The non-preferred alternatives are described in more detail in section 5 and their expected socioeconomic impacts are described in section 7.4.

The Council identified the following as preferred alternatives:

- Alternative 1.C.ii: designate the taxa included in the amendment (except chub mackerel) as ECs and implement an incidental possession limit of 1,700 pounds of all of those taxa combined (section 5.1.3.2)
- Alternative 2.B.iii: manage chub mackerel as neither an EC nor a stock in the fishery through the Council’s discretionary authority under MSA section 303(b)(12) (section 5.2.2.3)
- Alternative 2.C.i.c: implement an annual chub mackerel landings limit of 2.86 million pounds (section 5.2.3.1.3)
- Alternative 2.C.ii.c: implement a chub mackerel possession limit of 40,000 pounds after the annual landings limit is reached (section 5.2.3.2.3)
- Alternative 2.C.iii.b: chub mackerel management measures expire three years after implementation (section 5.2.3.3.2)
- Alternative 3.A.iii.b: require use of an EFP prior to development of new or expansion of existing fisheries for ECs and adopt a new policy for Council review of EFP applications relating to ECs prior to review by GARFO (section 5.3.1.3.2)
- Alternative 3.A.iv: consider stock in the fishery designation or use of discretionary management measures prior to allowing new fisheries or expansion of existing fisheries for ECs (section 5.3.1.4)
- Alternative 3.C.ii: require commercial vessels which possess ECs in Mid-Atlantic Federal waters to have a commercial fishing permit from GARFO (section 5.3.3)
- Alternative 3.E.ii: add codes for EC species to required catch and landings reporting mechanisms (section 5.3.5)
- Alternative 3.F.ii: management unit for the amendment defined as the EEZ (excluding state waters), bounded by the CT/NY boundary extended seaward to the north and Cape Hatteras, NC to the south (section 5.3.6.2)
- Alternative 3.G.ii.a: identify the list of ECs as a frameworkable item (section 5.3.7.2.1)
- Alternative 3.G.ii.b: identify possession and landings limits as frameworkable items (section 5.3.7.2.2)
- Alternative 3.H.ii: transit provisions (section 5.3.8.2)

E.O. 12866 requires a cost/benefit analysis for all sectors of the economy which may be affected by the proposed action. The RFA requires an analysis of likely short-term changes in financial status for directly affected entities. Preferred alternatives which are not expected to result in changes in costs, benefits, or financial status (e.g. administrative alternatives) are not analyzed in the following sections. The following sections thus summarize the economic impacts of a 1,700 pound possession limit for 14 taxa which would be designated as ECs in combination with a 2.86 million pound chub mackerel annual landings limit with a 40,000 pound chub mackerel possession limit in effect after the annual landings limit is reached.

8.11.2. Objective and Legal Basis and Purpose of Action

Section 303(b)(12) of the MSA provides the legal basis for this action. Section 303(b)(12) states: “Any fishery management plan which is prepared by any Council, or by the Secretary [of Commerce], with respect to any fishery, may . . .include management measures in the plan to conserve target and non-target species and habitats, considering the variety of ecological factors affecting fishery populations”.

The objective of this amendment is to advance an ecosystem approach to fisheries management in the Mid-Atlantic through the consideration of management alternatives that would afford protection to currently unmanaged forage species through regulation of landings and/or possession of those species. This amendment was developed to proactively protect the important role that forage species play in marine ecosystems in the Mid-Atlantic (section 4.1).

8.11.3. RIR/Evaluation of E.O. 12866 Significance

E.O. 12866 requires consideration of the costs and benefits of the proposed action for all affected sectors over time. It also requires that the Office of Management and Budget review significant proposed regulatory actions. A significant regulatory action is one that is likely to: (1) have an annual effect on the economy of \$100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, safety, or state, local, or tribal governments or communities; (2) create a serious inconsistency or otherwise interfere with an action taken or planned by another agency; (3) materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof; or (4) raise novel legal or policy issues arising out of legal mandates, the President’s priorities, or the principles set forth in this E.O. A regulatory program is economically significant if it is likely to result in the effects described above.

The RIR serves as the basis for determining whether the proposed regulations are a significant regulatory action under E.O. 12866. The RIR summarizes the economic effects associated with a proposed or final regulatory action, provides a review of the problem to be addressed (section 4.1), evaluates the major alternatives that could be used to address the problem (section 8.11.1), and ensures that the regulatory agency considers all available alternatives so that public welfare can be enhanced in the most efficient and cost-effective way (sections 5 and 7). The RIR in this

section provides a comprehensive review of the expected changes in net economic benefits to society associated with the preferred alternatives based on available information.

8.11.3.1. Description of the Fishery

Fisheries for the forage species included in this amendment are described in section 6.4. Apart from chub mackerel, these fisheries are presumed to be largely bycatch fisheries in Mid-Atlantic Federal waters, though some small-scale directed harvest likely occurs. This action will not create new regulations for, and is not expected to have economic impacts on, existing managed fisheries; therefore, managed fisheries are not addressed in this section.

8.11.3.2. Analysis of the Proposed Action

As previously described, this section focuses on the economic impacts of a 1,700 pound possession limit for the taxa to be designated as ECs (henceforth referred to as ECs), as well as a 2.86 million pound annual landings limit for chub mackerel with a 40,000 pound possession limit coming into effect after the annual landings limit is reached.

Commercial fish dealer data show that 842,460 pounds of ECs were landed in the northeast between 1996 and 2015; however, only 387,074 pounds (about 46%) were associated with enough information to identify the number of trips which resulted in those landings. Only those records associated with a fishing permit number or a hull number could be associated with individual trips.

Using a combination of the date of landings and vessel identification information, it was determined that a total of 2,546 trips resulted in landings of ECs in the northeast between 1996 and 2015. Of these, only 14 trips (0.05% of all trips) resulted in landings in excess of 1,700 pounds. If these trips had been restricted to 1,700 pounds, they would have collectively landed 23,115 fewer pounds. With an average price of \$1.04 per pounds (in 2015 dollars) over 1996-2015, a landings reduction of this magnitude would have resulted in a loss of about \$24,039.60 (in 2015 dollars) for all of these trips over the entire 20 year period, or about \$1,201.98 per year.

As described in section 6.4.1.8, the chub mackerel fishery from 2013 through 2015 was quite different from the fishery in previous years in terms of landings and effort. It is assumed that if no action is taken through this amendment, the fishery would continue at 2013-2015 levels into the near future. Chub mackerel landings exceeded 2.86 million pounds in only one year between 1996 and 2015 (Table 16). For these reasons, a 2.86 million pound landings limit is not expected to represent a major restriction on the chub mackerel fishery. In addition, if this limit is met, vessels would be restricted to a 40,000 pound possession limit, which would allow them to generate revenues of up to \$8,800 per trip (based on the 2013-2015 average price per pound of \$0.22) after the annual landings limit is met. The number of trips which landed more than 40,000 pounds of chub mackerel during 1996-2015 represents fewer than three vessels and/or dealers and is therefore confidential.

Overall, both the EC and chub mackerel management measures are expected to have little impact on landings and on fishing practices more generally. They are thus not expected to result in a change in prices, consumer benefits, producer benefits harvesting costs, or enforcement costs.

The economic benefits of the proposed action are not as easily quantified. Restrictions on fisheries for over 50 previously unmanaged forage species could translate into economic benefits for individuals, communities, and businesses which rely on predators of those species for social and/or economic purposes. Examples of fisheries for these predators are described in sections 6.4.2 and 6.4.3.

8.11.3.2.1. Summary of E.O. 12866 Impacts for Preferred Alternatives

None of the factors defining “significant regulatory action” are triggered by this proposed action. For example, between 1996 and 2015, the highest reported value for landings of the taxa included in the amendment occurred in 2013 and was approximately \$1.04 million^{lxvii} (about \$974,444 in 2015 dollars), substantially below the E.O. 12866 threshold of \$100 million. The measures which would be implemented under the proposed action include possession and landings limits which were designed to prevent fisheries for 15 taxa from expanding substantially beyond historic levels. The proposed action is not expected to impact landings of managed species. Therefore, this action will not have an annual effect on the economy of more than \$100 million.

This action is also not expected to adversely affect in a material way the economy, a sector of the economy, productivity, safety, or state, local, or tribal governments or communities. It is not expected to create a serious inconsistency or otherwise interfere with an action taken or planned by another agency. It will not materially alter the budgetary impact of entitlements, grants, user fees, or loan programs, or the rights and obligations of recipients thereof. It is similar in many ways to an amendment recently developed by the Pacific Fishery Management Council (81 *Federal Register* 19054, April 4, 2016). As such, it will not raise novel legal or policy issues.

For these reasons, this action has been determined to be not significant for purposes of E.O. 12866.

8.11.4. Regulatory Flexibility Act Analysis

The RFA requires the Federal rulemaker to examine the impacts of proposed and existing rules on small businesses, small organizations, and small governmental jurisdictions. In reviewing the potential impacts of proposed regulations, the agency must either certify that the rule “will not, if promulgated, have a significant economic impact on a substantial number of small entities.” If a substantial number of small entities are expected to experience significant economic impacts as a

^{lxvii} As previously described, not all the taxa included in this amendment were reported in commercial fish dealer data from the northeast. Landings of some taxa were likely reported in categories such as “unidentified squids” and “other fish”.

result of the proposed action, then an initial RFA analysis must be developed. This determination depends on the context of the proposed action, the problem to be addressed, and the structure of the regulated industry. Standards for determining significance are discussed below.

8.11.4.1. Reporting Requirements

The proposed action would require vessels to have a commercial fishing permit from GARFO if they operate in Mid-Atlantic Federal waters and retain the taxa to be identified as ECs (alternative 3.C.ii; section 5.3.3.2). Vessels which have commercial fishing permits through GARFO for other managed species would not be required to obtain another GARFO permit. Vessels which operate in Mid-Atlantic Federal waters, retain ECs, and do not have a GARFO commercial fishing permit for any species would be required to obtain a GARFO permit. The number of vessels which meet these criteria is not known. All vessels issued a GARFO permit are subject to the reporting requirements at 50 CFR 648.7 (b).

8.11.4.2. Conflict with Other Federal Rules

This action does not duplicate, overlap, or conflict with other Federal rules.

8.11.4.3. RFA Analysis of Economic Impacts from the Proposed Action

Under the RFA, effects on profitability associated with the proposed management measures should be evaluated by assessing the impact of the proposed measures on the costs and revenues for individual business entities. Changes in gross revenues are used as a proxy for profitability in the absence of cost data for individual business entities engaged in these fisheries.

Business entities (i.e. affiliates) were identified as groups of vessels with shared owners. Affected affiliates were identified as those which reported any amount of revenue from the taxa included in this amendment between 2006 and 2015. This time period was chosen to capture affiliates which only occasionally reported revenue from these taxa. As described in section 6.4.1, landings of many of these taxa show substantial year to year variation. Much of these landings are assumed to be the result of incidental harvest. Some species likely serve as occasional, but important, sources of income for some individual affiliates.

For RFA purposes only, NMFS established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (50 CFR 200.2). A business primarily engaged in commercial fishing (North American Industry Classification System code 11411) is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of \$11 million for all its affiliated operations worldwide.

Between 2006 and 2015, a total of 63 affiliates reported revenues from the taxa included in the amendment. All these affiliates were classified as small businesses based on their average annual receipts during 2013-2015 (i.e. receipts were less than \$11 million). Ten affiliates (16%) reported

landings of both ECs and chub mackerel between 2006 and 2015. The remaining 53 affiliates (84%) reporting landings of either ECs or chub mackerel, but not both.

Receipts from the forage taxa included in the amendment (both ECs and chub mackerel) averaged \$3,140 per year per affiliate. This average is heavily influenced by a small number of affiliates with much higher receipts than most affiliates.^{lxviii} The median receipts from ECs and chub mackerel per year was \$30 (Table 27).

None of the 63 affiliates reported receipts from ECs or chub mackerel in every year between 2006 and 2015. Twenty-nine affiliates (46%) reported receipts from ECs or chub mackerel in only one year between 2006 and 2015. Fifteen affiliates (24%) reported such receipts in at least five years (Table 28).

ECs and chub mackerel made up at least 10% of the total annual receipts from fishing for five affiliates (8%) in at least one year between 2006 and 2015. No affiliates reported forage taxa as at least 10% of their total receipts from fishing in more than four years between 2006 and 2015. Between 2006 and 2015, three affiliates reported that 100% of their annual fishing receipts during a single year came from either sand lances or silversides. In all three cases, dealer reports show that landings were well below the 1,700 pound trip limit proposed in this amendment; therefore, these three affiliates are not expected to be impacted by the proposed action. In addition, these three affiliates reported receipts from fishing for any species during four or fewer years over 2006-2015. As previously described, sand lance are one of the highest valued taxa included in this amendment (section 6.4.1.5) and silversides are moderately valued, compared to the other taxa (section 6.4.1.6). These three affiliates likely did not rely on fishing for income in any year between 2006 and 2016 and may simply have taken advantage of high to moderate prices on a few occasions. No other taxa included in this amendment, including chub mackerel, accounted for 100% of the annual fishing receipts for any affiliate between 2006 and 2015.

As summarized in section 8.11.3.2, the proposed action is expected to have little impact on landings and on fishing practices more generally. In addition, no affiliate consistently relied on ECs or chub mackerel for a substantial portion (i.e. >10%) of their annual income over the past 10 years (though a few affiliates did rely on them for moderate to high portions of their annual receipts from fishing in a few years). For these reasons, the proposed action is not expected to have a significant economic impact on a substantial number of small entities. It is also not expected to have distributional economic effects.

^{lxviii} A more detailed summary of the revenues from this small number of affiliates is not provided in order to protect confidential data representing fewer than three vessels and/or dealers.

Table 27: Average annual total gross receipts from all fishing activities during 2006-2015 for the 63 small businesses likely to be affected by the proposed action, as well as annual receipts from the forage taxa included in this amendment. The businesses are grouped based on their average annual revenue from fishing during 2006-2015.

Avg. annual fishing revenue 2006-2015	# of affiliates	Avg. annual gross receipts from all fishing	Avg. annual receipts from forage	Forage as proportion of annual gross receipts
<\$20,000	17	\$9,792	\$93	0.95%
\$20,000-<\$50,000	13	\$37,798	\$206	0.55%
\$50,000-<\$100,000	15	\$77,395	\$87	0.11%
\$100,000+	18	\$608,048	\$10,680	1.76%
Total	63	\$202,597	\$3,140	1.55%

Table 28: Number of years between 2006 and in which affiliates reported receipts from the forage taxa included in the amendment.

Number of years between 2006 & 2015 with receipts from forage taxa	Number of affiliates	Percent of Total
1	29	46%
2	12	19%
3	3	5%
4	4	6%
5	5	8%
6 or 7*	6	10%
8 or 9*	4	6%
Total	63	100%

*Combined to protect confidential data (representing fewer than three vessels and/or dealers)

8.11.4.4. Other Management Measures Considered

The Council considered two alternatives which, if implemented, would have greater positive socioeconomic impacts than the preferred alternatives.

Under alternative 2.B.i, vessels could retain up to 1,500 pounds of each of the species included in the amendment, except chub mackerel. Under the preferred alternative for these species (alternative 2.B.ii), vessels will be limited to 1,700 pounds for all these taxa combined. The Council did not select alternative 2.B.i as a preferred alternative due to enforcement concerns. It was thought that alternative 2.B.i would create a greater burden for enforcement agents than alternative 2.B.ii because if a vessel retained more than 1,500 pounds of the taxa included in the amendment (except chub mackerel), enforcement agents would need to sort through the catch to determine if more than 1,500 pounds of a single species were retained. The preferred 1,700 pound combined limit was deemed simpler to enforce because it would only require sorting to the species level if the catch exceeded 1,700 pounds and included species other than those included in this amendment.

Under alternative 3.B.i.d, the Council considered implementing a 5.25 million pound annual landings limit for chub mackerel, rather than the 2.86 million-pound annual limit which was

selected as a preferred alternative (alternative 3.B.i.c). Alternative 3.B.i.d was not chosen as a preferred alternative due to the unknown and potentially negative impacts to the ecosystem.

9. Literature Cited

- Alder, J., B. Campbell, V. Karpouzi, K. Kaschner, and D. Pauly. 2008. Forage fish: from ecosystems to markets. *Annual Reviews in Environment and Resources*. 33: 153-166.
- Amos, A.F. 1989. The occurrence of hawksbills (*Eretmochelys imbricate*) along the Texas coast. In: S.A. Eckert, K.L. Eckert, and T.H. Richardson, compilers. Proceedings of the ninth annual workshop on sea turtle conservation and biology. NOAA technical memorandum NMFS/SEFC-232.
- Asche, F. and T. Bjørndal. 2003. Demand elasticities for fish: A review. Center for Fisheries Economics. Norwegian School of Economics and Business Administration. Hellevein 30N-5045, Bergen, Norway.
- ASMFC (Atlantic States Marine Fisheries Commission). 2007. Special report to the Atlantic sturgeon management board: estimation of Atlantic sturgeon bycatch in coastal Atlantic commercial fisheries of New England and the Mid-Atlantic. August 2007. 95 pp.
- ASSRT (Atlantic Sturgeon Status Review Team). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 pp.
- Awk, R. 1988. *Microeconomics: theory and applications*. A Wiley/Hamilton Publication, John Wiley & Sons, Inc. 492 pp.
- Baumgartner, M.F., T.V.N. Cole, R.G. Campbell, G.J. Teegarden and E.G. Durbin. 2003. Associations between North Atlantic right whales and their prey, *Calanus finmarchicus*, over diel and tidal time scales. *Marine Ecological Progress Series*. 264: 155–166.
- Baumgartner, M.F. and B.R. Mate. 2003. Summertime foraging ecology of North Atlantic right whales. *Marine Ecological Progress Series*. 264: 123–135.
- Baumgartner, M.F., N.S.J. Lysiak, C. Schuman, J. Urban-Rich, and F.W. Wenzel. 2011. Diel vertical migration behavior of *Calanus finmarchicus* and its influence on right and sei whale occurrence. *Marine Ecology Progress Series*. 423:167-184.
- Beardsall, J.W., M. F. McLean, S. J. Cooke, B. C. Wilson, M. J. Dadswell, A. M. Redden, and M. J. W. Stokesbury. 2013. Consequences of incidental otter trawl capture on survival and physiological condition of threatened Atlantic sturgeon. *Transactions of the American Fisheries Society*. 142:1202–1214.
- Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. In: Lutz, P.L. and J.A. Musick (editors). *The Biology of Sea Turtles*. CRC Press. Boca Raton, Florida.
- Blumenthal, J.M., J.L. Solomon, C.D. Bell, T.J. Austin, G. Ebanks-Petrie, M.S. Coyne, A.C. Broderick, and B.J. Godley. 2006. Satellite tracking highlights the need for international cooperation in marine turtle management. *Endangered Species Research*. 2:51-61.
- Braun, J. and S.P. Epperly. 1996. Aerial surveys for sea turtles in southern Georgia waters, June 1991. *Gulf of Mexico Science*. 1996(1):39-44.

- Braun-McNeill, J. and S.P. Epperly. 2004. Spatial and temporal distribution of sea turtles in the western North Atlantic and the U.S. Gulf of Mexico from Marine Recreational Fishery Statistics Survey (MRFSS). *Marine Fisheries Review*. 64(4):50-56.
- Braun-McNeill, J., C.R. Sasso, S.P.Epperly, and C. Rivero. 2008. Feasibility of using sea surface temperature imagery to mitigate cheloniid sea turtle–fishery interactions off the coast of northeastern USA. *Endangered Species Research*. 5: 257–266.
- Broadhurst M. K., P. Suuronen, and A. Hulme. 2006. Estimating collateral mortality from towed fishing gear. *Fish and Fisheries*. 7:180–218.
- Brown, M.B., O.C. Nichols, M.K. Marx, and J.N. Ciano. 2002. Surveillance of North Atlantic right whales in Cape Cod Bay and adjacent waters. Final report to the Division of Marine Fisheries, Commonwealth of Massachusetts. September 2002. 29 pp.
- Burke, V.J., S.J. Morreale, and A.G.J. Rhodin. 1993. Diet of juvenile Kemp's ridley and loggerhead sea turtles from Long Island, New York. *Copeia*. 1993(4):1176-1180.
- Burke, V.J., S.J. Morreale, and E.A. Standora. 1994. Diet of the Kemp's ridley sea turtle, *Lepidochelys kempii*, in New York waters. NMFS Fishery Bulletin 92(1):26-32.
- CeTAP (Cetacean and Turtle Assessment Program). 1982. Final report or the cetacean and turtle assessment program, University of Rhode Island, to Bureau of Land Management, U.S. Department of the Interior. Ref. No. AA551-CT8-48. 568 pp.
- Chase, B. C. 2002. Differences in diet of Atlantic bluefin tuna (*Thunnus thynnus*) at five seasonal feeding grounds on the New England continental shelf. *Fisheries Bulletin*. 100(2002): 168-180.
- Chuenpagdee, R., and L. E. Morgan. 2003. Shifting gears: addressing collateral impacts of fishing methods in U.S. waters. Pew Science Series. The Pew Charitable Trusts.
- Clapham, P.J., L.S. Baraff, C.A. Carlson, M.A. Christian, D.K. Mattila, C.A. Mayo, M.A. Murphy and S. Pittman. 1993. Seasonal occurrence and annual return of humpback whales, *Megaptera novaeangliae*, in the southern Gulf of Maine. *Canadian Journal of Zoology*. 71: 440-443.
- Clay, P. M., G. DePiper, S. Gaichas, J. Hare, E. Houde, and R. Seagraves. 2014. Managing forage fishes in the Mid-Atlantic Region: a white paper to inform the Mid-Atlantic Fishery Management Council. Available at: www.mafmc.org/actions/unmanaged-forage.
- Cohen, A. 1976. The systematics and distribution of *Loligo* (Cephalopoda, Myopsida) in the western North Atlantic, with descriptions of two new species. *Malacologia*. 15(1): 299-367.
- Cole, T. V. N., P. Hamilton, A. G. Henry, P. Duley, R. M. Pace III, B. N. White, T. Frasier. 2013. Evidence of a North Atlantic right whale *Eubalaena glacialis* mating ground. *Endangered Species Research*. 21: 55–64.
- Collette, B. B and G. Klein-MacPhee, editors. 2002. *Bigelow and Schroeder's Fishes of the Gulf of Maine*, third edition. Smithsonian Institution Press. Washington, D.C.
- Collins, M. R. and T. I. J. Smith. 1997. Distribution of shortnose and Atlantic sturgeons in South Carolina. *North American Journal of Fisheries Management*. 17: 995-1000.

- Cury, P. M., I. L. Boyd, S. Bonhommeau, T. Anker-Nilssen, R. J. M. Crawford, R. W. Furness, J. A. Mills, E. J. Murphy, H. Osterblom, M. Paleczny, J. F. Piatt, J. Roux, L. Shannon, and W. J. Sydeman. 2011. Global seabird response to forage fish depletion- one third for the birds. *Science*. 334:1703- 1706.
- Dadswell, M. 2006. A review of the status of Atlantic sturgeon in Canada, with comparisons to populations in the United States and Europe. *Fisheries*. 31: 218-229.
- Dadswell, M. J., B. D. Taubert, T. S. Squiers, D. Marchette, and J. Buckley. 1984. Synopsis of biological data on shortnose sturgeon, *Acipenser brevirostrum*, LeSuer 1818. NOAA Technical Report NMFS 14.
- Davenport, J. 1998. Sustaining endothermy on a diet of cold jelly: energetics of the leatherback turtle *Dermochelys coriacea*. *British Herpetological Society Bulletin*. 62: 4-8.
- Davis, M. W. 2002. Key principles for understanding fish bycatch discard mortality. *Canadian Journal of Fisheries and Aquatic Sciences* 59:1834– 1843.
- Den Hartog, J.C. 1980. Notes on the food of sea turtles: *Eretmochelys imbricata* (Linnaeus) and *Dermochelys coriacea* (Linnaeus). *Netherlands Journal of Zoology*. 30(4):595-610.
- Den Hartog, J.C. and M.M. Van Nierop. 1984. A study on the gut contents of 6 leathery turtles *Dermochelys coriacea* (Linnaeus) (Reptilia:Testudines: Dermochelyidae) from British waters and The Netherlands. *Zoologische Verhandelingen*. 209:1-31.
- DFO (Canadian Department of Fisheries and Oceans). 1999. Neon flying squid stock status report. DFO Science Stock Status Report C6-12. Available at: <http://www.dfo-mpo.gc.ca/csas/Csas/status/1999/C6-12e.pdf>.
- Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). U.S. Fish and Wildlife Service, Biological Report 88(14). 110 pages.
- Dodge, K.L., J. M. Logan, and M. E. Lutcavage. 2011. Foraging ecology of leatherback sea turtles in the Western North Atlantic determined through multi-tissue stable isotope analyses. *Marine Biology*. 158:2813-2824.
- Dodge, K.L., B. Galuardi, T. J. Miller, and M. E. Lutcavage. 2014. Leatherback Turtle movements, dive behavior, and habitat characteristics in ecoregions of the Northwest Atlantic Ocean. *PLOS ONE*. 9 (3) e91726: 1-17.
- Dovel, W.L. and T.J. Berggren. 1983. Atlantic sturgeon of the Hudson River Estuary, New York. *New York Fish and Game Journal*. 30: 140-172.
- Drohan, A.F., J. P. Manderson, and D. B. Packer. 2007. Essential fish habitat source document: black sea bass, *Centropristis striata*, life history and habitat characteristics, 2nd edition. NOAA Technical Memorandum NMFS NE 200; 68 p.
- Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.J. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*) within the Northwest Atlantic Ocean, determined from five fishery-independent surveys. *Fishery Bulletin*. 108:450-465.
- Dunton, K.J., D. Chapman, A. Jordaan, K. Feldheim, S. J. O’Leary, K. A. McKown, and M. G. Frisk. 2012. Brief communications: genetic mixed-stock analysis of Atlantic sturgeon *Acipenser oxyrinchus oxyrinchus* in a heavily exploited marine habitat indicates the need for routine genetic monitoring. *Journal of Fish Biology*. 80: 207–217.

- Dunton, K.J., A. Jordaan, D. O. Conover, K.A. McKown, L. A. Bonacci, and M. G. Frisk. 2015. Marine distribution and habitat use of Atlantic sturgeon in New York lead to fisheries interactions and bycatch. *Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science*. 7:18–32.
- Dzaugis, M.P. 2013. Diet and prey availability of sturgeons in the Penobscot River, Maine. Marine Science Honors Thesis. Honors College, University of Maine. May 2013. pp.36.
- Eckert, S.A., D. Bagley, S. Kubis, L. Ehrhart, C. Johnson, K. Stewart, and D. DeFreese. 2006. Internesting and postnesting movements of foraging habitats of leatherback sea turtles (*Dermochelys coriacea*) nesting in Florida. *Chelonian Conservation and Biology*. 5(2): 239-248.
- Eno, N.C., D.S MacDonald, J.A.M. Kinnear, S.C Amos, C.J. Chapman, R.A Clark, F.P.D Bunker, Munro, C. 2001. Effects of crustacean traps on benthic fauna. *ICES Journal of Marine Science*. 58:11-20.
- Epperly, S.P., J. Braun, and A.J. Chester. 1995a. Aerial surveys for sea turtles in North Carolina inshore waters. *Fishery Bulletin*. 93:254-261.
- Epperly, S.P., J. Braun, A.J. Chester, F.A. Cross, J.V. Merriner, and P.A. Tester. 1995b. Winter distribution of sea turtles in the vicinity of Cape Hatteras and their interactions with the summer flounder trawl fishery. *Bulletin of Marine Science*. 56(2):547-568.
- Epperly, S.P., J. Braun, and A. Veishlow. 1995c. Sea turtles in North Carolina waters. *Conservation Biology*. 9(2):384-394.
- Erickson, D. L., A. Kahnle, M. J. Millard, E. A. Mora, M. Bryja, A. Higgs, J. Mohler, M. DuFour, G. Kenney, J. Sweka, and E. K. Pikitch. 2011. Use of pop-up satellite archival tags to identify oceanic-migratory patterns for adult Atlantic Sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchell, 1815. *Journal of Applied Ichthyology*. 27: 356–365.
- Essington T. E., P. E. Moriarty, H. E. Froelich, E. H. Hodgson, L. E. Koehn, K. L. Oken, M. C. Siple, and C. C. Stawitz. 2015. Fishing amplifies forage fish population collapses. *Proceedings of the National Academy of Sciences*. 112(21):6648-6652.
- FL FWCC (Florida Fish and Wildlife Conservation Commission). 2010a. Spanish sardine, *Sardinella aurita* (Valenciennes, 1847). Available at: http://myfwc.com/media/195536/spanish_sardine.pdf
- FL FWCC (Florida Fish and Wildlife Conservation Commission). 2010b. Atlantic thread herring, *Opisthonema oglinum* (Lesueur, 1871). Available at: http://myfwc.com/media/194720/atlantic_thread_herring.pdf
- Froese, R. and D. Pauly (editors). 2016. FishBase. <http://www.fishbase.org/search.php>.
- Gaichas, S., J. Hare, M. Pinsky, G. DePiper, O. Jensen, T. Lederhouse, J. Link, D. Lipton, R. Seagraves, J. Manderson, and M. Clark. 2015. Climate change and variability: a white paper to inform the Mid-Atlantic Fishery Management Council on the impact of climate change on fishery science and management. Second draft. Available at: <http://www.mafmc.org/eafm/>
- Good, C. 2008. Spatial ecology of the North Atlantic right whale (*Eubalaena glacialis*). Doctoral Dissertation, Duke University. Available at: <http://dukespace.lib.duke.edu/dspace/handle/10161/588>

Greene, J.K., M.G. Anderson, J. Odell, and N. Steinberg, eds. 2010. The Northwest Atlantic Marine Ecoregional Assessment: Species, Habitats and Ecosystems. Phase One. The Nature Conservancy, Eastern U.S. Division, Boston, MA. Available at: <http://www.conservationgateway.org/ConservationByGeography/NorthAmerica/UnitedStates/edc/Documents/namera-phase1-fullreport.pdf>

Griffin, D.B., S. R. Murphy, M. G. Frick, A. C. Broderick, J. W. Coker, M. S. Coyne, M. G. Dodd, M. H. Godfrey, B. J. Godley, L. A. Hawkes, T. M. Murphy, K. L. Williams, and M. J. Witt. 2013. Foraging habitats and migration corridors utilized by a recovering subpopulation of adult female loggerhead sea turtles: implications for conservation. *Marine Biology*. 160: 3071–3086.

Groombridge, B., and R. Luxmoore. 1989. The green turtle and hawksbill (Reptilia: Cheloniidae): world status, exploitation and trade. CITES Secretariat; Lausanne, Switzerland.

Guilbard, F., J. Munro, P. Dumont, D. Hatin, and R. Fortin. 2007. Feeding ecology of Atlantic sturgeon and lake sturgeon co-occurring in the St. Lawrence Estuarine Transition Zone. American Fisheries Society Symposium. 56: 85-104.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn. 1992. The fin whale, *Balaenoptera physalus*, in waters of the northeastern United States continental shelf. Reports of the International Whaling Commission 42: 653-669.

Hamilton, P.K., and C.A. Mayo. 1990. Population characteristics of right whales (*Eubalaena glacialis*) observed in Cape Cod and Massachusetts Bays, 1978-1986. Reports of the International Whaling Commission, Special Issue No. 12: 203-208.

Hammill, M. O., and G. B. Stenson. 2000. Estimated prey consumption by harp seals (*Phoca groenlandica*), hooded seals (*Cystophora cristata*), grey seals (*Halichoerus grypus*) and harbor seals (*Phoca vitulina*) in Atlantic Canada. *Journal of Northwest Atlantic Fishery Science*. 26:1–23.

Hare, J. A., W. E. Morrison, M. W. Nelson, M. M. Stachura, E. J. Teeters, R. B. Griffis, M. A. Alexander, J. D. Scott, L. Alade, R. J. Bell, A. S. Chute, K. L. Curti, T. H. Curtis, D. Kircheis, J. F. Kocik, S. M. Lucey, C. T. McCandless, L. M. Milke, D. E. Richardson, E. Robillard, H. J. Walsh, M. C. McManus, K. E. Marancik, C. A. Griswold. 2016. A vulnerability assessment of fish and invertebrates to climate change on the northeast U.S. continental shelf. *PLOS One*. 11(2): 1-30.

Hawkes, L.A., A.C. Broderick, M.S. Coyne, M.H. Godfrey, L.-F. Lopez-Jurado, P. Lopez- Suarez, S.E. Merino, N. Varo-Cruz, and B.J. Godley. 2006. Phenotypically linked dichotomy in sea turtle foraging requires multiple conservation approaches. *Current Biology*. 16: 990-995.

Hawkes, L.A., M.J. Witt, A.C. Broderick, J.W. Coker, M.S. Coyne, M. Dodd, M.G. Frick, M.H. Godfrey, D.B. Griffin, S.R. Murphy, T.M. Murphy, K.L. Williams, and B.J. Godley. 2011. Home on the range: spatial ecology of loggerhead turtles in Atlantic waters of the USA. *Diversity and Distributions*. 17:624–640.

Henry AG, Cole TVN, Hall L, Ledwell W, Morin D, Reid A. 2015. Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States east coast and Atlantic Canadian provinces, 2009-2013. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 15-10; 45 p.

Hildebrand, H.H. 1982. A historical review of the status of sea turtle populations in the western Gulf of Mexico. In: K. Bjorndal (editor), *Biology and Conservation of Sea Turtles*. Proceedings of the World Conference of Sea Turtle Conservation. Smithsonian Institution Press, Washington, DC. p. 447-453.

- Houde, E. D. 1977. Abundance and potential yield of the round herring, *Etrumeus teres*, and aspects of its early life history in the eastern Gulf of Mexico. *Fishery Bulletin*. 75(1): 61-89.
- Hutt, C. P., S. J. Lovell, and G. Silva. 2014. The economic contribution of Atlantic highly migratory species angling permit holders in New England and the Mid-Atlantic, 2011. NOAA Technical Memorandum NMFS-F/SPO-147.
- Ihde, T.F., E.D. Houde, C.F. Bonzek, and E. Franke. 2015. Assessing the Chesapeake Bay Forage Base: Existing Data and Research Priorities. STAC Publication Number 15-005. Chesapeake Bay Program Science and Technical Advisory Committee. 198 pp. Available at: http://www.chesapeake.org/pubs/346_Ihde2015.pdf
- James, M.C., and T.B. Herman. 2001. Feeding of *Dermochelys coriacea* on medusae in the northwest Atlantic. *Chelonian Conservation Biology*. 4:202-205.
- James, M.C., R.A. Myers, and C.A. Ottenmeyer. 2005. Behaviour of leatherback sea turtles, *Dermochelys coriacea*, during the migratory cycle. *Proceedings of the Royal Society of London B*. 272: 1547-1555.
- James, M.C., S.A. Sherrill-Mix, K. Martin, and R. A. Myers. 2006. Canadian waters provide critical foraging habitat for leatherback sea turtles. *Biological Conservation*. 133: 347-357.
- Jefferson, T.A., D. Fertl, J. Bolanos-Jimenez and A.N. Zerbini. 2009. Distribution of common dolphins (*Delphinus spp.*) in the western North Atlantic: a critical re-examination. *Marine Biology*. 156:1109-1124.
- Johnson, J. H., D. S. Dropkin, B. E. Warkentine, J. W. Rachlin, and W. D. Andrews. 1997. Food habits of Atlantic sturgeon off the central New Jersey coast. *Transactions of the American Fisheries Society*. 126: 166-170.
- Jones T.T., and Seminoff J.A. 2013. Feeding biology: advances from field-based observations, physiological studies, and molecular techniques. In: Wyneken J, Musick J, Lohmann K (eds.). *The Biology of Sea Turtles*, Vol. III, p. 211-248. Boca Raton: CRC Press, 475 p.
- Jung, S. and E. D. Houde. 2004. Recruitment and spawning-stock biomass distribution of bay anchovy (*Anchoa mitchilli*) in Chesapeake Bay. *Fisheries Bulletin*. 102(1): 63-77.
- Kaschner, K. 2004. Modeling and mapping resource overlap between marine mammals and fisheries on a global scale. Dissertation. Marine Mammal Research Unit, Fisheries Centre, University of British Columbia, Vancouver, British Columbia, Canada.
- Kaufman, K. 1996. *Lives of North American Birds*. Houghton Mifflin Harcourt Publishing.
- Kells, V. and K. Carpenter. 2011. *A Field Guide to Coastal Fishes from Maine to Texas*. The Johns Hopkins University Press.
- Kenney, J., and D. Hartley. 2001. Draft large whale entanglement summary 1997-2001. Report to the National Marine Fisheries Service, updated October.
- Kenney, R.D., M.A.M. Hyman, R.E. Owen, G.P. Scott and H.E. Winn. 1986. Estimation of prey densities required by western North Atlantic right whales. *Marine Mammal Science*. 2: 1-13.
- Kenney, R.D., H.E. Winn and M.C. Macaulay 1995. Cetaceans in the Great South Channel, 1979-1989: right whale (*Eubalaena glacialis*). *Continental Shelf Research*. 15: 385-414.

- Khan, C., T.V.N. Cole, P. Duley, A. Glass, M. Niemeyer, and C. Christman. 2009. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2008 Results Summary. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 09-05. 7 pp.
- Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2010. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 10-07. 7 pp.
- Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2011. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2010 Results Summary. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 11-05. 6 pp.
- Khan C., T. Cole, P. Duley, A. Glass, and J. Gatzke, J. Corkeron. 2012. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2011 Results Summary. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 12-09; 6 p.
- Kynard, B., M. Horgan, M. Kieffer, and D. Seibel. 2000. Habitat used by shortnose sturgeon in two Massachusetts rivers, with notes on estuarine Atlantic sturgeon: a hierarchical approach. *Transactions of the American Fisheries Society*. 129: 487-503.
- Laney, R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr., and S.E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988–2006. In: J. Munro, D. Hatin, J. E. Hightower, K. McKown, K. J. Sulak, A. W. Kahnle, and F. Caron, (editors), *Anadromous sturgeons: Habitats, threats, and management*. American Fisheries Society Symposium 56. Bethesda, MD.
- Leftwich, R. 1973. *The Price System and Resource Allocation*. The Dryer Press. Hinsdale, Illinois.
- Lucey, S. M. and J. A. Nye. 2010. Shifting species assemblages in the northeast US continental shelf large marine ecosystem. *Marine Ecology Progress Series*. 415: 23-33.
- Lund, P. F. 1985. Hawksbill turtle *Eretmochelys imbricata* nesting on the east coast of Florida. *Journal of Herpetology*. 19:164-166.
- Lyssikatos MC. 2015. Estimates of cetacean and pinniped bycatch in Northeast and mid-Atlantic bottom trawl fisheries, 2008-2013. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 15-19.
- MAFMC (Mid-Atlantic Fishery Management Council). 2012. Vision and strategic planning project stakeholder input report, appendix A: survey results. Available at: www.mafmc.org/strategic-plan/.
- MAFMC (Mid-Atlantic Fishery Management Council). 2016. Ecosystem approach to fisheries management guidance document. Available at: <http://www.mafmc.org/eafm>
- Mangold, K. M., M. Vecchione, and R. E. Young. 2016. Ocythoidea Gray 1849. *Ocythoe tuberculata* Rafinesque, 1814. The Tree of Life Web Project. http://tolweb.org/Ocythoe_tuberculata/20205/2016.02.27
- Mansfield, K.L., V.S. Saba, J. Keinath, and J.A. Musick. 2009. Satellite telemetry reveals a dichotomy in migration strategies among juvenile loggerhead sea turtles in the northwest Atlantic. *Marine Biology*. 156:2555-2570.

- Márquez, M.,R. 1994. Synopsis of biological data on the Kemp's ridley turtle, *Lepidochelys kempi* (Garman, 1880). NOAA Technical Memorandum. NMFS-SEFSC-343.
- Mayo, C.A. and M.K. Marx. 1990. Surface foraging behaviour of the North Atlantic right whale, *Eubalaena glacialis*, and associated zooplankton characteristics. *Canadian Journal of Zoology*. 68: 2214–2220.
- Meylan, A.B. and M. Donnelly. 1999. Status justification for listing the hawksbill turtle (*Eretmochelys imbricata*) as critically endangered on the 1996 IUCN Red List of Threatened Animals. *Chelonian Conservation and Biology*. 3(2):200-224.
- McClellan, C.M., and A.J. Read. 2007. Complexity and variation in loggerhead sea turtle life history. *Biology Letters*. 3:592-594.
- McLean, M.F., M. J. Dadswell, and M. J. W. Stokesbury. Feeding ecology of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus* Mitchill, 1815 on the infauna of intertidal mudflats of Minas Basin, Bay of Fundy. *Journal of Applied Ichthyology*. 29: 503–509
- Miller, T. and G. Shepard. 2011. Summary of discard estimates for Atlantic sturgeon. Northeast Fisheries Science Center, Population Dynamics Branch, August 2011.
- Mitchell, G.H., R.D. Kenney, A.M. Farak, and R.J. Campbell. 2003. Evaluation of occurrence of endangered and threatened marine species in naval ship trial areas and transit lanes in the Gulf of Maine and offshore of Georges Bank. NUWC-NPT Technical Memo 02-121A. March 2003. 113 pp.
- Morgan, L. E. and R. Chuenpagdee. 2003. Shifting gears: addressing the collateral impacts of fishing methods in U.S. Waters. Pew Science Series. Available at: <http://www.pewtrusts.org/en/research-and-analysis/reports/2003/05/01/shifting-gears-addressing-the-collateral-impacts-of-fishing-methods-in-us-waters>
- Morreale, S.J. and E.A. Standora. 2005. Western North Atlantic waters: crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. *Chelonian Conservation Biology*. 4(4):872-882.
- Murphy, T.M., S.R. Murphy, D.B. Griffin, and C. P. Hope. 2006. Recent occurrence, spatial distribution, and temporal variability of leatherback turtles (*Dermochelys coriacea*) in nearshore waters of South Carolina, USA. *Chelonian Conservation Biology*. 5(2): 216-224.
- Murray, K.T., 2008. Estimated average annual bycatch of loggerhead sea turtles (*Caretta caretta*) in US Mid-Atlantic Bottom Otter Trawl Gear, 1996–2004, second ed. U.S. Department of Commerce Northeast Fisheries Science Center Reference Document 08-20, p. 32. <http://www.nefsc.noaa.gov/publications/crd/crd0820>
- Murray, K.T. 2015. The importance of location and operational fishing factors in estimating and reducing loggerhead turtle (*Caretta caretta*) interactions in U.S. bottom trawl gear. *Fisheries Research*. 172: 440–451.
- NEFSC (Northeast Fisheries Science Center). 2006. 42nd Northeast Regional Stock Assessment Workshop (42nd SAW) Stock Assessment Report: Part A: Silver Hake, Atlantic Mackerel, & Northern Shortfin Squid. Northeast Fisheries Science Center Reference Document 06-09. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2010. 51st Northeast Regional Stock Assessment Workshop (51st SAW): Assessment Summary Report (2nd Edition). Northeast Fisheries Science Center Reference Document 11-01. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2013a. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Report. Northeast Fisheries Science Center Reference Document 13-10. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2013b. 2013 Stock assessment update for ocean quahogs (*Arctica islandica*) through 2011. Northeast Fisheries Science Center Reference Document 13-17. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2013c. 2013 Monkfish operational assessment. Northeast Fisheries Science Center Reference Document 13-23. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2014. 58th Northeast Regional Stock Assessment (58th SAW) assessment report. Northeast Fisheries Science Center Reference Document 14-04. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2015A. 60th Northeast Regional Stock Assessment (60th SAW) assessment report. Northeast Fisheries Science Center Reference Document 15-08. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC (Northeast Fisheries Science Center). 2015B. Update on the status of spiny dogfish in 2015 and projected harvests at the Fmsy proxy and Pstar of 40%. Available at: <http://www.mafmc.org/ssc-meetings/2015/sept-16-17>

NEFSC (Northeast Fisheries Science Center). 2016B. Summer Flounder Stock Assessment Update for 2016. Available at: <http://www.nefsc.noaa.gov/saw/>

NEFSC (Northeast Fisheries Science Center). 2017. 62nd Northeast Regional Stock Assessment (62nd SAW) assessment report. Northeast Fisheries Science Center Reference Document 17-03. Available at: <http://www.nefsc.noaa.gov/publications/>

NEFSC FSB (Northeast Fisheries Science Center Fisheries Statistics Branch). 2015. Northeast Fisheries Observer Program: incidental take reports. Omnibus data request + supplemental data for 2014 from http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html.

NMFS (National Marine Fisheries Service). 1991. Final recovery plan for the humpback whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, MD. 105 pp.

NMFS (National Marine Fisheries Service). 2001. Endangered Species Act Section 7 consultation on the golden tilefish fishery management plan. Available at: http://www.greateratlantic.fisheries.noaa.gov/prot_res/section7/NMFS-signedBOs/Tilefish2001signedBO.pdf

NMFS (National Marine Fisheries Service). 2005. Revision- recovery plan for the North Atlantic right whale (*Eubalaena glacialis*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 137 pp.

NMFS (National Marine Fisheries Service). 2007. Guidelines for economic review of National Marine Fisheries Service regulatory actions. National Marine Fisheries Service Instruction 01-111-05. Available at: <http://www.nmfs.noaa.gov/op/pds/documents/01/111/01-111-05.pdf>

NMFS (National Marine Fisheries Service). 2009. Amendment 1 to the Consolidated HMS FMP. Available at: <http://www.nmfs.noaa.gov/sfa/hms/documents/fmp/index.html>

NMFS (National Marine Fisheries Service). 2010a. Recovery plan for the sperm whale (*Physeter macrocephalus*). National Marine Fisheries Service, Silver Spring, MD. 165pp.

NMFS (National Marine Fisheries Service). 2010b. Final recovery plan for the fin whale (*Balaenoptera physalus*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 121 pp.

NMFS (National Marine Fisheries Service). 2011. Final recovery plan for the sei whale (*Balaenoptera borealis*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 108 pp.

NMFS (National Marine Fisheries Service). 2012a. North Atlantic Right Whale (*Eubalaena glacialis*) five year review: summary and evaluation. NOAA Fisheries Service, Northeast Regional Office, Gloucester, MA. 36pp.

NMFS (National Marine Fisheries Service). 2012b. NMFS-Greater Atlantic Region Endangered Species Act section 7 consultation on the Atlantic Sea Scallop Fishery Management Plan. http://www.greateratlantic.fisheries.noaa.gov/prot_res/section7/NMFS-signedBOs/2012ScallopBiOp071212.pdf

NMFS (National Marine Fisheries Service). 2013. NMFS-Greater Atlantic Region Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the Northeast Multispecies, Monkfish, Spiny Dogfish, Atlantic Bluefish, Northeast Skate Complex, Mackerel/Squid/Butterfish, and Summer Flounder/Scup/Black Sea Bass Fisheries. <http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/batchedfisheriesopinionfinal121613.pdf>

NMFS (National Marine Fisheries Service). 2014a. NMFS-Greater Atlantic Region Memo to the record: Determination regarding reinitiation of Endangered Species Act section 7 consultation on 12 GARFO fisheries and two Northeast Fisheries Science Center funded fisheries research surveys due to critical habitat designation for loggerhead sea turtles. Memo issued September 17, 2014.

NMFS (National Marine Fisheries Service). 2014b. NMFS-Greater Atlantic Region Endangered Species Act Section 7 Consultation on the Continued Implementation of Management Measures for the American Lobster Fishery. <http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/2014finalamericanlobsterbiop073114.pdf>

NMFS (National Marine Fisheries Service). 2014c. Section 7 Informal Consultation on a Proposed Rule to Regulations Implementing the Atlantic Surfclam and Ocean Quahog Fishery Management Plan (FMP). GARFO, June 26, 2014.

NMFS (National Marine Fisheries Service). 2015. 2015 Stock assessment and fishery evaluation (SAFE) report for Atlantic highly migratory species. Available at: http://www.nmfs.noaa.gov/sfa/hms/documents/safe_reports/index.html

- NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1992. Recovery plan for leatherback turtles (*Dermochelys coriacea*) in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65 pp.
- NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1993. Recovery plan for hawksbill sea turtles in the U.S. Caribbean Sea, Atlantic Ocean, and Gulf of Mexico. National Marine Fisheries Service, St. Petersburg, Florida. 52 pp.
- NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2008. Recovery plan for the Northwest Atlantic population of the loggerhead turtle (*Caretta caretta*), Second revision. Washington, D.C.: National Marine Fisheries Service. 325 pp.
- NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2013. Hawksbill sea turtle (*Eretmochelys imbricata*) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 89 pp.
- NOAA (National Oceanic and Atmospheric Administration). 2008. High numbers of rightwhales seen in Gulf of Maine: NOAA researchers identify wintering ground and potential breeding ground. NOAA press release. December 31, 2008.
- NOAA OST (NOAA Office of Science and Technology). 2016. Northeast fish and shellfish climate vulnerability assessment. Species profiles. Available at: <https://www.st.nmfs.noaa.gov/ecosystems/climate/northeast-fish-and-shellfish-climate-vulnerability/index>
- Nye, J. A., T. M. Joyce, Y.O. Kwon, and J.S. Link. 2011. Silver hake tracks changes in Northwest Atlantic circulation. *Nature Communications*. 2:412.
- Ogren, L.H. 1989. Distribution of juvenile and subadult Kemp's ridley turtles: preliminary results from the 1980-1987 surveys. In: Caillouet, C.W. Jr., and Landry, A.M. Jr., (editors), Proceedings of the 1st International Symposium on Kemp's Ridley Sea Turtle Biology, Conservation and Management. Texas A & M University Sea Grant College Program Special Publication 89-105:116-123.
- O'Leary, S.J., K. J. Dunton, T. L. King, M. G. Frisk, and D.D. Chapman. 2014. Genetic diversity and effective size of Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*, river spawning populations estimated from the microsatellite genotypes of marine-captured juveniles. *Conservation Genetics*. 15(5):1173-1181.
- Packer, D. B, S. J. Griesbach, P. L. Berrien, C. A. Zetlin, D. L. Johnson, and W.W. Morse. 1999. Essential fish habitat source document: summer flounder, *Paralichthys dentatus*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-151.
- Patel, S. H., K. L. Dodge, H. L. Haas, and R. J. Smolowitc. 2016. Videography reveals in-water behavior of loggerhead turtles (*Caretta caretta*) at a foraging ground. *Frontiers in Marine Science*. 3, 254.
- Payne, P.M., D.N. Wiley, S.B. Young, S. Pittman, P.J. Clapham and J.W. Jossi. 1990. Recent fluctuations in the abundance of baleen whales in the southern Gulf of Maine in relation to changes in selected prey. *Fisheries Bulletin*. 88: 687-696.
- Payne, P.M. and D.W. Heinemann. 1993. The distribution of pilot whales (*Globicephala sp.*) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. Report of the International Whaling Commission. (Special Issue) 14: 51- 68.

- Payne, P.M., L. A. Selzer, and A. R. Knowlton. 1984. Distribution and density of cetaceans, marine turtles, and seabirds in the shelf waters of the northeastern United States, June 1980 - December 1983, based on shipboard observations. National Marine Fisheries Service-NEFSC, Woods Hole, MA. 294pp.
- Payne, P.M., J.R. Nicholas, L. O'Brien and K.D. Powers 1986. The distribution of the humpback whale, *Megaptera novaeangliae*, on Georges Bank and in the Gulf of Maine in relation to densities of the sand eel, *Ammodytes americanus*. *Fisheries Bulletin*. 84: 271-277.
- Pechenik, J. A. 2005. *Biology of the Invertebrates*. Fifth edition. McGraw-Hill.
- Pikitch, E., P. D. Boersma, I. L. Boyd, D. O. Conover, P. Cury, T. Essington, S. S. Heppell, E. D. Houde, M. Mangel, D. Pauly, , É. Plagányi, K. Sainsbury, and R. S. Steneck. 2012. Little fish, big impact: managing a crucial link in ocean food webs. Lenfest Ocean Program. Washington, DC. Available at: <http://www.lenfestocean.org/en/research-projects/lenfest-forage-fish-task-force>
- Pikitch, E. K., K. J. Rountos, T. E. Essington, C. Santora, D. Pauly, R. Watson, U. R. Sumaila, P. D. Boersma, I. L. Boyd, D. O. Conover, P. Cury, S. S. Heppell, E. D. Houde, M. Mangel, É. Plagányi, K. Sainsbury, R. S. Steneck, T. M. Geers, N. Gownaris, and S. B. Munch. 2014. The global contribution of forage fish to marine fisheries and ecosystems. *Fish and Fisheries*. 15 (1): 43-64.
- Plotkin, P. and A.F. Amos. 1988. Entanglement in and ingestion of marine turtles stranded along the south Texas coast. In: B.A. Schroeder, compiler. Proceedings of the eighth annual workshop on sea turtle conservation and biology. NOAA Technical Memorandum NMFS/SEFC-214.
- Plotkin, P. and A.F. Amos. 1990. Effects of anthropogenic debris on sea turtles in the northwestern Gulf of Mexico. In: R.S. Shomura and M.L. Godfrey (eds.), Proceedings of the Second International Conference on Marine Debris, 2-7 April 1989, Honolulu, HI, p. 736-747, NOAA Tech. Mem. NMFS-SWFSC-154. 1274 pp.
- Risch, D., C. W. Clark, P. J. Dugan, M. Popescu, U. Siebert, and S. M. Van Parijs. 2013. Minke whale acoustic behavior and multi-year seasonal and diel vocalization patterns in Massachusetts Bay, USA. *Marine Ecological Progress Series*. 489: 279–295.
- Pinsky, M.L., B. Worm, M.J. Fogarty, J.L. Sarmiento, and S.A. Levin. 2013. Marine taxa track local climate velocities. *Science*. 341(6151): 1239-1242.
- Rudershausen, P. J., J. A. Buckel, J. Edwards, D. P. Gannon, C. M. Butler, and T. W. Averett. 2010. Feeding ecology of blue marlins, dolphinfish, yellowfin tuna, and wahoos from the North Atlantic Ocean and comparisons with other oceans. *Transactions of the American Fisheries Society*. 139(5): 1335-1359.
- Salmon, M., T.T. Jones, and K. Horch. 2004. Ontogeny of diving and feeding behavior in juvenile sea turtles: a comparison study of green turtles (*Chelonia mydas* L.) and leatherbacks (*Dermochelys coriacea* L.) in the Florida current. *Journal of Herpetology*. 38:36-43.
- Savenkoff, C., L. Morissette, M. Castonguay, D. P. Swain, M. O. Hammill, D. Chabot, and J. M. Hanson. 2008. Interactions between marine mammals and fisheries: implications for cod recovery. In: J. Chen and C. Guo, editors. *Ecosystem Ecology Research Trends*. Nova Science Publishers, Hauppauge, New York, USA.
- Savoy, T. 2007. Prey eaten by Atlantic sturgeon in Connecticut waters. American Fisheries Society Symposium 56: 157-165.

- Schevill, W.E., W.A. Watkins, and K.E. Moore. 1986. Status of *Eubalaena glacialis* off Cape Cod. Report of the International Whaling Commission, Special Issue 10: 79-82.
- Schilling, M. R., I. Seipt, M. T. Weinrich, S. E. Frohock, A. E. Kuhlberg, and P. J. Clapham. 1992. Behavior of individually-identified sei whales *Balaenoptera borealis* during an episodic influx into the southern Gulf of Maine in 1986. *Fishery Bulletin*. 90:749–755.
- Scott, T.M. and S.S. Sadove. 1997. Sperm whale, *Physeter macrocephalus*, sightings in the shallow shelf waters off Long Island, New York. *Marine Mammal Science*. 13:317-321.
- SEDAR (Southeast Data, Assessment, and Review). 2013. SEDAR 32 stock assessment report: south Atlantic blueline tilefish. Available at: <http://sedarweb.org/>
- Seney, E.E. 2003. Historical diet analysis of loggerhead (*Caretta caretta*) and Kemp's ridley (*Lepidochelys kempi*) sea turtles in Virginia. Unpublished Master of Science thesis. College of William and Mary, Williamsburg, Virginia. 123 pages.
- Seney, E.E., and J.A. Musick. 2005. Diet analysis of Kemp's ridley sea turtles in Virginia. *Chelonian Conservation and Biology*. 4(4):864-871.
- Seney, E.E. and J.A. Musick. 2007. Historical diet analysis of loggerhead sea turtles (*Caretta caretta*) in Virginia. *Copeia*. 2007(2):478-489.
- Shaver, D.J. 1991. Feeding ecology of Kemp's ridley in south Texas waters. *Journal of Herpetology*. 25:327-334.
- Shoop, C.R., and R.D. Kenney. 1992. Seasonal distributions and abundance of loggerhead and leatherback sea turtles in waters of the northeastern United States. *Herpetological Monographs*. 6:43-67.
- Smolowitz, R. J., S. H. Patel, H. L. Haas, and S. A. Miller. 2015. Using a remotely operated vehicle (ROV) to observe loggerhead sea turtle (*Caretta caretta*) behavior on foraging grounds of the Mid-Atlantic United States. *Journal of Experimental Marine Biology and Ecology*. 471: 84-91.
- Smith, A. D. M., C. J. Brown, C. M. Bulman, E. A. Fulton, P. Johnson, I. C. Kaplan, H. Lozano-Montes, S. Mackinson, M. Marzloff, L. J. Shannon, Y. Shin, and J. Tam. 2011. Impacts of fishing low-trophic level species on marine ecosystems. *Science*. 333: 1147-1150.
- Smith, L. A., J. S. Link, S. X. Cadrin, and D. L. Palka. 2015. Consumption by marine mammals on the Northeast U.S. continental shelf. *Ecological Applications*. 25(5):373-389.
- Steimle, F.W, C. A. Zetlin, P. L. Berrien, D. L. Johnson, and S. Chang. 1999. Essential fish habitat source document: scup, *Stenotomus chrysops*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-149.
- Steimle, F.W. and C. Zetlin. 2000. Reef habitats in the middle Atlantic bight: abundance, distribution, associated biological communities, and fishery resource use. *Marine Fisheries Review*. 62: 24-42.
- Stein, A. B., K. D. Friedland, and M. Sutherland. 2004a. Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. *Transactions of the American Fisheries Society*. 133: 527-537.
- Stein, A. B., K. D. Friedland, and M. Sutherland. 2004b. Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. *North American Journal of Fisheries Management*. 24: 171-183.

- Stevenson, D., L. Chiarella, D. Stephan, R. Reid, K. Wilhelm, J. McCarthy, and M. Pentony. 2004. Characterization of the fishing practices and marine benthic ecosystems of the northeast US shelf, and an evaluation of the potential effects of fishing on essential habitat. NOAA Technical Memorandum NMFS-NE-181; 179 p.
- Swingle, W.M., S.G. Barco, T.D. Pitchford, W.A. McLellan and D.A. Pabst. 1993. Appearance of juvenile humpback whales feeding in the nearshore waters of Virginia. *Marine Mammal Science*. 9: 309-315.
- TEWG (Turtle Expert Working Group). 1998. An assessment of the Kemp's ridley (*Lepidochelys kempii*) and loggerhead (*Caretta caretta*) sea turtle populations in the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-409:1-96.
- TEWG (Turtle Expert Working Group). 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-444:1-115.
- TEWG (Turtle Expert Working Group). 2009. An assessment of the loggerhead turtle population in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-575:1-131.
- Timoshkin, V. P. 1968. Atlantic sturgeon (*Acipenser sturio* L.) caught at sea. *Prob. Ichthyol.* (4):598.
- TRAC (Transboundary Resource Assessment Committee). 2010. An assessment of the northwest Atlantic mackerel (*Scomber scombrus* L.) with XSA (Extended Survivors Analysis). Available at: http://www.bio.gc.ca/info/intercol/trac-cert/documents/ref/TRD_2010_14_E.pdf
- U.S. EPA (United States Environmental Protection Agency). 1999. Consideration of cumulative impacts in EPA review of NEPA documents. EPA 315-R-99-002.
- USFWS (United States Fish and Wildlife Service). 2008. Birds of Conservation Concern 2008. Available at: <https://www.fws.gov/migratorybirds/pdf/management/BCC2008.pdf>
- Valinassab, T., G. J. Pierce, and K. Johannesson. 2007. Lantern fish (*Benthosema pterotum*) resources as a target for commercial exploitation in the Oman Sea. *Journal of Applied Ichthyology*. 23(2007):573-577.
- Vu, E., D. Risch, C. Clark, S. Gaylord, L. Hatch, M. Thompson, D. Wiley, and S. Van Parijs. 2012. Humpback whale song occurs extensively on feeding grounds in the western North Atlantic Ocean. *Aquatic Biology*. 14(2):175-183.
- Waldman, J.R., T. King, T. Savoy, L. Maceda, C. Grunwald, and I. Wirgin. 2013. Stock origins of subadult and adult Atlantic sturgeon, *Acipenser oxyrinchus*, in a non-natal estuary, Long Island Sound. *Estuaries and Coasts*. 36:257-267.
- Wallace, B.P., Heppell, S.S., Lewison, R.L., Kelez, S., Crowder, L.B. 2008. Impacts of fisheries bycatch on loggerhead turtles worldwide inferred from reproductive value analyses. *Journal of Applied Ecology*. 45, 1076-1085.
- Warden, M.L. 2011. Modeling loggerhead sea turtle (*Caretta caretta*) interactions with US Mid-Atlantic bottom trawl gear for fish and scallops, 2005-2008. *Biological Conservation*. 144: 2202-2212.
- Waring, G. T., C. P. Fairfield, C. M. Ruhsam, and M. Sano. 1992. Cetaceans associated with Gulf Stream features off the northeastern USA shelf. ICES C.M. 1992/N:12 29 pp

- Waring G.T., E. Josephson, C.P. Fairfield-Walsh, K. Maze-Foley K, editors. 2007. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments -2007. NOAA Tech Memo NMFS-NE- 205. 415 pp.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2010. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2010. NOAA Tech Memo NMFS-NE-219. 606 pp.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2014. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2013. NOAA Tech Memo NMFS- NE-228. 475 pp.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2015. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2014.
- Waring, G.T., E. Josephson, K. Maze-Foley, and P. E. Rosel. 2016. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2015. NOAA Technical Memorandum NMFS-NE-238. Available at: http://www.nmfs.noaa.gov/pr/sars/pdf/atlantic2015_final.pdf
- Watkins, W.A., and W.E. Schevill. 1982. Observations of right whales (*Eubalaena glacialis*) in Cape Cod waters. *Fisheries Bulletin*. 80(4):875-880.
- Weinberg, J. R. 2005. Bathymetric shift in the distribution of Atlantic surfclams: response to warmer ocean temperature. *ICES Journal of Marine Science*. 62(7): 1444-1453.
- Winn, H.E., C.A. Price, and P.W. Sorensen. 1986. The distributional biology of the right whale (*Eubalaena glacialis*) in the western North Atlantic. Reports of the International Whaling Commission (Special issue). 10: 129-138.
- Wirgin, I., L. Maceda, J.R. Waldman, S. Wehrell, M. Dadswell, and T. King. 2012. Stock origin of migratory Atlantic sturgeon in the Minas Basin, Inner Bay of Fundy, Canada, determined by microsatellite and mitochondrial DNA analyses. *Transactions of the American Fisheries Society*. 141(5): 1389-1398.
- Wirgin, I., M. W. Breece, D. A. Fox, L. Maceda, K. W. Wark, and T. King. 2015. Origin of Atlantic sturgeon collected off the Delaware coast during Spring months. *North American Journal of Fisheries Management*. 35: 20–30.
- Young, R. E., M. Vecchione, and D.T. Donovan. 1998. The evolution of coleoid cephalopods and their present biodiversity and ecology. *South African Journal of Marine Science*. 20: 393-420.
- Youngkin, D.A. 2001. A long-term dietary analysis of loggerhead sea turtles (*Caretta caretta*) based on strandings from Cumberland Island, Georgia. Unpublished Master of Science thesis. Florida Atlantic University, Boca Raton, Florida. 65 pages.

10. List of agencies and persons consulted

In preparing this document, the Council consulted with NMFS, New England and South Atlantic Fishery Management Councils, Fish and Wildlife Service, and the states of Maine through North Carolina through their membership on the Mid-Atlantic and New England Fishery Management Councils. The advice of NMFS GARFO personnel was sought to ensure compliance with NMFS formatting requirements.

Copies of the document and other supporting documents are available from Dr. Christopher Moore, Executive Director, Mid-Atlantic Fishery Management Council, Suite 201, 800 North State Street, Dover, DE 19901