FRAMEWORK ADJUSTMENT 9

TO THE

SUMMER FLOUNDER, SCUP, AND BLACK SEA BASS

FISHERY MANAGEMENT PLAN

Includes Environmental Assessment, Regulatory Impact Review, and Regulatory Flexibility Act Analysis

October 2016

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

Mid-Atlantic Fishery Management Council
800 North State Street, Suite 201
Dover, DE 19901
(302) 674-2331 tel.
(302) 674-5399 fax

National Marine Fisheries Service
55 Great Republic Drive
Gloucester, MA 01930
(978) 281-9315 tel.
(978) 281-9135 fax

1. EXECUTIVE SUMMARY

This framework document was prepared by the Mid-Atlantic Fishery Management Council (Council) in consultation with the National Marine Fisheries Service (NMFS). This document was developed in accordance with all applicable laws and statutes as described in section 8.

The purpose of this framework is to implement measures to modify the Scup Gear Restricted Areas (GRAs). This action is needed to maintain low levels of scup discards in small-mesh fisheries while allowing those fisheries to access longfin squid.

The Scup GRAs were first implemented in November 2000 and were designed to reduce discard mortality of juvenile scup in small-mesh fisheries. They are thought to have not only achieved this goal, but also lead to improved the post-recruitment survival of those small scup and contributed to the rebuilding of the scup stock (Tercerio and Miller 2014). The GRAs prohibit trawl vessels from fishing for or possessing longfin squid, black sea bass, and silver hake (also known as whiting) when using mesh smaller than 5.0 inches in diameter (henceforth referred to as “small-mesh”) in the Northern Scup GRA during November and December and in the Southern Scup GRA from January 1 through March 15.

This framework was initiated in response to requests from commercial fishing industry members to modify the boundaries of the Southern GRA in order to regain access to important winter fishing areas for longfin squid. The size of the scup stock has increased considerably since the GRAs were last modified in late 2004. In addition, a new discard estimation methodology has been implemented, allowing for analysis of discards at a finer spatial scale than was previously possible (NEFSC 2015A). For these reasons, a re-evaluation of the effectiveness of the GRAs was warranted. The alternatives considered in this framework are informed by the most recent information on scup stock status and scup discards in and near the GRAs, and by input from commercial fishing industry members.

Summary of Alternatives

This framework includes twelve alternatives for the Scup GRAs. The expected biological, habitat, protected species, and socioeconomic impacts of each alternative are largely based on the expected changes in the availability of longfin squid and the resulting potential changes in small-mesh fishing effort. The alternatives and expected impacts are briefly summarized here and are described in more detail in sections 5 and 7.

Alternative set 1 contains three alternatives for the Northern GRA. Alternative 1A is the *status quo* alternative for the Northern GRA. It is the preferred alternative for the Northern GRA. Alternative 1A is expected to have positive biological impacts by maintaining reduced levels of discard mortality for scup and other non-target species, as well as potentially reduced fishing mortality for target species such as longfin squid. Alternative 1A is expected to have continued slight negative to slight positive impacts on habitat and protected species, and continued mixed (i.e. both positive and negative) socioeconomic impacts.

Alternative 1B would expand the Northern GRA into statistical area 613. Alternative 1B is expected to lead to a reduction in small-mesh fishing effort in statistical area 613 for two months each year. Alternative 1B is expected to have slight positive biological impacts, compared to the *status quo* (alternative 1A) by reducing fishing mortality (including discard mortality) for longfin squid and non-target species (including scup). Alternative 1B is expected to have neutral to slight positive impacts to habitat and protected species by slightly reducing the potential for interactions between fishing gear and habitat and fishing gear and protected species, compared to the *status quo* (alternative 1A). Alternative 1B is expected to have neutral to slight negative socioeconomic impacts by reducing the availability of longfin squid for small-mesh fisheries, and thus potentially reducing landings and revenues, compared to the *status quo* (Table 1).

Alternative 1C would eliminate the Northern GRA. As such, it would remove the existing restrictions on small-mesh fishing in the Northern GRA in November and December. In doing so, it could result in increased small-mesh fishing effort for two months each year, compared to the *status quo* (alternative 1A). Alternative 1C would likely have moderate negative biological impacts because it would likely lead to increased fishing mortality (including discard mortality) for longfin squid and non-target species, including scup, compared to the *status quo* (alternative 1A). An increase in small-mesh fishing effort under alternative 1C could have neutral to slight negative impacts to habitat and protected species by increasing the potential for interactions between fishing gear and habitat and fishing gear and protected species, compared to the *status quo* (alternative 1A). Alternative 1C is expected to have moderate positive socioeconomic impacts by allowing for increased landings of longfin squid, and thus increased revenues, compared to the *status quo* (alternative 1A). In general, the impacts of alternative 1C are expected to be slight to moderate because any changes in fishing effort would occur only with small-mesh trawl gear (the only gear type restricted by the GRA regulations) during a two-month period (Table 1).

Alternative set 2 contains nine alternatives for the Southern GRA. Alternative 2A is the *status quo* alternative for the Southern GRA. Alternative 2A is expected to have positive biological impacts by maintaining reduced levels of discard mortality for scup and other non-target species, as well as potentially reduced fishing mortality for target species such as longfin squid. Alternative 2A is expected to have continued slight negative to slight positive impacts on habitat and protected species, and continued mixed (i.e. both positive and negative) socioeconomic impacts.

Alternative 2B would modify the eastern boundary of the Southern GRA based on a proposal by a member of the Council's Summer Flounder, Scup, and Black Sea Bass and Mackerel, Squid, and Butterfish Advisory Panels (APs) in 2012. Alternative 2B is meant to restore access to certain canyon areas for longfin squid fishing. Alternative 2C is identical to alternative 2B, but with areas of overlap with the Council's proposed deep sea coral protection zones (81 *Federal Register* 60666, September 2, 2016) removed from the Southern GRA. If implemented, the coral zones will prohibit the use of bottom-tending gear, including the gear regulated by the Scup GRAs, year-round. If the coral zones are implemented, the impacts of alternatives 2B and 2C will be identical. If the coral zones are not implemented, the size of the Southern GRA would differ by only 1% under alternatives 2B and 2C; therefore, the impacts of Alternatives 2B and 2C will be similar if the coral zones are not implemented or if this framework is implemented prior to implementation of the coral zones. Alternatives 2B and 2C are expected to result in a slight increase in small-mesh fishing effort for longfin squid during January 1 – March 15, compared to the *status quo* (alternative 2A). An increase in fishing effort could lead to increased fishing mortality (including discard mortality) for longfin squid and non-target species (including scup); therefore, alternatives 2B and 2C are expected to have slight negative biological impacts, compared to the *status quo* (alternative 2A). An increase in fishing effort could increase the potential for interactions between fishing gear and physical habitat and between fishing gear and protected species; therefore; alternatives 2B and 2C could result in neutral to slight negative impacts to habitat and protected species, compared to the *status quo* (alternative 2A). Alternatives 2B and 2C are expected to result in slight to moderate positive socioeconomic impacts by allowing for increased landings of longfin squid and increased revenues, compared to the *status quo* (alternative 2A; Table 1).

Alternative 2D would remove statistical area 632 from the Southern GRA. It would slightly increase the amount of longfin squid available to small-mesh fisheries during January 1 – March 15 and could result in a slight increase in fishing effort, compared to the *status quo* (alternative 2A). However, the expected increase in longfin squid availability may not be large enough to result in a notable change in effort. A slight increase in fishing effort could lead to a slight increase in fishing mortality (including discard mortality) for longfin squid and non-target species (including scup); therefore, alternative 2D is expected to have neutral to slight negative biological impacts, compared to the *status quo* (alternative 2A). Impacts to habitat and protected species are expected to be neutral to slight negative due to the possibility of a slight increase in the potential for interactions between fishing gear and habitat and fishing gear and protected species, compared to the *status quo* (alternative 2A). Neutral to slight positive socioeconomic impacts are expected because landings of longfin squid, and thus revenues, could slightly increase, compared to the *status quo*. Because alternative 2D would result in a lesser increase in longfin squid availability, the magnitude of the expected impacts is lesser than those of alternatives 2B and 2C (Table 1).

Alternative 2E would modify the eastern boundary of the Southern GRA based on a proposal developed by several AP members in January 2016. Like alternatives 2B and 2C, this alternative is intended to restore access to important areas for longfin squid fishing. This alternative would restore access to a larger area than alternatives 2B and 2C. Like alternatives 2B and 2C, and for the same reasons, alternative 2E is expected to have moderate to slight negative biological impacts, neutral to slight negative impacts to habitat and protected species, and moderate positive socioeconomic impacts, compared to the *status quo* (alternative 2A). Because alternative 2E would result in a greater increase in longfin squid availability, the magnitude of the expected impacts is greater than those of alternatives 2B-2D (Table 1).

Alternative 2F is identical to alternative 2E except that it would leave portions of the Southern GRA in statistical area 616 unchanged. Like alternatives 2B, 2C, and 2E, and for the same reasons, alternative 2F is expected to have slight to moderate negative biological impacts, neutral to slight negative impacts to habitat and protected species, and moderate positive socioeconomic impacts, compared to the *status quo* (alternative 2A). The magnitude of the expected impacts of alternative 2F is expected to be greater than alternatives 2B-2D, but lesser than alternative 2E (Table 1).

Alternative 2G is the preferred Southern GRA alternative. Alternative 2G is identical to alternatives 2E and 2F, except that in areas where the Southern GRA overlaps with statistical area 616, the boundary would be based on the 2012 AP proposal (alternative 2B). Alternative 2G is thus a combination of the January 2016 AP proposal and the 2012 AP proposal. Like alternatives 2B, 2C, 2E, and 2F, and for the same reasons, alternative 2G is expected to have slight to moderate negative biological impacts, neutral to slight negative impacts to habitat and protected species, and moderate positive socioeconomic impacts, compared to the *status quo* (alternative 2A). The impacts are expected to be greater in magnitude than the impacts under alternatives 2B-2D and 2F, but lesser in magnitude than alternative 2E (Table 1).

Alternative 2H would expand the Southern GRA into statistical area 616. Alternative 2H is expected to result in a decrease in small-mesh fishing effort in statistical area 616 during January 1 – March 15. Statistical area 616 contains Hudson Canyon, an important fishing area for many species. The Scup GRAs included Hudson Canyon for a brief period of time. Hudson Canyon was removed from the GRAs in 2001 due to concerns from the commercial fishing industry about negative economic impacts. Alternative 2H is expected to result in a reduction in small-mesh fishing effort for many species; therefore, alternative 2H is expected to have moderate positive biological impacts, moderate positive impacts on habitat and protected species, and moderate negative socioeconomic impacts, compared to the *status quo* (alternative 2A). Alternative 2H is the only alternative that would increase the size of the Southern GRA; therefore, it has the most positive biological, habitat, and protected species impacts, and the most negative socioeconomic impacts of all the Southern GRA alternatives (Table 1).

Alternative 2I would eliminate the Southern GRA. As such, alternative 2I would remove the existing restrictions on small-mesh fishing in the Southern GRA during January 1 – March 15. In doing so, it could result in increased small-mesh fishing effort in those areas and times of year. Alternative 2I is expected to have moderate negative biological impacts, slight negative impacts to habitat and protected species, and moderate positive economic impacts, compared to the *status quo* (alternative 2A). Alternative 2I has the highest potential for negative biological, habitat, and protected species impacts, and the highest potential for positive socioeconomic impacts of all the Southern GRA alternatives.

Cumulative Impacts

When the preferred alternatives are considered in conjunction with all the other pressures placed on the impacted fisheries by past, present, and reasonably foreseeable future actions, they are not expected to result in any significant impacts, positive or negative. There are no significant cumulative effects on the human environment associated with the preferred alternatives (section 0).

Conclusions

Section 0 includes a description of the expected environmental impacts, as well as any cumulative impacts resulting from the alternatives considered in this document. The preferred alternatives are not associated with significant impacts to the biological, social or economic, or physical environment individually or in conjunction with other actions under the National Environmental Protection Act (NEPA); therefore, a Finding of No Significant Impact (FONSI) is warranted.

Table 1: Summary of expected impacts of the alternatives considered in this document, relative to the *status quo* alternatives (alternatives 1A and 2A). The *status quo* alternatives are compared to the baseline environmental conditions. A minus sign (-) signifies a negative impact, a plus sign (+) signifies a positive impact, and zero (0) indicates a neutral impact. “Sl” indicates a slight effect. A symbol without “Sl” signifies a moderate impact. “Mixed” refers to both positive and negative impacts.

Alternative Set	Alternative	Biological	Habitat	Protected Species	Socio-economic
1: Northern GRA Alternatives	1A: *Status Quo* Northern GRA **(preferred)**	+	Sl-/Sl+	Sl-/Sl+	Mixed
	1B: Northern GRA Expanded into Statistical Area 613	Sl+	0/Sl+	0/Sl+	0/Sl-
	1C: Eliminate Northern GRA	-	0/Sl-	0/Sl-	+
2: Southern GRA Alternatives	2A: *Status Quo* Southern GRA	+	Sl-/Sl+	Sl-/Sl+	Mixed
	2B: 2012 AP Proposal	0/Sl-	0/Sl-	0/Sl-	Sl+/+
	2C: Alternative 2B with Coral Areas Removed	0/Sl-	0/Sl-	0/Sl-	Sl+/+
	2D: Area 632 Removed from Southern GRA	0/Sl-	0/Sl-	0/Sl-	0/Sl+
	2E: January 2016 AP Proposal	Sl-/-	0/Sl-	0/Sl-	+
	2F: Modified January 2016 AP Proposal	Sl-/-	0/Sl-	0/Sl-	+
	2G: Combination of Alternatives 2B and 2E **(preferred)**	Sl-/-	0/Sl-	0/Sl-	+
	2H: Southern GRA Expanded into Area 616	+	+	+	-
	2I: Eliminate Southern GRA	-	0/Sl-	0/Sl-	+

2. LIST OF ACRONYMS AND ABBREVIATIONS

ACL	Annual Catch Limit
AM	Accountability Measure
ASMFC	Atlantic States Marine Fisheries Commission
ATGTRS	Atlantic Trawl Gear Take Reduction Strategy
ATGTRT	Atlantic Trawl Gear Take Reduction Team
CEA	Cumulative Effects Assessment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
Council	Mid-Atlantic Fishery Management Council
CPUE	Catch per Unit Effort
CS	Consumer Surplus
DPS	Distinct Population Segment
DPSWG	Data Poor Stocks Working Group
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fishing Mortality Rate
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
GRA	Gear Restricted Area
IRFA	Initial Regulatory Flexibility Analysis
MMPA	Marine Mammal Protection Act
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
NOAA	National Oceanic and Atmospheric Administration
NEFSC	Northeast Fisheries Science Center
NEFOP	Northeast Fisheries Observer Program
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PRA	Paperwork Reduction Act
PS	Producer Surplus
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SBA	Small Business Administration
VEC	Valued Ecosystem Component
VTR	Vessel Trip Report

3. CONTENTS, TABLES, AND FIGURES

3.1. Contents

3.2. TABLES

3.3. FIGURES

4. INTRODUCTION AND BACKGROUND

This framework was developed in accordance with the Magnuson-Stevens Fishery Conservation and Management Act (MSA)[1], NEPA, and the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan (FMP). The FMP and subsequent amendments describe the management regime for these fisheries and can be found at: http://www.mafmc.org.

The Environmental Assessment (EA) contained in this document (sections 0 - 0) examines the impacts of each management alternative on the human environment. The aspects of the human environment that are likely to be directly or indirectly affected by the actions proposed in this document are described as valued ecosystem components (VECs; Beanlands and Duinker 1984). These VECs comprise the affected environment. The VECs for this framework are:

- The managed stocks most directly affected by the Scup GRA regulations (i.e. scup, longfin squid, black sea bass, and silver hake) and non-target species caught in fisheries for those stocks;
- Habitat for the managed stocks and non-target species;
- Species afforded protection under the Endangered Species Act (ESA; i.e. species listed as endangered or threatened) and/or the Marine Mammal Protection Act (MMPA), and
- Human communities (the social and economic aspects of the affected environment).

The impacts of the alternatives are evaluated with respect to these VECs.

4.1. PURPOSE AND NEED

The purpose of this framework is to implement measures to modify the Scup GRAs. This action is needed to maintain low levels of scup discards in small-mesh fisheries while allowing those fisheries to access longfin squid.

The Scup GRAs were designed to reduce discard mortality of juvenile scup in small-mesh fisheries. The Scup GRAs are thought to have reduced the discard mortality of small scup, lead to improved post-recruitment survival of those small scup, and contributed to the rebuilding of the scup stock (Tercerio and Miller 2014).

This framework was initiated in response to requests from commercial fishing industry members who requested modifications to the boundaries of the Southern GRA in order to regain access to important winter fishing areas for longfin squid. The size of the scup stock has increased considerably since the GRAs were last modified in late 2004. In addition, a new discard estimation methodology has been implemented, allowing for analysis of discards at a finer spatial scale than was previously possible (NEFSC 2015A). The alternatives considered in this

[1] MSA portions retained plus revisions made by the MSA Reauthorization Act of 2006.

framework are informed by the most recent information on scup stock status, scup discards in and near the GRAs, and by input from commercial fishing industry members.

4.2. BACKGROUND ON SCUP GRAs

The Council develops regulations for scup fisheries in Federal waters. The Council submits these regulations to the NMFS Greater Atlantic Regional Administrator to consider for implementation. The Regional Administrator reviews the Council's recommendations and approves and implements them if they are determined to achieve FMP objectives and meet statutory requirements.

The current Scup GRA regulations include a Northern GRA, which is in effect from November 1 through December 31 and a Southern GRA, which is in effect from January 1 through March 15 (Table 2 and Table 3, Figure 1). All trawl vessels that fish for or possess longfin squid, black sea bass, or silver hake (also known as whiting) in either GRA during the effective times of year must fish with nets that have a minimum mesh size of 5.0 inches diamond mesh (the minimum mesh size for the directed commercial scup fishery; 50 CFR §648.124).

The Scup GRAs were first implemented in November 2000 through the annual specifications for the summer flounder, scup, and black sea bass fisheries (65 *Federal Register* 33386, May 24, 2000). The GRAs were developed in response to recommendations from the 27th Stock Assessment Review Committee (SARC) and the Council's Summer Flounder, Scup, and Black Sea Bass Monitoring Committee. The 27th SARC concluded that "the scup stock is over-exploited and at a low biomass level… Although discard estimates are uncertain, the majority of fishing mortality in recent years is clearly attributable to discards, particularly when incoming recruitment is strong. Reduction in fishing mortality due to discards from small-mesh fisheries will have the most positive impact on the stock" (NEFSC 1998). The Monitoring Committee recommended that the Council develop regulations to close certain areas with high abundances of juvenile scup to fishing with trawl net mesh sizes smaller than 4.5 inches in diameter (the minimum mesh size required in the directed commercial scup fishery at the time).

The Council followed the advice of the SARC and the Monitoring Committee and developed a proposal for Scup GRAs. NMFS did not approve the Council's proposal and instead implemented two GRAs which were much larger in size than the GRAs proposed by the Council. The original Northern Scup GRA implemented by NMFS was designed to include Federal waters off of Massachusetts, Rhode Island, and New York out to approximately 100 fathoms from November 1 through December 31. The Southern GRA was designed to encompass Federal waters off New Jersey and Delaware out to approximately 100 fathoms from January 1 through April 30. These initial GRAs applied to vessels fishing for or possessing longfin squid, black sea bass, silver hake, and Atlantic mackerel (listed in the regulations as "non-exempt species"). Discard estimates suggested that when these species were targeted in the GRAs, scup discards made up at least 10% of the catch by weight. Vessels possessing other species were exempt from the GRA regulations (65 *Federal Register* 33490, May 24, 2000).

Several members of the commercial fishing industry opposed the initial GRAs due to their large size, claiming they would cause severe economic hardships for small-mesh fisheries. Based on industry concerns and an analysis suggesting that the GRAs could be reduced in size without compromising the conservation benefits to scup, the Council and NMFS modified the GRAs in late 2000, significantly reducing their size. NMFS also permanently exempted the Atlantic mackerel fishery from the GRAs after considering data suggesting that the GRAs would have a minimal impact on reducing scup discards in the Atlantic mackerel fishery (65 *Federal Register* 81761, December 27, 2000).

The Council and NMFS modified the GRAs again in early 2001. This modification removed Hudson Canyon and surrounding areas from the GRAs in response to industry requests. Hudson Canyon is an important winter fishing area for several small-mesh fisheries. This modification also widened the Southern GRA and expanded it to the south to include areas with high concentrations of scup in the winter (66 *Federal Register* 12902, March 1, 2001).

The Council and NMFS modified the GRAs again in late 2004, shifting the Southern GRA by 3 longitudinal minutes to the west. An analysis suggested that this modification would expose an additional 3% of the scup stock to small-mesh gear during the effective period, while restoring access to an additional 8% of the longfin squid stock (70 *Federal Register* 303, January 4, 2005). The GRAs have not been modified since this time.

The scup stock has expanded substantially since the GRAs were last modified in late 2004. Scup were declared rebuilt in 2009 based on the results of a benchmark stock assessment (DPSWG 2009). The most recent scup benchmark stock assessment took place in 2015 and concluded that scup was not overfished and overfishing was not occurring in 2014. Scup spawning stock biomass (SSB) in 2014 was estimated to be about 405 million pounds, approximately 210% of SSB at maximum sustainable yield (SSB_{MSY}; NEFSC 2015A).

In recent years, some commercial fishing industry advisors recommended that the Council modify the boundaries of the Scup GRAs in order to restore access to certain areas for longfin squid fishing, arguing that modifications to the GRA boundaries would not harm the scup stock given that scup SSB is so high. At the request of the Council, the Northeast Fisheries Science Center (NEFSC) analyzed data on scup discards in the GRA areas from 1989 through 2013. This analysis suggests that from 1989 through 2013 most commercial fishery scup discards occurred in small-mesh tows in statistical areas that now include GRAs and that scup discards have decreased since GRA implementation. The authors concluded that “the GRAs have likely reduced the discard mortality of small scup, and are responsible for the improved post-recruitment survival of these small scup”. The analysis also suggests that in recent years relatively high scup discards occurred in areas outside of the GRAs as well as within the GRAs during times of the year when the GRAs are not in effect (Terceiro and Miller 2014).

In February 2014 the Council considered the NEFSC analysis and discussed management alternatives for a framework action to modify the GRAs. The Council postponed further development of the framework in June 2014. At the time, the Council was developing alternatives for deep sea coral protection zones, which overlapped with the scup GRAs (81 *Federal Register* 60666, September 2, 2016). The Council discussed the GRA framework again in December 2015, February 2016, and April 2016. The alternatives considered, including the preferred alternative selected by the Council in April 2016, are described in section 0 of this document.

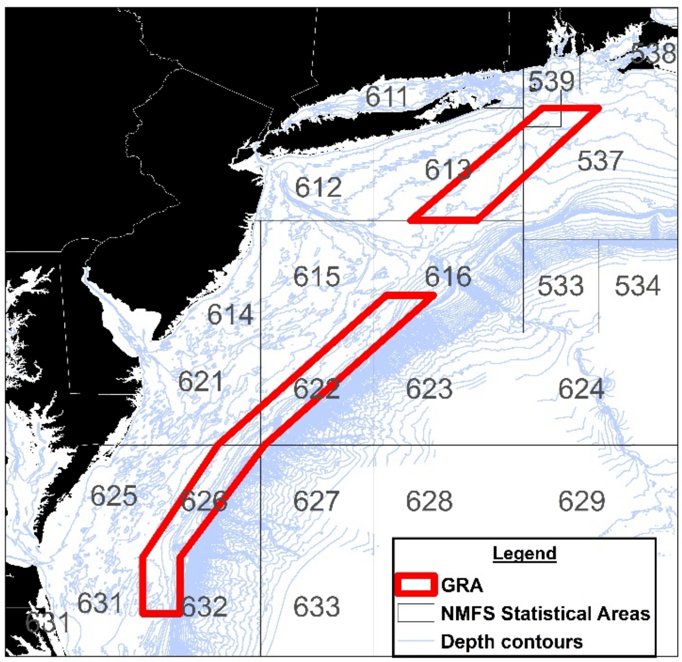


Figure 1: Current scup Gear Restricted Areas.

Table 2: Coordinates for the Northern Scup GRA. The boundary of the Northern GRA is defined by straight lines connecting the points below in the order below (50 CFR §648.124).

Point	N. latitude	W. longitude
NGA1	41°00′	71°00′
NGA2	41°00′	71°30′
NGA3	40°00′	72°40′
NGA4	40°00′	72°05′
NGA1	41°00′	71°00′

Table 3: Coordinates for the Southern Scup GRA. The boundary of the Southern GRA is defined by straight lines connecting the points below in the order below (50 CFR §648.124).

Point	N. latitude	W. longitude
SGA1	39°20′	72°53′
SGA2	39°20′	72°28′
SGA3	38°00′	73°58′
SGA4	37°00′	74°43′
SGA5	36°30′	74°43′
SGA6	36°30′	75°03′
SGA7	37°00′	75°03′
SGA8	38°00′	74°23′
SGA1	39°20′	72°53′

5. MANAGEMENT ALTERNATIVES

The action alternatives described in this document would modify the boundaries of or eliminate either of the current Scup GRAs. Each alternative is described in detail in the following sections.

5.1. Alternative Set 1: Northern GRA Alternatives

Alternative set 1 contains three alternatives for the Northern GRA.

5.1.1. Alternative 1A: *Status Quo* Northern GRA (Preferred Northern GRA Alternative)

Alternative 1A is the *status quo*/no action alternative for the Northern GRA. Under this alternative, the regulations for the Northern GRA would remain unchanged. The current regulations for the Northern GRA are described in section 4 of this document and at 50 CFR §648.124. Alternative 1A is the preferred Northern GRA alternative.

5.1.2. Alternative 1B: Expand the Northern GRA into Statistical Area 613

Alternative 1B would expand the boundaries of the Northern GRA to encompass more of NMFS statistical area 613 (Figure 2). Alternative 1B represents about a 63% increase in the size of the Northern GRA (Table 4).

This alternative is informed by the 2014 NEFSC analysis of scup discards (Terceiro and Miller 2014). This analysis shows that relatively high amounts of scup discards occurred in tows which used mesh 2.125 inches or smaller in diameter (the mesh size typically used to target squid) in statistical area 613 in November and December from 1989 through 2013. Since implementation of the GRAs, scup discards in small-mesh[2] tows in the Northern GRA statistical areas during the last quarter of the year[3] have generally been much lower than prior to implementation of the GRAs (Figure 3).

Table 4: Approximate size of Northern GRA alternatives.

Alternative	Area (square nautical miles)	Difference from *status quo* Northern GRA
1A: *Status quo* Northern GRA	1,489	0%
1B: Expand Northern GRA into statistical area 613	2,434	+63%
1C: Eliminate the Northern GRA	0	-100%

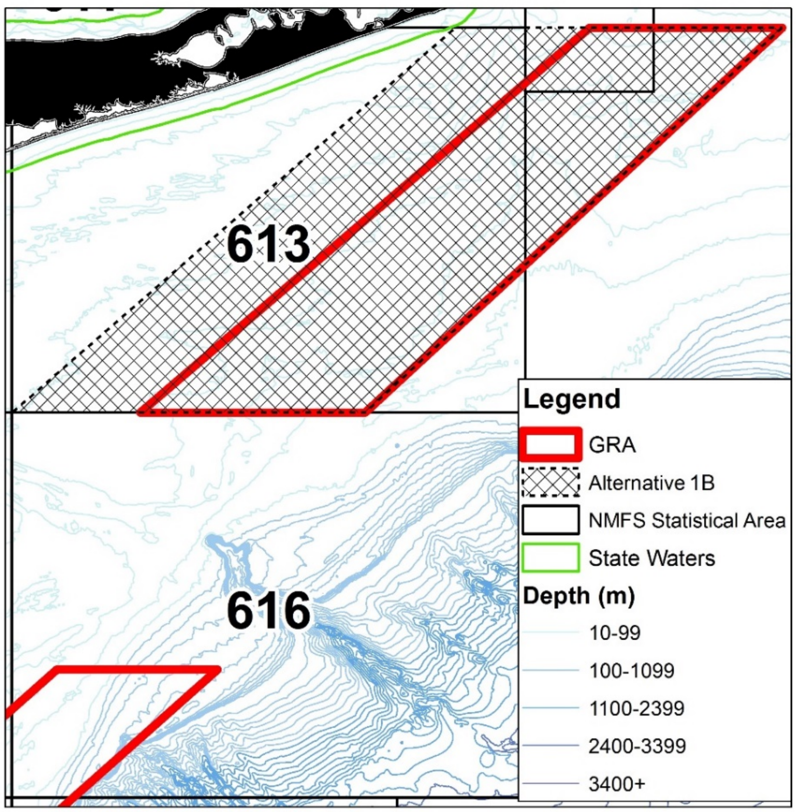


Figure 2: Alternative 1B shown with the current Scup GRA boundaries.

[2] As in other sections of this document, "small-mesh" refers to mesh smaller than the minimum mesh size required in the directed scup fishery (either 4.5 or 5.0 inches in diameter, depending on the year).

[3] The scup discard estimates used in Terceiro and Miller (2014) and in the 2015 benchmark stock assessment (NEFSC 2015A) are estimated by calendar quarter, by statistical area, and by three mesh size categories.

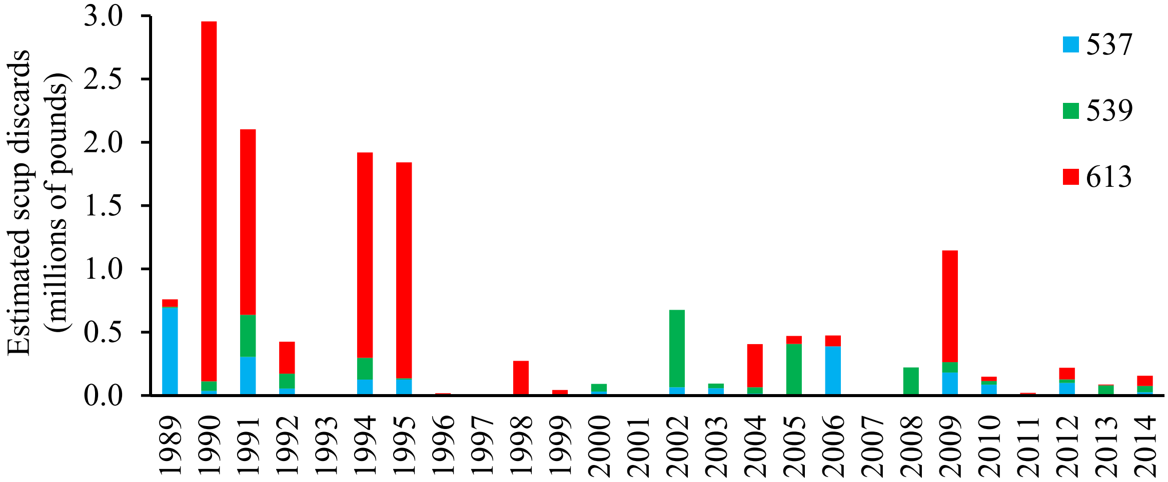


Figure 3: Estimated scup discards in small-mesh trips in the Northern GRA statistical areas (537, 539, and 613) during the fourth quarter of the year from 1989 through 2014. Small-mesh refers to mesh smaller than the minimum mesh size required in the directed scup fishery (either 4.5 or 5.0 inches in diameter, depending on the year).

5.1.3. Alternative 1C: Eliminate the Northern GRA

Under alternative 1C, the Northern Scup GRA would be eliminated from the regulations. Vessels fishing for or possessing longfin squid, black sea bass, or silver hake would no longer be prohibited from using mesh smaller than 5.0 inches in diameter in the Northern GRA from November 1 through December 31 unless prohibited from doing so by other regulations.

5.2. Alternative Set 2: Southern GRA Alternatives

Alternative set 2 includes nine alternatives for the Southern GRA.

5.2.1. Alternative 2A: *Status Quo* Southern GRA

Alternative 2A is the *status quo*/no action alternative for the Southern GRA. Under this alternative the regulations for the Southern GRA would remain unchanged. The current regulations for the Southern GRA are described in section 4 of this document and at 50 CFR §648.124.

5.2.2. Alternative 2B: 2012 AP Proposal

Alternative 2B includes modifications to the eastern boundary of the Southern GRA based on a 2012 proposal by a commercial scup and longfin squid fisherman and a member of both the Council's Mackerel, Squid, and Butterfish AP and Summer Flounder, Scup, and Black Sea Bass AP. This modification is intended to restore access to certain canyon areas for longfin squid fishing. This modification represents about a 7% decrease in the size of the Southern GRA (Table 5, Figure 4).

Table 5: Approximate size of Southern GRA alternatives.

Alternative	Area (square nautical miles)	Difference from *status quo* Southern GRA
2A: *Status quo* Southern GRA	3,117	0%
2B: 2012 AP proposal	2,887	-7%
2C: Alternative 3A with modification for coral zones	2,868	-8%
2D: Statistical area 632 removed from Southern GRA	2,635	-15%
2E: January 2016 AP proposal	2,009	-36%
2F: Modified January 2016 AP proposal	2,140	-31%
2G: Combination of alternatives 3A and 3D	2,086	-33%
2H: Southern GRA expanded into statistical area 616	3,996	+28%
2I: Eliminate the Southern GRA	0	-100%

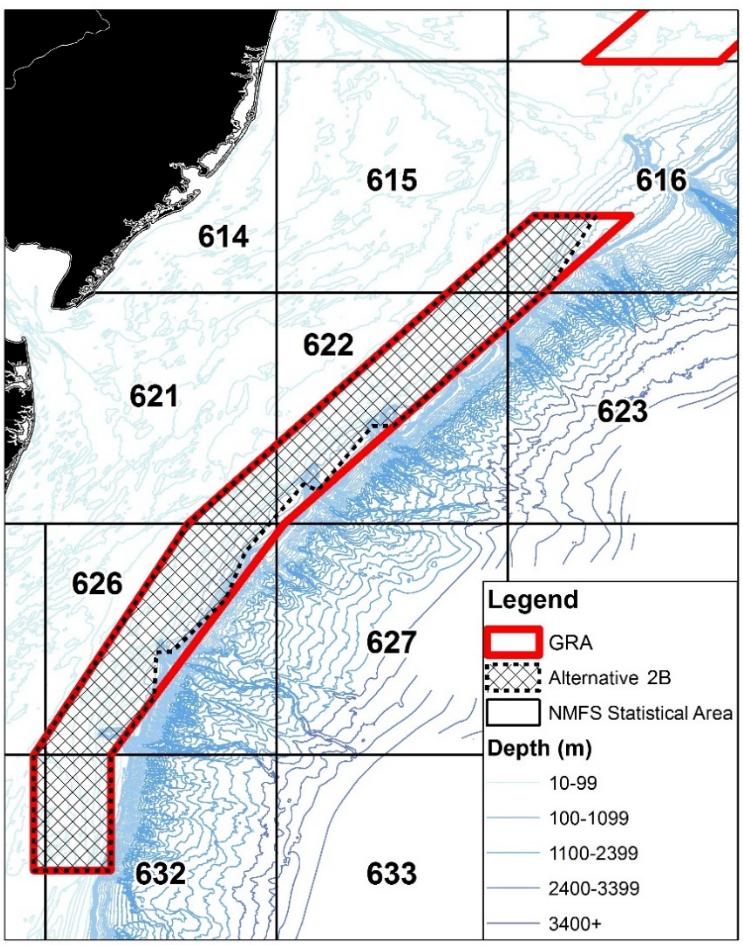


Figure 4: Alternative 2B shown with the current scup GRA boundaries.

5.2.3. Alternative 2C: Alternative 2B Adjusted for Coral Zones

Alternative 2C would modify the eastern boundary of the Southern GRA as proposed in alternative 2B and would also remove areas of overlap with the discrete and broad zones recommended by the Council in June 2015 as part of the Deep Sea Coral Amendment to the Mackerel, Squid, and Butterfish FMP (81 *Federal Register* 60666, September 2, 2016). These zones have not yet been approved by GARFO and have not yet been implemented. If approved, all bottom tending gear, including the trawl gear subject to the Scup GRA regulations, will be prohibited in the coral zones year-round. Alternative 2C represents about an 8% decrease in the size of the Southern GRA (Table 5, Figure 5).

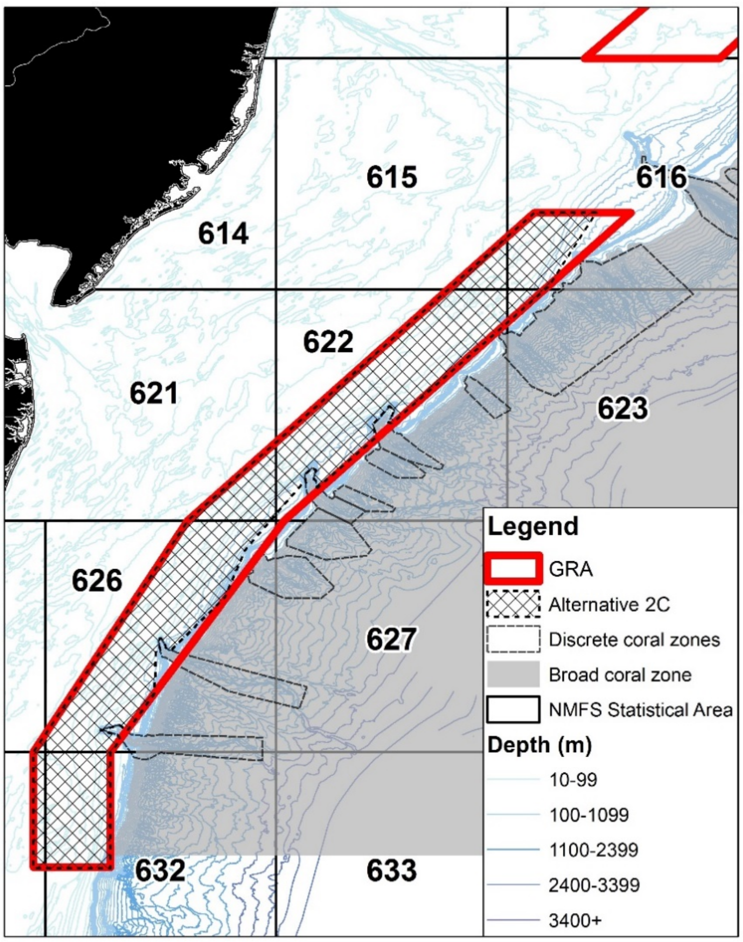


Figure 5: Alternative 2C shown with the current scup GRA boundaries and the discrete and broad coral zones.

5.2.4. Alternative 2D: Statistical Area 632 Removed from the Southern GRA

Alternative 2D would remove statistical area 632 from the Southern GRA. This alternative is informed by the 2014 NEFSC analysis of scup discards (Terceiro and Miller 2014). Between 1989 and 2013, 90 pounds of scup discards were observed in statistical area 632. Of all the statistical areas included in the GRAs, only statistical area 627 had fewer observed discards (40 pounds) during 1989-2013 (Terceiro and Miller 2014). Because so few scup discards have been observed in statistical area 632, both before and after implementation of the GRAs, it is assumed that statistical area 632 is not significantly contributing to the conservation benefits of GRAs. Under alternative 2D, statistical area 631 would also be removed from the Southern GRA. A small part of statistical area 631 became part of the Southern GRA in late 2004 when the Southern GRA was moved three longitudinal minutes to the west. This alternative would result in a 15% decrease in the size of the Southern GRA (Table 5, Figure 6).

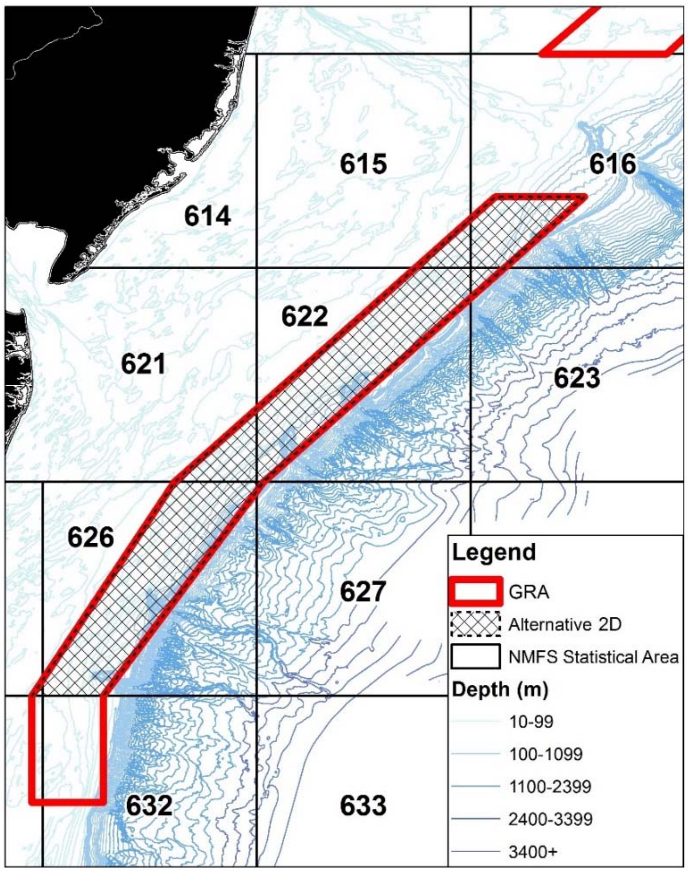


Figure 6: Alternative 2D shown with the current GRA boundaries.

5.2.5. Alternative 2E: January 2016 AP Proposal

Alternative 2E would modify the boundaries of the Southern GRA based on a proposal developed by several AP members in January 2016 (Figure 7). Like alternatives 2B and 2C, this proposal is intended to restore access to important fishing areas for longfin squid. The eastern boundary of the Southern GRA under this alternative roughly approximates the 55 and 60 fathom contours (depending on the area). The advisors who developed this proposal excluded statistical area 632 from the modified Southern GRA because, as previously described, very low amounts of scup discards were observed in that area from 1989 through 2013 (Terceiro and Miller 2014). Alternative 2E represents a 36% decrease in the size of the Southern GRA (Table 5).

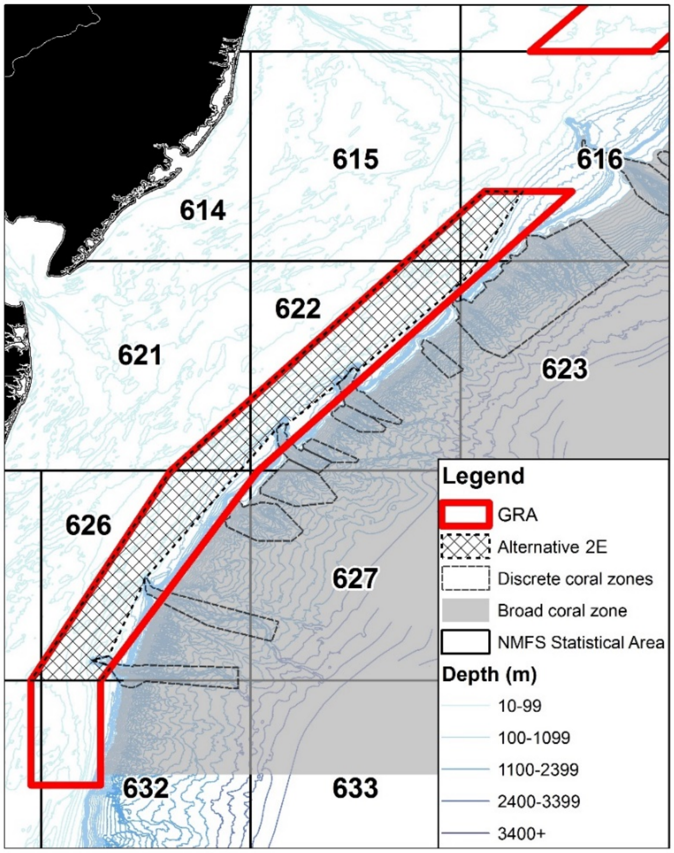


Figure 7: Alternative 2E shown with the current Southern GRA boundaries and the discrete and broad coral protection zones.

5.2.6. Alternative 2F: Modified January 2016 AP Proposal

Alternative 2F is identical to alternative 2E, but with areas of overlap with statistical area 616 left unchanged (Figure 8). This alternative is intended to restore access for small-mesh fisheries to depths of about 55 fathoms and deeper in the areas between Carteret Canyon and Norfolk Canyon. Statistical area 616 continues to have relatively high amounts of scup discards, compared to the other statistical areas which are partly included in the Scup GRAs (Figure 9; Terceiro and Miller 2014). Most scup discards in statistical area 616 occurred in small-mesh fisheries. During 2000-2014 (years when the GRAs were in effect), 80% of scup discards in statistical area 616 during the first quarter of the year were from small-mesh fisheries and 20% were from large mesh fisheries (Figure 10). Alternative 2F represents a 31% decrease in the size of the Southern GRA (Table 5).

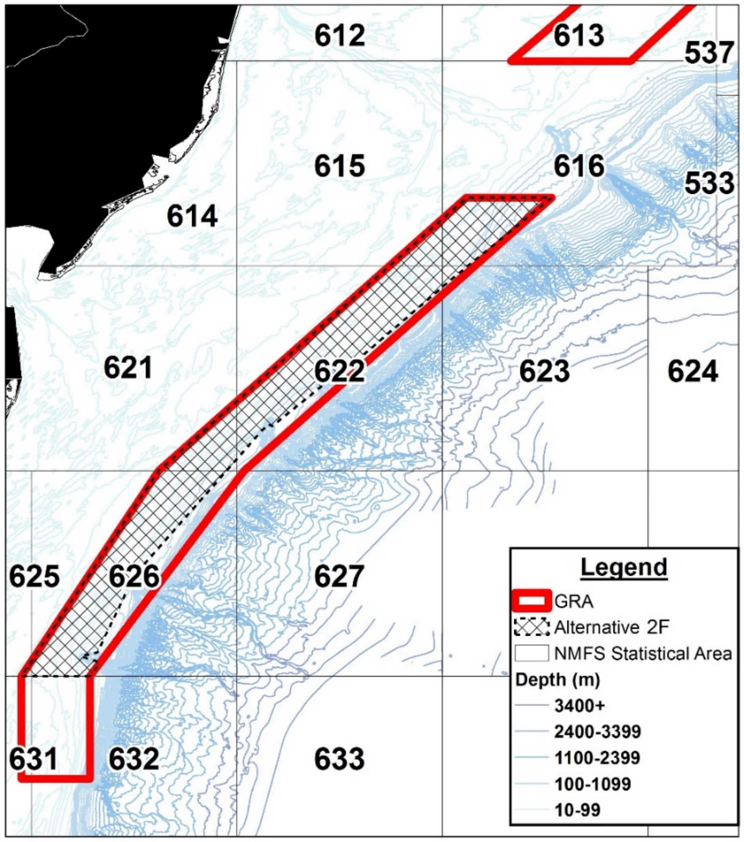


Figure 8: Alternative 2F shown with the current Southern GRA boundaries.

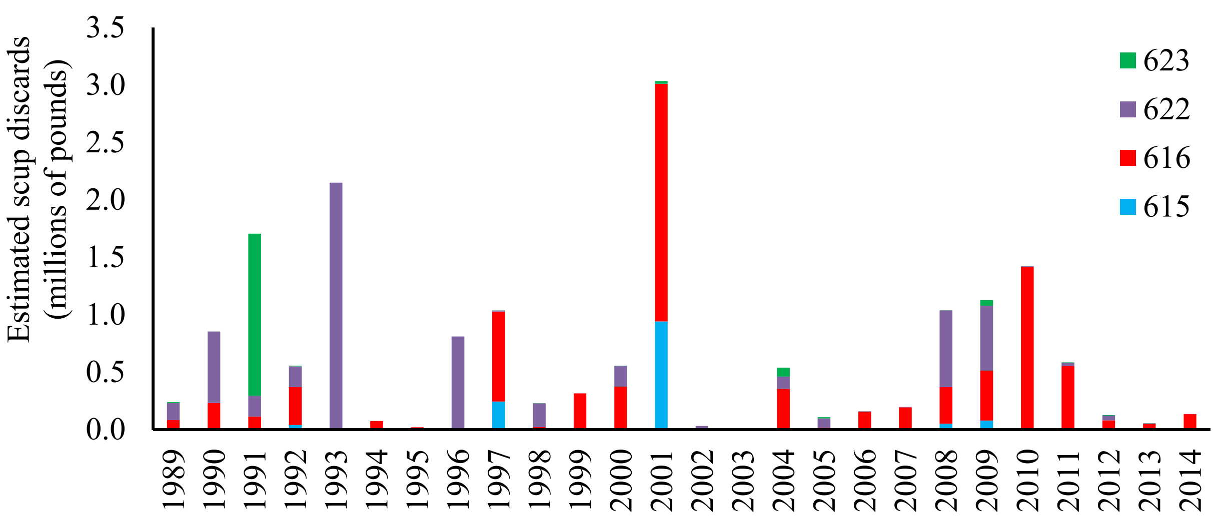


Figure 9: Estimated scup discards in small-mesh tows in the Southern GRA statistical areas during the first quarter of the year from 1989 through 2014. Statistical areas with fewer than 1 million pounds of estimated scup discards over this time period (i.e. statistical areas 621, 626, 631, 632) are not shown. Small-mesh refers to mesh smaller than the minimum mesh size required in the directed scup fishery (either 4.5 or 5.0 inches in diameter, depending on the year).

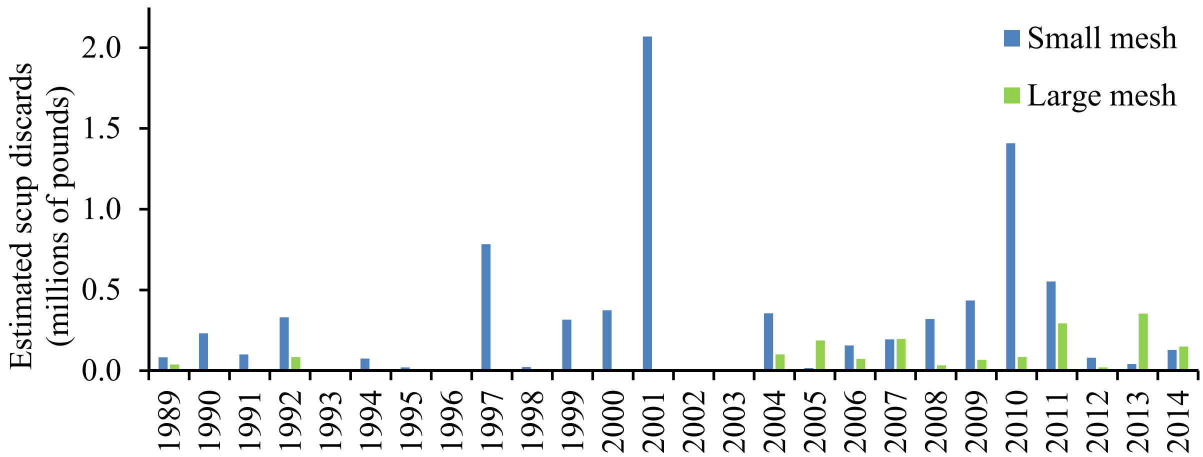


Figure 10: Estimated scup discards from small and large-mesh tows in statistical area 616 during the first quarter of the year from 1989 through 2014. "Small-mesh" refers to mesh smaller than the minimum mesh size required in the directed scup fishery (either 4.5 or 5.0 inches in diameter, depending on the year).

5.2.7. Alternative 2G: Combination of alternatives 2B and 2F (Preferred Southern GRA Alternative)

Alternative 2G is the preferred Southern GRA alternative. This alternative was suggested by six AP members prior to the April 2016 Council meeting and is intended to represent a compromise between alternatives 2E and 2F. Alternative 2G follows the boundary proposed by AP members in January 2016 (alternative 2E), except that in statistical area 616 the boundary follows the 2012 AP proposal (alternative 2B; Figure 11). Like alternative 2E, this alternative is intended to restore access to important fishing areas for longfin squid in areas approximately 55 to 60 fathoms and deeper. Alternative 2G would remove a smaller section of statistical area 616 from the Southern GRA than alternative 2E. In all other respects, alternative 2G is identical to alternative 2E. Alternative 2G represents about a 33% decrease in the size of the Southern GRA (Table 5).

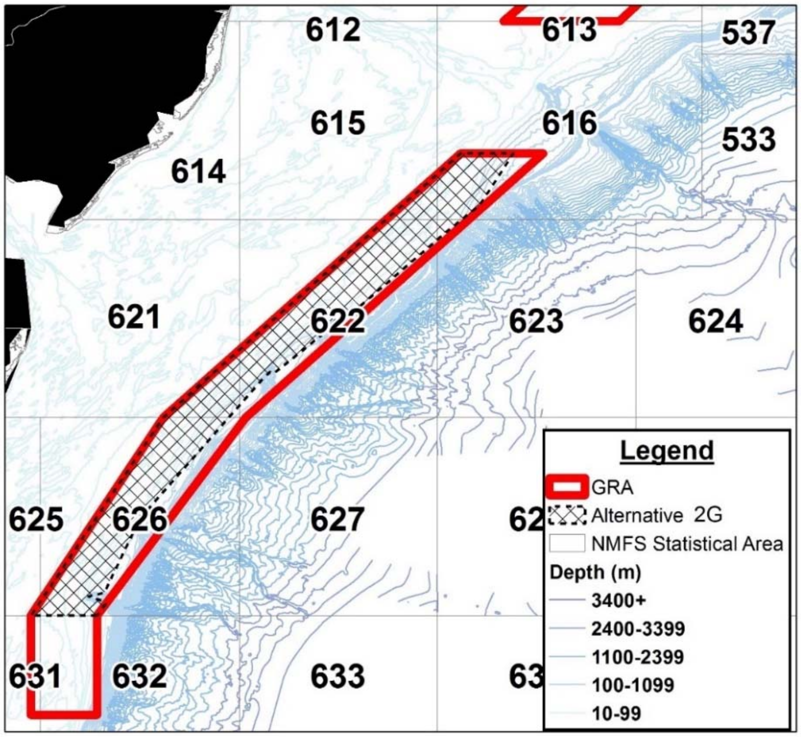


Figure 11: Alternative 2G shown with the current GRA boundaries.

Table 6: Coordinates for the Southern GRA under alternative 2G (the preferred Southern GRA alternative). The boundary of the Southern GRA is defined by straight lines connecting the points below in the order stated. An asterisk (*) indicates that the point is unchanged from the *status quo* Southern GRA. (C) indicates that the point is identical to a vertex of the proposed coral protection zones.

Point	N. latitude	W. longitude
SGA1	39° 20' N	72° 37' W
SGA2	39° 4.38' N	72° 47.22' W
SGA3	38° 28.65' N	73° 29.37' W
SGA4 (C)	38° 29.72' N	73° 30.65' W
SGA5 (C)	38° 26.32' N	73° 33.44' W
SGA6 (C)	38° 25.08' N	73° 34.99' W
SGA7 (C)	38° 13.15' N	73° 49.77' W
SGA8 (C)	38° 13.74' N	73° 50.73' W
SGA9 (C)	38° 11.98' N	73° 52.65' W
SGA10 (C)	37° 29.53' N	74° 29.95' W
SGA11 (C)	37° 29.43' N	74° 30.29' W
SGA12 (C)	37° 28.6' N	74° 30.6' W
SGA13 (C)	37° 6.97' N	74° 40.8' W

Table 6, continued: Coordinates for the Southern GRA under alternative 2G. The boundary of the Southern GRA is defined by straight lines connecting the points below in the order stated. An asterisk (*) indicates that the point is unchanged from the *status quo* Southern GRA. (C) indicates that the point is identical to a vertex of the proposed coral protection zones.

Point	N. latitude	W. longitude
SGA14 (C)	37° 5.83' N	74° 45.57' W
SGA15 (C)	37° 4.43' N	74° 41.03' W
SGA16	37° 3.5' N	74° 40.39' W
SGA17*	37° N	74° 43' W
SGA18*	37° N	75° 3' W
SGA19*	38° N	74° 23' W
SGA20*	39° 20' N	72° 53' W
SGA1	39° 20' N	72° 37' W

5.2.8. Alternative 2H: Southern GRA Expanded into Statistical Area 616

Under alternative 2H, the boundaries of the Southern GRA would be modified to include more of statistical area 616 (Figure 12). Alternative 2H represents a 28% increase in the size of the Southern GRA (Table 5).

This alternative is informed by the 2014 NEFSC analysis of scup discards. As described in section 5.2.6, area 616 continued to have relatively high amounts of scup discards after implementation of the GRAs (Figure 9; Terceiro and Miller 2014). Between 1989 and 2013, most scup discards in statistical area 616 during the first quarter of the year occurred in small-mesh fisheries. During 2000-2014 (years when the GRAs were in effect), 80% of scup discards in statistical area 616 during the first quarter of the year occurred in small-mesh fisheries and 20% occurred in large-mesh fisheries (Figure 10).

When the GRAs were first implemented in May 2000, both GRAs were much larger than their current configuration and the Southern GRA included about half of statistical area 616. Several fishing industry members expressed concern that the GRAs would cause severe economic hardships due to their large size. The GRA boundaries were modified shortly after their initial implementation to address this concern. Under this first modification, effective December 2000, both GRAs were greatly reduced in size and a second Northern GRA was added, which mostly fell within statistical area 616. This modification did not sufficiently address the concerns of several fishing industry members. Statistical area 616 includes Hudson Canyon, which is a productive fishing area for many species. When the GRAs were modified a second time, effective March 2001, the second Northern GRA was eliminated and much of statistical area 616 was removed from the GRAs (66 *Federal Register* 12902, March 1, 2001).

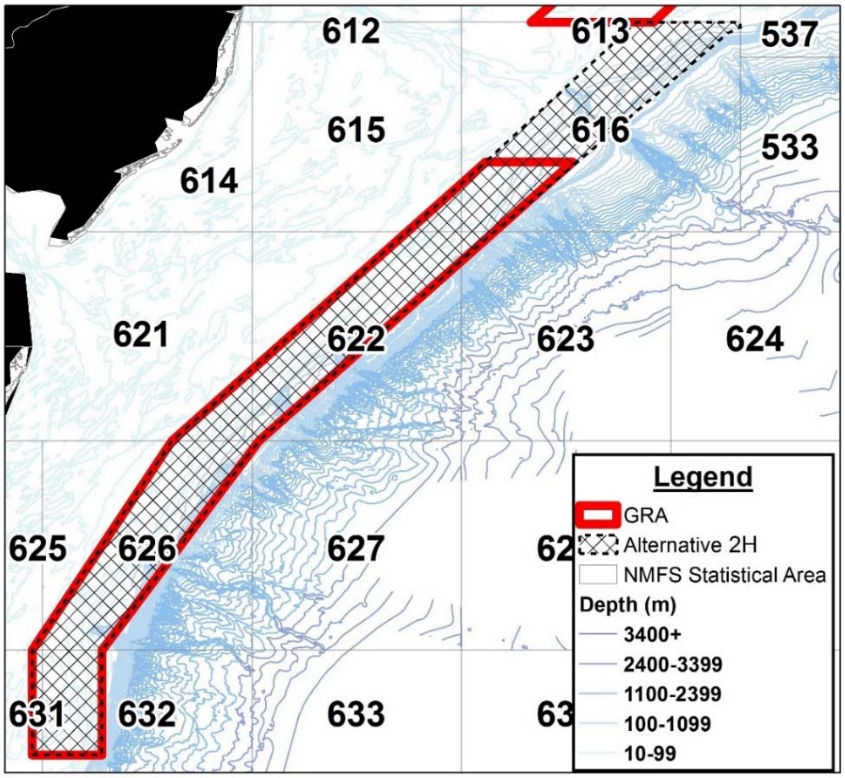


Figure 12: Alternative 2H shown with the current GRA boundaries.

5.2.9. Alternative 2I: Eliminate the Southern GRA

Under alternative 2I, the Southern Scup GRA would be eliminated from the regulations. Vessels fishing for or possessing longfin squid, black sea bass, or silver hake would no longer be prohibited from using mesh smaller than 5.0 inches in diameter in the Southern GRA from January 1 through March 15, unless prohibited from doing so by other regulations.

5.3. Considered but Rejected from Further Analysis

In December 2015, the Council decided not to include alternatives to modify the times of year when the GRAs are in effect as part of this framework. The Council considered a summary of scup discard estimates by month.[4] These data suggested that most scup discards during 2010-2014 occurred in tows using mesh smaller than 5.0 inches in diameter (the mesh size required in the directed scup fishery) but larger than 2.125 inches (the mesh size typically used to target squid) in statistical areas 537-539 and 611 during May and June, and in tows using mesh 2.125 inches or smaller in statistical area 616 during January through March. Based on this

[4] The scup discard estimates used in Terceiro and Miller (2014) and in the 2015 benchmark stock assessment (NEFSC 2015A) are estimated by calendar quarter, by statistical area, and by three mesh size categories. Using month as the time stratum degrades the precision of overall discard estimates and was therefore only used to make generalizations about the timing of discards for the purposes of assessing the effectiveness of the dates of the scup GRAs.

information, the Council decided that changes to the GRA dates would likely not substantially improve the effectiveness of the GRAs.

6. Description of the Affected Environment

6.1. Description of the Managed Resources

In addition to impacts on the scup resource itself, the scup GRAs primarily impact the longfin squid, black sea bass, and silver hake fisheries. This section contains a brief description of the biological condition of each of these stocks.

6.1.1. Scup

Scup were under a formal rebuilding plan from 2005 through 2009. NMFS declared the scup stock rebuilt in 2009 based on the findings of the Data Poor Stocks Working Group (DPSWG 2009).

The most recent benchmark stock assessment for scup took place in 2015 as part of the 60th Stock Assessment Work Group and Stock Assessment Review Committee (SAW/SARC 60). This assessment found that the scup stock was not overfished and overfishing was not occurring in 2014 relative to the new biomass reference points. SSB was estimated to be 403 million pounds in 2014, about 210% of the SSB_{MSY} proxy (i.e. $SSB_{40\%}$) of 192 million pounds. Fishing mortality (F) in 2014 was estimated to be 0.127, about 57% of the F_{MSY} proxy (i.e. $F_{40\%}$) of 0.220 (NEFSC 2015A).

6.1.2. Longfin Squid

The longfin squid stock exhibits dramatic annual fluctuations in abundance. The life history characteristics of short-lived squid species such as longfin squid present unique challenges for stock assessments. Most traditional approaches used for finfish species have not been successfully applied to squid stocks (Boyle and Rodhouse 2005). The most recent longfin squid stock assessment (NEFSC 2010) indicated that the longfin stock was not overfished in 2009. Overfishing status could not be determined because no overfishing threshold was recommended due to a lack of a clear statistical relationship between catch and biomass estimates. The assessment produced a biomass estimate of approximately 120 million pounds based on the two-year average of catchability-adjusted NEFSC spring and fall survey biomass during 2008-2009. This biomass estimate is greater than the biomass threshold and the biomass target. The assessment and reviewers concluded that the stock appears to be lightly exploited (NEFSC 2010).

6.1.3. Black Sea Bass

Black sea bass are distributed from the Gulf of Maine through the Gulf of Mexico. Black sea bass north of Cape Hatteras, North Carolina are managed as a separate stock from black sea bass south of Cape Hatteras. The two stocks are also assessed separately. The southern black sea bass stock is not described in this document as it is found outside of the Scup GRAs and thus will not be impacted by this framework.

The protogynous life history (i.e. transitioning from female to male) and structure-orienting behavior of black sea bass pose challenges for analytical assessments of this species. Most stock assessments of Mid-Atlantic species rely heavily on data collected during the NEFSC's biannual bottom trawl survey, as well as other bottom trawl surveys. These surveys largely do not sample areas with physical structure that are used extensively by black sea bass for habitat.

The northern stock of black sea bass (i.e. black sea bass north of Cape Hatteras) was under a rebuilding plan from 2000 until 2009. The stock was declared rebuilt based on the findings of a 2008 benchmark stock assessment (DPSWG 2009). This remains the most recent benchmark stock assessment for black sea bass that has passed peer review and been accepted for use in management. A new benchmark assessment is planned for late 2016.

The most recent assessment update for black sea bass took place in 2012. This update indicated that the stock was not overfished and overfishing was not occurring in 2011 relative to the biological reference points from the last benchmark stock assessment. F was estimated to be 0.21 in 2011, about 48% of the F_{MSY} reference point of 0.44. SSB was estimated to be 24.6 million pounds in 2011, slightly above SSB_{MSY} reference point of 24.0 million pounds (NEFSC 2012).

6.1.4. Silver Hake

The silver hake stock is divided into two stock areas based on differences in silver hake morphology, population trends, and fishery patterns (NEFSC 2011). The northern silver hake stock is found in the Gulf of Maine and on northern Georges Bank and therefore will not be affected by this framework. The southern stock is distributed from southern Georges Bank to Cape Hatteras. The Scup GRAs are within the distribution of the southern silver hake stock.

The most recent benchmark assessment for silver hake indicated that the southern stock was not overfished and overfishing was not occurring relative to the biological reference points in 2009. The three-year survey biomass index was greater than the biomass threshold but below the biomass target. The three-year exploitation index for 2007-2009 was below the overfishing threshold and target (NEFSC 2011).

A 2014 assessment update indicated that the three-year average fall biomass index for the southern stock was well above the overfished threshold and the exploitation index was well below the overfishing threshold, meaning that the southern stock of silver hake was not overfished and overfishing was not occurring in 2013 (NEFMC 2014).

6.2. Habitat (Including Essential Fish Habitat)

6.2.1. Physical Environment

Greene et al. (2010) identified and described Ecological Marine Units (EMUs) in New England and the Mid-Atlantic based on sediment type, slope, relative depth, and benthic organisms.[5] According to this classification scheme, the Northern GRA, which spans depths of about 42 to 79 meters, is dominated by the "moderate flat sand" benthic habitat type (i.e. EMU; 49% by area), followed by the "moderate depression sand" EMU (22% by area) and the "moderate flat gravel" EMU (11% by area). "Moderate", in this context, refers to depth compared to surrounding areas. In total, thirteen different EMUs are found within the Northern GRA (Table 7, Figure 13). In general, the Northern GRA can be classified as largely flat (73% by area) and sandy (84% by area; Greene et al. 2010).

The Southern GRA is much larger than the Northern GRA and spans a greater range of depths, latitudes, and slopes. The Southern GRA is about 22 meters at its shallowest point and about 142 meters at its deepest. The Southern GRA is dominated by the "high flat sand" EMU (38% by area), followed by the "somewhat deep flat sand" EMU (16% by area) and the "high flat gravel" EMU (9% by area). Twenty-seven different EMUs are found within the Southern GRA (Table 8, Figure 13). Like the Northern GRA, the Southern GRA is largely flat (76% by area) and sandy (80% by area). Slope is more variable within the Southern GRA than within the Northern GRA, especially near the eastern boundary, which extends onto the continental slope.

Both GRAs are dominated by flat bathymetry and sandy sediments; however, they both contain small areas which are classified as "side slope" or "steep" and contain small areas of gravel and silt/mud substrates (Greene et al. 2010). In addition, several canyons, including Hudson, Wilmington, Baltimore, Washington, and Norfolk Canyons, intersect the existing GRAs and/or the boundaries of the GRAs under one or more of the GRA alternatives. These canyons generally have steep walls and outcroppings of bedrock and clay. Some of these canyons have a greater substrate variability and nutrient enrichment than surrounding areas and provide important habitat for a variety of species (Stevenson et al. 2004).

Table 7: Ecological Marine Units found within the Northern GRA (continued on next page; Greene et al. 2010).

Ecological Marine Unit	Percent of Northern GRA
Moderate flat sand	49%
Moderate depression sand	22%
Moderate flat gravel	11%
High flat sand	6%
Somewhat deep flat sand	5%

[5] See Greene et al. 2010 for a description of the methodology used to define EMUs.

Table 7, continued: Ecological Marine Units found within the Northern GRA.

Ecological Marine Unit	Percent of Northern GRA
Deep depression sand	3%
Moderate depression gravel	2%
High flat gravel	1%
High flat silt/mud	1%
Moderate flat silt/mud	1%
Side slope sand	<1%
Somewhat deep flat silt/mud	<1%
Side slope gravel	<1%

Table 8: Ecological Marine Units found within the Southern GRA (Greene et al. 2010).

Ecological Marine Unit	Percent of Southern GRA
High flat sand	38%
Somewhat deep flat sand	16%
High flat gravel	9%
Somewhat deep depression sand	6%
Somewhat deep flat gravel	5%
Side slope sand	4%
Deeper depression sand	3%
Moderate flat sand	3%
Deep depression sand	3%
Somewhat deep depression gravel	2%
Deep flat sand	2%
Deeper flat sand	2%
Steep sand	1%
Moderate depression sand	1%
Moderate flat gravel	1%
Deep depression gravel	1%
Low slope sand	1%
Deep flat gravel	1%
Deeper depression gravel	<1%
Moderate depression gravel	<1%
Deeper flat gravel	<1%
Side slope silt/mud	<1%
Steep silt/mud	<1%
Side slope gravel	<1%
High flat silt/mud	<1%
Low slope gravel	<1%
Deeper flat silt/mud	<1%

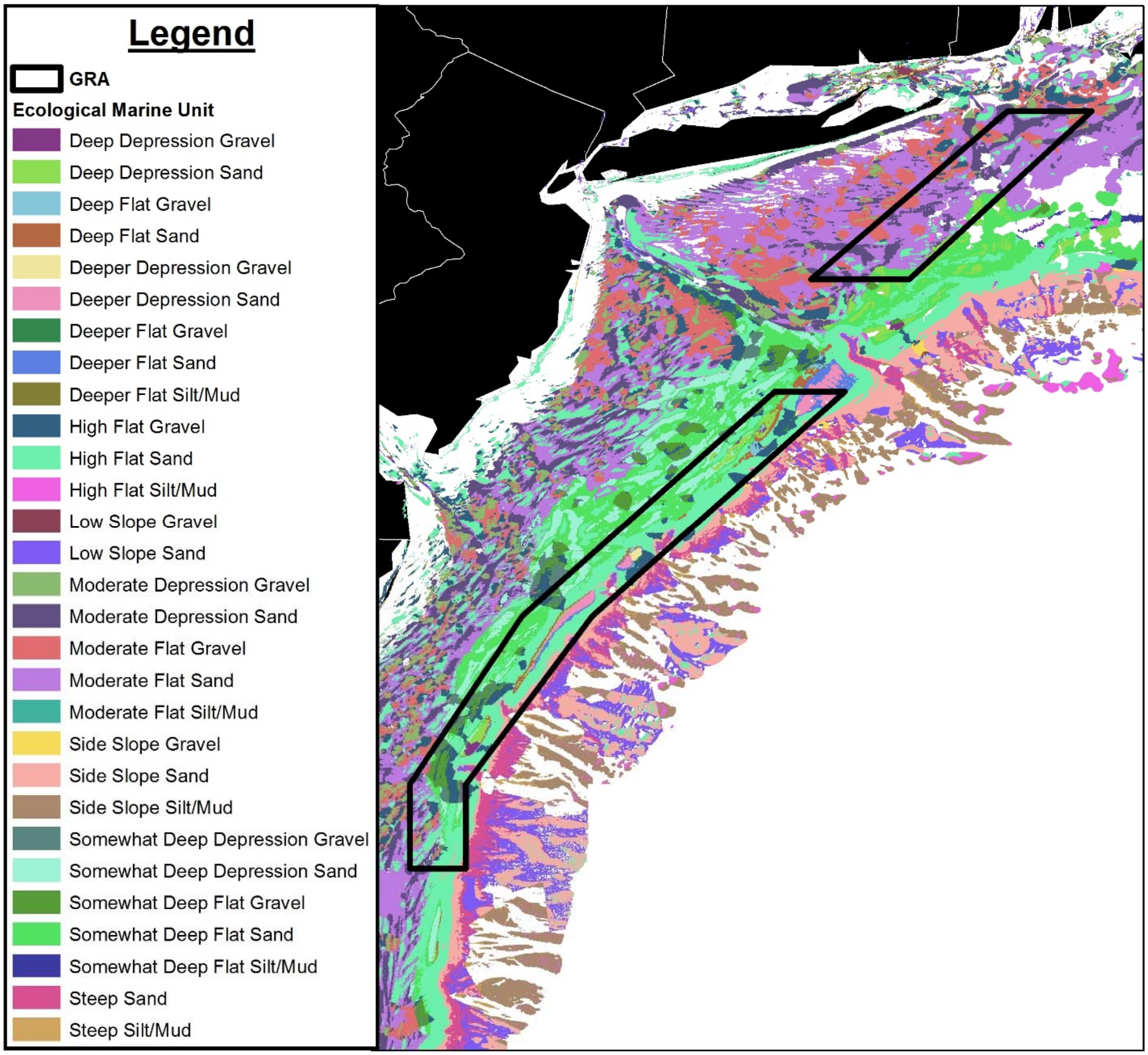


Figure 13: Ecological Marine Units found within the Scup GRAs (Greene et al. 2010).

6.2.2. Essential Fish Habitat (EFH)

The areas that could be affected by the alternatives described in this document overlap with EFH for a number of managed species. Information on EFH for managed species and life stages that are potentially vulnerable to bottom trawls and overlap with the Scup GRAs is shown in Table 9.

Table 9: Essential Fish Habitat for federally-managed species which overlaps with the Northern or Southern Scup GRAs (David Stevenson, personal communication; Stevenson et al. 2004). EFH that is vulnerable to impacts from bottom trawl gear are shaded in gray. At their shallowest point, the Scup GRAs are about 22 meters in depth. Because the Scup GRAs only regulate bottom trawl gear, any life stages found at depths less than 22 meters will not be impacted by the GRA alternatives.

Species	Life Stage	Scup GRA	Depth (Meters)	EFH Description	EFH Vulnerability to Bottom Trawls[6]
American plaice	Larvae	Northern	30-130	Surface waters	NA
Atlantic butterfish	Adult and juvenile	Northern and Southern	10-365	Pelagic waters (schools form over sandy, sandy silt, and muddy substrates)	NA
Atlantic butterfish	Eggs	Northern and Southern	0-1829	Pelagic waters	NA
Atlantic butterfish	Larvae	Northern and Southern	10-1829	Pelagic waters	NA
Atlantic cod	Adult	Northern	10-150	Rocks, pebbles, or gravel	M
Atlantic cod	Eggs	Northern	<110	Surface waters	NA
Atlantic cod	Larvae	Northern	30-70	Pelagic waters	NA
Atlantic herring	Adult	Northern and Southern	20-130	Pelagic waters and bottom habitats	NA
Atlantic herring	Juvenile	Northern and Southern	15-135	Pelagic waters and bottom habitats	NA
Atlantic herring	Larvae	Northern	50-90	Pelagic waters	NA
Atlantic mackerel	Adult	Northern and Southern	0-380	Pelagic waters	NA
Atlantic mackerel	Eggs	Northern and Southern	0-15	Pelagic waters	NA
Atlantic mackerel	Juvenile	Northern and Southern	0-320	Pelagic waters	NA
Atlantic mackerel	Larvae	Northern and Southern	10-130	Pelagic waters	NA
Atlantic surfclam	Adult	Southern	0-60, low density beyond 38	Throughout substrate to a depth of 3 ft	L
Atlantic surfclam	Juvenile	Northern and Southern	0-60, low density beyond 38	Throughout substrate to a depth of 3 ft	L
Black sea bass	Adult	Northern and Southern	20-50	Structured habitats (natural and manmade), sand and shell substrates preferred	H
Black sea bass	Juvenile	Northern and Southern	1-38	Rough bottom, shellfish/ eelgrass beds, manmade structures, offshore clam beds, and shell patches	H
Black sea bass	Larvae	Northern and Southern	<100	Estuaries, structured inshore habitat	H
Bluefish	Adult	Northern and Southern		Pelagic waters	NA
Bluefish	Eggs	Northern and Southern	Mid-shelf depths	Pelagic waters	NA

[6] NA= Not applicable, L = low vulnerability, M = moderate vulnerability, H = high vulnerability.

Table 9, continued: Essential Fish Habitat for federally-managed species which overlaps with the Northern or Southern Scup GRAs.

Species	Life Stage	Scup GRA	Depth (Meters)	EFH Description	EFH Vulnerability to Bottom Trawls
Bluefish	Juvenile	Northern and Southern		Pelagic waters	NA
Bluefish	Larvae	Northern and Southern	>15	Pelagic waters	NA
Clearnose skate	Adult and juvenile	Southern	0–500, most <111	Soft bottom and rocky or gravelly bottom	M
Golden tilefish		Southern	76-365	Rough bottom, small burrows, and sheltered areas; substrate rocky, stiff clay, human debris	H
Haddock	Juvenile	Northern and Southern	35-100	Pebble and gravel	H
Haddock	Larvae	Northern and Southern	30-90	Surface waters	NA
Little skate	Adult and juvenile	Northern	0-137, most 73 - 91	Sandy or gravelly substrate or mud	M
Longfin inshore squid	Adult	Northern and Southern	0-305	Pelagic waters	NA
Longfin inshore squid	Eggs	Northern and Southern		Pelagic waters	NA
Longfin inshore squid	Juvenile	Northern and Southern	0-213	Pelagic waters	NA
Monkfish	Adult and juvenile	Northern and Southern	25-200	Substrates of a sand-shell mix, algae-covered rocks, hard sand, pebbly gravel, or mud	L
Monkfish	Eggs	Northern and Southern	15-1000	Surface waters	NA
Monkfish	Larvae	Northern and Southern	25-1000	Pelagic waters	NA
Northern shortfin squid	Adult and juvenile	Northern and Southern	0-182	Pelagic waters	NA
Northern shortfin squid	Eggs	Southern		Pelagic waters	NA
Ocean pout	Eggs	Northern and Southern	<50	Generally sheltered nests in hard bottom in holes or crevices	H
Ocean pout	Juvenile	Northern and Southern	< 80	Bottom habitats, often smooth bottom near rocks or algae	H
Ocean pout	Adult	Northern and Southern	< 110	Bottom habitats; dig depressions in soft sediments	H
Ocean pout	Larvae	Northern and Southern	<50	Close proximity to hard bottom nesting areas	H
Ocean quahog	Adult and juvenile	Northern and Southern	8-245	Throughout substrate to a depth of 3 ft within federal waters	L
Offshore hake	Adult	Southern	150-380	Bottom habitats	L
Offshore hake	Eggs	Southern	<1250	Pelagic waters	NA
Offshore hake	Juvenile	Southern	170-350	Bottom habitats	L

Table 9, continued: Essential Fish Habitat for federally-managed species which overlaps with the Northern or Southern Scup GRAs.

Species	Life Stage	Scup GRA	Depth (Meters)	EFH Description	EFH Vulnerability to Bottom Trawls
Offshore hake	Larvae	Northern and Southern	<1250	Pelagic waters	NA
Pollock	Adult	Northern	15– 65	Hard bottom habitats including artificial reefs	M
Red crab	Adult	Southern	200-1300	Continental slope substrates of silts, clays, and all silt-clay- sand composites	L
Red crab	Eggs	Southern	200-400	Attached to the underside of the female crab until hatched (see adults)	NA
Red crab	Juvenile	Southern	700-1800	Continental slope substrates of silts, clays, and all silt-clay- sand composites	L
Red crab	Larvae	Southern	200-1800	Water column from surface to seafloor	NA
Red hake	Juvenile	Northern and Southern	< 100	Shell fragments, including areas with an abundance of live scallops	H
Red hake	Adult	Northern and Southern	10-130	In sand and mud, in depressions	M
Red hake	Eggs	Northern and Southern	--	Surface waters	NA
Red hake	Larvae	Northern and Southern	<200	Surface waters	NA
Rosette skate	Adult and juvenile	Southern	33-530, most 74-274	Soft substrate, including sand/mud bottoms	M
Scup	Adult	Northern and Southern	2-185	Demersal waters, inshore estuaries on various substrate types	L
Scup	Juvenile	Northern and Southern	0-38	Demersal waters, inshore on various sand, mud, mussel, and eelgrass bed substrates	M
Sea scallop		Northern and Southern	18-110	Cobble, shells, coarse/gravelly sand, and sand	L
Silver hake	Juvenile	Northern and Southern	20–270	All substrate types	M
Silver hake	Adult	Northern and Southern	30-325	All substrate types	L
Silver hake	Eggs	Northern and Southern	50-150	Surface waters	NA
Silver hake	Larvae	Northern and Southern	50-130	Surface waters	NA
Spiny dogfish	Adult	Northern and Southern	10-450	Continental shelf waters and estuaries	L
Spiny dogfish	Juvenile	Northern and Southern	10-390	Continental shelf waters and estuaries	L
Summer Flounder	Adult and juvenile	Northern and Southern	0-25	Demersal/estuarine waters, varied substrates. Mostly inshore in summer and offshore in winter.	L

Table 9, continued: Essential Fish Habitat for federally-managed species which overlaps with the Northern or Southern Scup GRAs.

Species	Life Stage	Scup GRA	Depth (Meters)	EFH Description	EFH Vulnerability to Bottom Trawls
Summer Flounder	Larvae	Northern and Southern	10-70	Pelagic waters	NA
White hake	Juvenile	Northern and Southern	5-225	Seagrass beds, mud, or fine grained sand	M
White hake	Adult	Northern and Southern	5-325	Mud or fine grained sand	L
White hake	Eggs	Northern and Southern		Surface waters	NA
White hake	Larvae	Northern and Southern		Pelagic waters	NA
Windowpane flounder	Adult	Northern and Southern	1-75	Mud or fine-grained sand	L
Windowpane flounder	Eggs	Northern and Southern	<70	Surface waters	NA
Windowpane flounder	Juvenile	Northern	1-100	Mud or fine-grained sand	L
Windowpane flounder	Larvae	Northern and Southern	<70	Pelagic waters	NA
Winter flounder	Adult	Northern and Southern	1-100	Mud, sand, and gravel	M
Winter flounder	Eggs	Northern and Southern	<5	Sand, muddy sand, mud, and gravel	L
Winter flounder	Juvenile	Northern and Southern	0-50	Mud or fine grained sand	L
Winter flounder	Larvae	Northern and Southern	<6	Pelagic and bottom waters	L
Winter skate	Adult and juvenile	Northern	0-371, most <111	Sand and gravel or mud	M
Witch flounder	Juvenile	Northern and Southern	50-450 to 1500	Fine grained substrate	M
Witch flounder	Adult	Northern and Southern	25-300	Fine grained substrate	M
Witch flounder	Eggs and larvae	Northern and Southern		Surface waters	NA
Yellowtail flounder	Adult and juveniles	Northern and Southern	20-50	Sand or sand and mud	M
Yellowtail flounder	Eggs	Northern and Southern	30-90	Surface waters	NA
Yellowtail flounder	Larvae	Northern and Southern	10-90	Surface waters	NA

6.2.3. Fishery Impact Considerations

The Scup GRAs regulate small-mesh trawl gear used in the longfin squid, black sea bass, and silver hake fisheries. Trawl fisheries for these species are pursued with bottom otter trawls. Otter trawl doors contacting the bottom generally produce furrows and can cause shifts in surface sediment composition. The duration of these impacts varies based on sediment type and other factors. Dynamic environments with less structured bottom composition typically experience shorter durations of impact than less dynamic environments with structured bottom. Bottom otter trawls can affect the composition and biomass of benthic species in the affected areas. The directionality and duration of these effects varies by substrate type, and also varies across different studies (Stevenson et al. 2004). The Northern and Southern GRAs are dominated by flat, sandy benthic habitats, which would be expected to experience relatively short duration of impacts from contact with bottom otter trawl gear. Both GRAs also contain relatively small areas with complex bathymetry, especially near the canyons (section 6.2.1). These areas would be expected to experience a greater duration of impacts from contact with bottom otter trawl gear than the flat, sandy areas that cover most of the sea floor within the GRAs.

Actions implemented through the Mackerel, Squid, and Butterfish FMP that affect species with overlapping EFH were assessed in Amendment 9 to that FMP (MAFMC 2008). In Amendment 9, the Council determined that bottom trawls used in mackerel, squid, and butterfish fisheries have the potential to adversely affect EFH for some federally-managed fisheries. As a result, 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. As previously described, the Mid-Atlantic Council also developed amendment 16 to the Mackerel, Squid, and Butterfish FMP which will prohibit 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 (Figure 5). This amendment has not yet been implemented (81 *Federal Register* 60666, September 2, 2016).

Actions implemented in the Summer Flounder, Scup, and Black Sea Bass FMP that affected species with overlapping EFH were considered Amendment 13 to that FMP (MAFMC 2002). The analysis in Amendment 13 indicated that no management measures were needed to minimize impacts to EFH because the trawl fisheries for summer flounder, scup, and black sea bass in Federal waters are conducted primarily in high energy mobile sand and bottom habitat where gear impacts are minimal and/or temporary in nature.

The New England Council's initial EFH amendment concluded that bottom-tending mobile gears, including those used to harvest silver hake, are associated with adverse impacts to habitat, the severity of which varies based on the weight of the gear. In order to address these adverse impacts in the small-mesh multispecies fishery (which includes the silver hake fishery), the New England Council developed requirements for raised footropes in most of the small-mesh exemption areas in the northern stock area. The raised footrope requirements were designed to make the trawls fish 1.5 to 2 feet off the bottom (though the trawl doors still contact the bottom), thus reducing adverse impacts to habitat (NEFMC 2012). The New England Council's Omnibus EFH Amendment 2, which is currently under review by NMFS, includes an updated analysis of the impacts of fisheries managed by the New England Fishery Management Council (including silver hake) on habitat and considers actions to minimize the adverse effects of fishing on EFH (NEFMC 2016).

There have been no major changes in the ways in which the small-mesh trawl fisheries for longfin squid, black sea bass, and silver hake are prosecuted since the effects of those fisheries on habitat were last evaluated. This framework is not expected to alter the manner in which these fisheries are pursued. For these reasons, no alternatives designed with the specific intent of minimizing adverse impacts on EFH are included in this document. The expected impacts of each of the alternatives on habitat (including EFH) are described in section 7.2.

6.3. ESA-Listed Species and MMPA Protected Species

Several species of fish, marine mammals, and sea turtles afforded protection under the ESA (i.e. for those designated as threatened or endangered) and/or the MMPA are found within and/or near the Scup GRAs as configured under each of the alternatives analyzed in this document. A subset of these species are known to have the potential to interact with bottom trawl gear (the only gear type that is regulated by the Scup GRAs; Table 10).

Several candidate species under the ESA are found within or near the Scup GRAs (Table 10). 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. The conference provisions under Section 7 of the ESA apply if a species is proposed for listing (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 document. Additional information can be found at http://www.nmfs.noaa.gov/pr/species/esa/candidate.htm

Table 10: Species protected under the ESA and/or MMPA that may occur in the affected environment of this framework action.

Species	Status	Potentially affected by this action?[a]
Cetaceans		
North Atlantic right whale (*Eubalaena glacialis*)	Endangered	No
Humpback whale (*Megaptera novaeangliae*)[b]	Protected	No
Fin whale (*Balaenoptera physalus*)	Endangered	No
Sei whale (*Balaenoptera borealis*)	Endangered	No
Blue whale (*Balaenoptera musculus*)	Endangered	No
Sperm whale (*Physeter macrocephalus*	Endangered	No
Minke whale (*Balaenoptera acutorostrata*)	Protected	Yes
Pilot whale (*Globicephala spp.*)[c]	Protected	Yes
Pygmy sperm whale (*Kogia breviceps*)	Protected	No
Dwarf sperm whale (*Kogia sima*)	Protected	No
Risso's dolphin (*Grampus griseus*)	Protected	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected	Yes
Short Beaked Common dolphin (*Delphinus delphis*)[d]	Protected	Yes
Atlantic Spotted dolphin (*Stenella frontalis*)	Protected	No
Striped dolphin (*Stenella coeruleoalba*)	Protected	No
Bottlenose dolphin (*Tursiops truncatus*)[e]	Protected	Yes
Beaked whales (*Ziphius and Mesoplodon spp*)[f]	Protected	No
Harbor porpoise (*Phocoena phocoena*)	Protected	Yes
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle (*Chelonia mydas*), North Atlantic DPS	Threatened[g]	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Atlantic salmon (*Salmo salar*)	Endangered	No

Table 10, continued: Species protected under the ESA and/or MMPA that may occur in the affected environment of this framework action.

Species	Status	Potentially affected by this action?[a]
Fish, continued		
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS	Threatened	Yes
New York Bight, Chesapeake Bay, Carolina, & South Atlantic DPSs	Endangered	Yes
Cusk (*Brosme brosme*)	Candidate	Yes
Thorny skate (*Amblyraja radiata*)	Candidate	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected	Yes
Gray seal (*Halichoerus grypus*)	Protected	Yes
Harp seal (*Phoca groenlandicus*)	Protected	Yes
Hooded seal (*Cystophora cristata*)	Protected	No
Critical Habitat		
Northwest Atlantic DPS of Loggerhead Sea Turtle		No

***Notes*:**

[a] Fay et al. 2006, NMFS 2013, NMFS 2014, NMFS 2015B, NMFS and USFWS 2005, Waring et al. 2014A, Waring et al. 2014B, Waring et al. 2015A, Waring et al. 2015B, Waring et al. 2016.

[b] 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 found in U.S. Atlantic waters, the West Indies DPS, is delisted under the ESA; however, this DPS is still protected under the MMPA

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

[d] Prior to 2008, this species was called "common dolphin."

[e] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins (Waring et al. 2014A).

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

[g] A final rule was issued on April 6, 2016 to remove the previous range-wide listing of green sea turtles and, in its place list 8 green sea turtle DPSs as threatened and 3 as endangered (81 *Federal Register* 20058). The green sea turtle DPS located in the Northwest Atlantic is the North Atlantic DPS and is listed as threatened.

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

Several protected species which occur within the affected environment of the proposed action are not likely to be affected by the alternatives described in this document (Table 10). The geographic range of some of these species is not known to overlap with the area primarily affected by the action. Other species have not been documented in interactions with bottom trawl gear (the only gear type affected by this action).

The alternatives are not expected to affect critical habitat of any of these species. This action will not affect the essential physical and biological features of loggerhead critical habitat and therefore will not result in the destruction or adverse modification of any species critical habitat (NMFS 2013, 2014, 2015B).

6.3.2. 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 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; Mitchell et al. 2003; 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 offshore of North Carolina and further south. Hard-shelled sea turtles can occur year-round off Cape Hatteras and south (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

Humpback, North Atlantic right, fin, sei, and minke whales are found throughout the Northwest Atlantic Ocean. In general, these species follow an annual pattern of migration between low latitude (south of 35ºN) wintering/calving grounds and high latitude spring/summer foraging grounds (primarily north of 41ºN; Waring et al. 2015A, 2016; NMFS 1991, 2005, 2010, 2011, 2012). It is not known if all individuals of a population migrate to low latitudes in the winter. Increasing evidence suggests that some portion of the population 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; Swingle et al. 1993; Vu et al. 2012; Waring et al. 2014A, 2015A, 2016). Although large whale movements and distribution in the winter is 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 2001; Kenney et al. 1986; Kenney *et al.* 1995; Mayo and Marx 1990; Payne et al. 1986, 1990; Schilling *et al*. 1992).

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; however, some species (e.g. harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (Waring et al. 2014A, 2015A, 2016).

6.3.2.4. Atlantic Sturgeon

The marine range of Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. Individuals from all five Distinct Population Segments (DPS) 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; Erickson et al. 2011; Wirgin et al. 2012; Waldman et al. 2013; O'Leary et al. 2014; Wirgin et al. 2015). Atlantic sturgeon are primarily found in depths of 50 meters or less; however, excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein et al. 2004A, 2004B; Dunton et al. 2010; Erickson et al. 2011). Atlantic sturgeon undertake seasonal movements along the coast but individuals may be present throughout the marine environment throughout the year (Dunton et al. 2010; Erickson et al. 2011).[7]

6.3.3. Gear Interactions and Protected Species

The Scup GRA regulations directly affect trawl vessels which use mesh smaller than 5.0 inches in diameter and fish for or possess longfin squid, black sea bass, or silver hake within the GRAs during certain times of the year. The vast majority of these species which are caught with trawl gear in and near the GRAs at the times of year when the GRAs are in effect are caught with bottom otter trawls; therefore, this section focuses on interactions between bottom otter trawls and those protected species of sea turtles, fish, and marine mammals known to interact with this gear type (Table 10).

6.3.3.1. Gear Interactions with Sea Turtles

There have been documented interactions between green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles and bottom trawl gear; however, 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 (2011A) 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.[8] Warden (2011A) estimated that an additional 61 loggerheads per year interacted with trawls but were released through a Turtle Excluder Device[9]. 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 (2011A) 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 2011A).

Warden (2011B), also estimated total loggerhead interactions with bottom otter trawl gear attributable to managed species from 2005-2008. An estimated average annual take of 23 loggerheads (estimated observable and unobservable but quantifiable) were attributed to the longfin squid fishery and one loggerhead to the black sea bass fishery. Murray (2015) provided

[7] For additional information on the biology, status, and range-wide distribution of each DPS of Atlantic sturgeon please refer to 77 *Federal Register* 5880 and 77 *Federal Register* 5914 (finalized February 6, 2012), as well as the Atlantic Sturgeon Status Review Team's 2007 status review of Atlantic sturgeon (ASSRT 2007).

[8] Adult equivalence considers the reproductive value (i.e. expected reproductive output) of the animal (Warden 2011, Murray 2013, Wallace et al. 2008).

[9] 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)).

similar estimates of loggerhead interactions by managed fished species for 2009-2013. Specifically, an estimated average annual take of 42 loggerheads were attributed to the longfin squid fishery, one loggerhead to the silver hake fishery, and one loggerhead to the black sea bass fishery (Murray 2015).

6.3.3.2. Gear Interactions with Atlantic Sturgeon

Sturgeon bycatch occurs in bottom otter trawl gear (Miller and Shepard 2011, Stein et al. 2004b; and ASMFC 2007). Since 1989, NEFOP and the NEFSC At-Sea Monitoring Program observed 70 interactions between Atlantic sturgeon and bottom trawl gear on trips where squid were the primary target species. Nine Atlantic sturgeon interactions were observed on bottom trawl trips where silver hake were the primary target species and six were observed on bottom trawl trips where the primary target species was black sea bass (NEFSC 2015C). The most recent estimate of bycatch 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 and large 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), the overall impacts to Atlantic sturgeon survival from trawl interactions are uncertain (Beardsall et al. 2013). As a result, 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.

6.3.3.3. Gear Interactions with Marine Mammals

Some marine mammal species have been observed seriously injured or killed in bottom trawl gear. Pursuant to the MMPA, NMFS annually publishes a list of fisheries which classifies U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortality of marine mammals. Category I fisheries have frequent interactions with marine mammals that result in serious injuries and/or mortality. Category II fisheries have occasional interactions that result in serious injuries and/or mortality. Category III fisheries have a remote likelihood of interactions or no known interactions. In 2016, commercial bottom trawl fisheries in the Northeast and Mid-Atlantic were classified as Category II fisheries (81 *Federal Register* 20550, April 8, 2016).

Large Whales

Minke whales are the only large whale species known to interact with bottom trawl gear (Henry et al. 2015; Waring et al. 2014A, 2015A; Lyssikatos 2015). Interactions have only been observed in the northeast bottom trawl fisheries. Waring et al. (2015A) estimated that 7.8 minke whale mortalities were attributed to this fishery in 2008 and none were attributed during 2009-2012; no serious injuries were reported during this time. Based on this, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (Waring et al. 2015A). Lyssikatos (2015) estimated that an average of 1.40 minke whales per year were seriously injured or killed as a result of interactions with the northeast bottom trawl fishery from 2008 through 2013.

Small Cetaceans and Pinnipeds

Small cetacean and pinniped species have been observed seriously injured and killed in bottom trawl gear and have been observed taken in this gear type on trips targeting longfin squid, silver hake, or black sea bass (Table 10; Waring et al. 2014A, 2014B, 2015A, 2015B, 2016; Lyssikatos 2015).

According to Lyssikatos (2015), from 2008 through 2013, the highest annual bycatch mortality in Northeast and Mid-Atlantic commercial bottom trawl trips was observed for short beaked common dolphins, followed by Atlantic white-sided dolphins, gray seals, risso's dolphins, long-finned pilot whales, bottlenose dolphins, harbor seals, harbor porpoise, and harp seals. [10]

The Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened in 2006 to address the incidental mortality and serious injury of long-finned pilot whales, short -finned pilot whales, common dolphins, and white sided dolphins due to interactions with bottom and mid-water trawl fisheries in the Northeast and Mid-Atlantic regions. None of these stocks are classified as a "strategic stock" and none currently interact with a Category I fishery; therefore, 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 to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero. The ATGTRS also identifies several potential voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.[11]

6.4. Human Communities and Economic Environment

This section describes the socioeconomic baseline conditions of the fisheries for the four species most directly affected by the scup GRA regulations (i.e. scup, longfin squid, silver hake, and black sea bass).

---

[10] 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.

[11] Additional details on the ATGTRS are available at:
http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/

6.4.1. Scup

Scup fisheries are managed under the Summer Flounder, Scup, and Black Sea Bass FMP. Scup are cooperatively managed by the Council, which develops regulations for federal waters, and the Atlantic States Marine Fisheries Commission (ASMFC), which works with member states to develop regulations for state waters. The management unit for scup is U.S. waters in the western Atlantic Ocean from Cape Hatteras, North Carolina northward to the U.S.-Canadian border.

Scup are commercially harvested year-round. Most commercial scup catch in the winter occurs in Federal waters and most commercial scup catch in the summer occurs in state waters. The commercial scup fishery is a mixed species fishery where multiple species such as summer flounder, black sea bass, squid, Atlantic mackerel, silver hake, Atlantic croaker, skates, spiny dogfish, and other species are targeted (personal communication with Dr. Mark Terceiro, NEFSC). Amendment 13 to the Summer Flounder, Scup, and Black Sea Bass FMP (MAFMC 2002) includes a description of bycatch[12] and non-target species in the scup fishery. More recent information on bycatch and non-target species associated with Mid-Atlantic trawl fisheries can be found in the Standardized Bycatch Reporting Methodology Amendment (NMFS 2015A).

The vast majority of commercially-landed scup are caught with bottom otter trawls (e.g. 98% in 2015). In 2015, commercial fishermen from Maine through North Carolina landed 16.95 million pounds of scup, valued at $11.3 million (an average of $0.67/pound). There is a strong relationship between the amount of scup landed in a given year and the average price per pound. As landings increase, price generally decreases.

A moratorium permit is required to commercially harvest scup in Federal waters. In 2015, 650 vessels held scup moratorium permits.

At least 100,000 pounds of scup were landed at each of 16 ports in seven states in 2015. These 16 ports accounted for approximately 94% of all 2015 commercial scup landings. The top five ports in terms of weight of scup landed by commercial fishermen in 2015 were: Point Judith, Rhode Island; Montauk, New York; Point Pleasant, New Jersey; New Bedford, Massachusetts, and Little Compton, Connecticut.

According to estimates from the Marine Recreational Information Program (MRIP)[13], recreational fishermen from Maine through North Carolina landed an estimated 5.05 million pounds of scup in 2015 (Figure 14) and took an estimated 461,840 trips for which scup was the

[12] The MSA defines bycatch as harvested fish that are not sold or kept for personal use. Bycatch includes discards of whole fish at sea or elsewhere, including economic and regulatory discards, and also includes fishing mortality due to an encounter with fishing gear that does not result in capture of fish. Bycatch does not include fish released alive under a recreational catch-and-release fishery management program.

[13] More information available at: http://www.st.nmfs.noaa.gov/recreational-fisheries/MRIP/index

primary target.[14]. In 2015, about 98% of recreational scup harvest occurred in state waters and about 2% occurred in Federal waters.[15] In 2015, 717 vessels held Federal party/charter permits for scup.

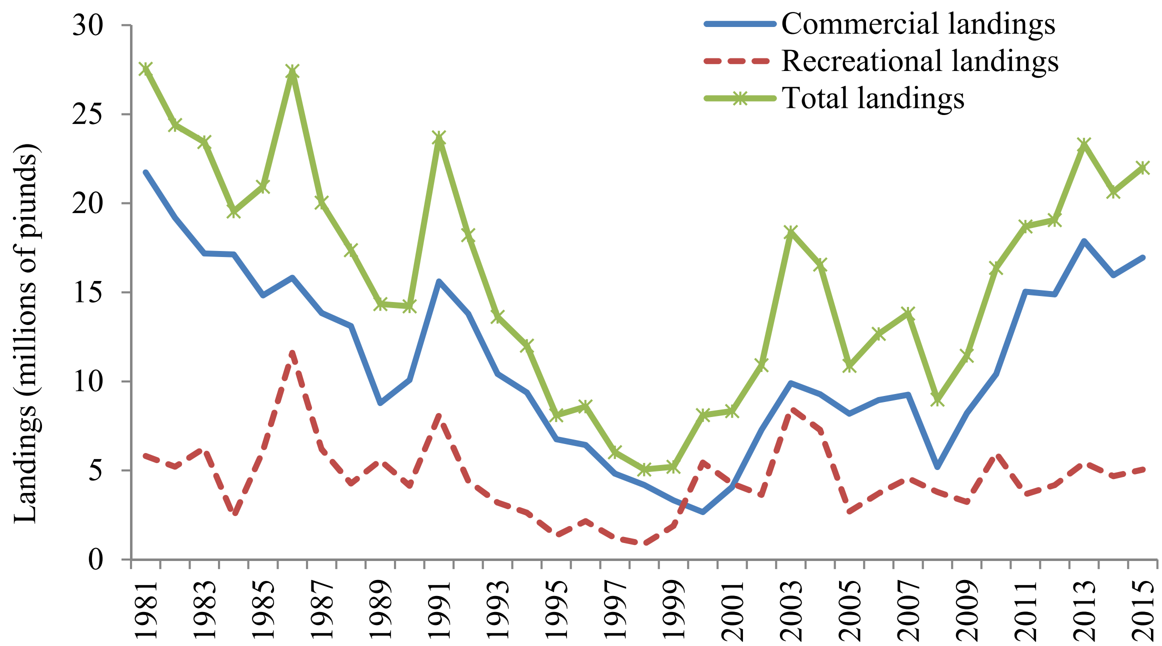


Figure 14: Commercial and recreational scup landings, from Maine through North Carolina, 1981-2014.

6.4.2. Longfin Squid

Longfin squid are managed by the Mid-Atlantic Council under the Mackerel, Squids, and Butterfish FMP. The management unit for longfin squid is U.S. waters in the western Atlantic Ocean from Cape Hatteras, North Carolina northward to the U.S.-Canadian border.

The U.S. commercial longfin squid fishery occurs primarily in southern New England and Mid-Atlantic waters, but some fishing also occurs along the southern edge of Georges Bank. Effort is generally directed offshore during October-March and inshore in April-September. Longfin squid are targeted solely with bottom otter trawls (NEFSC 2016A). In 2015 commercial longfin squid landings totaled about 26.34 million pounds from Maine through North Carolina (Figure 15) and generated $31.20 million in ex-vessel revenues, for an average price of about $1.18 per pound. In 2015 there were 301 potentially active butterfish/longfin squid moratorium permits.

At least 100,000 pounds of longfin squid were landed at each of 13 ports in five states in 2015. These 13 ports accounted for approximately 98% of all 2015 commercial longfin squid landings.

[14] MRIP estimates downloaded July 28, 2016.

[15] MRIP estimates downloaded June 13, 2016.

The top five ports in terms of weight of longfin squid landed by commercial fishermen in 2015 were: Point Judith, Rhode Island; North Kingstown, Rhode Island; Montauk, New York; Cape May, New Jersey; and Hampton Bay, New York.

Vessels targeting longfin squid occasionally catch other species such as *Illex* squid, butterfish, spiny dogfish, hakes, skates, scup, summer flounder, bluefish, monkfish, and other species. Some of these incidentally caught species are sometimes landed, while others are typically discarded.[16]The species most commonly caught incidentally by vessels targeting longfin squid are managed by the Mid-Atlantic or New England Fishery Management Council. With the exception of thorny skate, none of these species are known to be overfished. The overfished and overfishing status of *Illex* squid is unknown. Overfishing was occurring for summer flounder in 2015, though the stock was not overfished (NEFSC 2016B). The New England and Mid-Atlantic Councils developed accountability measures (AMs) for all of these species to ensure that any overages in the annual catch limits (ACLs) are addressed through reductions in landings limits in the following year. The AMs for all of these species, with the exception of *Illex* squid, take discards into account.

There is some recreational fishing for longfin squid but it is not currently quantifiable. MRIP does not collect data on recreational catch of invertebrates.

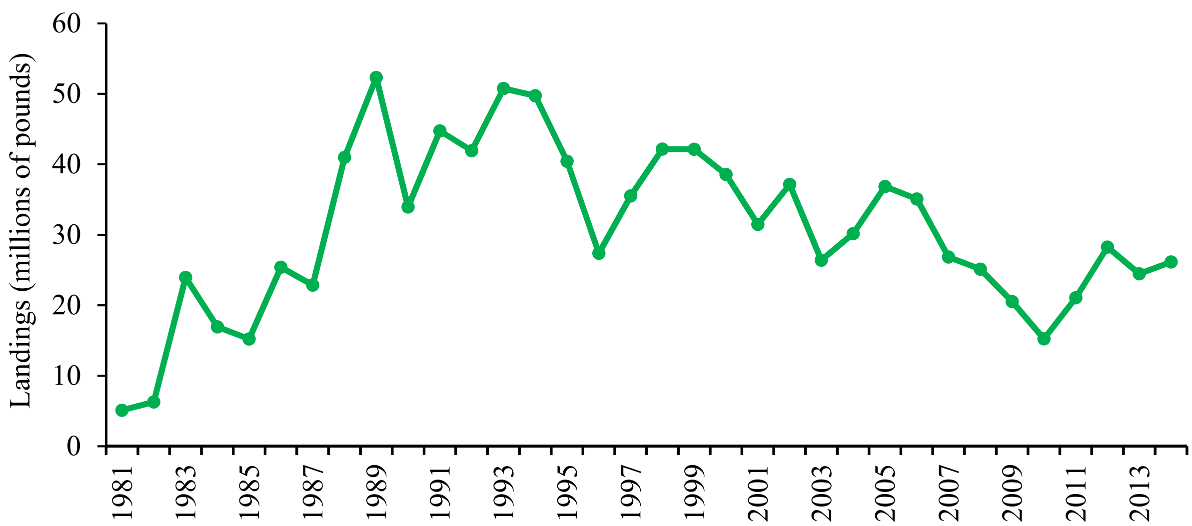


Figure 15: U.S. commercial longfin squid landings from Maine to North Carolina, 1981-2014.

[16] For more information on incidental catch in the longfin squid fishery, see the EA associated with the proposed rule for 2016 Mackerel, Squid, and Butterfish Specifications, published in the *Federal Register* on January 22, 2016 and available at: http://www.greateratlantic.fisheries.noaa.gov/regs/2016/January/16msb2016specspr.html

6.4.3. Black Sea Bass

Black sea bass fisheries are managed under the Summer Flounder, Scup, and Black Sea Bass FMP. Black sea bass are cooperatively managed by the Council, which develops regulations for federal waters, and the ASMFC, which works with member states to develop regulations for state waters. The management unit for the northern stock of black sea bass is U.S. waters from Cape Hatteras, North Carolina northward to the U.S.-Canadian border. Black sea bass fisheries south of Cape Hatteras are managed by the South Atlantic Fishery Management Council.

In 2015, commercial fishermen from Maine through North Carolina landed about 2.34 million pounds of black sea bass (Figure 16), valued at $7.84 million (an average of $3.35/pound). A moratorium permit is required to commercially harvest black sea bass in Federal waters. In 2015, 697 vessels held black sea bass moratorium permits.

About 68% of the black sea bass landed by commercial Federal permit holders from Maine through North Carolina in 2015 were caught with bottom otter trawl gear. About 18% were caught with fish pots and traps, 8% in offshore lobster traps, and about 3% with hand lines.

At least 100,000 pounds of black sea bass were landed in each of eight ports in seven east coast states in 2015. These eight ports accounted for 56% of all commercial black sea bass landings in 2015. The top five ports in terms of weight of black sea bass landed by commercial fishermen in 2015 were: Point Pleasant, New Jersey; Ocean City, Maryland; Point Judith, Rhode Island; Hampton, Virginia; and Cape May, New Jersey.

Commercial black sea bass fisheries are mixed species fisheries where summer flounder, scup, and other species are also targeted. Amendment 13 to the Summer Flounder, Scup, and Black Sea Bass FMP (MAFMC 2002) includes a description of bycatch and non-target species in the black sea bass fishery. More recent information on bycatch and non-target species associated with the Mid-Atlantic trawl fisheries can be found in the Standardized Bycatch Reporting Methodology Amendment (NMFS 2015A).

According to MRIP data for Maine through North Carolina, recreational anglers landed an estimated 4.06 million pounds of black sea bass in 2015 and took an estimated 517,607 million trips for which black sea bass was the primary target. About 70% of black sea bass landed by recreational fishermen were caught in state waters and about 38% in federal waters.[17] In 2015, 778 vessels held federal party/charter permits.

[17] MRIP estimates downloaded July 28, 2016.

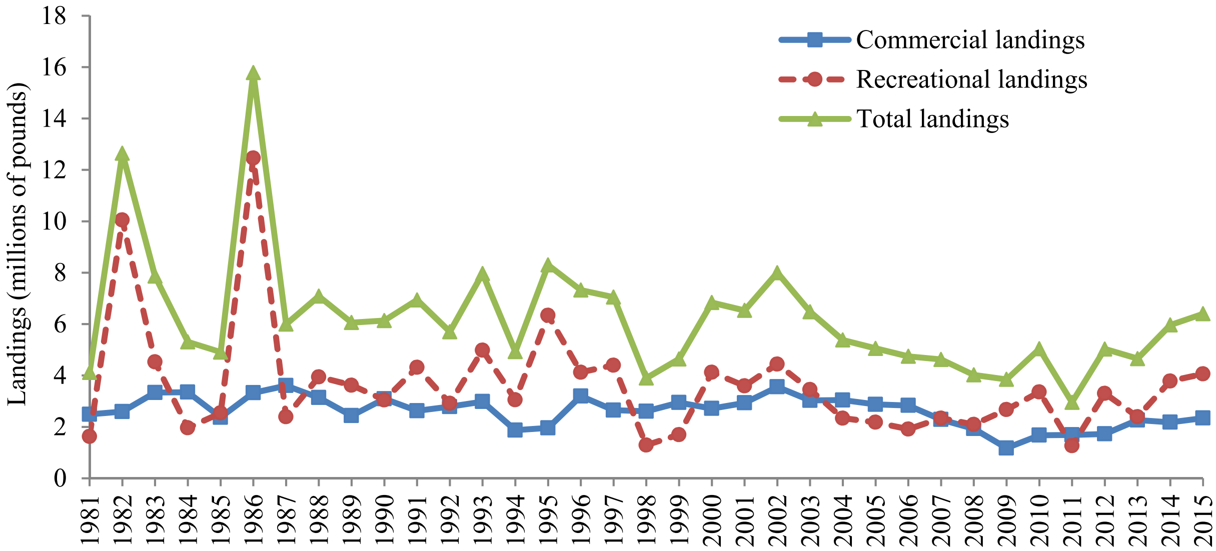


Figure 16: Commercial and recreational black sea bass landings from Maine through North Carolina, 1981-2015.

6.4.4. Silver Hake

Silver hake are managed by the New England Fishery Management Council through a series of exemptions from the Northeast Multispecies FMP regulations. The management unit for silver hake is U.S. waters from North Carolina northward to the U.S.-Canadian border. Silver hake are divided into a northern and southern stock. The distribution of the northern stock does not overlap with the Scup GRAs; therefore, the northern stock will not be affected by this framework. The southern silver hake stock is distributed from southern Georges Bank to Cape Hatteras, North Carolina.

In 2015, commercial fishermen from Massachusetts through North Carolina (which roughly corresponds to the geographic area of the southern stock of silver hake) landed about 13.84 million pounds of silver hake (Figure 17), valued at $10.21 million (an average of $0.74/pound). About 98% of these landings were caught with bottom otter trawls.

At least 100,000 pounds of silver hake were landed at each of nine ports in six states between Massachusetts and North Carolina in 2015. These ten ports accounted for approximately 96% of all 2015 commercial silver hake landings in those states. The top five ports in terms of weight of silver hake landed by commercial fishermen in 2015 were: New Bedford, Massachusetts; Gloucester, Massachusetts; Point Judith, Rhode Island; Montauk, New York; and New London, Connecticut.

As previously stated, the silver hake fishery is managed through a series of exemptions to the Northeast Multispecies FMP. Vessels fishing for silver hake in an exemption program must possess either an open access (Category K) or limited access (Categories A-F) Northeast

Multispecies permit. In 2015, 1,734 of these permits were issued; however, the number of vessels which fished for silver hake in 2015 was likely much lower.

The commercial silver hake fishery is a mixed species fishery where multiple hake species are harvested, along with squid, scup, Atlantic mackerel, skates, and other species. Amendment 19 to the Northeast Multispecies FMP includes a full description of bycatch and non-target species in these fisheries (NEFMC 2012).

Recreational catches of silver hake are considered negligible and are not accounted for in the stock assessment (NEFMC 2014). MRIP estimates of silver hake recreational harvest show high inter-annual variability and high percent standard errors (a measure of precision of the estimates). According to MRIP estimates, 20,689 pounds of silver hake were harvested by recreational anglers from Massachusetts through North Carolina[18] in 2015. There were no reported recreational trips between Massachusetts and North Carolina in 2015 for which silver hake was the primary target species.[19]

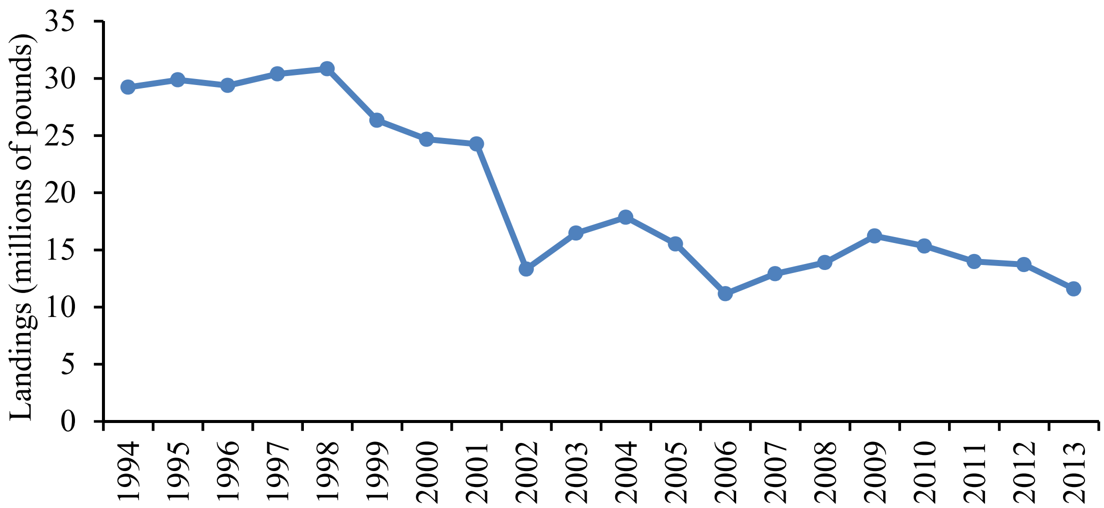


Figure 17: Commercial landings of the southern stock of silver hake, 1994-2013 (NEFMC 2014).

7. ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

This EA analyzes the expected impacts of each alternative on each VEC. When considering impacts on each VEC, the alternatives are compared to the *status quo* (alternatives 1A and 2A, i.e. the existing GRAs) and assessed in terms of how they impact current environmental and socioeconomic baseline conditions. The *status quo* alternatives assume that the current management regimes and fishery operations will continue into the future. It is not possible to

[18] This area roughly corresponds to the southern stock, though both the northern and southern stocks are found off Massachusetts.

[19] MRIP estimates downloaded July 28, 2016.

quantify with confidence how effort will change under each alternative; therefore, expected changes are described qualitatively.

The baseline conditions include the biological conditions of the scup, longfin squid, black sea bass, and silver hake stocks, as well as the associated fisheries over the most recent five years (i.e. the fishing practices and levels of effort and landings over the most recent five years), as well as the economic characteristics of the fisheries over the most recent three to five years (depending on the dataset).

The alternatives are not compared to a theoretical condition where scup, longfin squid, black sea bass, and/or silver hake fisheries are not operating. These fisheries have occurred for many decades and are expected to continue into the foreseeable future. The nature and extent of the management programs for the scup, longfin squid, black sea bass, and silver hake fisheries have been examined in detail in EAs and Environmental Impact Statements (EISs) prepared for previously implemented management actions under the respective FMPs. The analysis in this section focuses on the impacts of the GRA alternatives relative on each VEC.

Throughout this section, the impacts of the *status quo* alternatives are evaluated based on their expected impacts on the baseline conditions. The impacts of the non-*status quo* alternatives on the baseline conditions are evaluated relative to one another and in comparison to the *status quo* alternatives.

Impacts to scup, longfin squid, black sea bass, silver hake, and other non-target species, as well as impacts to habitat and protected resources are described in relation to expected changes in fishing effort under each of the alternatives (

Table 11). 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 *status quo.* 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.

Alternatives which may result in a reduction in fishing effort may have positive impacts for habitat and protected species by decreasing the time that fishing gear is in the water and thus reducing the potential for interactions between fishing gear and habitat and fishing gear and protected species. Alternatives which may cause an increase in fishing effort may result in negative impacts to habitat and protected species due to an increased potential for interactions between fishing gear and habitat and fishing gear and protected species. A neutral impact could result from negligible or no changes in effort.

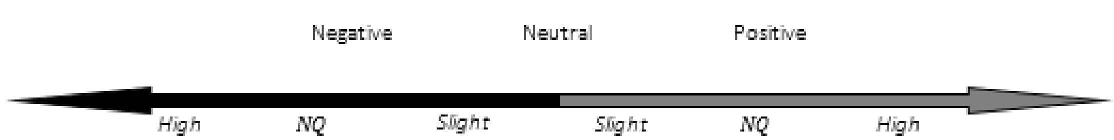
Socioeconomic impacts are considered in relation to potential changes in landings and prices under each alternative, and by extension, revenues, compared to the *status quo*. Alternatives which could lead to increased availability of target species and/or an increase in catch per unit effort (CPUE) could lead to increased landings. Alternatives which could result in an increase in landings are generally considered to have positive socioeconomic impacts because they could result in increased revenues; however, if an increase in landings leads to a decrease in price or a decrease in SSB for any of the landed species, then negative socioeconomic impacts could occur.

As previously stated, the GRA regulations apply to vessels fishing for or possessing longfin squid, black sea bass, or silver hake and using mesh smaller than 5.0 inches in diameter from November 1 through March 15. The alternatives listed in this document are expected to affect the amount of fishing effort with small-mesh during the effective times of the year and in the affected areas, but they are not expected to change patterns in fishing effort with other gear types, with larger mesh sizes, at other times of the year, or in areas outside the boundaries of the GRA alternatives.

Table 11: Definition of impact and impact qualifiers.

Impact Definition			
	Directional Impact		
VEC	Positive (+)	Negative (-)	Neutral (0)
Allocated Target Species, Other Landed Species, and Protected Resources	Actions that increase stock / populations size	Actions that decrease stock / populations size	Actions that have no positive or negative impacts on stock / populations size
Physical Environment / Habitat / EFH	Actions that improve the quality or reduce disturbance of habitat	Actions that degrade the quality or increase disturbance of habitat	Actions that have no positive or negative impacts on habitat quality
Human Communities (Socioeconomic)	Actions that increase revenue and social well-being of fishermen and/or associated business	Actions that decrease revenue and social well-being of fishermen and/or associated business	Actions that have no positive or negative impacts on revenue and social well-being of fishermen and/or associated business

Impact Qualifiers	
Slight (sl), as in slight positive or slight negative)	To a lesser degree / minor
No qualifier, as in positive or negative	To an average degree (i.e., more than "slight", but not "high")
High (H), as in high positive or high negative	To a substantial degree
Likely	Some degree of uncertainty associated with the impact



7.1. Biological Impacts

This section summarizes the impacts of each alternative on the scup, longfin squid, black sea bass, and silver hake stocks, as well as on other non-target species. Northeast Fisheries Observer Program (NEFOP) data were used to examine patterns in small-mesh fishing effort and in scup discards within the GRA areas. NEFSC bottom trawl survey data were used to examine patterns in scup, longfin squid, black sea bass, and silver hake abundance within the boundaries of each of the GRA alternatives. Abundances were interpolated based on catches in the NEFSC spring and fall bottom trawl surveys during 2011-2015 using an inverse distance weighted algorithm (Figure 18 and Figure 19). The interpolation focused on 2011-2015 in order to describe recent patterns in abundance and distribution. Recent survey catches are assumed to provide a more accurate prediction of future impacts of the alternatives than a longer time series of catch data. Fall survey catches were used to examine scup, longfin squid, black sea bass, and silver hake abundance within the Northern GRA, which is in effect during November and December each year. Spring survey catches were used to examine abundance within the Southern GRA, which is in effect from January 1 through March 15 each year.

The impacts of each alternative are considered in relation to the estimated increase or decrease in the amount of scup, longfin squid, black sea bass, and silver hake found within the boundaries of each GRA alternative, expressed as a percentage of survey catches of each species found within the boundaries of the *status quo* GRAs and as a percentage of total interpolated catches within the entire survey area. In this way, impacts are expressed as a change relative to the *status quo* and relative to a proxy for the entire stock of each species.

An increase in the amount of any of these species found within the GRAs means that fewer of these species will be available to capture with small-mesh during the times of year when the GRAs are in effect. This could lead to a decrease in small-mesh fishing effort in those areas and during those times of year. A decrease in the amount of any of these species found within the GRA boundaries means that more of these species would be available to capture with small-mesh during the effective times of year, thus small-mesh fishing effort could increase in those areas and times. Expected impacts to each VEC are described based on these potential changes in small-mesh fishing effort. As described in more detail in section 7.1.2.2, expected changes in small-mesh fishing effort are assumed to derive mostly from changes in the availability of longfin squid.

There are several caveats to this approach. First, the survey catches provide information on the spatial distribution of scup in the spring and the fall during 2011 through 2015, but they are not meant to describe overall stock abundances in the same way as would a stock assessment. Secondly, the inverse distance weighted algorithm used assumed that abundance could be interpolated based only on survey catches in nearby locations. It did not account for other variables which may influence abundance, such as depth. Thirdly, the 2011-2015 spring and fall survey dates only partially overlapped with the GRA time periods. During 2011-2015, the spring surveys took place from late February through late May and the fall surveys took place from early September through mid-November. Nonetheless, this analysis assumes that the survey catches are reflective of abundance during the GRA time periods. During the coldest months of the year (usually January through early March), scup generally remain in one location (Dr. Mark Terceiro, NEFSC, personal communication); therefore; this may be a reasonable assumption. Despite these important caveats, the NEFSC bottom trawl survey data are considered the best available data on abundance of scup, longfin squid, black sea bass, and silver hake. No other fishery-independent stratified random survey encompasses the GRA areas during the months of November-March.

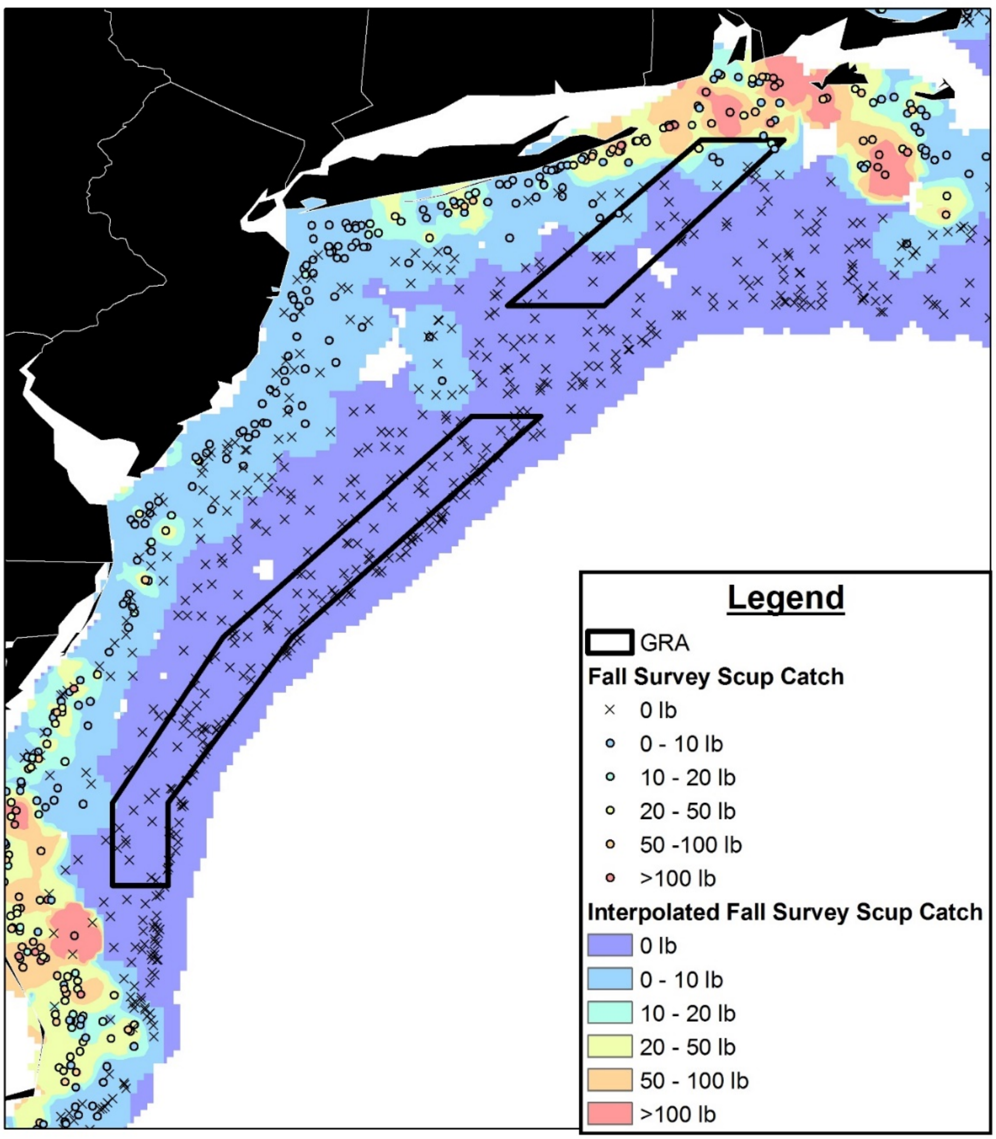


Figure 18: Actual (points) and interpolated scup catches in the NEFSC fall bottom trawl survey in the Mid-Atlantic, 2011-2015.

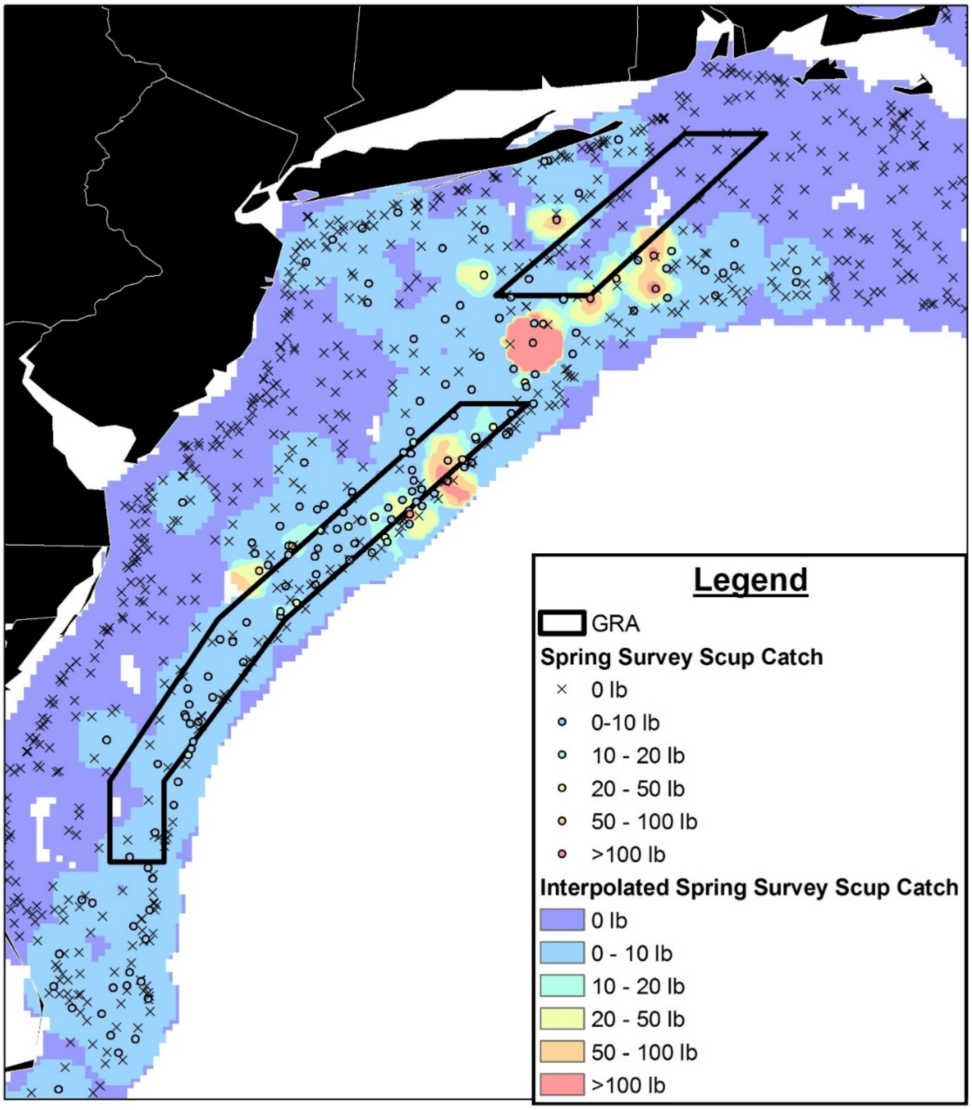


Figure 19: Actual (points) and interpolated scup catches in the NEFSC spring bottom trawl survey in the Mid-Atlantic, 2011-2015.

7.1.1. Biological Impacts of Northern GRA Alternatives

The biological impacts of the Northern GRA alternatives range from moderate negative to slight positive. Of the Northern GRA alternatives, alternative 1B has the highest potential for positive biological impacts, followed by alternative 1A and 1C, in that order.

7.1.1.1. Biological Impacts of Alternative 1A (*Status Quo* Northern GRA; Preferred Northern GRA Alternative)

Alternative 1A is the *status quo* alternative for the Northern GRA (Figure 1, section 5.1.1). Under this alternative, the Northern GRA regulations would remain unchanged. This is the preferred Northern GRA alternative.

Since their implementation, the GRAs have likely reduced the discard mortality of small scup and improved the post-recruitment survival of these small scup (Terceiro and Miller 2014). Estimated scup discards in small-mesh fisheries have generally decreased in the Northern GRA statistical areas during the fourth quarter of the year[20] since the GRAs were first implemented in 2000. Estimated scup discards in small-mesh tows in the Northern GRA statistical areas during the fourth quarter of the year decreased from an average of 939,296 pounds during 1989-1999 to an average of 280,808 pounds during 2000-2014, a decrease of about 70% (Figure 3).

Assuming compliance with the regulations, small-mesh fishing effort for longfin squid, black sea bass, and silver hake within the Northern GRA during November and December has undoubtedly decreased since 2000 when the GRAs were first implemented. The Northern GRA likely changed the distribution of, and potentially changed the overall amount of, small-mesh fishing effort for these species, in November and December; however, these changes are not well understood. Implementation of the Northern GRA may have caused a reduction in small-mesh fishing effort during November and December. Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have resulted in an increase in fishing effort.

NEFOP data suggest that catches of longfin squid, black sea bass, and silver hake in the Northern GRA during November and December decreased since 2000 and also suggest that the distribution of small-mesh fishing effort for these species has changed over time; however, these changes cannot be definitively attributed to the GRAs. These changes are likely partly influenced by changes in NEFOP coverage over time. Many factors besides the GRAs impact fishery catches including a variety of regulations, market conditions, and environmental conditions.

NEFSC bottom trawl survey data suggest that scup abundances are low in the Northern GRA in the fall. When measured both in numbers of scup and in weight, less than 1% of the 2011-2015 fall survey scup catch occurred within the boundaries of the Northern GRA. Most catch occurred inshore of the GRAs (Figure 18). Scup caught within the boundaries of the Northern GRA weighed 0.8 pounds on average, compared to an average of 0.12 pounds for scup caught outside of the Northern GRA.[21] This suggests that the Northern GRA may not contain a notably higher amount of juvenile scup than surrounding areas.

---

[20] As previously described, the discard estimates used in the 2014 NEFSC analysis of scup discards (Terceiro and Miller 2014) and in the most recent benchmark stock assessment (NEFSC 2015A) were calculated by calendar quarter, statistical area, and three mesh sizes. These are considered to be the most precise estimates of scup discards.

[21] These statements refer to actual (not interpolated) survey catches.

Overall, the NEFOP and NEFSC survey data suggest that the Northern GRA resulted in positive impacts for the scup stock by reducing discard mortality. The Northern GRA may have resulted in slight positive impacts for longfin squid, black sea bass, and silver hake stocks by reducing catches (and thus fishing mortality) of those species within the Northern GRA during November and December. Alternative 1A is expected to maintain these positive biological impacts by maintaining a *status quo* Northern GRA. However, because the Northern GRA, as currently configured, has been in place since late 2000, the positive impacts of maintaining a *status quo* Northern GRA are not expected to be different (e.g. more positive) than they were over the past several years.

7.1.1.2. Biological Impacts of Alternative 1B (Northern GRA Expanded into Area 613)

Alternative 1B would expand the Northern GRA into statistical area 613 (Figure 2, section 5.1.2). Alternative 1B would increase the size of the Northern GRA by 945 square nautical miles, or approximately 63%, compared to the *status quo* (alternative 1A). Based on interpolated fall NEFSC bottom trawl survey catches, alternative 1B would increase the amount of scup found within the Northern GRA by 293%, compared to the *status quo* (alternative 1A). It would increase the amount of longfin squid in the Northern GRA by 60%, the amount of black sea bass by 184%, and the amount of silver hake by 30% (

Table 12 and

Table 13).

When expressed as a percentage of 2011-2015 interpolated fall survey catches within the entire survey area, the amount of scup found within the Northern GRA would increase from 0.4% under the *status quo* (alternative 1A) to 1.5% under alternative 1B. The amount of longfin squid would increase from 5.3% to 8.5%. The amount of black sea bass would increase from 3.0% to 8.5%. The amount of silver hake would increase from 1.0% to 1.2% (Table 14 and Table 15).

By increasing the amount of scup, longfin squid, black sea bass, and silver hake found within the Northern GRA, alternative 1B would reduce the amount of these species available to small-mesh fisheries during November and December. In doing so, it could result in a decrease in fishing effort and thus a decrease in fishing mortality for target and non-target stocks, during November and December in 945 square nautical miles. Alternative1B is thus expected to have moderate positive biological impacts compared to the *status quo* (alternative 1A).

Table 12: Size and interpolated 2011-2015 fall survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of each Northern GRA alternative (with the exception of alternative 1C, which would eliminate the Northern GRA).

Alternative	Size (square nautical miles)	Scup (lb)	Longfin squid (lb)	Black sea bass (lb)	Silver hake (lb)
1A	1,489	391	6,456	157	2,605
1B	2,434	1,537	10,341	445	3,379

Table 13: Size and interpolated 2011-2015 fall NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of alternative 1B, expressed as a percentage of the *status quo* alternative (alternative 1A).

Alternative	Size	Scup	Longfin squid	Black sea bass	Silver hake
1B	+63%	+293%	+60%	+184%	+30%

Table 14: Total interpolated 2011-2015 spring and fall NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake.

	Scup (lb)	Longfin squid (lb)	Black sea bass (lb)	Silver hake (lb)
Spring survey	65,968	47,466	8,060	219,941
Fall survey	111,368	133,567	5,753	300,613

Table 15: Interpolated 2011-2015 fall NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of each Northern GRA alternative (with the exception of alternative 1C, which would eliminate the Northern GRA), expressed as a percentage of the total interpolated fall survey catch of each species (Table 14).

Alternative	Scup	Longfin squid	Black sea bass	Silver hake
1A	0.4%	5.3%	3.0%	1.0%
1B	1.5%	8.5%	8.5%	1.2%

7.1.1.3. Biological Impacts of Alternative 1C (Eliminate the Northern GRA)

Alternative 1C would eliminate the Northern GRA. As described in section 7.1.1, NEFOP data and NEFSC bottom trawl survey data suggest that the Northern GRA may be partially responsible for a reduction in scup discards in statistical areas 537, 539, and 613 since 1989. Since their implementation, the GRAs have likely reduced the discard mortality of small scup and improved the post-recruitment survival of these small scup (Terceiro and Miller 2014). Eliminating the Northern GRA could lead to an increase in discard mortality for small scup and is thus expected to have moderate negative biological impacts to the scup stock. It could also lead to increased small-mesh fishing effort and thus increased fishing mortality for other species, including longfin squid, black sea bass, and silver hake, and non-target species in those fisheries. Alternative 1C is thus expected to have moderate negative biological impacts, compared to the *status quo* (alternative 1A).

Although alternative 1C could result in an increase in fishing mortality (including discard mortality) for several species, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is threatened. The Councils have implemented AMs for scup, longfin squid, black sea bass, silver hake, and several non-target species caught in the longfin squid fishery. If the ACLs (which, for most species, include landings and discards) for any of these species are exceeded, repayments in the form of quota deductions can be required in future years. In this way, AMs prevent catches in excess of the ACLs from occurring in multiple consecutive years.

Of all the Northern GRA alternatives, alternative 1C has the greatest potential for negative biological impacts because it is the only Northern GRA alternative which could lead to an increase in fishing effort, compared to the *status quo* (alternative 1A).

7.1.2. Biological Impacts of Southern GRA Alternatives

The biological impacts of the Southern GRA alternatives range from moderate negative to moderate positive. Of the nine Southern GRA alternatives, alternative 2H has the highest potential for positive biological impacts, followed by alternatives 2A, 2D, 2B, 2C, 2F, 2G, 2E, and 2I, in that order.

7.1.2.1. Biological Impacts of Alternative 2A (*Status Quo* Southern GRA)

Alternative 2A is the *status quo* alternative for the Southern GRA (Figure 1, section 5.2.1). Under this alternative, the Southern GRA regulations would remain unchanged.

When measured in numbers of scup, about 77% of the 2011-2015 NEFSC spring survey scup catch occurred within the boundaries of the Southern GRA; however, only about 4% of the scup catch in weight occurred within the Southern GRA. Scup caught within the boundaries of the Southern GRA weighed 0.13 pounds on average, compared to an average of 0.33 pounds for scup caught outside of the Southern GRA. This suggests that scup in the Southern GRA tend to be smaller than scup in other areas in the spring. The Southern GRA appears to provide a higher protective value for scup in general, and for juvenile scup in particular, than the Northern GRA (section 7.1.1).

The impacts of the GRAs on the amount and distribution of fishing effort are not well understood. Small-mesh fishing effort within the GRAs during the times of year when the GRAs are in effect undoubtedly decreased after implementation of the GRAs, assuming compliance with the regulations; however, the impacts of the GRAs on the overall amount and distribution of fishing effort is not well understood. NEFOP data suggest that small-mesh catch of longfin squid and black sea bass in the Southern GRA during January 1 – March 15 decreased slightly since implementation of the GRAs. NEFOP data suggest that the distribution of small-mesh fishing effort for these species has changed over time; however, these changes cannot be definitively attributed to the GRA and are likely partly influenced by changes in NEFOP coverage rates. Many additional factors, including a variety of regulations, market conditions, and environmental conditions also impact fishery catches. Implementation of the Southern GRA may have caused a reduction in small-mesh fishing effort during January 1 – March 15. Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have resulted in an increase in fishing effort.

Overall, the survey and NEFOP data suggest that the GRAs have had positive impacts for the scup stock by decreasing discard mortality (Terceiro and Miller 2014). Alternative 2A would perpetuate these positive biological impacts by maintaining a *status quo* Southern GRA. However, because the Southern GRA, as currently configured, has been in place since late 2004, the positive impacts of maintaining a *status quo* Southern GRA are not expected to be different (e.g. more positive) than they were over the past several years.

7.1.2.2. Biological Impacts of Alternative 2B (2012 AP Proposal)

Alternative 2B is the 2012 AP proposal (section 5.2.2, Figure 4). Alternative 2B would decrease the size of the Southern GRA by 230 square nautical miles, or about 7%, compared to the *status quo* Southern GRA (alternative 2A).

The biological impacts of alternative 2B, and of all the other alternatives which would reduce the size of the Southern GRA (i.e. alternatives 2C-2G and 2I), are expected to result mostly from changes in small-mesh fishing effort during January 1 – March 15 due to changes in the availability of longfin squid. Changes in small-mesh fishing effort for longfin squid are expected to impact fishing mortality for longfin squid, as well as for non-target species caught in the longfin squid fishery, including scup.

Alternatives 2B, 2C, and 2E-2G were all designed to restore access to winter fishing areas for longfin squid. In recent years, several commercial fishing industry members and representatives requested modifications to the Southern GRA, citing negative economic impacts to the longfin squid fishery. These individuals argued that since scup has been rebuilt to more than double the target biomass (NEFSC 2015A), the GRAs can be reduced in size without jeopardizing the sustainability of the scup stock. Given that these requests have all focused on impacts to the longfin squid fishery, and given that alternative 2B and the other alternatives which would reduce the size of the Southern GRA would all result in a greater change in longfin squid availability than scup, black sea bass, or silver hake (Table 16 - Table 18), the expected changes in fishing effort as a result of these alternatives are largely based on the changes in availability of longfin squid.

Changes in the availability of scup under these alternatives are not expected to substantially impact fishing effort because trawl vessels which use mesh smaller than 5.0 inches in diameter (the only gear type affected by the Scup GRA regulations) may not possess more than 1,000 pounds of scup from November 1 through April 30 (which encompasses the times of year when both GRAs are in effect) and may not land scup that are smaller than 9 inches total length (50 CFR 648). Because of these limitations, none of the alternatives are expected to result in a substantial increase in fishing effort for or landings of scup.

These alternatives are also not expected to result in a notable change in commercial fishing effort for black sea bass. Commercial black sea bass landings reached or exceeded 95% of the commercial quota in every year between 2007 and 2015. If recent trends in black sea bass landings continue, then any of the alternatives which would reduce the size of the Southern GRA (i.e. alternatives 2B-2G and 2I) will not result in a notable increase in effort directed at and landings of black sea bass because an increase could cause the quota to be exceeded and would trigger AMs (section 7.1.1.3). Additionally, because these alternatives only affect small-mesh fisheries in certain areas during January 1-March 15, any increase in black sea bass landings as a result of these alternatives would occur early in the year. NMFS has the authority to close the fishery for the remainder of the year if it is anticipated that the quota will be exceeded prior to the end of the year. Therefore, any increase in black sea bass landings early in the year as a result of these alternatives could be offset by reduced landings later in the year, or in the following year if AMs are triggered.

These alternatives are also not expected to result in a notable change in effort directed at or landings of silver hake because the amount of silver hake found within the Southern GRA is relatively low. The changes in availability of silver hake under any of the Southern GRA alternatives (compared to the *status quo*; alternative 2A) are relatively minor in absolute terms (Table 14, Table 17, and Table 18).

According to interpolated NEFSC bottom trawl survey data, alternative 2B would reduce the amount of scup found in the Southern GRA by 4%. It would reduce the amount of longfin squid found in the Southern GRA by 16%, the amount of black sea bass by 13%, and the amount of silver hake by 23% (Table 16 and Table 17).

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 6.0% under alternative 2B. The amount of longfin squid would decrease from 17.0% to 14.4%. The amount of black sea bass would decrease from 44.5% to 38.5%. The amount of silver hake would decrease from 0.6% to 0.5% (Table 14 and Table 18).

By decreasing the amount of longfin squid found in the Southern GRA, alternative 2B could result in an increase in fishing effort, and thus an increase in fishing mortality for longfin squid and non-target species, including scup. If the distribution of effort changes, but the overall amount of effort remains similar to the *status quo*, then biological impacts would be minimal. Any increase in fishing effort under this alternative is expected to be slight to moderate compared to the *status quo* and will occur in a relatively small area, during 2.5 months each year, for only one gear type; therefore, the biological impacts of alternative 2B are expected to be slight negative.

Table 16: Size and interpolated 2011-2015 spring NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of each Southern GRA alternative (with the exception of alternative 2I, which would eliminate the Southern GRA).

Alternative	Size (square nautical miles)	Scup (lb)	Longfin squid (lb)	Black sea bass (lb)	Silver hake (lb)
2A	3,117	4,127	8,071	3,586	1,373
2B	2,887	3,959	6,815	3,107	1,064
2C	2,868	3,959	6,815	3,107	1,064
2D	2,635	4,121	7,214	3,566	1,332
2E	2,009	3,045	3,878	2,600	638
2F	2,140	3,349	4,036	3,316	944
2G	2,086	3,280	3,975	2,925	828
2H	3,996	41,133	11,437	5,433	3,273

Table 17: Size and interpolated 2011-2015 spring NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of each Southern GRA alternative (with the exception of alternative 2I, which would eliminate the Southern GRA), expressed as a percentage of the *status quo* Southern GRA (alternative 2A).

Alternative	Size	Scup	Longfin squid	Black sea bass	Silver hake
2B	-7%	-4%	-16%	-13%	-23%
2C	-8%	-4%	-16%	-13%	-23%
2D	-15%	<1%	-11%	-1%	-3%
2E	-36%	-26%	-52%	-28%	-54%
2F	-31%	-19%	-50%	-8%	-31%
2G	-33%	-21%	-51%	-18%	-40%
2H	+28%	+897%	+42%	+51%	+138%

Table 18: Interpolated 2011-2015 spring NEFSC bottom trawl survey catch of scup, longfin squid, black sea bass, and silver hake within the boundaries of each Southern GRA alternative (with the exception of alternative 2I, which would eliminate the Southern GRA), expressed as a percentage of the total interpolated spring survey catch of each species (Table 14).

Alternative	Scup	Longfin Squid	Black Sea Bass	Silver Hake
2A	6.3%	17.0%	44.5%	0.6%
2B	6.0%	14.4%	38.5%	0.5%
2C	6.0%	14.2%	38.2%	0.5%
2D	6.2%	15.2%	44.2%	0.6%

2E	4.6%	8.2%	32.3%	0.3%
2F	5.1%	8.5%	41.1%	0.4%
2G	5.0%	8.4%	36.3%	0.4%
2H	62.4%	24.1%	67.4%	1.5%

7.1.2.3. Biological Impacts of Alternative 2C (2012 AP Proposal with Coral Areas Removed)

Alternative 2C is the 2012 AP proposal with areas of overlap with the deep sea coral protection zones removed (section 5.2.3, Figure 5). Alternative 2C would decrease the size of the Southern GRA by 249 square nautical miles, or about 8%, compared to the *status quo* Southern GRA (alternative 2A). Alternative 2C would reduce the amount of scup found in the Southern GRA by 4%, compared to the *status quo*. It would reduce the amount of longfin squid found in the Southern GRA by 16%, the amount of black sea bass by 13%, and the amount of silver hake by 23% (Table 16 and Table 17).

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 6.0% under alternative 2C. The amount of longfin squid would decrease from 17.0% to 14.2%. The amount of black sea bass would decrease from 44.5% to 38.2%. The amount of silver hake would decrease from 0.6% to 0.5% (Table 14 and Table 18).

By decreasing the amount of longfin squid found in the Southern GRA, alternative 2C would increase the amount available to small-mesh fisheries during January 1 – March 15 and therefore could result in an increase in small-mesh fishing effort. As described in section 7.1.2.2, changes in the availability of other species are not expected to lead to a notable change in fishing effort. An increase in fishing effort could result in increased fishing mortality for longfin squid and non-target species, including scup. If the distribution of effort changes but the overall amount of effort remains similar to the *status quo*, then biological impacts would be minimal. Any increase in fishing effort under this alternative is expected to be slight to moderate compared to the *status quo* and would occur in a relatively small area during 2.5 months each year; therefore, biological impacts of alternative 2C are expected to be slight negative.

7.1.2.4. Biological Impacts of Alternative 2D (Area 632 Removed from Southern GRA)

Alternative 2D would remove statistical area 632 from the Southern GRA (section 5.2.4, Figure 6). It would decrease the size of the Southern GRA by 482 square nautical miles, or about 15%, compared to the *status quo* Southern GRA (alternative 2A). Alternative 2D would reduce the amount of scup found in the Southern GRA by less than 1%. It would reduce the amount of longfin squid found in the Southern GRA by 11%, the amount of black sea bass by 1%, and the amount of silver hake by 3% (Table 16 and Table 17).

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 6.2% under alternative 3C. The amount of longfin squid would decrease from 17.0% to 15.2%. The amount of black sea bass would decrease from 44.5% to 44.2%. The amount of silver hake would not change (Table 14 and Table 18).

By slightly decreasing the amount of these species found in the Southern GRA, alternative 2D would slightly increase the amount available to small-mesh fisheries during January 1 – March 15. Alternative 2D may result in a slight increase in fishing effort for longfin squid, which could result in a slight increase in fishing mortality for longfin squid and non-target species, including scup. Because alternative 2D would only result in an 11% increase in longfin squid availability compared to the *status quo* (alternative 2A) and about a 2% increase when expressed as a percentage of the entire interpolated survey catches, it may not result in a notable change in effort. The biological impacts of alternative 2D are thus expected to range from neutral to slight negative, depending on the change in fishing effort, compared to the *status quo* (alternative 2A). The alternative 2D is expected to have lesser biological impacts than alternatives 2B and 2C because it is expected to result in a lesser change in fishing effort.

7.1.2.5. Biological Impacts of Alternative 2E (January 2016 AP Proposal)

Alternative 2E is the January 2016 AP proposal (section 5.2.5, Figure 7). Alternative 2E would decrease the size of the Southern GRA by 1,108 square nautical miles, or about 36%, compared to the *status quo* Southern GRA (alternative 2A). Alternative 2E would reduce the amount of scup found in the Southern GRA by 26%, compared to the *status quo*. It would reduce the amount of longfin squid found in the Southern GRA by 52%, the amount of black sea bass by 28%, and the amount of silver hake by 54% (Table 16 and Table 17).

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 4.6% under alternative 2E. The amount of longfin squid would decrease from 17.0% to 8.2%. The amount of black sea bass would decrease from 44.5% to 32.3%. The amount of silver hake would decrease from 0.6% to 0.3% (Table 14 and Table 18).

By decreasing the amount of these species found in the Southern GRA, alternative 2E would increase the amount available to small-mesh fisheries and therefore could result in an increase in fishing effort in 1,108 square nautical miles during January 1 – March 15. As described in section 7.1.2.2, changes in fishing effort are expected to result mostly from changes in the availability of longfin squid. Alternative 2E was designed to restore access to important winter fishing areas for longfin squid and it is expected to decrease the amount of longfin squid found within the Southern GRA by 52%; therefore, it is expected to result in a moderate increase in fishing effort for longfin squid during January 1 – March 15. An increase in fishing effort could lead to increased fishing mortality for longfin squid and non-target species, including scup. However, due to AMs and other management measures, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is jeopardized (section 7.1.1.3). The biological impacts of alternative 2E are thus expected to be slight to moderate negative compared to the *status quo* (alternative 2A), depending on the degree of the increase in fishing effort. If the distribution of effort changes, but the overall amount effort remains similar to the *status quo*, then biological impacts would be minimal.

Alternative 2E is expected to result in greater biological impacts than alternatives 2B-2D because it is expected to result in a greater increase in small-mesh fishing effort.

7.1.2.6. Biological Impacts of Alternative 2F (Modified January 2016 AP Proposal)

Alternative 2F is a modified version of the January 2016 AP proposal (section 5.2.6, Figure 8). It would decrease the size of the Southern GRA by 977 square nautical miles, or about 31%, compared to the *status quo* Southern GRA (alternative 2A). Alternative 2F would reduce the amount of scup found in the Southern GRA by 19%. It would reduce the amount of longfin squid found in the Southern GRA by 50%, the amount of black sea bass by 8%, and the amount of silver hake by 31% (Table 16 and Table 17). By decreasing the amount of these species found in the Southern GRA, it would increase the amount available to small-mesh fisheries during January 1 – March 15.

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 5.1% under alternative 2F. The amount of longfin squid would decrease from 17.0% to 8.5%. The amount of black sea bass would decrease from 44.5% to 41.1%. The amount of silver hake would decrease from 0.6% to 0.4% (Table 14 and Table 18).

By decreasing the amount of these species found in the Southern GRA, alternative 2F would increase the amount available to small-mesh fisheries during January 1 – March 15 in 977 square nautical miles and therefore could result in an increase in fishing effort. As described in section 7.1.2.2, changes in fishing effort are expected to result mostly from changes in the availability of longfin squid. Alternative 2F was designed to restore access to important winter fishing areas for longfin squid and it is expected to decrease the amount of longfin squid found within the Southern GRA by 50%; therefore, it is expected to result in a moderate increase in small-mesh fishing effort for longfin squid during January 1 – March 15. An increase in fishing effort could lead to increased fishing mortality for longfin squid and non-target species caught in that fishery. However, due to AMs and other management measures, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is jeopardized (section 7.1.1.3). The biological impacts of alternative 2F are thus expected to be slight to moderate negative compared to the *status quo*, depending on the degree of the increase in fishing effort. If the distribution of effort changes, but overall effort remains similar to the *status quo*, then biological impacts would be minimal.

Alternative 2F is expected to result in greater biological impacts than alternatives 2B-2D because it is expected to result in a greater increase in small-mesh fishing effort. It is expected to result in a slightly lesser change in small-mesh fishing effort than alternative 2E; therefore, it is expected to have slightly lesser biological impacts than alternative 2E.

7.1.2.7. Biological Impacts of Alternative 2G (Combination of Alternative 2B and 2E; Preferred Southern GRA Alternative)

Alternative 2G is the preferred Southern GRA alternative and represents a combination of the 2012 and 2016 AP proposals (section 5.2.7, Figure 11). Alternative 2G would decrease the size of the Southern GRA by 1,031 square nautical miles, or 33%, compared to the *status quo* Southern GRA (alternative 2A). Alternative 2G would reduce the amount of scup found in the Southern GRA by 21%. It would reduce the amount of longfin squid found in the Southern GRA by 51%, the amount of black sea bass by 18%, and the amount of silver hake by 40% (Table 16 and Table 17). By decreasing the amount of these species found in the Southern GRA, it would increase the amount available to small-mesh fisheries during January 1 – March 15.

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would decrease from 6.3% under the *status quo* (alternative 2A) to 5.0% under alternative 2G. The amount of longfin squid would decrease from 17.0% to 8.4%. The amount of black sea bass would decrease from 44.5% to 36.3%. The amount of silver hake would decrease from 0.6% to 0.4% (Table 14 and Table 18).

By decreasing the amount of scup, longfin squid, black sea bass, and silver hake found in the Southern GRA, Alternative 2G would increase the amount available to small-mesh fisheries during January 1 – March 15 in 1,031 square nautical miles and therefore could result in an increase in fishing effort. As described in section 7.1.2.2, changes in fishing effort are expected to result mostly from changes in the availability of longfin squid. Alternative 2G was designed to restore access to important winter fishing areas for longfin squid and it is expected to decrease the amount of longfin squid found within the Southern GRA by 51%; therefore, it is expected to result in a moderate increase in fishing effort for longfin squid during January 1 – March 15. An increase in fishing effort could lead to increased fishing mortality for longfin squid and non-target species caught in that fishery. However, due to AMs and other management measures, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is jeopardized (section 7.1.1.3). The biological impacts of alternative 2G are thus expected to be slight to moderate negative compared to the *status quo*, depending on the degree of the increase in fishing effort. If the distribution of effort changes, but overall effort remains similar to the *status quo*, then biological impacts would be minimal.

Alternative 2G is expected to result in greater biological impacts than alternatives 2B-2D and 2F because it is expected to result in a greater increase in small-mesh fishing effort. It is expected to result in a slightly lesser change in small-mesh fishing effort than alternative 2E; therefore, it is expected to have slightly lesser biological impacts than alternative 2E.

7.1.2.8. Biological Impacts of Alternative 2H (Southern GRA Expanded into Area 616)

Alternative 2H would expand the Southern GRA into statistical area 616 (section 5.2.8, Figure 12) and would increase the size of the Southern GRA by 879 square nautical miles, or about 28%, compared to the *status quo* (alternative 2A). Alternative 2H would increase the amount of scup found in the Southern GRA by 897%. It would increase the amount of longfin squid found in the Southern GRA by 42%, the amount of black sea bass by 51%, and the amount of silver hake by 138% (Table 16 and Table 17).

When expressed as a percentage of 2011-2015 interpolated spring survey catches within the entire survey area, the amount of scup found within the Southern GRA would increase from 6.3% under the *status quo* (alternative 2A) to 62.4% under alternative 2H. The amount of longfin squid would increase from 17.0% to 24.1%. The amount of black sea bass would increase from 44.5% to 67.4%. The amount of silver hake would increase from 0.6% to 1.5% (Table 14 and Table 18).

By increasing the amount of these species found in the Southern GRA, alternative 2G would decrease the amount available to small-mesh fisheries during January 1 – March 15 in 879 square nautical miles. Alternative 2G would add much of Hudson Canyon to the Southern GRA. Hudson Canyon is an important fishing area for many species. Alternative 2G would greatly decrease the amount of scup available to capture with small-mesh during January 1 - March 15. It would substantially decrease the amount of silver hake available and would result in moderate decreases for longfin squid and black sea bass (Table 18). For these reasons, alternative 2G is expected to result in a substantial decrease in overall small-mesh fishing effort in an 879 square nautical mile during January 1 – March 15. It is therefore expected to result in a decrease in fishing mortality for target and non-target species, compared to the *status quo* (alternative 2A). Alternative 2H is thus expected to have moderate positive biological impacts.

Alternative 2H is the only alternative which would increase the size of the Southern GRA. Of all the Southern GRA alternatives, it has the highest potential for positive biological impacts.

7.1.2.9. Biological Impacts of Alternative 2I (Eliminate the Southern GRA)

Alternative 2I would eliminate the Southern GRA. As described in section 7.1.2.1, observer and NEFSC survey data suggest that the Southern GRA has reduced the discard mortality of juvenile scup and has contributed to improved post-recruitment survival of those scup (Terceiro and Miller 2014). Eliminating the Southern GRA could lead to an increase in discard mortality for small scup and thus is expected to have moderate negative biological impacts to the scup stock. By eliminating the existing restrictions on small-mesh fishing in the Southern GRA during January 1 – March 15, alternative 2I is expected to result in an increase in small-mesh fishing effort, particularly for longfin squid, compared to the *status quo* (alternative 2A). By allowing for an increase in fishing effort, alternative 2I is expected to result in an increase in fishing mortality for target and non-target species and is therefore expected to have overall moderate negative biological impacts, compared to the *status quo*. Due to AMs and other management measures, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is jeopardized (section 7.1.1.3).

Of all the Southern GRA alternatives, alternative 2I has the highest likelihood of resulting in an increase in small-mesh fishing effort; therefore, it has the highest potential for negative biological impacts.

7.2. Habitat Impacts

This section summarizes the expected impacts of each alternative on physical habitat, including EFH. Alternatives which could result in an overall increase in fishing effort or which could subject an increased amount of vulnerable bottom habitats to increased contact with bottom trawl gear (the only gear type regulated by the Scup GRAs) are expected to have negative habitat impacts due to the increased potential for interactions between fishing gear and habitat. Alternatives which could result in a decrease in fishing effort or could reduce the exposure of vulnerable bottom habitats to these fisheries are expected to have positive habitat impacts due to the decreased potential for interactions between fishing gear and habitat. As described in section 7.1.2.2, the expected changes in fishing effort under each alternative are primarily based on expected changes in longfin squid availability. Any significant changes in the types of bottom habitat that would be susceptible to increased or decreased contact with bottom trawl gear as a result of changes to the GRA boundaries have been identified using the EMU classification scheme developed by Greene et al. (2010; section 6.2.1).

Fishing effort might be displaced outside the boundaries of the various GRA alternatives; however, without knowing where and how much, it is not possible to determine with any certainty whether there would be positive or negative habitat impacts due to the displacement of effort. Furthermore, any habitat impacts (positive or negative) of the management measures proposed in this framework action would only apply for a limited period of time (November 1-December 31 in the Northern GRA and January 1-March 15 in the Southern GRA). Not only would the habitats within the GRAs be exposed to adverse impacts during the rest of the year, but trawling with large-mesh nets could continue during the time of year that the small-mesh restrictions are in place. In addition, both GRAs are dominated by flat, sandy bottom types, which tend to experience a lesser duration of impacts from bottom trawl gear than more complex bottom types. However, there are some areas of relatively complex bottom within the GRAs (sections 6.2.1 and 6.2.3). For these reasons, any positive or negative impacts to benthic habitats within the GRAs are, in general, expected to be minimal and temporary.

7.2.1. Habitat Impacts of Northern GRA Alternatives

The expected impacts of the Northern GRA alternatives on habitat range from slight negative to slight positive. Of the three Northern GRA alternatives, alternative 1B has the highest potential for positive impacts to habitat, followed by alternative 1A, and then alternative 1C.

7.2.1.1. Habitat Impacts of Alternative 1A (*Status Quo* Northern GRA; Preferred Northern GRA Alternative)

Alternative 1A is the *status quo* Northern GRA alternative (Figure 1, section 5.1.1). It is the preferred Northern GRA alternative. As described in section 7.1.1.1, it is not known if implementation of the Northern GRA caused a change in the overall amount or distribution of fishing effort. It may have caused a reduction in small-mesh fishing effort during November and December. Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have resulted in an increase in fishing effort. Because the Northern GRA largely consists of habitat types that experience a relatively short duration of impacts from contact with bottom trawl gear (sections 6.2.1 and 6.2.3), a reduction in trawl fishing effort may have had only slight positive impacts to habitat.

If the Northern GRA did result in an overall decrease in the amount of fishing effort during November and December, then alternative 1A would have slight positive impacts to habitat by maintaining a *status quo* Northern GRA. If the Northern GRA caused a change in the distribution of fishing effort, but did not result in a change in the amount of fishing effort, then alternative 1A would have continued neutral impacts on habitat. If the Northern GRA resulted in an increase in fishing effort, due to a decrease in CPUE, then alternative 1A would have continued slight negative impacts on habitat.

7.2.1.2. Habitat Impacts of Alternative 1B (Northern GRA Expanded into Area 613)

Alternative 1B would expand the Northern GRA into statistical area 613 (Figure 2, section 5.1.2). As described in more detail in section 7.1.1.2, alternative 1B could result in a reduction in small-mesh fishing effort in 945 square nautical miles during November and December. Alternative 1B would expand the Northern GRA into shallower depths, but would not change the slope and substrate makeup of the Northern GRA (i.e. it would remain predominantly flat and sandy, Figure 13).

Because alternative 1B would increase the size of the Northern GRA, it could lead to a reduction in small-mesh fishing effort during November and December. If effort decreases, then the amount of time that small-mesh trawl gear is in the water would decrease and the potential for interactions between fishing gear and physical habitat would also decrease. If this were to occur, then alternative 1B would have slight positive habitat impacts compared to the *status quo* (alternative 1A). Impacts are expected to be slight positive because alternative 1B will only affect small-mesh fishing effort in 945 square nautical miles during two months each year. It will not affect other gear types, other areas, or other times of the year. If alternative 1B were to cause small-mesh fishing effort to shift out of the Northern GRA and into other areas, then the overall amount of effort could remain similar to the *status quo*, which would result in neutral habitat impacts. The impacts of alternative 1B on habitat are thus expected to range from neutral to slight positive, compared to the *status quo* (alternative 1A).

7.2.1.3. Habitat Impacts of Alternative 1C (Eliminate the Northern GRA)

Alternative 1C would eliminate the Northern GRA. As described in more detail in section 7.1.1.1, NEFOP data suggest that fishing effort within the Northern GRA has decreased since implementation of the GRAs. However, this decrease cannot be de definitely attributed to the GRAs. The impacts of the Northern GRA on the overall amount of effort and the distribution of effort, within and outside of the GRAs, is unknown. Elimination of the Northern GRA could result in an increase in small-mesh fishing effort in November and December in 1,489 square nautical miles. Alternatively, alternative 1C could result in a shift in the distribution of effort without a change in the overall amount of effort. If effort remains similar to the *status quo* (alternative 1A), then habitat impacts would be neutral. If effort increases, then impacts to habitat would be slight negative due to an increase in the amount of time that fishing gear is in the water and thus increased potential for interactions between fishing gear and physical habitat. Impacts are expected to be slight negative because alternative 1C would only affect small-mesh trawl effort in the Northern GRA for two months each year. The bottom habitat within the Northern GRA is largely flat and sandy (section 6.2.1); therefore, impacts from increased contact with small-mesh bottom trawls are expected to be relatively short in duration (section 6.2.3). Alternative 1C will not directly affect other gear types, other areas, or other times of the year. The habitat impacts of alternative 1C are thus expected to range from neutral to slight negative. Of all the Northern GRA alternatives, alternative 1C has the greatest potential for negative impacts to habitat because it is the only Northern GRA alternative which could lead to an increase in fishing effort, compared to the *status quo* (alternative 1A).

7.2.2. Habitat Impacts of Southern GRA Alternatives

The impacts of the Southern GRA alternatives on habitat range from slight negative to slight positive. Of the nine Southern GRA alternatives, alternative 2H has the highest potential for positive habitat impacts, followed by alternatives 2A, 2D, 2B, 2C, 2F, 2G, 2E, and 2I in that order.

7.2.2.1. Habitat Impacts of Alternative 2A (*Status Quo* Southern GRA)

Alternative 2A is the *status quo* Southern GRA alternative (Figure 1, section 5.2.1). As described in more detail in section 7.1.2.1, it is not known if implementation of the Southern GRA caused a change in the overall amount or distribution of fishing effort. It may have caused a reduction in small-mesh fishing effort during January 1 – March 15 Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have caused an increase in fishing effort. Because the Southern GRA largely consists of habitat types that experience a relatively short duration of impacts from contact with bottom trawl gear (sections 6.2.1 and 6.2.3), a reduction in trawl fishing effort may have had only slight positive impacts to habitat.

If the Southern GRA did result in an overall decrease in the amount of fishing effort during January 1 – March 15, then alternative 2A would have slight positive impacts to habitat by maintaining a *status quo* Southern GRA. If the Southern GRA caused a change in the distribution of fishing effort, but did not result in a change in the amount of fishing effort, then alternative 2A would have continued neutral impacts on habitat. If the Southern GRA resulted in an increase in fishing effort, due to a decrease in CPUE, then alternative 2A would have continued slight negative impacts on habitat.

7.2.2.2. Habitat Impacts of Alternative 2B (2012 AP Proposal)

Alternative 2B is the 2012 AP proposal (section 5.2.2, Figure 4). It is intended to restore access to important areas for longfin squid fishing. As described in more detail in section 7.1.2.2, it is expected to result in an increase in small-mesh fishing effort, especially for longfin squid, in 230 square nautical miles during January 1 – March 15. The areas which would be removed from the Southern GRA under alternative 2B are, in general, deeper, have steeper slopes, and have more gravel and silt/mud substrates than most of the other areas within the Southern GRA, which are mostly flat and sandy (section 6.2.1, Figure 13). These more complex bottom types generally experience a longer duration of impacts from contact with bottom otter trawls than less complex bottom types such as flat sand (section 6.2.3).

If alternative 2B results in an increase in small- mesh fishing effort, it could result in slight negative habitat impacts by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and physical habitat over 230 square nautical miles during January 1 – March 15. Although alternative 2B would remove some areas with complex bottom habitats from the Southern GRA, impacts to habitat are expected to be slight negative (as opposed to moderate negative) because alternative 2B would remove a relatively small area (i.e. 230 square nautical miles) from the Southern GRA. If alternative 2B results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to habitat would be neutral. The habitat impacts of alternative 2B are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

7.2.2.3. Habitat Impacts of Alternative 2C (2012 AP Proposal with Coral Areas Removed)

Alternative 2C is the 2012 AP proposal with areas of overlap with the deep sea coral protection areas removed (section 5.2.3, Figure 5). It is intended to restore access to important fishing areas for longfin squid. As described in more detail in section 0, it could result in an increase in small-mesh fishing effort in 249 square nautical miles during January 1 – March 15. The areas which would be removed from the Southern GRA under alternative 2C are, in general, deeper, have steeper slopes, and have more gravel and silt/mud substrates than most of the other areas within the Southern GRA, which are mostly flat and sandy (section 6.2.1, Figure 13). These more complex bottom types generally experience a longer duration of impacts from contact with bottom otter trawls than less complex bottom types such as flat sand (section 6.2.3).

If alternative 2C results in an increase in small- mesh fishing effort, it could result in slight negative habitat impacts by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and physical habitat over 249 square nautical miles during January 1 – March 15. Although alternative 2C would remove some areas with complex bottom habitats from the Southern GRA, impacts to habitat are expected to be slight negative (as opposed to moderate negative) because alternative 2C would remove a relatively small area (i.e. 249 square nautical miles) from the Southern GRA. The habitat impacts of alternative 2C are expected to be slightly more negative than those of alternative 2B because alternative 2C would remove a greater area from the Southern GRA. However, if the coral zones are implemented as proposed, then the habitat impacts of alternatives 2B and 2C will be identical. If alternative 2C results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to habitat would be neutral. The habitat impacts of alternative 2C are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

7.2.2.4. Habitat Impacts of Alternative 2D (Area 632 Removed from Southern GRA)

Alternative 2D would remove statistical area 632 from the Southern GRA (section 5.2.4, Figure 6). Removing statistical area 632 would not substantially change the benthic habitat composition of the Southern GRA (Figure 13).

As described in section 7.1.2.4, alternative 2D is not expected to notably alter patterns in small-mesh fishing effort. Alternative 2D could result in a slight increase in fishing effort for longfin squid, but is not expected to change fishing effort for the other species. If fishing effort increases slightly under alternative 2D, then slight negative habitat impacts would be expected due to an increase in the amount of time that small-mesh trawl gear is in the water and thus an increase in the potential for interactions between fishing gear and physical habitat. If fishing effort does not increase, then impacts to habitat would be neutral. The habitat impacts of alternative 2D are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

Although alternative 2D would remove a larger area from the Southern GRA than alternatives 2B and 2C, it is expected to have a lesser impact on fishing effort and is therefore expected to have lesser impacts on habitat, compared to alternatives 2B and 2C.

7.2.2.5. Habitat Impacts of Alternative 2E (January 2016 AP Proposal)

Alternative 2E is the January 2016 AP proposal and is intended to restore access to important areas for longfin squid fishing (section 5.2.5, Figure 7). As described in more detail in section 7.1.2.5, it is expected to result in an increase in small-mesh fishing effort in 1,108 square nautical miles during January 1 – March 15. The areas which would be removed from the Southern GRA under alternative 2E are, in general, deeper, have steeper slopes, and have more gravel and silt/mud substrates than most of the other areas within the Southern GRA, which are mostly flat and sandy (section 6.2.1, Figure 13). These more complex bottom types generally experience a longer duration of impacts from contact with bottom otter trawls than less complex bottom types such as flat sand (section 6.2.3).

If alternative 2E results in an increase in small- mesh fishing effort, it could result in slight negative habitat impacts by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and physical habitat in 1,108 square nautical miles during January 1 – March 15. Although alternative 2E would remove some areas with complex bottom habitats from the Southern GRA, impacts to habitat are expected to be slight negative (as opposed to moderate negative) because alternative 2E will impact only one gear type in certain areas for 2.5 months each year. If alternative 2E results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to habitat would be neutral. The habitat impacts of alternative 2E are thus expected to range from slight negative to neutral.

Because alternative 2E would remove a greater area from the Southern GRA than alternatives 2B-2D, and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2E is expected to result in a greater increase in small-mesh fishing effort and thus greater potential impacts to habitat, compared to alternatives 2B-2D.

7.2.2.6. Habitat Impacts of Alternative 2F (Modified January 2016 AP Proposal)

Alternative 2F is a modification of the January 2016 AP proposal (alternative 2E) and is intended to restore access to important areas for longfin squid fishing, while leaving the section of the Southern GRA within statistical area 616 unchanged (section 5.2.6, Figure 8). As described in more detail in section 7.1.2.6, alternative 2F could result in an increase in fishing effort in 977 square nautical miles during January 1 – March 15. The areas which would be removed from the Southern GRA under alternative 2F are, in general, deeper, have steeper slopes, and have more gravel and silt/mud substrates than most of the other areas within the Southern GRA, which are mostly flat and sandy (section 6.2.1, Figure 13). These more complex bottom types generally experience a longer duration of impacts from contact with bottom otter trawls than less complex bottom types such as flat sand (section 6.2.3). Compared to alternative 2E, alternative 2F would remove a smaller amount of "deeper flat sand" and "deeper depression sand" habitats from the Southern GRA (section 6.2.1, Figure 13; Greene et al. 2010).

If alternative 2F results in an increase in small- mesh fishing effort, it could result in slight negative habitat impacts by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and physical habitat over 977 square nautical miles during January 1 – March 15. Although alternative 2F would remove some areas with complex bottom habitats from the Southern GRA, impacts to habitat are expected to be slight negative (as opposed to moderate negative) because alternative 2F will impact only one gear type in certain areas for 2.5 months each year. If alternative 2F results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to habitat would be neutral. The habitat impacts of alternative 2F are thus expected to range from slight negative to neutral.

Because alternative 2F would remove a greater area from the Southern GRA than alternatives 2B-2D, and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2F is expected to result in a greater increase in small-mesh fishing effort and thus greater impacts to habitat, compared to alternatives 2B-2D. Alternative 2F is expected to have lesser habitat impacts than alternative 2E because it would remove a smaller area from the Southern GRA.

7.2.2.7. Habitat Impacts of Alternative 2G (Combination of Alternatives 2B and 2E; Preferred Southern GRA Alternative)

Alternative 2G is the preferred Southern GRA alternative. It represents a combination of the 2012 and 2016 AP proposals and is designed to restore access to fishing areas for longfin squid (section 5.2.7, Figure 11). As described in more detail in section 7.1.2.7, alternative 2G could result in a moderate increase in fishing effort, and therefore an increase in the amount of time that small-mesh fishing gear is in the water and thus an increase in the potential for interactions between fishing gear and physical habitat, in 1,031 square nautical miles during January 1 – March 15. The areas which would be removed from the Southern GRA under alternative 2G are, in general, deeper, have steeper slopes, and have more gravel and silt/mud substrates than most of the other areas within the Southern GRA, which are mostly flat and sandy (section 6.2.1, Figure 13). These more complex bottom types generally experience a longer duration of impacts from contact with bottom otter trawls than less complex bottom types such as flat sand (section 6.2.3).

If alternative 2G results in an increase in small- mesh fishing effort, it could result in slight negative habitat impacts by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and physical habitat over 1,031 square nautical miles during January 1 – March 15. Although alternative 2G would remove some areas with complex bottom habitats from the Southern GRA, impacts to habitat are expected to be slight negative (as opposed to moderate negative) because alternative 2G will impact only one gear type in certain areas for 2.5 months each year. If alternative 2G results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to habitat would be neutral. The habitat impacts of alternative 2G are thus expected to range from slight negative to neutral.

Because alternative 2G would remove a greater area from the Southern GRA than alternatives 2B-2D and 2F and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2G is expected to result in a greater increase in small-mesh fishing effort and thus greater impacts to habitat, compared to alternatives 2B-2D and 2F. Alternative 2G is expected to have lesser habitat impacts than alternative 2E because it would remove a smaller area from the Southern GRA.

7.2.2.8. Habitat Impacts of Alternative 2H (Southern GRA Expanded into Area 616)

Alternative 2H would expand the Southern GRA into statistical area 616 (section 5.2.8, Figure 12). As described in section 7.1.2.8, it is expected to result in a substantial decrease in small-mesh fishing effort in 880 square nautical miles during January 1 – March 15. By reducing small-mesh fishing effort, it would reduce the amount of time that fishing gear is in the water and would thus decrease the potential for interactions between fishing gear and physical habitat. Alternative 2H would alter the bottom habitat composition of the Southern GRA by increasing the amount of high flat sand, deeper depression sand, deeper flat sand, steep sand, high flat gravel, low slope sand, and side slope gravel found within the Southern GRA (section 6.2.1, Figure 13; Greene et al. 2010). The steep, slope, side slope, and gravel habitat types are considered to be more complex habitats than the flat, sandy habitat that covers the most area within the GRAs. Complex habitats typically experience a greater duration of impacts from bottom trawl gear compared to less complex habitats; therefore, by reducing the amount of small-mesh fishing effort within complex habitats, alternative 2H is expected to have positive habitat impacts, compared to the *status quo* (alternative 2A). Although alternative 2H is expected to result in a substantial decrease in small-mesh fishing effort in 880 square nautical miles for 2.5 months each year, it will not affect other gear types, other times of the year, and other areas, therefore the overall impacts on habitat are expected to be moderate positive compared to the *status quo* (alternative 2A).

Alternative 2H is the only alternative which would increase the size of the Southern GRA. It is the only Southern GRA alternative which is expected to result in a decrease in small-mesh fishing effort. For this reason, alternative 2H is expected to have greater positive habitat impacts than any of the other Southern GRA alternatives under consideration.

7.2.2.9. Habitat Impacts of Alternative 2I (Eliminate the Southern GRA)

Alternative 2I would eliminate the Southern GRA. Elimination of the Southern GRA could result in an increase in small-mesh fishing effort in 3,117 square nautical miles during January 1 - March 15. Alternatively, alternative 2I could result in a shift in the distribution of fishing effort without a change in the amount of effort. If effort increases, then impacts to habitat would be slight negative, compared to the *status quo* (alternative 2A), due to an increase in the amount of time that small-mesh fishing gear is in the water and thus an increase in the potential for interactions between fishing gear and physical habitat. Impacts are expected be slight (as opposed to moderate) negative because they will occur only in the areas currently included in the Southern GRA, for only 2.5 months each year, and are based on one gear type. If effort remains similar to the *status quo,* then habitat impacts would be neutral. The habitat impacts of alternative 2I are thus expected to range from neutral to slight negative. Of all the Southern GRA alternatives, alternative 2I has the greatest potential for negative habitat impacts.

7.3. Impacts to ESA and MMPA Protected Species

This section summarizes the expected impacts of each alternative on protected species (i.e. species listed as endangered or threatened under the ESA and species afforded protection under the MMPA). As described in section 6.3, several protected species can be found within the GRAs. Many of these species are migratory and/or widely distributed. A quantitative analysis of changes in interaction rates between bottom trawl gear and protected species under each of the alternatives is not possible; therefore, impacts are described in a general, qualitative sense.

Alternatives that result in interactions with protected species are considered to have negative impacts for those protected species. Alternatives that do not have the potential to result in interactions with protected species have neutral impacts. When compared to each other, alternatives that result in more interactions are negative when compared with alternatives that result in fewer interactions. As described in section 7.1.2.2, the expected changes in fishing effort under each alternative are primarily based on changes in longfin squid availability under each alternative, compared to the *status quo* (alternatives 1A and 2A).

7.3.1. Protected Species Impacts of Northern GRA Alternatives

The expected impacts of the Northern GRA alternatives on protected species range from slight negative to slight positive. Of the three Northern GRA alternatives, alternative 1B has the highest potential for positive impacts to protected species, followed by alternative 1A, and then alternative 1C.

7.3.1.1. Protected Species Impacts of Alternative 1A (*Status Quo* Northern GRA; Preferred Northern GRA Alternative)

Alternative 1A is the *status quo* Northern GRA alternative (Figure 1, section 5.1.1). It is the preferred Northern GRA alternative. As described in more detail in section 7.1.1.1, it is not known if implementation of the Northern GRA caused a change in the overall amount or distribution of fishing effort. It may have caused a reduction in small-mesh fishing effort during November and December. Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have resulted in an increase in fishing effort.

If the Northern GRA did result in an overall decrease in the amount of fishing effort during November and December, then alternative 1A would have slight positive impacts on protected species by maintaining a *status quo* Northern GRA. If the Northern GRA caused a change in the distribution of fishing effort, but did not result in a change in the amount of fishing effort, then alternative 1A would have continued neutral impacts on protected species. If the Northern GRA resulted in an increase in fishing effort, due to a decrease in CPUE, then alternative 1A would have continued slight negative impacts on protected species.

7.3.1.2. Protected Species Impacts of Alternative 1B (Northern GRA Expanded into Area 613)

Alternative 1B would expand the Northern GRA into statistical area 613 (Figure 2, section 5.1.2). As described in more detail in section 7.1.1.2, alternative 1B could result in a reduction in small-mesh fishing effort in 945 square nautical miles during November and December. If small-mesh fishing effort decreases as a result of alternative 1B, then the amount of time that small-mesh trawl fishing gear is in the water would decrease and the potential for interactions between fishing gear and protected species would also decrease. If this were to occur, then alternative 1B would have slight positive impacts for protected species compared to the *status quo* (alternative 1A). Impacts are expected to be slight positive because alternative 1B will only affect small-mesh fishing effort in 945 square nautical miles during two months each year. It will not affect other gear types, other areas, or other times of the year. If alternative 1B were to cause small-mesh fishing effort to shift out of the Northern GRA and into other areas, then the overall amount of effort could remain similar to the *status quo*, which would result in neutral impacts to protected species. The impacts of alternative 1B on protected species are thus expected to range from neutral to slight positive, compared to the *status quo* (alternative 1A).

7.3.1.3. Protected Species Impacts of Alternative 1C (Eliminate the Northern GRA)

Alternative 1C would eliminate the Northern GRA. As described in section 7.1.1.1, elimination of the Northern GRA could result in an increase in small-mesh fishing effort in November and December in 1,489 square nautical miles. Alternatively, alternative 1C could result in a shift in the distribution of fishing effort without a change in the amount of effort. If effort increases, then impacts to protected species would be slight negative due to an increase in the amount of time that fishing gear is in the water and thus increased potential for interactions between fishing gear and protected species. The impacts are expected to be slight negative (as opposed to moderate negative) because alternative 1C only affects small-mesh fishing gear in the Northern GRA for two months each year. It does not affect other gear types, other areas, or other times of the year. If effort remains similar to the *status quo* (alternative 1A), then impacts to protected species would be neutral. The impacts of alternative 1C on protected species are thus expected to range from neutral to slight negative, compared to the *status quo* (alternative 1A). Of all the Northern GRA alternatives, alternative 1C has the greatest potential for negative impacts to protected species because it is the only Northern GRA alternative which could lead to an increase in fishing effort, compared to the *status quo* (alternative 1A).

7.3.2. Protected Species Impacts of Southern GRA Alternatives

The impacts of the Southern GRA alternatives on protected species range from slight negative to slight positive. Of the nine Southern GRA alternatives, alternative 2H has the highest potential for positive impacts to protected species, followed by alternatives 2A, 2D, 2B, 2C, 2F, 2G, 2E, and 2I, in that order.

7.3.2.1. Protected Species Impacts of Alternative 2A (*Status Quo* Southern GRA)

Alternative 2A is the *status quo* Southern GRA alternative (Figure 1, section 5.2.1). As described in section 7.1.2.1, it is not known if implementation of the Southern GRA caused a change in the overall amount or distribution of fishing effort. It may have caused a reduction in small-mesh fishing effort during January 1 – March 15. Alternatively, it may have caused effort to shift out of the GRA and into other areas, without increasing or decreasing. It may also have caused vessels to fish in areas with lower CPUE, which could have caused an increase in fishing effort.

If the Southern GRA did result in an overall decrease in the amount of fishing effort during January 1 – March 15, then alternative 2A would have slight positive impacts on protected species by maintaining a *status quo* Southern GRA. If the Southern GRA caused a change in the distribution of fishing effort, but did not result in a change in the amount of fishing effort, then alternative 2A would have continued neutral impacts on protected species. If the Southern GRA resulted in an increase in fishing effort, due to a decrease in CPUE, then alternative 2A would have continued slight negative impacts on protected species.

7.3.2.2. Protected Species Impacts of Alternative 2B (2012 AP Proposal)

Alternative 2B is the 2012 AP proposal (section 5.2.2, Figure 4). It is intended to restore access to important areas for longfin squid fishing. As described in more detail in section 7.1.2.2, alternative 2B could result in an increase in small-mesh fishing effort in 230 square nautical miles during January 1 – March 15. If alternative 2B results in an increase in small- mesh fishing effort, it could result in slight negative impacts to protected species by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and protected species in 230 square nautical miles during January 1 – March 15. If alternative 2B results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to protected species would be neutral. The protected species impacts of alternative 2B are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

7.3.2.3. Protected Species Impacts of Alternative 2C (2012 AP Proposal with Coral Areas Removed)

Alternative 2C is the 2012 AP proposal with areas of overlap with the deep sea coral protection areas removed (section 5.2.3, Figure 5). It is intended to restore access to important areas for longfin squid fishing. As described in more detail in section 0, it could result in an increase in small-mesh fishing effort in 249 square nautical miles during January 1 – March 15.

If alternative 2C results in an increase in small-mesh fishing effort, it could result in slight negative impacts to protected species by increasing the time that fishing gear is in the water and thus increasing the potential for interactions between trawl gear and protected species over 249 square nautical miles during January 1 – March 15. The impacts of alternative 2C on protected species are expected to be slightly more negative than those of alternative 2B because alternative 2C would remove a slightly greater area from the Southern GRA than alternative 2B. However, if the coral zones are implemented as proposed, then the impacts of alternatives 2B and 2C on protected species will be identical. If alternative 2C results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts on protected species would be neutral. The impacts of alternative 2C on protected species are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

7.3.2.4. Protected Species Impacts of Alternative 2D (Area 632 Removed from Southern GRA)

Alternative 2D would remove statistical area 632 from the Southern GRA (section 5.2.4, Figure 6). As described in section 7.1.2.4, removing statistical area 632 from the Southern GRA could result in a slight increase in fishing effort for longfin squid. If fishing effort increases slightly under alternative 2D, then slight negative impacts to protected species would be expected due to an increase in the amount of time that small-mesh trawl gear is in the water and thus an increase in the potential for interactions between fishing gear and protected species. If the distribution of fishing effort does not increase, then impacts to protected species would be neutral. The impacts of alternative 2D on protected species are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

Although alternative 2D would remove a larger area from the Southern GRA than alternatives 2B and 2C, it is expected to have a lesser impact on fishing effort and is therefore expected to have lesser impacts on protected species, compared to alternatives 2B and 2C.

7.3.2.5. Protected Species Impacts of Alternative 2E (January 2016 AP Proposal)

Alternative 2E is the January 2016 AP proposal and is intended to restore access to important areas for longfin squid fishing (section 5.2.5, Figure 7). As described in more detail in section 7.1.2.5, it could result in an increase in small-mesh fishing effort in 1,108 square nautical miles during January 1 – March 15. In doing so, alternative 2E could result in slight negative impacts to protected species by increasing the time that trawl gear is in the water and thus increasing the potential for interactions between trawl gear and protected species in 1,108 square nautical miles during January 1 – March 15. If alternative 2E results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to protected species would be neutral. The impacts of alternative 2E on protected species are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

Because alternative 2E would remove a greater area from the Southern GRA than alternatives 2B-2D, and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2E is expected to result in a greater increase in small-mesh fishing effort and thus greater impacts to protected species than alternatives 2B-2D.

7.3.2.6. Protected Species Impacts of Alternative 2F (Modified January 2016 AP Proposal)

Alternative 2F is a modification of the January 2016 AP proposal and is intended to restore access to important areas for longfin squid fishing (section 5.2.6, Figure 8). As described in more detail in section 7.1.2.6, alternative 2F could result in an increase in small-mesh fishing effort in 977 square nautical miles during January 1 – March 15.

If alternative 2F results in an increase in effort, it could result in slight negative impacts to protected species by increasing the time that trawl gear is in the water and thus increasing the potential for interactions between gear and protected species over 977 square nautical miles during January 1 – March 15. If alternative 2F results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to protected species would be neutral. The impacts of alternative 2F on protected species are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

Because alternative 2F would remove a greater area from the Southern GRA than alternatives 2B-2D, and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2F is expected to result in a greater increase in small-mesh fishing effort and thus greater impacts to protected species, compared to alternatives 2B-2D. Alternative 2F is expected to have lesser impacts on protected species than alternative 2E because it would remove a smaller area from the Southern GRA and is expected to result in a lesser change in fishing effort.

7.3.2.7. Protected Species Impacts of Alternative 2G (Combination of Alternatives 2B and 2E; Preferred Southern GRA Alternative)

Alternative 2G is the preferred Southern GRA alternative. It represents a combination of the 2012 and 2016 AP proposals and is designed to restore access to fishing areas for longfin squid (section 5.2.7, Figure 11). As described in more detail in section 7.1.2.7, alternative 2G could result in a moderate increase in small-mesh fishing effort and therefore could result in an increase in the amount of time that fishing gear is in the water and thus an increase in the potential for interactions between fishing gear and protected species in 1,031 square nautical miles during January 1 – March 15. In doing so, alternative 2G could result in slight negative impacts to protected species. If alternative 2G results in an increase in CPUE or a change in the distribution of fishing effort without changing the overall amount of effort, then impacts to protected species would be neutral. The impacts of alternative 2G on protected species are thus expected to range from slight negative to neutral, compared to the *status quo* (alternative 2A).

Because alternative 2G would remove a greater area from the Southern GRA than alternatives 2B-2D and 2F and because these areas would be removed due to their importance to the longfin squid fishery, alternative 2G is expected to result in a greater increase in small-mesh fishing effort and thus greater impacts to protected species, compared to alternatives 2B-2D, and 2F. Alternative 2G is expected to have lesser impacts on protected species than alternative 2E because it would remove a smaller area from the Southern GRA and is expected to result in a lesser change in fishing effort.

7.3.2.8. Protected Species Impacts of Alternative 2H (Southern GRA Expanded into Area 616)

Alternative 2H would expand the Southern GRA into statistical area 616 (section 5.2.8, Figure 12). As described in section 7.1.2.8, it is expected to result in a substantial decrease in small-mesh fishing effort in 880 square nautical miles during January 1 – March 15. By reducing small-mesh fishing effort, it would reduce the amount of time that fishing gear is in the water and would thus decrease the potential for interactions between fishing gear and protected species. Although alternative 2H is expected to result in a substantial decrease in small-mesh fishing effort in 880 square nautical miles for 2.5 months each year, it will not affect other gear types, other times of the year, and other areas, therefore the overall impacts on protected species are expected to be moderate positive compared to the *status quo* (alternative 2A).

Alternative 2H is the only alternative which would increase the size of the Southern GRA. It is the only Southern GRA alternative which is expected to result in a decrease in small-mesh fishing effort. For these reasons, alternative 2H is expected to have greater positive impacts for protected species than any of the other Southern GRA alternatives under consideration.

7.3.2.9. Protected Species Impacts of Alternative 2I (Eliminate the Southern GRA)

Alternative 2I would eliminate the Southern GRA. As described in more detail in section 7.1.2.9, elimination of the Southern GRA could result in an increase in small-mesh fishing effort in 3,117 square nautical miles during January 1 - March 15. Alternatively, alternative 2I could result in a shift in the distribution of fishing effort without a change in the amount of effort. If effort increases, then impacts to protected species would be slight negative, compared to the *status quo* (alternative 2A), due to an increase in the amount of time that small-mesh fishing gear is in the water and thus an increase in the potential for interactions between fishing gear and protected species. If effort remains similar to the *status quo,* then impacts to protected species would be neutral. The impacts of alternative 2I on protected species are thus expected to range from neutral to slight negative, compared to the *status quo* (alternative 2A). Of all the Southern GRA alternatives, alternative 2I has the greatest potential for negative impacts to protected species.

7.4. Socioeconomic Impacts

This section summarizes the expected socioeconomic impacts of each alternative. Socioeconomic impacts are evaluated based on expected changes in revenues. Changes in revenues are expected to result from changes in landings of longfin squid, which are in turn expected to result from the changes in availability of longfin squid under each alternative as described in section 7.1. As described in section 7.1.2.2, changes in the availability of other species are not expected to result in notable changes in effort.

In general, alternatives which could result in increased landings are expected to have positive socioeconomic impacts due to the potential for increased revenues. Alternatives which could result in decreased landings are expected to have negative socioeconomic impacts. The expected socioeconomic impacts of each alternative are described in more detail in the following sections.

Landings and revenues are influenced by a variety of factors, including many different regulations, availability of various targeted species, weather, and markets. For these reasons, expected changes in landings and revenues under each alternative are not quantified but are instead described qualitatively in comparison to the *status quo* alternatives (alternatives 1A and 2A) and in comparison to the other alternatives.

7.4.1. Socioeconomic Impacts of Northern GRA Alternatives

The expected socioeconomic impacts of the Northern GRA alternatives range from slight negative to moderate positive. Of the three Northern GRA alternatives, alternative 1C has the highest potential for positive socioeconomic impacts, followed by alternative 1A, and then 1B.

7.4.1.1. Socioeconomic Impacts of Alternative 1A (*Status Quo* Northern GRA; Preferred Northern GRA Alternative)

Alternative 1A is the *status quo* Northern GRA alternative (Figure 1, section 5.1.1). It is the preferred Northern GRA alternative.

As previously described, the impact of the GRAs on landings and revenues is not quantifiable because it cannot be separated from the influence of prices, markets, environmental conditions, and other factors. Many fishing industry members and representatives have said that the GRAs in general, and the Southern GRA in particular, have negatively impacted their revenues from longfin squid fishing by preventing them from fishing in productive areas in the winter. The Northern GRA has likely had negative socioeconomic impacts on small-mesh fisheries for longfin squid and other species by limiting where vessels can fish. Alternative 1A would continue these negative socioeconomic impacts by maintaining a *status quo* Northern GRA.

As described in previous sections, the GRAs likely played a role in decreasing the discard mortality of juvenile scup and may be partly responsible for the increase in scup SSB over the past several years (Terceiro and Miller 2014). In this way, the GRAs likely resulted in positive socioeconomic impacts for scup fisheries. Alternative 1A would continue these positive socioeconomic impacts for the scup fishery by maintaining a *status quo* Northern GRA.

For these reasons, alternative 1A is expected to have mixed (i.e. both negative and positive) socioeconomic impacts.

7.4.1.2. Socioeconomic Impacts of Alternative 1B (Northern GRA Expanded into Area 613)

Alternative 1B would expand the Northern GRA into statistical area 613 (Figure 2, section 5.1.2). As described in more detail in section 7.1.1.2, alternative 1B would decrease the amount of longfin squid available to small-mesh fisheries during November and December in 945 square nautical miles (

Table 13). Alternative 1B could result in reduced profits for the longfin squid fishery by resulting in decreased landings during November and December. Alternative 1B is therefore expected to result in slight negative socioeconomic impacts for the longfin squid fishery, compared to the *status quo* (alternative 1A). Some negative economic impacts could be mitigated if fishing effort shifts out of the areas added to the Northern GRA under this alternative and into other areas. However, a shift in effort may increase harvesting costs by increasing search time and/or leading to a decrease in CPUE.

Alternative 1B could have slight positive long-term socioeconomic impacts for the associated fisheries if the biomass of longfin squid and non-target species (including scup) increases in the future as a result of a decrease in small-mesh fishing effort in November and December. A significant increase in biomass is unlikely as this alternative only impacts one gear type for two months out of the year. Overall, the expected socioeconomic impacts of alternative 1B range from neutral to slight negative, compared to the *status quo* (alternative 1A).

7.4.1.3. Socioeconomic Impacts of Alternative 1C (Eliminate Northern GRA)

Alternative 1C would eliminate the Northern GRA and would allow vessels to fish for or possess longfin squid, black sea bass, and silver hake while using mesh smaller than 5.0 inches in 1,489 square nautical miles where they are currently prohibited from doing so during November and December. Alternative 1C is expected to have moderate positive socioeconomic impacts for these small-mesh fisheries because it could allow for increased landings during November and December. Due to AMs and other management measures, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is jeopardized (section 7.1.1.3).

Because alternative 1C would remove a restriction on small-mesh fishing during November and December, it is expected to have greater positive socioeconomic impacts than alternative 1A, which would maintain the *status quo* restrictions, and alternative 1B, which would increase the area over which the GRA restrictions apply.

7.4.2. Socioeconomic Impacts of Southern GRA Alternatives

The expected socioeconomic impacts of the Southern GRA alternatives range from moderate negative to moderate positive. Of the nine Southern GRA alternatives, alternative 2I has the highest potential for positive socioeconomic impacts, followed by alternatives 2E, 2G, 2F, 2D, 2C, 2B, 2A, and 2H, in that order.

7.4.2.1. Socioeconomic Impacts of Alternative 2A (*Status Quo* Southern GRA)

Alternative 2A is the *status quo* Southern GRA alternative (Figure 1, section 5.2.1). As described in sections 7.1.1 and 7.4, the impacts of the GRAs on the amount of fishing effort, the distribution of fishing effort, landings, and revenues are not quantifiable. Many fishing industry members and representatives have said that the GRAs in general, and the Southern GRA in particular, have negatively impacted revenues from longfin squid fishing by preventing vessels from fishing in productive areas during certain times of the year. Alternative 2A would maintain a *status quo* Southern GRA and would therefore likely have continued negative socioeconomic impacts for longfin squid fisheries.

As described in previous sections, the GRAs likely played a role in decreasing discard mortality of juvenile scup and may be partly responsible for the increase in scup SSB over the past several years (Terceiro and Miller 2014). In this way, the GRAs likely resulted in positive socioeconomic impacts for scup fisheries and alternative 2A would continue these positive socioeconomic impacts by maintaining a *status quo* Southern GRA.

For these reasons, alternative 2A is expected to have mixed (i.e. both negative and positive) socioeconomic impacts.

7.4.2.2. Socioeconomic Impacts of Alternative 2B (2012 AP Proposal)

Alternative 2B is the 2012 AP proposal (section 5.2.2, Figure 4). Alternative 2B is intended to restore access to important areas for longfin squid fishing. As described in section 7.1.2.2, the impacts of alternative 2B stem largely from an increase in the availability of longfin squid in 230 square nautical miles during January 1 – March 15 (Table 17). Alternative 2B is expected to result in an increase in effort directed at and landings of longfin squid.

According to AP members, global demand and ex-vessel prices for longfin squid in 2015 and 2016 (to date) were higher than in recent years (Table 19), due in part to decreased squid landings in other parts of the world because of El Niño. If this trend continues, alternative 2B could result in an increase in longfin squid landings without a decrease in price. For these reasons, alternative 2B is expected to have moderate positive socioeconomic impacts compared to the *status quo* (alternative 2A).

Table 19: Average dealer-reported price per pound of longfin squid, 2011-2016.

Year	January - March	January - December
2011	$1.07	$1.18
2012	$1.31	$1.11
2013	$1.20	$1.08
2014	$1.01	$0.97
2015	$1.02	$1.18
2016	$1.27	--

7.4.2.3. Socioeconomic Impacts of Alternative 2C (2012 AP Proposal with Coral Areas Removed)

Alternative 2C is the 2012 AP proposal with areas of overlap with the deep sea coral protection areas removed (section 5.2.3, Figure 5). As described in section 0, the impacts of alternative 2C stem largely from an increase in the availability of longfin squid in 249 square nautical miles during January 1 – March 15 (Table 17). Alternative 2C is expected to result in an increase in effort directed at and landings of longfin squid. As described in section 7.4.2.2, an increase in longfin squid landings is not expected to result in a decrease in price. For these reasons, alternative 2B is expected to lead to increased revenues and moderate positive socioeconomic impacts compared to the *status quo* (alternative 2A).

Alternative 2C could lead to slightly higher revenues than alternative 2B because it could result in slightly higher longfin squid availability than alternative 2B. However, if the coral zones are implemented as proposed, the impacts of alternatives 2B and 2C will be identical.

7.4.2.4. Socioeconomic Impacts of Alternative 2D (Area 632 Removed from Southern GRA)

Alternative 2D would remove statistical area 632 from the Southern GRA (section 5.2.4, Figure 6). As described in section 7.1.2.4, alternative 2D may result in a minor increase in small-mesh fishing effort for and landings of longfin squid. As described in section 7.4.2.2, an increase in longfin squid landings is not expected to result in a decrease in price; therefore, an increase in landings is expected to lead to increased revenues. If prices remain high, fishing effort for longfin squid could increase under alternative 2D, despite the fact that alternative 2D would increase squid availability by only 11%, compared to the *status quo* (alternative 2A). Alternatively, an 11% increase in availability may not be large enough to result in a notable change in fishing effort or landings. For these reasons, alternative 2D is expected to have neutral to slight positive socioeconomic impacts, compared to the *status quo* (alternative 2A).

Alternative 2D is expected to have a lesser impact on longfin squid availability than alternatives 2B and 2C (section 7.1.2); therefore, it is expected to have a lesser impact on landings and revenues and lesser socioeconomic impacts than alternatives 2B and 2C.

7.4.2.5. Socioeconomic Impacts of Alternative 2E (January 2016 AP Proposal)

Alternative 2E is the January 2016 AP proposal (section 5.2.5, Figure 7). As described in section 7.1.2.5, it is expected to increase longfin squid availability during January 1-March 15 (Table 17). It is expected to result in increased landings of longfin squid. As described in section 7.4.2.2, an increase in landings is not expected to lead to a decrease in price; therefore, an increase in landings is expected to lead to increased revenues. The socioeconomic impacts of alternative 2E are expected to be moderate positive, compared to the *status quo* (alternative 2A).

Alternative 2E is expected to have greater positive socioeconomic impacts than alternatives 2B-2D because it would increase the availability of longfin squid (and by extension, landings and revenues) by a greater amount than these other alternatives (section 7.1.2).

7.4.2.6. Socioeconomic Impacts of Alternative 2F (Modified January 2016 AP Proposal)

Alternative 2F is a modified version of the January 2016 AP proposal (section 5.2.6, Figure 8). As described in section 7.1.2.6, it is expected to increase longfin squid availability during January 1-March 15 (Table 17). It is expected to result in increased landings of longfin squid. As described in section 7.4.2.2, an increase in landings is not expected to lead to a decrease in price; therefore, an increase in landings is expected to lead to increased revenues. The socioeconomic impacts of alternative 2F are expected to be moderate positive, compared to the *status quo* (alternative 2A).

Alternative 2F is expected to have greater positive socioeconomic impacts than alternatives 2B-2D because it would increase the availability of longfin squid (and by extension, landings and revenues) by a greater amount than would these other alternatives. It is expected to have lesser socioeconomic impacts than alternative 2E because it would result in a smaller increase in longfin squid availability, compared to alternative 2E (section 7.1.2).

7.4.2.7. Socioeconomic Impacts of Alternative 2G (Combination of Alternatives 2B and 2E; Preferred Southern GRA Alternative)

Alternative 2G represents a combination of the 2012 and 2016 AP proposals and is the preferred Southern GRA alternative (section 5.2.7, Figure 11). As described in section 7.1.2.7, it is expected to increase longfin squid availability during January 1-March 15 (Table 17). It is expected to result in increased landings of longfin squid. As described in section 7.4.2.2, an increase in landings is not expected to lead to a decrease in price; therefore, an increase in landings is expected to lead to increased revenues. The socioeconomic impacts of alternative 2G are expected to be moderate positive, compared to the *status quo* (alternative 2A).

Alternative 2G is expected to have greater positive socioeconomic impacts than alternatives 2B-2D and 2F because it would increase the availability of longfin squid (and by extension, landings and revenues) by a greater amount than would these other alternatives. It is expected to have lesser socioeconomic impacts than alternative 2E because it would result in a smaller increase in longfin squid availability, compared to alternative 2E (section 7.1.2).

7.4.2.8. Socioeconomic Impacts of Alternative 2H (Southern GRA Expanded into Area 616)

Alternative 2H would expand the Southern GRA into statistical area 616 (section 5.2.8, Figure 12). As described in section 7.1.2.8, it would substantially increase the amount of scup, longfin squid, black sea bass, and silver hake found within the Southern GRA and would thus decrease the amount of those species available to capture with small-mesh in 880 square nautical miles during January 1–March 15 (Table 17). Because alternative 2H would add Hudson Canyon, an important fishing area for many species, to the Southern GRA, it is expected to result in a decrease in small-mesh fishing effort and would likely lead to decreased landings of various species and would therefore lead to decreased revenues during January 1–March 15. As described in section 5.2.6, Hudson Canyon was once included in the GRAs but was later removed due to concerns of negative economic impacts. Alternative 2H is expected to have moderate negative socioeconomic impacts due to the potential for reduced revenues. Some negative impacts may be mitigated if fishing effort shifts out of statistical area 616 and into other areas; however, a shift in the distribution of effort could increase the cost of harvest due to increased search time and/or decreased CPUE. Overall, the socioeconomic impacts of alternative 2H are expected to be moderate negative, compared to the *status quo* (alternative 2A).

Alternative 2H is the only alternative which would increase the size of the Southern GRA. It is the only alternative that would decrease the availability of multiple species to small-mesh fisheries during January 1 – March 15, compared to the *status quo* (alternative 2A). For this reason, of all the Southern GRA alternatives, alternative 2H has the highest potential for negative socioeconomic impacts.

7.4.2.9. Socioeconomic Impacts of Alternative 2I (Eliminate Southern GRA)

Alternative 2I would eliminate the Southern GRA and would allow vessels to fish for or possess longfin squid, black sea bass, and silver hake while using mesh smaller than 5.0 inches in diameter in 3,117 square nautical miles where they are currently prohibited from doing so during January 1 – March 15. Alternative 2I is expected to have moderate positive socioeconomic impacts for small-mesh fisheries because it could allow for increased landings of several species during January 1–March 15 and thus could lead to increased revenues.

Alternative 2I could result in an increase in fishing mortality (including discard mortality) for target and non-target species; however, fishing mortality is not expected to increase to the extent that the sustainability of the stocks is threatened. As previously described, the Councils implemented AMs for scup, black sea bass, silver hake, and several other of the most common non-target species in small-mesh trawl fisheries. AMs prevent catches in excess of the ACLs from occurring in multiple consecutive years. Thus, although fishing mortality for these species is expected to increase under alternative 2I, it would likely not increase to the extent that the sustainability of the stocks is jeopardized.

Because alternative 2I would eliminate the Southern GRA, which restricts small-mesh fishing during January 1–March 15, it is expected to have greater positive socioeconomic impacts than all the other Southern GRA alternatives, which would either increase (alternative 2H), maintain (alternative 2A), or decrease (alternatives 2B-2G) the current restrictions associated with the Southern GRA.

7.5. 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 a 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. The intent is rather to focus on those effects that are truly meaningful. A formal cumulative impact assessment is not necessarily required under NEPA as part of an EA as long as the significance of cumulative impacts have been considered. The following remarks address the significance of the expected cumulative impacts as they relate to the federally managed scup, longfin squid, black sea bass, and silver hake fisheries.

7.5.1. Consideration of the VECs

The VECs that exist within the scup, longfin squid, black sea bass, and silver hake fishery environment are described in section 6.0. The significance of the cumulative effects will be discussed in relation to the following VECs:

- The managed stocks most directly affected by the Scup GRA regulations (i.e. scup, longfin squid, black sea bass, and silver hake) and non-target species caught in fisheries for those stocks;
- Habitat for the managed stocks and non-target species;
- Species afforded protection under the ESA and/or the MMPA, and
- Human communities (the social and economic aspects of the affected environment).

7.5.2. Geographic Boundaries

The analysis of impacts focuses on actions related to the harvest of scup, longfin squid, black sea bass, and silver hake within the boundaries of the Scup GRAs during the effective times of the year. The core geographic scope for each of the VECs is focused on the Western Atlantic Ocean. The management units are the core geographic scopes for the managed resources (section 6.1). For non-target species, the ranges may be larger and would depend on the biological range of each non-target species in the Western Atlantic Ocean. The core geographic scope for habitat impacts is focused on EFH within the EEZ but includes all habitat utilized by scup, longfin squid, black sea bass, silver hake, and other non-target species in the Western Atlantic Ocean. The core geographic scope for endangered and protected species is the overall range of these species in the Western Atlantic Ocean. The core geographic boundaries for human communities are those U.S. fishing communities directly involved in the harvest or processing of the managed resources and which are located in coastal states from Maine through North Carolina.

7.5.3. Temporal Boundaries

The temporal scope of past and present actions for considering impacts to the VECs is primarily focused on actions that have occurred after late 2000, when the scup GRAs were first implemented. The temporal scope of future actions for all five VECs extends about three years into the future beyond the analyzed time frame of the proposed actions in this document (i.e. 2021). The dynamic nature of resource management for the managed species and lack of information on new projects that may occur in the future make it difficult to predict impacts beyond this timeframe with any certainty.

7.5.4. Actions Other Than Those Proposed in this Document

The impacts of the alternatives considered in this document are described in sections 7.1 through 7.4. Table 20 presents meaningful past (P), present (Pr), or reasonably foreseeable future (RFF) actions other than those considered in this specifications document. These impacts are described in chronological order and qualitatively as the actual impacts of these actions are too complex to be quantified in a meaningful way. When any of these abbreviations (P, Pr, or RFF), occur together it indicates that some past actions are still relevant to the present and/or future actions.

Past and Present Actions

The historical management practices of the Mid-Atlantic and New England Fishery Management Councils have resulted in overall positive impacts on the health of the scup, longfin squid, black sea bass, and silver hake stocks (section 6.1). The Councils have taken many actions to manage the commercial and recreational fisheries for these species. The MSA is the statutory basis for Federal fisheries management. To the degree with which this regulatory regime is complied, the cumulative impacts of past, present, and reasonably foreseeable future federal fishery management actions on the VECs should generally be associated with positive long-term outcomes. Constraining fishing effort through regulatory actions can have negative short-term socioeconomic impacts. These impacts are usually necessary to bring about long-term sustainability of a given resource, and as such should, in the long-term, promote positive effects on human communities.

Non-fishing activities that introduce chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment pose a risk to all the identified VECs. Human-induced non-fishing activities tend to be localized in nearshore areas and marine project areas where they occur. Examples of these activities include agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and as such may indirectly constrain the sustainability of the managed resources, non-target species, and protected species. Decreased habitat suitability tends to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that reduce fishing effort could negatively impact human communities. The overall impact to the affected species and their habitats on a population level is unknown, but likely to be neutral to low negative, since a large portion of these populations have a limited or minor exposure to these local non-fishing perturbations.

In addition to guidelines mandated by the MSA, NMFS reviews these types of effects through the review processes required by section 404 of the Clean Water Act and section 10 of the Rivers and Harbors Act for certain activities that are regulated by federal, state, and local authorities. The jurisdiction of these activities is "waters of the U.S." and includes both riverine and marine habitats.

Reasonably Foreseeable Future Actions

For many of the proposed non-fishing activities to be permitted under other Federal agencies (e.g. beach nourishment, offshore wind facilities, etc.), those agencies would conduct examinations of potential impacts on the VECs. The MSA imposes an obligation on other Federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH (50 CFR 600.930). The eight regional fishery management councils engage in this review process by making comments and recommendations on Federal or state actions that may affect habitat for their managed species and by commenting on actions likely to substantially affect habitat.

Under section 662 of the Fish and Wildlife Coordination Act, "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 takes place. This act provides another avenue for review of actions by other federal and state agencies that may impact resources that NMFS manages in the reasonably foreseeable future.

NMFS and the USFWS share responsibility for implementing the ESA. The ESA requires NMFS to designate "critical habitat" (i.e. areas that contain physical or biological features essential to conservation, which may require special management considerations or protection) for any species it lists under the ESA and to develop and implement recovery plans for threatened and endangered species. The ESA provides another avenue for NMFS to review actions by other entities that may impact endangered and protected species whose management units are under NMFS' jurisdiction.

Non Fishing Impacts - Global Climate Change

Global climate change will affect all components of marine ecosystems, including human communities. Physical changes that are occurring and will continue to occur to these systems include sea-level rise, changes in sediment deposition, changes in ocean circulation, increased frequency, intensity and duration of extreme climate events, changing ocean chemistry, and warming ocean temperatures. Emerging evidence demonstrates that these physical changes are resulting in direct and indirect ecological responses within marine ecosystems which may alter the fundamental production characteristics of marine systems (Stenseth et al. 2002). Climate change will potentially exacerbate the stresses imposed by fishing and other non-fishing human activities and stressors (described in this section).

Results from the Northeast Fisheries Climate Vulnerability Assessment for Mid-Atlantic Council managed species indicate that climate change could have overall directional impacts that range from negative to positive depending on the adaptability of these managed species to the changing environment (Hare et al. 2016). Based on this assessment, scup was determined to have a moderate overall vulnerability to climate change. The exposure of scup to the effects of climate change was determined to be high because early life stages are typically found in coastal, nearshore waters, and adults seasonally migrate between inshore and offshore waters. However, because they are mobile and are "habitat generalists", scup may be able to shift their distribution in response to changing temperatures and other factors related to climate change.[22]

Overall, climate change is expected to have impacts that range from positive to negative on all VECs depending on the species. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts as the science surrounding predicting, evaluating, monitoring and categorizing these changes evolves.

[22] The climate vulnerability profile for scup is available at: https://www.st.nmfs.noaa.gov/ecosystems/climate/northeast-fish-and-shellfish-climate-vulnerability/index

Table 20: Impacts of Past (P), Present (Pr), and Reasonably Foreseeable Future (RFF) Actions on the five VECs (not including those actions considered in this document).

Action	Description	Impacts on Scup, Longfin Squid, Black Sea Bass, Silver Hake, and Other Non-Target Species	Impacts on Habitat and EFH	Impacts on Protected Species	Impacts on Human Communities
P, Pr Original FMPs and subsequent FMP Amendments and Frameworks	Established commercial and recreational management measures	**Indirect Positive** Regulatory tool available to rebuild and manage stocks and to regulate fishing effort	**Indirect Positive** Reduced fishing effort	**Indirect Positive** Reduced fishing effort	**Indirect Positive** Benefited domestic businesses
P, Pr, RFF Specifications for managed resources	Establish quotas, recreational harvest limits, and other fishery regulations (commercial and recreational)	**Indirect Positive** Regulatory tool to specify catch limits, and other regulations; allows response to annual stock updates	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Benefited domestic businesses
P, Pr, RFF Standardized Bycatch Reporting Methodology	Established acceptable level of precision and accuracy for monitoring of bycatch in fisheries	**Neutral** May improve data quality for monitoring total removals	**Neutral** Will not affect distribution of effort	**Neutral** May increase observer coverage and will not affect distribution of effort	**Uncertain – Likely Indirect Negative** May impose an inconvenience on vessel operations
P, Pr, RFF Agricultural runoff	Nutrients applied to agricultural land are introduced into aquatic systems	**Indirect Negative** Reduced habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality negatively affects resource
P, Pr, RFF Port maintenance	Dredging of coastal, port and harbor areas for port maintenance	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects

Table 20 (continued): Impacts of Past (P), Present (Pr), and Reasonably Foreseeable Future (RFF) Actions on the five VECs (not including those actions considered in this document).

Action	Description	Impacts on Scup, Longfin Squid, Black Sea Bass, Silver Hake, and Other Non-Target Species	Impacts on Habitat and EFH	Impacts on Protected Species	Impacts on Human Communities
P, Pr, RFF Beach nourishment	Offshore mining of sand for beaches	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Mixed** Positive for mining companies, possibly negative for fishing industry
	Placement of sand to nourish beach shorelines	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Positive** Beachgoers like sand; positive for tourism
P, Pr, RFF Marine transportation	Expansion of port facilities, vessel operations and recreational marinas	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Mixed** Positive for some interests, potential displacement for others
P, Pr, RFF Offshore disposal of dredged materials	Disposal of dredged materials	**Indirect Negative** Reduced habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality negatively affects resource viability
P, Pr, RFF Renewable and Non-renewable Offshore and Nearshore Energy Development	Transportation of oil, gas, and electric through pipelines &cables; Construction of oil platforms, wind facilities, liquefied natural gas facilities; Additional port development infrastructure	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Reduced habitat quality; offshore platforms may benefit structure oriented fish species habitat	**Uncertain - Likely Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects

Table 20 (continued): Impacts of Past (P), Present (Pr), and Reasonably Foreseeable Future (RFF) Actions on the five VECs (not including those actions considered in this document).

Action	Description	Impacts on Scup, Longfin Squid, Black Sea Bass, Silver Hake, and Other Non-Target Species	Impacts on Habitat and EFH	Impacts on Protected Species	Impacts on Human Communities
P, Pr, RFF Deep Sea Corals Amendment to the Mackerel, Squid, and Butterfish FMP	Prohibits the use of bottom-tending gear in certain areas known or highly likely to contain deep sea corals.	**Direct Positive** If areas protected from bottom trawling result in increased productivity	**Direct Positive** Reduced gear impacts in protected areas	**Direct Positive** Reduced likelihood of gear interactions in protected areas	**Mixed** Negative impacts to fishermen who previously used bottom-tending gear in protected areas; positive impacts due to potential increased productivity of some species.
RFF Unmanaged Forage Omnibus Amendment	Will 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 the opportunity to consider available scientific information and potential impacts	**Indirect Positive** Is intended to protect the food source for a variety of species in the Mid-Atlantic	**Neutral** Is not likely to result in a substantial change in overall fishing effort.	**Indirect Positive** Is intended to protect the food source for a variety of species in the Mid-Atlantic	**Mixed** Could have positive impacts by maintaining a food source for several fish stocks. Could have negative impacts for fishermen who already harvest unmanaged forage species.
RFF Convening of Take Reduction Teams (periodically)	Recommend measures to reduce mortality and injury to marine mammals and sea turtles	**Indirect Positive** Will improve data quality for monitoring total removals; Reducing availability of gear could reduce bycatch	**Indirect Positive** Reducing availability of gear could reduce gear impacts	**Indirect Positive** Reducing availability of gear could reduce encounters	**Indirect Negative** Reducing availability of gear could reduce revenues

7.5.5. 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 taken into account. The following section describes the expected effects of these actions on each VEC.

7.5.5.1. Magnitude and Significance of Cumulative Effects on Managed Resources

Those past, present, and reasonably foreseeable future actions which may impact the managed resources (i.e. scup, longfin squid, black sea bass, silver hake, and other non-target species), and the direction of those potential impacts, are summarized in Table 21. The indirectly negative actions described in Table 21 are localized in nearshore and marine areas where the projects occur; therefore, the magnitude of those impacts on the managed resources is expected to be limited due to limited 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 larger in magnitude; however, the impact on productivity of the managed resources is not quantifiable.

NMFS has several means under which it can review non-fishing actions of other federal or state agencies that may impact NMFS' managed resources 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 resources under NMFS' jurisdiction.

Past fishery management actions taken through the respective FMPs and the annual specifications process have had a positive cumulative effect on the managed resources. It is anticipated that the future management actions described in Table 21 will have additional indirect positive effects on the managed resources through actions which reduce and monitor bycatch, protect habitat, and protect the ecosystem services on the productivity of managed species depends. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to the managed resources have had positive cumulative effects.

Catch limits, commercial quotas and recreational harvest limits for each of the managed species have been specified to ensure that these rebuilt stocks are managed sustainably and that measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts of annual specification of management measures are largely dependent on how effective those measures are in meeting the objectives of preventing overfishing and achieving optimum yield, and on the extent to which mitigating measures are effective. The proposed actions described in this document would positively reinforce the past and anticipated positive cumulative effects on the managed resources by achieving the objectives specified in the respective FMPs. Therefore, the proposed action would not have any significant effect on the managed resources individually or in conjunction with other anthropogenic activities (Table 21).

Table 21: Summary of the effects of past, present, and reasonably foreseeable future actions on the managed resources, including target and non-target species.

Action	Past to Present	Reasonably Foreseeable Future
Original FMPs and subsequent amendments and frameworks	Indirect Positive	
Annual specifications	Indirect Positive	
Standardized Bycatch Reporting Methodology	Neutral	
Agricultural runoff	Indirect Negative	
Port maintenance	Uncertain – Likely Indirect Negative	
Beach nourishment – offshore sand mining	Indirect Negative	
Beach nourishment – sand placement	Indirect Negative	
Marine transportation	Indirect Negative	
Offshore disposal of dredged materials	Indirect Negative	
Renewable & non-renewable offshore & nearshore energy development	Uncertain – Likely Indirect Negative	
Deep Sea Corals Amendment		Direct Positive
Unmanaged Forage Omnibus Amendment		Indirect Positive
Convening Gear Take Reduction Teams (periodically)		Indirect Positive
Summary of past, present, and future actions, excluding those proposed in this document	Overall, actions have had or will have positive impacts on managed resources	

7.5.5.2. Magnitude and Significance of Cumulative Effects on Habitat

Those past, present, and reasonably foreseeable future actions which may impact habitat (including EFH), and the direction of those potential impacts, are summarized in Table 22. The direct and indirect negative actions described in Table 22 are localized in nearshore and marine project areas where they occur; therefore, the magnitude of those impacts on habitat is expected to be limited due to limited exposure of habitat at large. Agricultural runoff may be much broader in scope and the impacts of nutrient inputs to the coastal system may be larger in magnitude; however, the impact on habitat is not quantifiable.

NMFS has several means under which it can review non-fishing actions of other Federal or state agencies that may impact NMFS' managed resources and the habitat on which they rely prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of direct and indirect negative impacts those actions could have on habitat utilized by species under NMFS' jurisdiction.

Past fishery management actions taken through the respective FMPs and annual specifications process have had positive cumulative effects on habitat. The actions have constrained fishing effort both at a large scale and locally and have implemented gear requirements which may reduce impacts on habitat. As required under these FMP actions, EFH and Habitat Areas of Particular Concern were designated for the managed resources. It is anticipated that the future management actions described in Table 22 will result in additional direct or indirect positive effects on habitat through actions which protect EFH and protect ecosystem services on which these species' productivity depends. These impacts could be broad in scope. All of the VECs are interrelated; therefore, the linkages among habitat quality, managed resources and non-target species productivity, and associated fishery yields should be considered. For habitat, there are direct and indirect negative effects from actions which may be localized or broad in scope; however, positive actions that have broad implications have been, and will likely continue to be, taken to improve the condition of habitat. Some actions, such as coastal population growth and climate change may indirectly impact habitat and ecosystem productivity; however, these actions are beyond the scope of NMFS and Council management. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to habitat have had neutral to positive cumulative effects.

The proposed actions described in this document would not significantly change the past and anticipated cumulative effects on habitat and thus would not have any significant effect on habitat individually or in conjunction with other anthropogenic activities (Table 22).

Table 22: Summary of the effects of past, present, and reasonably foreseeable future actions on habitat and EFH.

<table>
<tr><th>Action</th><th>Past to Present</th><th>Reasonably Foreseeable Future</th></tr>
<tr><td>Original FMPs and subsequent amendments and frameworks</td><td>Indirect Positive</td><td></td></tr>
<tr><td>Annual specifications</td><td colspan="2">Indirect Positive</td></tr>
<tr><td>Standardized Bycatch Reporting Methodology</td><td colspan="2">Neutral</td></tr>
<tr><td>Agricultural runoff</td><td colspan="2">Direct Negative</td></tr>
<tr><td>Port maintenance</td><td colspan="2">Uncertain – Likely Direct Negative</td></tr>
<tr><td>Beach nourishment – offshore sand mining</td><td colspan="2">Direct Negative</td></tr>
<tr><td>Beach nourishment – sand placement</td><td colspan="2">Direct Negative</td></tr>
<tr><td>Marine transportation</td><td colspan="2">Direct Negative</td></tr>
<tr><td>Offshore disposal of dredged materials</td><td colspan="2">Direct Negative</td></tr>
<tr><td>Renewable & non-renewable offshore & nearshore energy development</td><td colspan="2">Uncertain – Likely Direct Negative</td></tr>
<tr><td>Deep Sea Corals Amendment</td><td></td><td>Direct Positive</td></tr>
<tr><td>Unmanaged Forage Omnibus Amendment</td><td></td><td>Neutral</td></tr>
<tr><td>Convening Gear Take Reduction Teams (periodically)</td><td></td><td>Indirect Positive</td></tr>
<tr><td>Summary of past, present, and future actions, excluding those proposed in this document</td><td colspan="2">Overall, actions have had or will have neutral to positive impacts on habitat</td></tr>
</table>

7.5.5.3. Magnitude and Significance of Cumulative Effects on ESA Listed and MMPA Protected Species

Those past, present, and reasonably foreseeable future actions which may impact ESA listed and MMPA protected species, and the direction of those impacts, are summarized in

Table 23. The indirectly negative actions described in

Table 23 are localized in nearshore and marine project areas where they occur; therefore, the magnitude of those impacts on protected species is expected to be limited due to limited exposure of the populations at large. Agricultural runoff may be much broader in scope and the impacts of nutrient inputs to the coastal system may be larger in magnitude; however, the impact on protected species is not quantifiable.

NMFS has several means under which it can review non-fishing actions of other Federal or 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.

Past fishery management actions taken through the respective FMPs and annual specifications process have had a positive cumulative effect on protected species through the reduction of fishing effort (and thus reduction in potential interactions) and implementation of gear requirements. It is anticipated that future management actions, described in

Table 23, will result in additional indirect positive effects on protected species. These impacts could be broad in scope. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to protected species have had a positive cumulative effect.

The proposed actions described in this document would not change the past and anticipated cumulative effects on protected species and thus would not have any significant effect on protected species individually or in conjunction with other anthropogenic activities (

Table 23).

Table 23**:** Summary of the effects of past, present, and reasonably foreseeable future actions on protected species.

Action	**Past to Present**	**Reasonably Foreseeable Future**
Original FMP and subsequent amendments and frameworks	Indirect Positive	
Annual specifications	Indirect Positive	
Standardized Bycatch Reporting Methodology	Neutral	
Agricultural runoff	Indirect Negative	
Port maintenance	Uncertain – Likely Indirect Negative	
Beach nourishment – offshore sand mining	Indirect Negative	
Beach nourishment – sand placement	Indirect Negative	
Marine transportation	Indirect Negative	
Offshore disposal of dredged materials	Indirect Negative	
Renewable & non-renewable offshore & nearshore energy development	Uncertain – Likely Direct Negative	
Deep Sea Corals Amendment		Direct Positive
Unmanaged Forage Omnibus Amendment		Indirect Positive
Convening Gear Take Reduction Teams (periodically)		Indirect Positive
Summary of past, present, and future actions, excluding those proposed in this document	Overall, actions have had, or will have, positive impacts on protected species	

7.5.5.4. Magnitude and Significance of Cumulate Effects on Human Communities

Those past, present, and reasonably foreseeable future actions which may impact human communities and the direction of those potential impacts are summarized in

Table 24. The indirectly negative actions described in

Table 24 are localized in nearshore areas and marine project areas where they occur; therefore, the magnitude of those impacts on human communities is expected to be limited in scope. Those actions may displace fishermen from project areas. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal ecosystem may larger in magnitude. This may result in indirect negative impacts on human communities by reducing resource availability; however, this effect is not quantifiable.

NMFS has several means under which it can review non-fishing actions of other Federal or 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.

Past fishery management actions taken through the respective FMPs and annual specifications process have had both positive and negative cumulative effects by benefiting domestic fisheries through sustainable fishery management practices while also sometimes reducing the availability of the resource to fishery participants. Sustainable management practices are, however, expected to yield broad positive impacts to fishermen, their communities, businesses, and the nation as a whole. It is anticipated that the future management actions described in

Table 24 will result in positive effects for human communities due to sustainable management practices, although additional indirect negative effects on the human communities could occur if management actions result in reduced revenues. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to human communities have had overall positive cumulative effects.

Catch limits, commercial quotas, and recreational harvest limits for each of the managed species have been specified to ensure that these rebuilt stocks are managed in a sustainable manner and that management measures are consistent with the objectives of the FMPs under the guidance of the MSA. The impacts from annual specification of management measures on the managed species are largely dependent on how effective those measures are in meeting their intended objectives and the extent to which mitigating measures are effective.

Overages may alter the timing of commercial fishery revenues such that revenues can be realized a year earlier. Impacts to some fishermen may be caused by unexpected reductions in their opportunities to earn revenues from commercial fisheries in the year during which the overages are deducted. Similarly, recreational fisheries may have decreased harvest opportunities due to reduced harvest limits as a result of overages and more restrictive management measures (e.g. minimum fish size, possession limits, fishing seasons) implemented to address overages.

Despite the potential for negative short-term effects on human communities, positive long-term effects are expected due to the long-term sustainability of the managed stocks. Overall, the proposed actions described in this document would not change the past and anticipated cumulative effects on human communities and thus, would not have any significant effect on human communities individually, or in conjunction with other anthropogenic activities (

Table 24).

Table 24: Summary of the effects of past, present, and reasonably foreseeable future actions on human communities.

Action	Past to Present	Reasonably Foreseeable Future
Original FMPs and subsequent amendments and frameworks	Indirect Positive	
Annual specifications	Indirect Positive	
Standardized Bycatch Reporting Methodology	Uncertain – Likely Indirect Negative	
Agricultural runoff	Indirect Negative	
Port maintenance	Uncertain – Likely Mixed	
Beach nourishment – offshore sand mining	Mixed	
Beach nourishment – sand placement	Positive	
Marine transportation	Mixed	
Offshore disposal of dredged materials	Indirect Negative	
Renewable & non-renewable offshore & nearshore energy development	Uncertain – Likely Mixed	
Deep Sea Corals Amendment		Mixed
Unmanaged Forage Omnibus Amendment		Mixed
Convening Gear Take Reduction Teams (periodically)		Indirect Negative
Summary of past, present, and future actions, excluding those proposed in this document	Overall, actions have had, or will have, positive impacts on human communities.	

7.5.5.5. Cumulative Effects of Proposed Action on all VECs

The Council's preferred alternatives (alternatives 1A and 2G; i.e. the proposed action) are described in sections 5.1.1 and 5.2.7. The direct and indirect impacts of the proposed action on the VECs are described in section 0. The magnitude and significance of the cumulative effects, including additive and synergistic effects of the proposed action, as well as past, present, and future actions, have been taken into account.

When considered in conjunction with all other pressures placed on the fisheries by past, present, and reasonably foreseeable future actions, the preferred alternatives are not expected to result in any significant impacts, positive or negative. Implementation of the measures listed in previous sections are expected to generate positive impacts by maintaining optimal stock sizes and by allowing optimal yield to be taken while minimizing adverse impacts to the environment. The preferred alternatives are consistent with other management measures that have been implemented in the past for these fisheries. These measures are part of a broader management scheme for scup, longfin squid, and other affected fisheries. This management scheme has helped to rebuild stocks and ensure long-term sustainability while minimizing environmental impacts.

Federal fishery management actions must be taken in a manner that will optimize the conditions of resources, habitat, and human communities. Consistent with NEPA, the MSA requires that management actions be taken only after consideration of impacts to the biological, physical, economic, and social dimensions of the human environment. As long as management continues to prevent overfishing, the fisheries and their associated communities should continue to benefit. As noted above, the development of the FMPs and subsequent amendments and frameworks impacted the VECs. Given this regulatory environment, and because fishery management actions must strive to create and maintain sustainable resources, impacts on all VECs from past, present and reasonably foreseeable future actions, when combined with baseline conditions, have generally been positive and are expected to continue in that manner for the foreseeable future. Some aspects of the VECs may experience negative impacts; however, when considered as a whole, the overall long-term trends are positive (Table 25).

There are no significant cumulative effects associated with the preferred alternatives based on the information and analyses presented in this document and in past FMP documents (Table 25). Cumulatively, through 2021, the preferred alternatives are expected to result in generally positive impacts on the all VECs. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to the VECs have had neutral to positive cumulative effects.

Table 25: Magnitude and significance of the cumulative, additive, and synergistic effects of the preferred alternatives, as well as past (P), present (PR), and reasonably foreseeable future (RFF) actions.

VEC	Status in 2015	Net Impact of P, Pr, and RFF Actions	Impact of the Preferred Alternatives	Significant Cumulative Effects
Scup, longfin squid, black sea bass, silver hake, and other non-target species	Complex and variable (section 6.1)	Positive (sections 7.5.4 and 7.5.5.1)	Slight to moderate negative (section 7.1.2.7)	None
Habitat	Complex and variable (section 6.2)	Neutral to positive (sections 7.5.4 and 7.5.5.2)	Neutral to slight negative (section 0)	None
Protected species	Complex and variable (section 6.3)	Positive (sections 7.5.4 and 7.5.5.3)	Neutral to slight negative (section 0)	None
Human communities	Complex and variable (section 6.4)	Positive (sections 7.5.4 and 0)	Positive (section 0)	None

8. APPLICABLE LAWS

8.1. Magnuson-Stevens Fishery Conservation and Management Act (MSA)

8.1.1. National Standards

Section 301 of the MSA requires that FMPs contain conservation and management measures that are consistent with the ten National Standards. 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 optimum yield for managed species and the U.S. fishing industry on a continuing basis. The Council uses the best scientific information available (National Standard 2). Specifically, this framework action was informed by NEFOP data, NEFSC bottom trawl survey data, stock assessments, and other scientific data sources. The Council manages scup, longfin squid, and the northern stock of black sea bass throughout their range. The New England Council manages silver hake throughout its range (National Standard 3). These management measures do not discriminate among residents of different states (National Standard 4) and they do not have economic allocation as their sole purpose (National Standard 5). The measures account for variations in these fisheries (National Standard 6), they avoid unnecessary duplication (National Standard 7), they take into account the fishing communities (National Standard 8) and they promote safety at sea (National Standard 10). The proposed actions are consistent with National Standard 9, which states that "conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent that bycatch cannot be avoided, minimize the mortality of such bycatch". The Scup GRAs were designed with the intent of reducing scup discards and discard mortality in small-mesh fisheries. The proposed action is expected to maintain some of the conservation benefit of the Scup GRAs while improving opportunities for longfin squid fisheries and other small-mesh fisheries. The Council has implemented many regulations, including the scup GRAs, which have indirectly reduced fishing gear impacts on EFH. By continuing to meet the National Standards requirements of the MSA through future FMP amendments, framework actions, and the annual specification setting process, the Council will insure that cumulative impacts of these actions will remain positive overall for the managed resources, the ports and communities that depend on these fisheries, and the Nation as a whole.

8.2. NEPA Finding of No Significant Impact (FONSI)

National Oceanic and Atmospheric Administration Administrative Order 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action (i.e. the preferred alternatives). In addition, the CEQ regulations at 40 CFR §1508.27 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 NOAA Administrative Order 216-6 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?

None of the alternatives proposed in this document are expected to jeopardize the sustainability of any of the target species affected by the action (i.e. scup, longfin squid, black sea bass, and silver hake). The alternatives under consideration would impact scup discards in small-mesh fisheries. Scup SSB is currently more than double the target biomass level. Any alternatives which could cause an increase in scup discards are not expected to do so to the extent that they jeopardize the scup stock. The alternatives could also change the amount of longfin squid, black sea bass, and silver hake available to small-mesh fisheries during certain times of the year. These fisheries are regulated with commercial fishery quotas, gear regulations, and other measures. The alternatives under consideration will not modify the quotas or other commercial measures for these species and are not expected to jeopardize the sustainability of these fisheries (section 7.1).

2) Can the proposed action reasonably be expected to jeopardize the sustainability of any non-target species?

None of the alternatives presented in this document are expected to jeopardize the sustainability of any non-target species, including ESA and MMPA protected species. Some of the alternatives are expected to result in changes in small-mesh fishing effort in certain areas for a few months each year; however, these changes are not expected to threaten non-target species (sections 7.1 and 7.3).

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?

The proposed action is not expected to cause substantial damage to the ocean, coastal habitats, and/or EFH as defined under the MSA and identified in the respective FMPs. The small-mesh trawl gear impacted by the proposed action does have the potential to negatively impact habitat and EFH. The proposed action could lead to an increase in small-mesh fishing effort in certain areas during January 1 through March 15; however, adverse impacts to benthic habitats are not expected to be substantial (section 7.2) and are not expected to be beyond the scope previously identified for these fleets.

4) Can the proposed action be reasonably expected to have a substantial adverse impact on public health or safety?

None of the alternatives will alter the manner in which the industry conducts fishing activities for the target species. Therefore, no changes in fishing behavior that would affect safety are anticipated. The overall effect of the proposed action on these fisheries, including the communities in which they operate, will not adversely impact 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?

None of the alternatives presented in this document are expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of those species. Some of the alternatives are expected to result in changes in small-mesh fishing effort in certain areas for a few months each year; however, these changes are not expected to result in substantial negative impacts to protected species or habitats (sections 7.2 and 7.3).

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.)?

The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. Some of the alternatives are expected to result in changes in small-mesh fishing effort in certain areas for a few months each year in certain areas; however, none of these changes are expected to be substantial enough to impact biodiversity and/or ecosystem function within the affected area.

7) Are significant social or economic impacts interrelated with natural or physical environmental effects?

The proposed action is not expected to have a substantial impact on the natural or physical environment. Some of the alternatives, including one of the preferred alternatives (alternative 2G), are expected to result in a change in small-mesh fishing effort in certain areas for a few months each year; however, none of the alternatives are expected to cause fishing effort to increase to a level that results in a significant impact on the natural or physical environment (section 0).

8) Are the effects on the quality of the human environment likely to be highly controversial?

The proposed action would modify the boundaries of the Southern Scup Gear Restricted Area and is expected to result in an increase in small-mesh fishing effort in certain areas during January 1 through March 15. This proposed change is informed by NEFOP data, NEFSC trawl survey data, and recommendations from advisors, and is not expected to jeopardize any stocks or threaten the sustainability of any fisheries. The proposed action is therefore not expected to be highly controversial.

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?

The proposed action is expected to result in an increase in small-mesh fishing effort in certain areas during January 1 through March 15. Other types of commercial fishing already occur in these areas during this time of year. Small-mesh fishing effort is not restricted in these areas during other times of the year. It is possible that historic or cultural resources such as shipwrecks could be present in these areas; however, vessels try to avoid fishing too close to wrecks due to possible loss or entanglement of fishing gear. It is not likely that the proposed action would 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?

The impacts of the preferred alternatives on the human environment are described in section 7.4. The proposed action is informed by advisor recommendations, NEFOP and NEFSC trawl survey data, and is not expected to have highly uncertain effects or to involve unique or unknown risks for the human environment.

11) Is the proposed action related to other actions with individually insignificant, but cumulatively significant impacts?

As discussed in section 7.5, the preferred alternatives are not expected to have individually insignificant, but cumulatively significant impacts. The preferred alternatives, together with past, present, and reasonably foreseeable future actions, are 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?

There are no districts, sites, highways, structures, or objects, including shipwrecks, listed in or eligible for listing in the National Register of Historical Places that will be affected by the proposed action to a greater extent than they would be affected by the *status quo* alternatives. No known sites meeting this description are found within the area which would be removed from the Southern GRA under the preferred alternatives.

13) Can the proposed action reasonably be expected to result in the introduction or spread of a nonindigenous species?

There is no evidence or indication that the fisheries impacted by the Scup GRAs have ever resulted in the introduction or spread of nonindigenous species; therefore, it is highly unlikely that the proposed action would result in the introduction or spread of a non-indigenous 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?

The proposed action is not expected to results in significant effects, nor does it represent a decision in principle about a future consideration. The impact of any future changes to the Scup GRAs will be analyzed as to their significance in the process of developing future management actions.

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?

The proposed action is not 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 (sections 8.1 through 8.11).

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 0. The cumulative effects of the proposed action on target and non-target species, including ESA and MMPA protected species, are described in section 7.5. The proposed action is not expected to result in cumulate adverse effects that could have a substantial effect on target or non-target species.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting EA prepared for Framework Adjustment 9 to the Summer Flounder, Scup, and Black Sea Bass FMP, it is hereby determined that the proposed actions will not significantly impact the quality of the human environment as described above and in the EA. 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.

____ __________________

Regional Administrator for GARFO, NMFS, NOAA *Date*

8.3. Endangered Species Act

Sections 6.3 and 7.3 contain an assessment of the impacts of the proposed action on endangered species and other protected resources. 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.

8.4. Marine Mammal Protection Act

Sections 6.3 and 7.3 contain an assessment of the impacts of the proposed action on endangered species and other protected species (including marine mammals). This action is not expected to affect protected 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 productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. The Council has developed this framework document and will submit it to NMFS. NMFS will determine whether the proposed actions are consistent to the maximum extent practicable with the coastal zone management programs for each state (Maine through North Carolina).

8.6. Administrative Procedure Act

Sections 551-553 of the Federal Administrative Procedure Act establish 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 notice and opportunity to comment before the agency promulgates new regulations.

The Administrative Procedure Act requires solicitation and review of public comments on actions taken in the development of an FMP and subsequent amendments and framework adjustments. There were many opportunities for public review, input, and access to the rulemaking process during the development of the proposed management measures described in this document and during the development of this document. This action was developed through a multi-stage process that was open to review by affected members of the public. The public had the opportunity to review and comment on management measures during Council meetings on February 12, 2014 (in New Bern, NC), April 9, 2014 (in Montauk, NY), December 8, 2015 (in Annapolis, MD), February 9, 2016 (in New Bern, NC), and April 13, 2016 (in Montauk, NY) as well as during an Advisory Panel webinar on March 18, 2014 and during an Advisory Panel meeting on January 20, 2016 in Long Branch, NJ. The public will have further opportunity to comment on this specifications document once NMFS publishes a request for comments notice in the Federal Register.

8.7. Section 515 (Data Quality Act)

Utility of Information Product

This action proposes modifications to the boundaries of the Scup GRAs. This document includes a description of the alternatives considered, the preferred action and rationale for selection, and any changes to the implementing regulations of the FMP. As such, this document enables the implementing agency (NMFS) to make a decision on implementation and this document serves as a supporting document for the proposed rule.

This framework document was developed to be consistent with the FMP, MSA, and other applicable laws, through a multi-stage process that was open to review by affected members of the public. The public had the opportunity to review and comment on management measures during a number of public meetings (section 8.6). The public will have further opportunity to comment on this specifications document once NMFS publishes a request for comments notice in the Federal Register.

Integrity of Information Product

This information product meets the standards for integrity under the following types of documents: Other/Discussion (e.g. Confidentiality of Statistics of the MSA; NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics; 50 CFR 229.11, Confidentiality of information collected under the MMPA).

Objectivity of Information Product

The category of information product that applies here is "Natural Resource Plans." Section 8 describes how this document was developed to be consistent with any applicable laws, including MSA. The analyses used to develop the alternatives (i.e. policy choices) are based upon the best scientific information available. The most up to date information was used to develop the EA which evaluates the impacts of those alternatives (section 7). The specialists who worked with these core data sets and population assessment models are familiar with the most recent analytical techniques and are familiar with the available data and information relevant to the scup, longfin squid, black sea bass, and silver hake fisheries.

The review process for this specifications document involves Council, NEFSC, GARFO, and NMFS headquarters. The NEFSC technical review is conducted by senior level scientists with specialties in fisheries ecology, population dynamics and biology, as well as economics and social anthropology. The Council review process involves public meetings at which affected stakeholders have the opportunity to comment on proposed management measures. Review by GARFO is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with applicable law. Final approval of the document and clearance of the rule is conducted by staff at NOAA Fisheries Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget.

8.8. Paperwork Reduction Act

The Paperwork Reduction Act (PRA) concerns the collection of information. The intent of the PRA is to minimize the federal paperwork burden for individuals, small businesses, state and local governments, and other persons, as well as to maximize the usefulness of information collected by the Federal government. There are no changes to the existing reporting requirements previously approved under the respective FMPs for vessel permits, dealer reporting, or vessel logbooks. This action does not contain a collection-of-information requirement for purposes of the PRA.

8.9. Impacts of the Plan Relative to Federalism/Executive Order 13132

This framework document does not contain policies with federalism implications sufficient to warrant preparation of a federalism assessment under Executive Order (EO) 13132.

8.10. Environmental Justice/ Executive Order 12898

EO 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." EO 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 not expected to affect participation in the scup, longfin squid, black sea bass, and silver hake fisheries. Because the proposed action represents no changes relative to the current levels of participation in these fisheries, no negative economic or social effects in the context of EO 12898 are anticipated as a result. 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 and Regulatory Flexibility Act Analysis

8.11.1. Introduction

This section provides analysis to address the requirements of Executive Order 12866 (Regulatory Planning and Review) and the Regulatory Flexibility Act (RFA). Since many of the requirements of these mandates duplicate those required under the MSA and NEPA, this section contains references to other sections of this document. The following sections provide information to determine if the preferred alternatives are significant under E.O. 12866 and if they will have a significant economic impact on a substantial number of small entities under the RFA.

NMFS requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions that either implement or significantly amend an FMP. The RIR summarizes the economic effects associated with a proposed or final regulatory action, provides a review of the problem to be addressed, evaluates the major alternatives that could be used to address the problem, and ensures that the regulatory agency considers all available alternatives so that public welfare can be enhanced in the most efficient and cost-effective manner. The RIR also serves as the basis for determining whether the proposed regulations are a "significant regulatory action" under E.O. 12866.

The RIR in the following sections provides a comprehensive review of the expected changes in net economic benefits to society associated with the preferred alternatives.

8.11.2. Regulatory Impact Review (RIR)

8.11.2.1. Description of the Fishery

Section 6.1 contains a description of the fisheries affected by the proposed action.

8.11.2.2. Statement of the Problem

The purpose of this framework is to consider modifications to the GRAs. This framework was initiated in response to requests from commercial fishing industry members who wished to modify the boundaries of the Southern GRA in order to regain access to important winter fishing areas for longfin squid. This framework evaluates the current GRAs, as well as several proposed modifications, in light of changes in scup stock status since the GRAs were last modified (NEFSC 2015A) and an updated analysis of scup discards in and near the GRAs (Terceiro and Miller 2014).

8.11.2.3. Description of Alternatives

The Council considered twelve management alternatives as part of this framework. The preferred alternatives (alternatives 1A and 2G) would modify the boundaries of the Southern GRA and would leave all other aspects of the GRA regulations, including the boundaries of the Northern GRA, unchanged. For the purposes of the RIR, only the preferred alternatives are considered in detail in this section. The other alternatives are described in more detail in section 0. The expected socioeconomic impacts of all other alternatives are described in section 7.4.

As previously described, the preferred alternatives would modify the eastern boundary of the Southern GRA based on a proposal developed by several members of the Council’s Advisory Panels in January 2016, except that in areas of overlap with NMFS Statistical Area 616, the boundary would align with that proposed by an advisor in 2012. This alternative is intended to restore access to important winter fishing areas for longfin squid. It would remove certain canyon areas and depths greater than about 55 to 60 fathoms (depending on the area) from the Southern GRA. It would reduce the size of the Southern GRA by 1,031 square nautical miles, or 33%, compared to the *status quo* Southern GRA.

The Council considered three additional alternatives which would have greater positive socioeconomic impacts than the preferred alternatives, including an alternative which would reduce the size of the Southern GRA by a greater amount than the preferred alternative (i.e. alternative 2E, the January 2016 AP proposal) and alternatives which would eliminate either the Northern or the Southern GRA (alternatives 1C and 2I, respectively). These alternatives are described in more detail in section 0. The Council did not select these as preferred alternatives because alternatives 1A and 2G were deemed sufficient to improve fishing opportunities for the longfin squid fishery while still maintaining a conservation benefit for the scup stock.

8.11.2.4. Methodology to Evaluate Economic Impacts of Alternatives

This section evaluates the economic impacts of the preferred alternatives (alternatives 1A and 2G). Potential impacts on several areas of interest are discussed in order to comprehensively evaluate the economic effects of the alternatives. The types of effects considered include changes in landings, prices, consumer and producer benefits, harvesting costs, enforcement costs, and distributional effects (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.

Benefit-cost analysis is conducted to evaluate the net social benefit from changes in consumer and producer surpluses that are expected to occur upon implementation of a regulatory action. Total Consumer Surplus (CS) is the difference between the amounts consumers are willing to pay for products or services and the amounts they actually pay. CS thus represents net benefit to consumers. When the information necessary to plot the supply and demand curves for a particular commodity is available, CS is represented by the area below the demand curve and above the market clearing price where the two curves intersect. Since an empirical model describing the elasticities of supply and demand for longfin squid (the species for which landings are expected to change the most as a result of the preferred alternatives) is not available, it was assumed that the price was determined by the market clearing price, or the intersection of the supply and demand curves (NMFS 2007).

Net benefit to producers is producer surplus (PS). Total PS is the difference between the amounts producers actually receive for providing goods and services and the economic cost producers bear to do so. Graphically, it is the area above the supply curve and below the market clearing price where supply and demand intersect. Economic costs are measured by the opportunity cost of all resources including the raw materials and physical and human capital used in the process of supplying goods and services to consumers (NMFS 2007).

The law of demand states that price and quantity demanded are inversely related. Given a demand curve for a commodity, the elasticity of demand is a measure of the responsiveness of the quantity that will be taken by consumers given changes in the price of that commodity, holding other variables constant. Several major factors influence the elasticity for a specific commodity. These factors largely determine whether demand for a commodity is price elastic or inelastic[23] and include: 1) the number and closeness of substitutes for the commodity under consideration, 2) the number of uses for the commodity; and 3) the price of the commodity relative to the consumers' purchasing power (income). Other factors may also determine the elasticity of demand but are not mentioned here because they are beyond the scope of this discussion. As the number and closeness of substitutes and/or the number of uses for a specific commodity increase, the demand for the specific commodity will tend to be more elastic. Demand for commodities that take a large amount of the consumer's income is likely to be elastic compared to services with low prices relative to the consumer's income. The availability of substitutes is considered to be the most important of the factors listed in determining the elasticity of demand for a specific commodity (Leftwich 1973, Awk 1988). Seafood demand in general appears to be elastic. Demand is elastic for most species, product groups, and product forms (Asche and Bjørndal 2003).

An increase in the ex-vessel price of a given species may increase PS. A decrease in the ex-vessel price for that species may also increase PS if it is assumed that the demand for that species is moderately to highly elastic. However, the magnitude of these changes cannot be entirely assessed without knowing the exact shape of the market demand curve for this species.

One of the more visible societal costs of fisheries regulation is that of enforcement. From a budgetary perspective, the cost of enforcement is equivalent to the total public expenditure devoted to enforcement. The economic cost of enforcement is measured by the opportunity cost of devoting resources to enforcement vis à vis some other public or private use, and/or by the opportunity cost of diverting enforcement resources from one fishery to another. Properly defined, enforcement costs are not equivalent to the budgetary expense of dockside or at-sea inspection of vessels. Rather, enforcement costs from an economic perspective, are measured by opportunity cost in terms of foregone enforcement services that must be diverted to enforcing the scup GRA regulations.

[23] Price elasticity of demand is elastic when a change in quantity demanded is large relative to the change in price. Price elasticity of demand is inelastic when a change in quantity demanded is small relative to the change in price. Price elasticity of demand is unitary when a change in quantity demanded and price are the same.

8.11.2.5. Description of the Management Objectives

This framework action, if implemented, will be implemented under the Summer Flounder, Scup, and Black Sea Bass FMP. The management objectives of that FMP with respect to scup are to:

- Reduce fishing mortality in the scup fishery to assure that overfishing does not occur.
- Reduce fishing mortality on immature scup to increase spawning stock biomass.
- Improve the yield from the fisheries.
- Promote compatible management regulations between state and federal jurisdictions.
- Promote uniform and effective enforcement of regulations.
- Minimize regulations to achieve the management objectives stated above.

The proposed action is consistent with, and does not modify these objectives. This action is taken under the authority of the MSA and regulations at 50 C.F.R. part 648.

8.11.2.5.1. Analysis of Alternatives

Alternatives 1A and 2G are the preferred alternatives. Under alternative 1A, the regulations for the Northern GRA would remain unchanged (section 5.1.1). Under alternative 2G, the eastern boundary of the Southern GRA would be modified to remove certain canyon areas and depths greater than about 55 to 60 fathoms (depending on the area) from the Southern GRA (section 5.2.7).

The Northern GRA, as currently configured, has been a component of the baseline economic environment since 2000; therefore, alternative 1A is not expected to affect fishing effort or the spatial or temporal distribution of current fishing effort relative to baseline conditions.

The economic impacts of the preferred alternative are therefore only associated with the change in the boundaries of the Southern GRA. As described in more detail in section 7.1.2.2, the economic impacts of the preferred alternatives are expected to result primarily from the expected increase in the availability of longfin squid. The proposed action is expected to result in an increase in the amount of longfin squid landed during January 1–March 15. Alternative 2G (one of the two preferred alternatives) was designed specifically to increase access to important winter fishing areas for longfin squid. There is room for longfin squid landings to increase without exceeding the quota. Longfin squid commercial landings have been below the annual commercial quota since 2005. The longfin squid fishery has been managed under a trimester system since 2007. Commercial landings have not exceeded the trimester I (January – April) quota since 2007. The preferred alternative is expected to reduce the amount of longfin squid found within the Southern GRA by 51%, compared to the *status quo* Southern GRA (section 7.1.2.7). In doing so, it would increase the amount of longfin squid available to small-mesh fisheries during January 1–March 15 each year, compared to the *status quo*. A 51% change in availability might not translate into a 51% increase in landings. A number of unrealistic assumptions would be required to predict both the degree of the increase in longfin squid landings as a result of the preferred alternatives and the resulting change in revenues. Longfin squid landings are influenced by a variety of factors including, but not limited to, the trimester quotas, market demand, prices, weather, fuel costs, the abundance and availability of longfin squid, and the abundance, availability, and price of other species harvested by the vessels which participate in the longfin squid fishery. For this reason, revenue gains associated with the preferred alternatives have not been estimated.

Increased landings sometimes cause a decrease in prices; however, this is not expected to occur for longfin squid in the near future if the preferred alternatives are implemented. According to AP members with knowledge of the longfin squid fishery, ex-vessel prices and global demand for longfin squid in 2015 and 2016 (to date) were higher than in previous years, due in part to decreased squid landings in other parts of the world as a result of El Niño (Table 19). If demand remains strong, then longfin squid landings could increase without leading to a decrease in price. There will be no change in CS or PS if longfin squid prices remain similar to recent prices.

The preferred alternatives are expected to slightly decrease harvesting costs, compared to the *status quo*, by allowing vessels to harvest longfin squid in areas of relatively high abundance. The preferred alternatives could result in an increase in CPUE, greater efficiencies in harvesting, and, by extension, reduced harvesting costs.

Enforcement costs are not expected to change substantially if the preferred alternatives are implemented. The preferred alternatives would modify the existing regulations but will not change them in such a way that enforcement costs will be substantially different than under the *status quo*.

The preferred alternatives are not expected to have distributional effects. They are expected to result in an increase in squid landings, and thus increased revenues and positive economic impacts for squid fishermen. They are not expected to result in substantial negative impacts for other sectors of the economy.

In summary, the preferred alternatives will increase access to longfin squid during January 1–March 15 and are expected to result in a slight to moderate increase in longfin squid landings during that time of year without causing a decrease in price. Economic impacts for the longfin squid fishery, as well as for ports where longfin squid are landed and fishing communities that are partly dependent on the longfin squid fishery, are expected to be positive. Impacts to other sectors of the economy are expected to be neutral. The overall economic impacts of the preferred alternative are therefore expected to be positive.

8.11.2.5.2. Evaluation of Significance Under E.O. 12866

The proposed action (i.e. the preferred alternatives) does not constitute a significant regulatory action under E.O. 12866. It will not have an annual effect on the economy of more than $100 million. The change in revenues as a result of the preferred alternatives is unknown, but will undoubtedly be far below $100 million. The total value of all commercial landings of scup, longfin squid, black sea bass, and the southern stock of silver hake in 2015 was approximately $59.48 million.

The proposed action will benefit the economy, productivity, competition and jobs in a material way by allowing for increased longfin squid landings without jeopardizing the sustainability of other fisheries or creating negative impacts to other sectors of the economy. The action will not adversely affect, in the long-term, competition, jobs, the environment, public health or safety, or state, local, or tribal government communities. The action will not create a serious inconsistency or otherwise interfere with an action taken or planned by another agency. No other agency has indicated that it plans to pursue an action that will substantially affect scup, longfin squid, or black sea bass fisheries in the EEZ. The proposed action will not materially alter the budgetary impact of entitlement, grants, user fees, or loan programs or the rights and obligations of their participants. The action does not raise novel, legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in E.O. 12866.

8.11.3. Regulatory Flexibility 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" or prepare an Initial Regulatory Flexibility Analysis (IRFA). An IRFA describes the impacts of the proposed rule on small entities and is prepared when a Federal agency publishes a notice of proposed rulemaking if the agency cannot certify that the proposed rule will not have a significant impact on a substantial number of small entities. The determination of whether to certify or prepare an IRFA depends on the context of the proposed action, the problem to be addressed, and the structure of the regulated industry. If the agency prepares an IRFA, a Final Regulatory Flexibility Analysis will be prepared when the final rule is promulgated.

8.11.3.1. Proposed Action

The purpose of this framework is to consider modifications to the GRAs. This framework was initiated in response to requests from commercial fishing industry members who wished to modify the boundaries of the Southern GRA in order to regain access to important winter fishing areas for longfin squid. This framework evaluates the current GRAs, as well as several proposed modifications, in light of changes in scup stock status since the GRAs were last modified (NEFSC 2015A) and an updated analysis of scup discards in and near the GRAs (Terceiro and Miller 2014). This action is taken under the authority of the MSA and regulations at 50 CFR part 648.

As previously described, the proposed action would modify the eastern boundary of the Southern GRA based on a proposal developed by several members of the Council's Advisory Panels in

January 2016. In areas of overlap with NMFS Statistical Area 616, the boundary would align with that proposed by an advisor in 2012 (section 5.2.7). This alternative is intended to restore access to important winter fishing areas for longfin squid. It would remove certain canyon areas and depths greater than about 55 to 60 fathoms (depending on the area) from the Southern GRA. It would reduce the size of the Southern GRA by 1,031 square nautical miles, or 33%, compared to the *status quo* Southern GRA. All other regulations regarding the Scup GRAs, including the boundaries of the Northern GRA, the times of the year when the GRAs are in effect, and the regulated gear types, would remain unchanged.

There are no changes to the existing reporting requirements previously approved under this FMP for vessel permits, dealer reporting, or vessel logbooks. This action does not contain a collection-of-information requirement for purposes of the PRA. This action does not duplicate, overlap, or conflict with other Federal rules.

8.11.3.2. Universe of Regulated Entities

The RFA requires consideration of the economic impacts of proposed actions on directly affected entities. The proposed action will directly affect commercial harvesting entities. It will not *directly* affect seafood processors, recreational fishing entities, or other entities. More specifically, the proposed action will affect commercial fishing vessels that fish for or possess longfin squid, black sea bass, and/or silver hake during January 1-March 15 and use trawl nets with mesh smaller than 5.0 inches in diameter (section 4.2). It will impact these vessels by modifying existing restrictions on where they can fish.

Vessel Trip Report (VTR) data were used to identify vessels which reported use of trawl nets with mesh smaller than 5.0 inches in diameter and reported catch of longfin squid, black sea bass, and/or silver hake in the statistical areas which are partially included in the Southern GRA during January 1–March 15 from 2013 through 2015. These vessels were then grouped according to common owners. The resulting groupings were treated as a fishing business (i.e. affiliates). [24] Based on this methodology, 64 fishing businesses were identified as being potentially affected by the proposed action based on their fishing activities during 2013-2015. Each affiliate was then classified as either a small business or a large firm based on their revenues in 2015. For RFA purposes only, NMFS established a small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing (see 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. Of the 64 identified affiliates, two are considered large entities and 62 are considered small businesses based on their fishing

[24] Ownership data used to identify affiliates for 2013-2015 were provided by Min-Yang Lee, NEFSC Social Science Branch.

revenues in 2015. Two affiliates held party/charter permits and reported party/charter revenues between 2013 and 2015. These revenues are included in the total revenues reported in Table 26.

Table 26 includes summary information on total fishing revenues, as well as revenues from scup, longfin squid, black sea bass, and silver hake during 2013-2015 for the 62 small businesses which may be affected by the proposed action. Of the four fisheries most directly impacted by the proposed action (i.e. scup, longfin squid, black sea bass, and silver hake), longfin squid accounted for the highest proportion of total gross receipts (i.e. receipts from all fishing revenues), at about 16% of total gross receipts. The average proportion of total gross receipts from silver hake, scup, and black sea bass were much smaller, at about 5%, 4%, and 1% respectively. Longfin squid and scup revenues made up a higher proportion of total revenues for small businesses whose average revenues from fishing were less than $2 million per year, compared to vessels whose average revenues were greater than $2 million. Black sea bass revenues made up a higher proportion of total revenues for small businesses whose average revenues from fishing were less than $1 million per year, compared to vessels whose average revenues were greater than $1 million. Silver hake revenues made up a greater proportion of total revenues for small businesses whose average revenues from fishing were between $1 million and $5 million per year, compared to businesses with revenues of less than $1 million or greater than $5 million (Table 26).

The two firms that were categorized as large entities (not shown in Table 26) had average annual gross fishing receipts of about $20.5 million during 2013-2015. These entities had average annual scup receipts of $5,925 (<0.01% of total average annual fishing receipts), average annual longfin squid receipts of $10,434 (0.01% of total average annual fishing receipts), average annual black sea bass receipts of $24,693 (0.01% of total average annual fishing receipts), and no reported revenue from silver hake during 2013-2015.

The information in Table 26 is summarized at the annual level and does not distinguish between revenues from small-mesh tows and tows with mesh 5.0 inches in diameter or larger. Although all of these affiliates reported at least one small-mesh tow which resulted in catch of longfin squid, black sea bass, or silver hake during January–March in the Southern GRA statistical areas in 2013, 2014, or 2015, some of the revenues in Table 26 likely came from tows with larger mesh, outside of the Southern GRA, and/or at times of the year when the Southern GRA is not in effect. The information shown in Table 26 thus represents the maximum amount of average annual revenues that would be affected by the proposed action.

Table 26: Average annual total gross receipts from all fishing activities during 2013-2015 for the 62 small firms affected by the GRA regulations, as well as average annual scup, longfin squid, black sea bass, and silver hake receipts. Firms are grouped based on their average annual revenue from fishing during 2013-2015.

Avg. Annual Fishing Revenue 2013-2015	# of Firms	Avg. Gross Receipts ($)	Avg. Scup Receipts ($)	Scup as Proportion of Gross Receipts	Avg. Longfin Squid Receipts ($)	Longfin Squid as Proportion of Gross Receipts	Avg. Black Sea Bass Receipts ($)	BSB as Proportion of Gross Receipts	Avg. Silver Hake Receipts ($)	Silver Hake as Proportion of Gross Receipts
< $0.5 million	17	296,942	27,080	9.1%	83,470	28.1%	10,508	3.5%	13,422	4.5%
$0.5 million to < $1 million	19	740,476	85,459	11.5%	195,761	26.4%	28,642	3.9%	26,009	3.5%
$1 million to < $2 million	12	1,392,860	135,689	9.7%	312,173	22.4%	27,284	2.0%	159,939	11.5%
$2 to $5 million	9	2,960,603	96,938	3.3%	568,843	19.2%	30,140	1.0%	322,046	10.9%
>$5 million	5	10,780,246	33,924	0.3%	884,139	8.2%	28,241	0.3%	10,856	0.1%
Total	62	1,877,065	76,684	4.1%	297,174	15.8%	23,592	1.3%	90,231	4.8%

8.11.3.3. Expected Economic Impacts

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. As previously described, changes in revenues as a result of the proposed action are expected to result predominantly from changes in longfin squid landings. A number of factors influence longfin squid landings, including quotas, prices, weather, and availability of longfin squid and of other species harvested by the same vessels; therefore, changes in landings, and, by extension, changes in revenues, as a result of the proposed action cannot be precisely estimated. Changes in revenue are instead described in a general, qualitative sense.

The proposed action is expected to increase the amount of longfin squid available to small-mesh fisheries during January 1–March 15. It will remove certain areas from the Scup GRAs which, according to commercial fishing industry advisors, are important winter fishing areas for longfin squid. The proposed action is expected to result in an increase in longfin squid landings during January 1–March 15. As described in section 7.4.2.2, an increase in landings is not expected to result in a notable change in price; therefore, an increase in landings is expected to result in an increase in revenues. All directly affected businesses are expected to benefit from the anticipated increase in squid landings and revenues under the proposed action.

The proposed action is expected to directly affect 62 small businesses. On average, longfin squid made up about 16% of the average annual gross revenues from fishing for these small businesses. For the businesses which had average gross commercial fishing revenues of less than $2 million, the contribution of squid to total average annual revenues was even higher, at about 25%. For all of the affected small businesses, and for the smaller of the small business in particular (i.e. those with average annual fishing revenues of less than $5 million), the proposed action could have a noteworthy positive impact on their annual commercial fishing revenues by leading to increased revenues from longfin squid. The larger small business (i.e. those with average annual fishing revenues of more than $5 million), and the large entities (i.e. those with gross fishing revenues greater than $11 million in 2015) are also expected to experience positive economic impacts, though to a lesser degree than the smaller small businesses, due to their lesser dependence on longfin squid (Table 26).

According to the SBA definition of a small business presented above, 97% (62 out of 64) of the entities that are expected to be impacted by the proposed action meet the definition of a small business, while 3% (2 out of 64 business firms) are categorized as large entities. The proposed action is not expected to result in disproportional effects on profits, costs, or net revenue for a substantial number of small entities compared to large entities. It is not expected to place a substantial number of small entities at a significant competitive disadvantage compared to large entities. All directly affected business, both large and small, are expected to experience economic benefits from the proposed action. Small businesses are expected to see a greater positive benefit than the large entities due to their greater dependence on longfin squid.

8.11.3.4. Other Alternatives

The Council considered three alternatives which, if implemented, would have greater positive socioeconomic impacts than the preferred alternative. One of these alternatives (alternative 2E, the January 2016 AP proposal) would reduce the size of the Southern GRA by a greater amount than the preferred alternative. A second alternatives would eliminate the Northern GRA (alternative 1C), and a third would eliminate the Southern GRA (alternative 2I). These alternatives are described in more detail in section 0. The expected socioeconomic impacts of these alternatives are described in section 7.4. The Council did not select these as preferred alternatives because alternatives 1A and 2G were deemed sufficient to improve fishing opportunities for the longfin squid fishery while still maintaining a conservation benefit for the scup stock.

9. LITERATURE CITED

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.

ASSRT (Atlantic Sturgeon Status Review Team). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office.

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.

Beanlands, G.E., and P. N. Duinker. 1984. Ecological framework adjustment for environmental impact assessment. *Journal of Environmental Management*. 18(3).

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.

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.

Boyle, P. and R. Rodhouse. 2005. *Cephalopods: Ecology and Fisheries*. Wiley-Blackwell publishing.

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, 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.

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.

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.

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.

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.

Conant, T.A., P.H. Dutton, T. Eguchi, S.P. Epperly, C.C. Fahy, M.H. Godfrey, S.L. MacPherson, E.E. Possardt, B.A. Schroeder, J.A. Seminoff, M.L. Snover, C.M. Upite, and B.E. Witherington. 2009. Loggerhead Sea Turtle (*Caretta caretta*) 2009 Status Review under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service.

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.

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.

DPSWG (Northeast Data Poor Stocks Working Group). 2009. The Northeast Data Poor Stocks Working Group report, December 8-12, 2008 meeting. Part A. Skate species complex, deep sea red crab, Atlantic wolffish, scup, and black sea bass. Northeast Fisheries Science Center Reference Document 09-02; Available at: http://www.nefsc.noaa.gov/saw/archive.html

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.

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.

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.

Fay, C., M. Bartron, S. Craig, A. Hecht, J. Pruden, R. Saunders, T. Sheehan, and J. Trial. 2006. Status Review for Anadromous Atlantic Salmon (*Salmo salar*) in the United States. Report to the National Marine Fisheries Service and U.S. Fish and Wildlife Service.

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: www.conservationgateway.org

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. Mar. Biol. 160: 3071–3086.

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. Northeast Fisheries Science Center Reference Document. 15-10.

Hirth, H.F. 1997. Synopsis of the Biological Data of the Green Turtle, *Chelonia mydas* (Linnaeus 1758). *USFWS Biological Report*. 97(1):1-120.

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.

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. NorthAtlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting AdvisorySystem (RWSAS) 2008 Results Summary. Northeast Fisheries Science Center Reference Document 09-05.

Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2010. North Atlantic Right Whale SightingSurvey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 ResultsSummary. Northeast Fisheries Science Center Reference Document 10-07.

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. Northeast Fisheries Science Center Reference Document 11-05.

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. Northeast Fisheries Science Center Reference Document 12-09.

Kocik. J.F., S.E. Wigley, and D. Kircheis. 2014. Annual Bycatch Update Atlantic Salmon 2013. U.S. Atlantic Salmon Assessment Committee Working Paper 2014:05. Old Lyme, CT. 6 p. (cited with permission of authors).

Kynard, B., M. Horgan, M. Kieffer, and D. Seibel. 2000. Habitat Used by Shortnose Sturgeon inTwo 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. Pages 167-182. 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.

Lyssikatos MC. 2015. Estimates of Cetacean and Pinniped Bycatch in Northeast and Mid-Atlantic Bottom Trawl Fisheries, 2008-2013. Northeast Fisheries Science Center Reference Document 15-19.

MAFMC (Mid-Atlantic Fishery Management Council). 2002. Amendment 13 to the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan. Available at: http://www.mafmc.org/sf-s-bsb/

MAFMC (Mid-Atlantic Fishery Management Council). 2008. Amendment 9 to the Mackerel, Squid, Butterfish Fishery Management Plan. Available at: http://www.mafmc.org/msb/

MAFMC (Mid-Atlantic Fishery Management Council). 2010. Amendment 10 to the Mackerel, Squid, Butterfish Fishery Management Plan. Available at: http://www.mafmc.org/msb/

MAFMC (Mid-Atlantic Fishery Management Council). 2010. Amendment 10 to the Mackerel, Squid, Butterfish Fishery Management Plan. Available at: http://www.mafmc.org/msb/

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.

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.

McClellan, C.M. and A.J. Read. 2007. Complexity and Variation in Loggerhead Sea Turtle Life History. *Biology Letters*. 3:592-594

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.

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):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. Northeast Fisheries Science Center Reference Document 08-20. Available at: 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

NEFMC (New England Fishery Management Council). 2012. Amendment 19 to the Northeast Multispecies Fishery Management Plan. Available at: www.nefmc.org/library/amendment-19

NEFMC (New England Fishery Management Council). 2014. Stock Assessment and Fishery Evaluation (SAFE) Report for Fishing Year 2013: Small-Mesh Multispecies. Available at: www.nefmc.org.

NEFMC (New England Fishery Management Council). 2016. Omnibus Essential Fish Habitat Amendment 2. Available at: http://www.nefmc.org/library/omnibus-habitat-amendment-2

NEFSC (Northeast Fisheries Science Center). 1998. Report of the 27th Northeast Regional Stock Assessment Workshop (27th SAW): Public Review Workshop. *Northeast Fisheries Science Center Reference Document* 98-14; Available at: http://www.nefsc.noaa.gov/saw/archive.html

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). 2011. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Report. Northeast Fisheries Science Center Reference Document 11-02. Available at: http://www.nefsc.noaa.gov/publications/

NEFSC (Northeast Fisheries Science Center). 2012. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW) Assessment Summary Report. Northeast Fisheries Science Center Reference Document 12-03. 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. Black Sea Bass 2014 Catch and Survey Information for Northern Stock – Report to the Mid-Atlantic Science and Statistical Committee. Available at www.mafmc.org/ssc-meetings/2015/july-21-213

NEFSC (Northeast Fisheries Science Center). 2015C. Northeast Fisheries Observer Program: incidental take reports. Omnibus data request and supplemental data for 2014. Available at: http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html

NEFSC (Northeast Fisheries Science Center). 2016A. Report to the Mid-Atlantic Fishery Management Council: Fishery and Survey Data Updates Regarding the Northern Shortfin Squid (*Illex illecebrosus*) and Longfin Inshore Squid (*Doryteuthis (Amerigo) pealeii*) stocks through 2015. Available at: http://www.mafmc.org/ssc-meetings/2016/may-25-26

NEFSC (Northeast Fisheries Science Center). 2016B. Summer Flounder Stock Assessment Update for 2016. Available at: http://www.nefsc.noaa.gov/saw/

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.

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). 2010. Final Recovery Plan for the Fin Whale (*Balaenoptera physalus*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD.

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.

NMFS (National Marine Fisheries Service). 2012. North Atlantic Right Whale (*Eubalaena glacialis*) Five Year Review: Summary and Evaluation. NOAA Fisheries Service, Northeast Regional Office, Gloucester, MA.

NMFS (National Marine Fisheries Service). 2013. 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. Available at:http://www.greateratlantic.fisheries.noaa.gov/protected/section7/bo/actbiops/batchedfisheriesopinionfinal121613.pdf

NMFS (National Marine Fisheries Service). 2014. Determination Regarding Reinitiation of Endangered Species Act (ESA) Section 7 Consultation on 12 Greater Atlantic Region (GARFO) Fisheries and Two Northeast Fisheries Science Center (NEFSC) Funded Fisheries Research Surveys Due to Critical Habitat Designation for Loggerhead Sea Turtles.

NMFS (National Marine Fisheries Service). 2015A. Standardized Bycatch Reporting Methodology, an omnibus amendment to the fishery management plans of the Mid-Atlantic and New England Regional Fishery Management Councils. Available at: http://www.greateratlantic.fisheries.noaa.gov/regs/2015/June/15sbrmomnibusamendea.pdf

NMFS (National Marine Fisheries Service). 2015B. Endangered Species Act (ESA) Section 4(b)(2) Report Critical Habitat for the North Atlantic Right Whale (*Eubalaena glacialis*). Prepared by National Marine Fisheries Service Greater Atlantic Regional Fisheries Office and Southeast Regional Office.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1995. Status Reviews for Sea Turtles Listed under the Endangered Species Act of 1973.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998A. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys coriacea*).

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 1998B. Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*).

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2005. Recovery Plan for the Gulf of Maine Distinct Population Segment of the Atlantic salmon (*Salmo salar*).

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2007A. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) 5 Year Review: Summary and Evaluation.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2007B. Green sea turtle (*Chelonia mydas*) 5 Year Review: Summary and Evaluation.

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.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2013. Leatherback Sea Turtle (*Dermochelys coriacea*) 5 Year Review: Summary and Evaluation.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2015. Kemp's Ridley Sea Turtle (*Lepidochelys kempii*) 5 Year Review: Summary and Evaluation.

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 oxyrhinchus oxyrhinchus*, River Spawning Populations Estimated from the Microsatellite Genotypes of Marine-Captured Juveniles. *Conservation Genetics.*

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.

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.

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.

Seminoff, J.A., C.D. Allen, G.H. Balazs, P.H. Dutton, T. Eguchi, H.L. Hass, S.A. Hargrove, M. Jensen, D.L. Klemm, A.M. Lauritsen, S.L. MacPherson, P. Opay, E.E. Possardt, S. Pultz, E. Seney, K.S. Van Houtan, and R.S. Waples. 2015. Status Review of the Green Turtle (*Chelonia mydas)* Under the Endangered Species Act. NOAA Technical Memorandum: NOAA-TM-NMFS-SWFSC-539.

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.

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.

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.

Stenseth, N.C, Mysterud, A., Otterson, G., Hurrell, J.W., Chan, K., and M. Lima. 2002 Ecological Effects of Climate Fluctuations. *Science*. 297(5585); 1292-1296

Stevenson, D., L. Chiarella, D. Stephan, R. Reid, K. Wilhelm, J. McCarthy, M. Pentony. 2004. Characterization of the Fishing Practices and Marine Benthic Ecosystems of the Northeast U.S. Shelf, and an Evaluation of the Potential Effects of Fishing on Essential Fish Habitat. NOAA Technical Memorandum NMFS-NE-181.

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.

Tercerio, M. and A. Miller. 2014. Commercial fishery scup discarding and the Gear Restricted Areas (GRAs). Unpublished working paper from the NEFSC Population Dynamics Branch. Available at: http://www.mafmc.org/briefing/december-2015

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). 2007. An Assessment of the Leatherback Turtle Population in the Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-555:1-116.

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*. 8(4):598.

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.

Warden, M.L. 2011A. 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.

Warden, M.L. 2011B. Proration of Loggerhead Sea Turtle (*Caretta caretta*) Interactions in US Mid-Atlantic Bottom Otter Trawls for Fish and Scallops, 2005-2008, by Managed Species Landed. NEFSC Reference Document 11-04. Available at: www.nefsc.noaa.gov/publications/crd/

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2014A. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2013. NOAA Technical Memorandum: NMFS- NE-228.

Waring, G.T., F. Wenzel, E. Josephson, M.C. Lyssikatos. 2014B. Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast U.S. Coast, 2007-2011. Northeast Fisheries Science Center Reference Document 14-13.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2015A. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2014. Available at: www.nmfs.noaa.gov/pr/sars/pdf/atl2014_final.pdf

Waring, G.T., E. Josephson, M.C. Lyssikatos, F.W. Wenzel. 2015B. Serious Injury Determinations for Small Cetaceans and Pinnipeds Caught in Commercial Fisheries off the Northeast U.S. Coast, 2012. Northeast Fisheries Science Center Reference Document 15-12.

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. Available at: www.nmfs.noaa.gov/pr/sars/pdf/atlantic2015_final.pdf

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.

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, including the Environmental Assessment and Regulatory Flexibility Act Analysis and other supporting documents are available from Dr. Christopher M. Moore, Executive Director, Mid-Atlantic Fishery Management Council, Suite 201, 800 North State Street, Dover, DE 19901