Framework Adjustment 4
To the
Northeast Skate Complex FMP

Prepared by the
New England Fishery Management Council
in cooperation with the
National Marine Fisheries Service

New England Fishery Management Council
50 Water Street
Newburyport, MA 01950

Initial Framework Meeting:	April 18, 2017
Final Framework Meeting:	June 21, 2017
Preliminary Submission:	August 25, 2017
Final Submission:	December 8, 2017

1.0 Executive Summary

In New England, the New England Fishery Management Council (NEFMC) is charged with developing management plans that meet the requirements of the Magnuson-Stevens Act (M-S Act). The Northeast Skate Complex Fishery Management Plan (FMP) specifies management measures for seven skate species (barndoor, clearnose, little, rosette, smooth, thorny and winter skates) off the New England and Mid-Atlantic coasts. The FMP has been updated through a series of amendments, framework adjustments and specification packages.

This framework action would implement changes to skate bait fishery effort controls.

The *need* for this action is to prevent lengthy closures of the skate bait fishery during periods of low quota and extend fishing opportunities to reduce negative economic impacts from seasonal closures. The purpose of this action is to limit high volume skate landings in the skate bait fishery during Season 3.

Proposed Action

Under the provision of the M-S Act, the Council submits proposed management actions to the Secretary of Commerce for review. The Secretary of Commerce can approve, disapprove, or partially approve the action proposed by the Council. In the following alternative descriptions, measures identified as Preferred Alternatives constitute the Council's proposed management action. The proposed action does not set or modify specifications. FYs 2016 and 2017 specifications are as follows: the aggregate skate ABC/ACL is 31,081 mt, the ACT is 23,311 mt, the TAL is 12,590 mt, the wing TAL is 8,372 mt, and the bait TAL is 4,218 mt. Specifications for FYs 2018 and 2019 would be considered under Framework 5.

If the Preferred Alternatives identified in this document are adopted, this action would implement a range of measures designed to achieve mortality targets and net benefits from the fishery. Details of the measures summarized below can be found in Section 4.0.

The Preferred Alternatives include:

- *Modifications to Bait Skate Fishery Effort Controls*
    - *Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit.* The preferred alternative would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12,000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons.

Summary of Environmental Consequences

The environmental impacts of all of the alternatives under consideration are described in Section 7.0. Biological impacts are described in Section 7.1, impacts on essential fish habitat are described in Section 7.3, impacts on endangered and other protected species are described in Section 7.4, the economic impacts are described in Section 7.5, and social impacts are described in Section 7.6. Summaries of the impacts of the Preferred Alternatives are provided in the following paragraphs. As required by NEPA, the Preferred Alternatives are compared to the No Action alternative.

Biological Impacts
All the measures contained in this option would work together to keep bait skate landings below the TAL, and would have a positive biological impact. Because this alternative would reduce the possession limit, from 25,000 lb to 12,000 lb in Season 3, a small reduction in mortality would be expected. The closure of the bait fishery, once the TAL was achieved, would have a positive biological impact because the TAL could not be greatly exceeded. The preferred alternatives would be expected to have negligible impacts to non-skate species because no shift in timing of fishing effort would be expected. However, the addition of the closure once the bait TAL is achieved may have low positive impacts on non-target species if triggered, unless it results in unforeseen shifts to other fisheries.

Essential Fish Habitat (EFH) Impacts
The lower 12,000 lb bait limit during Season 3 is expected to decrease effort in the bait fishery, which is largely conducted on an order by order basis. A reduction in the use of trawl gear will reduce interactions with habitat. The reduction in the Season 3 trigger by 10% would allow the incidental possession limit to be implemented earlier in the fishing year, if needed; therefore further reducing directed fishing effort. In addition, a fishery closure once 100% of the bait skate TAL was achieved would continue to reduce interactions with habitat. Overall, impacts to EFH would likely decline.

Impacts on Endangered and Other Protected Species
The reduction in the possession limits may result in less, or restricted, directed fishing effort. The implementation of the closure when 100% of the TAL was achieved would end fishing for skate bait and reduce interactions with protected resources at that point. Further, since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish day-at-sea (DAS), fishing effort on skates is largely constrained by other FMPs. As a result, fishing effort would not only be restricted by the specifications, but also by the above nature of the fishery and the associated accountability measures (AMs) that compensate for any overage of ACLs. Based on this information, impacts to protected species are not expected to be any greater, and may be less, than those under status quo conditions.

Economic Impacts
The modified trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial year of fishing because of a closure. The reduced trigger in Season 3, revised incidental possession limit, and closure measures would ensure that the TAL was not exceeded and w9ould only have an economic impact if they were implemented. Overall, low positive impacts would be expected because it would increase the likelihood that the fishery could continue for the entire fishing year.

Social Impacts
The modified trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts and therefore beneficial social impacts because this would spread revenues throughout the fishing year as opposed to a partial fishing year because of a closure. Overall, the preferred alternative would have low positive social impacts.

Alternatives to the Proposed Action

If the Proposed Action is based on the Preferred Alternatives there are a number of alternatives that would not be adopted. These alternatives are briefly described below.

- *Modifications to the Bait Skate Fishery Effort Controls*
    - *Bait Skate Effort Controls.* The no action alternative would not modify skate bait effort controls, maintaining the existing possession limit, incidental possession limit, and trigger for the bait fishery. Option 2 would reduce the Season 3 skate bait possession limit from 25,000 lbs. to 12,000 lb in Season 3, maintain the skate bait trigger and incidental possession limits linked to the wing fishery, and establish a closure for when 100% of the annual bait skate TAL was achieved. Option 3 would maintain the existing 25,000 lb possession limit with a Letter of Authorization, but reduce the skate bait trigger by 10-15%, redefine the skate bait incidental possession limit to 9,307 lb, and establish a closure for when 100% of the annual bait skate TAL was achieved.

Impacts of Alternatives to the Proposed Action

Biological Impacts
The higher possession limit for the no action alternative and Option 3 would be expected to have low negative impacts on the skate complex, however, the incidental possession limit and trigger would be expected to mitigate this effect resulting in overall neutral biological impacts. Because Option 2 would reduce the possession limit a small reduction in mortality would be expected. Option 2 therefore is expected to have low positive impacts on the skate complex. All the measures contained in Option 2 would work together to keep bait skate landings below the TAL, which would have a positive biological impact. Option 3 relies on the closure once the bait skate TAL is fully achieved to provide positive biological impacts. The incidental possession limit and reduced trigger act more as mechanisms to prolong the fishery and reduce the likelihood of a closure occurring, providing socio-economic benefits. Overall, Option 3 would have neutral to low positive impacts on the complex. The preferred alternatives would be expected to have negligible impacts to non-skate species because no shift in timing of fishing effort would be expected. However, the addition of the closure once the bait TAL is achieved may have low positive impacts on non-target species if triggered, unless it results in unforeseen shifts to other fisheries.

Essential Fish Habitat (EFH) Impacts
The no action alternative may have low negative impacts on EFH because fishing effort would not be reduced. Option 2 would have low positive impacts on EFH, as fishing effort would likely be reduced. One possible outcome of Option 2 is that overall effort will be similar to effort under the higher possession limit, but spread over a longer period. It is also possible that the lower bait limit may decrease effort in the bait fishery. Option 3 would have similar neutral to low positive impacts compared to Option 2 because the reduced trigger and incidental possession limit may be implemented earlier in the fishing year, reducing directed fishing effort.

Impacts on Endangered and Other Protected Species
Under the no action alternative, effort is not expected to increase to levels above and beyond those that have been experienced in the skate management area (extending from Maine to Cape Hatteras, NC) to date. As a result, interaction risks to protected species in this management area is not expected to change significantly from what has been observed to date in these regions. Overall impacts of the no action alternative on protected species is low negative. Impacts to protected species under Options 2 and 3 are not expected to be any greater than those under status quo conditions), and in fact, may be less than status quo conditions. Specifically, fishing effort is likely to remain similar to status quo conditions or

potentially decrease; the latter potentially equates to less fishing time, and therefore, gear being present in the water for a shorter duration.

Economic Impacts
The no action alternative would be expected to have low negative impacts because the fishery would be expected to trigger the incidental possession limit early in Season 3, which would reduce directed effort. The negative economic impacts would be increased if the wing fishery had also triggered its incidental limit at the same time as the bait fishery, which was observed to effectively close the skate bait fishery in FY2016. Option 2 would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial fishing year because of a closure. Option 3 has similar low positive impacts compared to Option 2 because the combination of this higher seasonal possession limit and the low TAL in FY2017, in the short term this may result in low negative economic impacts if the lower trigger is reached. However, the revised incidental limit would be higher and may not be economically distinct compared to the 12,000 lb possession limit proposed in Option 2.

Social Impacts
The no action alternative would be expected to have low negative social impacts because the fishery would be expected to trigger the incidental possession limit early in Season 3, which would reduce directed effort. Option 2 would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts and therefore social impacts because this would spread revenues throughout the fishing year as opposed to a partial fishing year because of a closure. The combination of the higher seasonal possession limit and the low TAL in FY2017 under Option 3, in the short term this may result in low negative social impacts if the lower trigger is reached.

2.0 TABLE OF CONTENTS

2.1 List of Tables

2.2 List of Figures

2.3 List of Maps

2.4 List of Acronyms

ABC	Allowable biological catch
ACL	Annual Catch Limit
ALWTRP	Atlantic Large Whale Take Reduction Plan
AM	Accountability Measure
APA	Administrative Procedures Act
ASMFC	Atlantic States Marine Fisheries Commission
CAI	Closed Area I
CAII	Closed Area II
CPUE	catch per unit of effort
DAM	Dynamic Area Management
DAS	days-at-sea
DFO	Department of Fisheries and Oceans (Canada)
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DPWG	Data Poor Working Group
DSEIS	Draft Supplemental Environmental Impact Statement
EA	Environmental Assessment
EEZ	exclusive economic zone
EFH	essential fish habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
F	fishing mortality rate
FEIS	Final Environmental Impact Statement
FMP	fishery management plan
FW	framework
FY	fishing year
GARFO	Greater Atlantic Regional Fisheries Office
GARM	Groundfish Assessment Review Meeting
GB	Georges Bank
GIS	Geographic Information System
GOM	Gulf of Maine
GRT	gross registered tons/tonnage
HAPC	habitat area of particular concern
HPTRP	Harbor Porpoise Take Reduction Plan
IFQ	individual fishing quota
ITQ	individual transferable quota
IVR	interactive voice response reporting system
IWC	International Whaling Commission
LOA	letter of authorization

LPUE	landings per unit of effort
MA	Mid-Atlantic
MAFAC	Marine Fisheries Advisory Committee
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MPA	marine protected area
MRFSS	Marine Recreational Fishery Statistics Survey
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSMC	Multispecies Monitoring Committee
MSY	maximum sustainable yield
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NERO	Northeast Regional Office
NLSA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NT	net tonnage
OBDBS	Observer database system
OLE	Office for Law Enforcement (NMFS)
OY	optimum yield
PBR	Potential Biological Removal
PDT	Plan Development Team
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RMA	Regulated Mesh Area
RPA	Reasonable and Prudent Alternatives
SA	Statistical Area
SAFE	Stock Assessment and Fishery Evaluation
SAP	Special Access Program
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SEIS	Supplemental Environmental Impact Statement
SFA	Sustainable Fisheries Act
SIA	Social Impact Assessment
SNE	Southern New England
SNE/MA	Southern New England-Mid-Atlantic
SSB	spawning stock biomass
SSC	Scientific and Statistical Committee
TAC	Total allowable catch
TAL	Total allowable landings
TED	Turtle excluder device

TEWG	Turtle Expert Working Group
TMS	ten minute square
TRAC	Trans-boundary Resources Assessment Committee
TSB	total stock biomass
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	vessel monitoring system
VPA	virtual population analysis
VTR	vessel trip report
WGOM	sestern Gulf of Maine
YPR	yield per recruit

3.0 INTRODUCTION AND BACKGROUND

3.1 Management Background

The Northeast Skate Complex Fishery Management Plan (FMP) specifies the management measures for seven skate species (barndoor, clearnose, little, rosette, smooth, thorny and winter skate) off the New England and Mid-Atlantic coasts. The seven species are managed as a stock complex. The FMP, first implemented in 2003, has been updated through a series of amendments, framework adjustments and specification packages, which can be found at www.nefmc.org.

Amendment 3 to the FMP implemented a new ACL management framework that capped catches at levels determined from survey biomass indices and median exploitation ratios, and addressed the rebuilding of smooth and thorny skates (NEFMC, 2009). Framework Adjustment 3 set specifications for FY 2016 and FY 2017, which decreased the ACL for the complex, set possession limits for the wing and bait fisheries, and established seasonal management for the wing fishery (NEFMC, 2016).

Skates are harvested in two very different fisheries, one for lobster bait and one for wings for food. Fishery specific Total Allowable Landings (TALs) and possession limits are set as part of specifications. Both fisheries have independent seasonal management structures. Both fisheries are subject to effort controls and Accountability Measures. In FY2016, the incidental possession limit was implemented twice for the bait fishery in both Seasons 1 and 3. The incidental skate bait possession limit is implemented when 90% of the seasonal quotas have been reached in Seasons 1 or 2, or when 90% of the annual skate bait TAL has been landed, unless the annual TAL was not expected to be achieved. The bait fishery incidental possession limit is defined as the whole weight equivalent of the wing possession limit in place at that time. There are two seasonal possession limits for the wing fishery – 2,600 lb in Season 1 and 4,100 lb in Season 2. The wing fishery incidental possession limit is 500 lb. In Season 3 of FY2016, both the wing and bait fisheries had incidental possession limits in place, which effectively closed the bait fishery. This framework is intended to adjust effort controls in the bait fishery to reduce the likelihood of seasonal closures occurring during the fishing year.

3.2 Purpose and Need for the Action (EA, RFA)

The purpose of this action is to limit high volume skate landings in the skate bait fishery during Season 3. A lengthy closure of the skate bait fishery in fishing year 2016 had a substantial impact on the skate bait fishery and the lobster industry.

This action is needed to prevent lengthy closures of the skate bait fishery during periods of low quota and extend fishing opportunities to reduce negative economic impacts from seasonal closures.

3.3 Brief History of the Northeast Skate Bait Fishery

Table 1 describes the seven species in the Northeast Region's skate complex, including each species common name(s), scientific name, size at maturity, and general distribution.

Table 1 - Species description for skates in the management unit.

SPECIES COMMON NAME	SPECIES SCIENTIFIC NAME	GENERAL DISTRIBUTION	SIZE AT MATURITY cm (TL)	OTHER COMMON NAMES
Winter Skate	*Leucoraja ocellata*	Inshore and offshore Georges Bank (GB) and Southern New England (SNE) with lesser amounts in Gulf of Maine (GOM) or Mid Atlantic (MA)	Females: 76 cm Males: 73 cm 85 cm	Big Skate Spotted Skate Eyed Skate
Barndoor Skate	*Dipturus laevis*	Offshore GOM (Canadian waters), offshore GB and SNE (very few inshore or in MA region)	Males (GB): 108cm Females (GB): 116 cm	
Thorny Skate	*Amblyraja radiata*	Inshore and offshore GOM, along the 100 fm edge of GB (very few in SNE or MA)	Males (GOM): 87 cm Females (GOM): 88 cm 84 cm	Starry Skate
Smooth Skate	*Malacoraja senta*	Inshore and offshore GOM, along the 100 fm edge of GB (very few in SNE or MA)	56 cm	Smooth-tailed Skate Prickly Skate
Little Skate	*Leucoraja erinacea*	Inshore and offshore GB, SNE and MA (very few in GOM)	40-50 cm	Common Skate Summer Skate Hedgehog Skate Tobacco Box Skate
Clearnose Skate	*Raja eglanteria*	Inshore and offshore MA	61 cm	Brier Skate
Rosette Skate	*Leucoraja garmani*	Offshore MA	34 – 44 cm; 46 cm	Leopard Skate

Abbreviations are for Gulf of Maine (GOM), Georges Bank (GB), Southern New England (SNE), and the Mid-Atlantic (MA) regions.

The fishery for lobster bait is a more historical and directed skate fishery, involving vessels primarily from Southern New England ports that target a combination of little skates (>90%) and, to a much lesser extent, juvenile winter skates (<10%). The catch of juvenile winter skates mixed with little skates is difficult to differentiate due to their nearly identical appearance. A description of available information about this fishery can be found in Section 6.5.1.

The Northeast skate complex was assessed in November 1999 at the 30th Stock Assessment Workshop (SAW 30) in Woods Hole, Massachusetts. The work completed at SAW 30 indicated that four of the seven species of skates were in an overfished condition: winter, barndoor, thorny and smooth. In addition, overfishing was thought to be occurring on winter skate (NEFSC, 2000). The FMP initially set limits on fishing related to the amount of groundfish, scallop, and monkfish DAS and measures in these and other FMPs to control the catch of skates. Initially, it was thought that barndoor, smooth, rosette, and thorny skates were overfished and that overfishing of winter skate was occurring.

Amendment 3 became effective on July 16, 2010, implementing a new ACL management framework that capped catches at specific levels determined from survey biomass indices and median exploitation ratios. In addition to the ACL framework and accountability measures, the amendment also included technical measures that reduced the skate wing possession limit from 20,000 (45,400 whole weight) to 5,000 (11,350 whole weight) lb of skate wings, established a 20,000 lb whole skate bait limit for vessels with skate bait letters of authorization, and allocated the skate bait quotas into three seasons proportionally to historic landings. A skate bait letter of authorization allows vessels possessing one to land whole skate, not exceeding 23 inches in total length, in quantities great than the skate possession limit (the whole weight equivalent of the wing possession limit).

During the end of the 2010 fishing year (Jan – Apr), the Skate PDT developed the analyses needed to update the ACL with new data, including calibrations of the survey tow data collected by the new FSV Bigelow in 2009-2011 and recent discard mortality research for little and winter skates captured by vessels using trawls.

In June 2011, the Council requested that the GARFO Regional Administrator initiate an Emergency Action to adjust the 2011 ACL specifications, based on the new analysis and calibrated survey data through spring 2011. A proposed rule was published on August 30, 2011 (FR 76(168) p53872; http://www.nero.noaa.gov/nero/regs/frdoc/11/11SkatePR.pdf) to raise the ACL specifications accordingly.

Specifications for FY 2012 and FY 2013 were set following the Amendment 3 ACL methodology; the assumed discard rate was updated using the 2008-2010 dead discards. The re-estimated discard rate also incorporates new discard mortality estimates for little (20%) and winter (12%) skates captured by trawls.

Framework Adjustment 2 (NEFMC, 2014) set specifications for FY 2014 and FY 2015 also following the Amendment 3 ACL methodology. It also incorporated final discard mortality rate estimates for little (22%), winter (9%), smooth (60%), and thorny (23%) skate for trawl gear. Framework Adjustment 2 also modified the VTR and dealer reporting codes for the skate wing and bait fisheries.

Framework Adjustment 3 (NEFMC, 2016) set specifications for FY 2016 and FY 2017 consistent with Amendment 3. It also set wing and bait skate possession limits and a seasonal management structure for the wing fishery.

In FY2016, the incidental possession limit was implemented twice for the bait fishery in both Seasons 1 and 3. In Season 3 of FY2016, both the wing and bait fisheries had incidental possession limits in place, which effectively closed the bait fishery.

Intentionally Blank

4.0 Alternatives Under Consideration

4.1 Modifications to Bait Skate Fishery Effort Controls

4.1.1 Option 1: No Action

This alternative would maintain the existing possession limit, incidental possession limit, and trigger for the bait skate fishery, as outlined below.

This alternative would maintain the skate bait possession limit at 25,000 lb year-round. Vessels that obtain a Skate Bait Letter of Authorization from the NMFS Regional Office would be able to retain up to 25,000 lb of whole skates provided that they comply with related rules and size limits.

Rationale: The No Action alternative would not modify existing skate bait possession limits. This alternative would also not modify the structure of the in-season adjustment of skate bait possession limits, which implements the incidental skate bait possession limit when 90% of the seasonal quotas have been reached in Seasons 1 or 2, or when 90% of the annual skate bait TAL has been landed, unless the annual TAL was not expected to be achieved. The incidental skate bait possession limit is the whole weight equivalent of the skate wing trip limit (the whole weight equivalent of the wing possession limits are: Season 1 – 5,902 lb; Season 2 – 9,307 lb; incidental - 1,135 lb). Based on recent trends in skate bait landings and the existing bait TAL, this may result in a higher probability of the incidental possession limit being implemented to prevent the TAL from being exceeded.

4.1.2 Option 2: Revised Skate Bait Possession Limit and Closure

This alternative would reduce the Season 3 skate bait possession limit from 25,000 lb to 12,000 lb. Vessels that obtain a Skate Bait Letter of Authorization from the NMFS Regional Office would be able to retain up to 25,000 lb in Seasons 1 (May 1 – July 31) and 2 (August 1 – October 31) and 12,000 lb of whole skates in Season 3 (November 1 – April 30) provided that they comply with related rules and size limits.

This alternative would also close the skate bait fishery once 100% of the TAL was projected to be achieved. All skate bait letters of authorization (LOAs) would be considered void and all vessels would be prohibited from landing skates in bait form. All skate landing would be attributed to the skate wing fishery and count against the wing TAL.

Rationale: In FY2016, the bait skate fishery was subject to an effective closure when the incidental possession limit was implemented for the wing and bait fisheries resulting in a skate bait possession limit of 1,135 lb. The skate FMP has not previously closed the fishery when the TAL is achieved; instead an incidental possession limit was put in place. Fishing effort could be impacted if the incidental possession limit was low enough to prevent a trip from taking place. A lower possession limit in the final trimester of the fishing year would slow fishing in the final trimester, allowing the fishery to remain operational longer. An analysis of fishing patterns in recent fishing years estimated 12,000 lb to be an appropriate possession limit during Season 3 to help the fishery remain open for a longer duration. The possession limit would minimize the likelihood of the bait skate TAL being exceeded, while allowing the fishery to be prosecuted. The closure of the bait fishery at 100% of the TAL would serve as a hard backstop. It would allow fishing to occur while also preventing the TAL from being exceeded. This alternative would not modify the structure of the in-season adjustment of skate bait possession limits, which implements the incidental skate bait possession limit when 90% of the seasonal quotas have been reached in Seasons 1 or 2, or when 90% of the annual skate bait TAL has been landed, unless the annual TAL was not expected to

be achieved. The incidental skate bait possession limit is the whole weight equivalent of the skate wing trip limit (the whole weight equivalent of the wing possession limits are: Season 1 – 5,902 lb; Season 2 – 9,307 lb; incidental - 1,135 lb).

4.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Closure

This alternative would maintain the skate bait possession limit at 25,000 lb year-round. Vessels that obtain a Skate Bait Letter of Authorization from the NMFS Regional Office would be able to retain up to 25,000 lb of whole skates provided that they comply with related rules and size limits.

This alternative would modify the structure of the in-season adjustment of skate bait possession limits. The incidental skate bait possession limit would be implemented when 75% of the seasonal quotas have been reached in Seasons 1 (May 1 – July 31) or 2 (August 1 – October 31), or when 75% of the annual skate bait TAL has been landed, unless the annual TAL was not expected to be achieved.

The incidental skate bait possession limit would be set at 9,307 lb, the whole weight equivalent of the skate wing possession limit.

This alternative would also close the skate bait fishery once 100% of the TAL was projected to be achieved. All skate bait letters of authorization (LOAs) would be considered void and all vessels would be prohibited from landing skates in bait form. All skate landing would be attributed to the skate wing fishery and count against the wing TAL.

Rationale: In FY2016, the bait skate fishery was subject to an effective closure when the incidental possession limit was implemented for the wing and bait fisheries resulting in a skate bait possession limit of 1,135 lb. It is difficult to forecast fishing behavior, maintaining a higher possession limit would increase the likelihood of the TAL being achieved. The reduction of the trigger would help limit the risk of the higher possession limit, by allowing the incidental possession limit to be implemented earlier in the fishing year, if needed. The incidental possession limit was selected because it would allow the bait fishery to continue at a lower effort level and not result in a potentially premature, effective closure. The closure of the bait fishery at 100% of the TAL would serve as a hard backstop, which is necessary because this option decouples the skate wing and bait incidental possession limits. It would allow fishing to occur at higher possession limits while also preventing the TAL from being exceeded. The Council discussed a range of thresholds (75-80%) for when the incidental possession limit would be implemented, however, a specific range was not selected; analyses for this alternative consider the range.

4.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

This alternative would reduce the Season 3 skate bait possession limit from 25,000 lb to **12,000** lb. Vessels that obtain a Skate Bait Letter of Authorization from the NMFS Regional Office would be able to retain up to 25,000 lb in Seasons 1 and 2 and 12,000 lb of whole skates in Season 3 provided that they comply with related rules and size limits.

This alternative would reduce the in-season adjustment of skate bait possession limits, which implements the incidental skate bait possession limit when needed, from 90% to **80**% in Season 3, unless the annual TAL was not expected to be achieved. The trigger in Seasons 1 and 2 would remain at 90%, i.e. when 90% of the seasonal quotas have been reached in Seasons 1 or 2, unless the annual TAL was not expected to be achieved.

The incidental skate bait possession limit would be set at 8,000 lb. This incidental possession limit would be implemented in any season that the trigger had been reached and implementation necessary.

This alternative would also close the skate bait fishery once 100% of the TAL was projected to be achieved. All skate bait letters of authorization (LOAs) would be considered void and all vessels would be prohibited from landing skates in bait form. All skate landing would be attributed to the skate wing fishery and count against the wing TAL.

Rationale: In FY2016, the bait skate fishery was subject to an effective closure when the incidental possession limit was implemented. A lower possession limit in the final trimester of the fishing year would allow the fishery to remain operational longer. An analysis of fishing patterns in recent fishing years estimated 12,000 lb to be an appropriate possession limit for the fishery to likely remain open for the entire fishing year. The possession limit would minimize the likelihood of the bait skate TAL being exceeded, while allowing the fishery to be prosecuted. The reduction of the trigger in Season 3 would help limit the risk of the TAL from being exceeded, by allowing the incidental possession limit to be implemented earlier in the fishing year, if needed. Revising the incidental possession limit would disconnect the link between the skate wing and bait fisheries formed by defining the bait incidental possession limit as the wing possession limit in place at the time. An independent incidental possession limit would allow the bait fishery to continue at a lower effort level and not result in a potentially premature, effective closure. The closure of the bait fishery at 100% of the TAL would serve as a hard backstop. It would allow fishing to occur while also preventing the TAL from being exceeded.

5.0 Considered but Rejected Alternatives

No management issues arose during the development of this specifications package that were not adopted as alternatives by the Council.

6.0 AFFECTED ENVIRONMENT (SAFE Report /EA)

This document serves two purposes: an update of the Stock Assessment and Fishery Evaluation Report (SAFE) and a Description of the Affected Environment (Section 7) for the Environmental Assessment (EA) for 2015-2016. Since the document serves as Section 7 of the EA in Amendment 3, it is numbered beginning with Section 7 in this stand-alone SAFE Report to reduce confusion. There are therefore no Sections 1-6 in the stand-alone SAFE Report.

This section is intended to provide background information for assessing the impacts, to the extent possible, of the proposed management measures on related physical, biological, and human environments. It includes a description of the stocks and the physical environment of the fishery as well as life history information, habitat requirements, and stock assessments for relevant stocks and a discussion of additional biological elements such as endangered species and marine mammals. This descriptive section also describes the human component of the ecosystem, including socioeconomic and cultural aspects of the commercial and recreational fisheries and the impacts of other human activities on the fisheries in question. Much of the information contained in this section is a compilation of information used to make choices from a range of alternatives during the development of the proposed management action.

This Stock Assessment and Fishery Evaluation (SAFE) Report was prepared by the New England Fishery Management Council's Skate Plan Development Team (PDT). It presents available biological, physical, and socioeconomic information for the Northeast's region skate complex and its associated fisheries. It also serves as the Affected Environment description for the Environmental Assessment associated with FW 4.

Table 1 presents the seven species in the northeast region's skate complex, including each species common name(s), scientific name, size at maturity (total length, TL), and general distribution.

6.1 Biological Environment

6.1.1 Species Distribution

In general, barndoor skate are found along the deeper portions of the Southern New England continental shelf and the southern portion of Georges Bank, extending into Canadian waters. They are also caught by the survey as far south as NJ during the spring. Clearnose skates are caught by the NMFS surveys in shallower water along the Mid-Atlantic coastline, but are known to extend into unsurveyed shallower areas and into the estuaries, particularly in Chesapeake and Delaware Bays. These inshore areas are surveyed by state surveys and the Mid-Atlantic NEAMap Survey (http://www.vims.edu/research/departments/fisheries/programs/multispecies_fisheries_research/neamap/index.php).

Little skate are found along the Mid-Atlantic, Southern New England, and Gulf of Maine coastline, in shallower waters than barndoor, rosette, smooth, thorny, and winter skates. Rosette, smooth, and thorny are typically deep-water species. The survey catches rosette skate along the shelf edge in the Mid-Atlantic region, while smooth and thorny are found in the Gulf of Maine and along the northern edge of Georges Bank. Winter skate are found on the continental shelf of the Mid-Atlantic and Southern New England regions, as well as Georges Bank and into Canadian waters. Winter skate are typically caught in deeper waters than little skate, but partially overlap the distributions of little and barndoor skates.

6.1.2 Stock status

The stock status relies entirely on the annual NMFS trawl survey. The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and it is concluded that overfishing is occurring for that species (NEFSC 2007a). The average CVs of the indices are given by species in Table 2. Except for little skates, the abundance and biomass trends are best represented by the fall survey, which has been updated through 2014 (Table 2). Little skate abundance and biomass trends are best represented by the spring survey, which has been updated through 2015 (Table 2). Details about long term trends in abundance and biomass are given in the SAW 44 Report (NEFSC 2007a) and in the Amendment 3 FEIS (Section 7.1.2).

Based on survey data updated through fall 2014/spring 2015, only thorny skate remained in an overfished condition (Table 2).

For barndoor skate, the 2014-2016 NEFSC autumn average survey biomass index of 1.60 kg/tow is above the biomass threshold reference point (0.78 kg/tow) and the B_{MSY} proxy (1.57 kg/tow) [Table 2]. The 2014-2016 average index is above the 2013-2015 index by 0.5%. It is recommended that this stock is not overfished and overfishing is not occurring.

For clearnose skate, the 2014-2016 NEFSC autumn average biomass index of 0.59 kg/tow is above the biomass threshold reference point (0.33 kg/tow) but below the B_{MSY} proxy (0.66 kg/tow) [Table 2]. The 2014-2016 index is below the 2013-2015 index by 19.5% which is less than the threshold percent change of 40%. It is recommended that this stock is not overfished and overfishing is not occurring.

For little skate, the 2015-2017 NEFSC spring average biomass index of 5.49 kg/tow is above the biomass threshold reference point (3.07 kg/tow) but below the B_{MSY} proxy (6.15 kg/tow) [Table 2]. The 2015-2017 average index is below the 2014-2016 average by 2.6% which is less than the threshold percent change of 20%. It is recommended that this stock is not overfished and overfishing is not occurring.

For rosette skate, the 2014-2016 NEFSC autumn average biomass index of 0.047 kg/tow is above the biomass threshold reference point (0.024 kg/tow) but below the B_{MSY} proxy (0.048 kg/tow) [Table 2]. The 2014-2016 index is below the 2013-2015 index by 7.9% which is less than the threshold percent change of 60%. It is recommended that this stock is not overfished and overfishing is not occurring.

For smooth skate, the 2014-2016 NEFSC autumn average biomass index of 0.25 kg/tow is above the biomass threshold reference point (0.134 kg/tow) but below the B_{MSY} proxy (0.27 kg/tow) [Table 2]. The 2014-2016 index is above the 2013-2015 index by 21.4%. It is recommended that this stock is not overfished and overfishing is not occurring.

For thorny skate, the 2014-2016 NEFSC autumn average biomass index of 0.18 kg/tow is well below the biomass threshold reference point (2.06 kg/tow) [Table 2]. The 2014-2016 index is higher than the 2013-2015 index by 3.7%. It is recommended that this stock is overfished but overfishing is not occurring.

For winter skate, the 2014-2016 NEFSC autumn average biomass index of 6.65 kg/tow is above the biomass threshold reference point (2.83 kg/tow) and above the B_{MSY} proxy (5.66 kg/tow) [Table 2]. The 2014-2016 average index is above the 2013-2015 index by 24.2%. It is recommended that this stock is not overfished and overfishing is not occurring.

Table 2 - Summary by species of recent survey indices, survey strata used and biomass reference points.

	BARNDOOR	CLEARNOSE	LITTLE	ROSETTE	SMOOTH	THORNY	WINTER
Survey (kg/tow)	**Autumn**	**Autumn**	**Spring**	**Autumn**	**Autumn**	**Autumn**	**Autumn**
Time Series Basis	**1963-1966**	**1975-2007**	**1982-2008**	**1967-2007**	**1963-2007**	**1963-2007**	**1967-2007**
Strata Set	**Offshore 1-30, 34-40**	**Offshore 61-76, Inshore 17,20,23,26,29,32,35,38,41,44**	**Offshore 1-30, 34-40, 61-76, Inshore 2,5,8,11,14,17,20,23,26,29,32,35,38,41,44-46,56,59-61,64-66**	**Offshore 61-76**	**Offshore 1-30, 34-40**	**Offshore 1-30, 34-40**	**Offshore 1-30, 34-40, 61-76**
2010	1.10	0.68	10.63	0.028	0.18	0.28	8.09
2011	1.02	1.32	6.88	0.034	0.30	0.18	6.65
2012	1.54	0.93	7.54	0.040	0.21	0.08	5.29
2013	1.07	0.77	6.90	0.056	0.14	0.11	2.95
2014	1.62	0.61	6.54[a]	0.053	0.22	0.21	6.95
2015	2.08	0.82	6.82	0.045	0.25	0.19	6.15
2016	1.09	.339	3.56[b]	0.044	0.27	0.13	6.84
2017			6.09				
2010-2012 3-year average	1.22	0.97	8.35	0.033	0.23	0.18	6.68
2011-2013 3-year average	1.21	1.01	7.11	0.042	0.22	0.12	4.96
2012-2014 3-year average	1.41	0.77	6.99[a]	0.048	0.19	0.13	5.06
2013-2015 3-year average	1.59	0.73	6.75 [a]	0.051	0.21	0.17	5.35
2014-2016 3-year average	1.60	0.59	5.64[b]	0.047	0.25	0.18	6.65
2015-2017 3-year average			5.49				
Percent change 2011-2013 compared to 2010-2012	-1.0	+3.1	-14.9	+28.8	-5.0	-31.9	-25.7
Percent change 2012-2014 compared to 2011-2013	+16.5	-23.3	-1.6	+14.6	-12.5	+8.7	+2.0
Percent change 2013-2015 compared to 2012-2014	+12.9	-4.8	-3.4	+6.0	+6.8	+26.3	+5.7
Percent change 2014-2016 compared to 2013-2015	+0.5	-19.5	-16.8	-7.9	+21.4	+3.7	+24.2
Percent change 2015-2017 compared to 2014-2016			-2.6				
Percent change for overfishing status determination in FMP	-30	-40	-20	-60	-30	-20	-20
Biomass Target	1.57	0.66	6.15	0.048	0.27	4.13	5.66
Biomass Threshold	0.78	0.33	3.07	0.024	0.13	2.06	2.83

[a] No survey tows completed south of Delaware in spring 2014. Values for 2014 were adjusted for missing strata (i.e., Offshore 61-68, Inshore 32,35, 38, 41, 44) but may not be fully comparable to other surveys which sampled all strata.
[b] The 2016 spring survey was later than usual.

6.1.3 Biological and Life History Characteristics

The Essential Fish Habitat Source Documents prepared by the Northeast Fisheries Science Center (NEFSC) of the National Marine Fisheries Service for each of the seven skate species provide most available biological and habitat information on skates. Any updated information will be provided below. These technical documents are available at http://www.nefsc.noaa.gov/nefsc/habitat/efh/ and contain the following information for each skate species in the northeast complex:

- Life history, including a description of the eggs and reproductive habits
- Average size, maximum size and size at maturity
- Feeding habits
- Predators and species associations
- Geographical distribution for each life history stage
- Habitat characteristics for each life history stage
- Status of the stock (in general terms, based on the Massachusetts inshore and NEFSC trawl surveys)
- A description of research needs for the stock
- Graphical representations of stock abundance from NEFSC trawl survey and Massachusetts inshore trawl survey data
- Graphical representations of percent occurrence of prey from NEFSC trawl survey data

Please refer to the source documents (http://www.nefsc.noaa.gov/nefsc/habitat/efh/) for more detailed information on the above topics. All additional biological information is presented below.

The seven species of the northeast skate complex follow a similar life history strategy but differ in their biological characteristics. This section describes any information made available after the publication of the EFH documents for the two skate species most frequently encountered in the skate bait fishery. Framework 3 contains detailed information for the seven skate species (NEFMC, 2016). A detailed summary of the biological and life history characteristics was included in the FEIS for Amendment 3 (NEFMC 2009).

Little Skate

Frisk and Miller (2006) examined vertebral samples of little skate to identify any latitudinal patterns in the northwestern Atlantic. Maximum observed age was 12.5 years. The oldest aged little skate from the mid-Atlantic was 11 years. The oldest individuals from the Gulf of Maine and Southern New England – Georges Bank were 11 years or older. Von Bertalanffy curves were fit for the northwestern Atlantic ($k = 0.19$, $L_\infty = 56.1$ cm TL, $t_o = -1.77$, $p < 0.0001$, $n = 236$) and for individual regions (GOM: $k = 0.18$, $L_\infty = 59.31$ cm TL, $t_o = -1.15$, $p < 0.0001$; SNE-GB: $k = 0.20$, $L_\infty = 54.34$ cm TL, $t_o = -1.22$, $p < 0.0001$; mid-Atlantic: $k = 0.22$, $L_\infty = 53.26$ cm, $t_o = -1.04$, $p < 0.0001$).

Sosebee (2005) used body morphometry to determine size at maturity (male – 39 cm TL; females – 40 – 48 cm TL) on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras. Fecundity was estimated to be 30 eggs per year (Packer et al. 2003 c). Palm et al. (2011) estimated an average fecundity of 46 eggs per captive female over the course of one year; the highest number of eggs was laid in June; the minimum occurred in March. Egg viability was 74.1%. Size at hatching varied with month; spring hatchlings were larger than other times of the year. Little skate are capable of reproducing year round but no reproductive peaks were observed (Williams et al. 2013).

Cicia et al. (2012) showed temperature influences survivability in little skate when exposed to air; little skates in summer exhibited higher mortality rates for air exposure times compared to winter.

Little skates are benthivorous which was reflected by the large portion of the diet that benthic macrofauna (polychaetes and amphipods) and benthic megafauna (crabs and bivalves) comprised. Overall, the diet of little skates was dominated by benthic invertebrates. Up to 8,000 mt of a particular prey item can be removed by this skate in any given year. This diet may overlap but not necessarily compete directly with flounders.

The amount of food consumed was related to the size of the skate. Small skates (<= 30 cm TL) consumed approximately 500 g per year of prey items, while large skates (>30 cm TL) consumed approximately 2.5 kg per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 100,000 and 350,000 mt per year, with total consumption dominated by mature skates.

Winter Skate

Sulikowski et al. (2003) aged winter skate in western Gulf of Maine and determined the oldest age estimated to be 18 and 19 years for females and males, respectively (corresponding length – 94.0 cm and 93.2 cm). Verification of the periodicity of the vertebral bands was determined to be annual with the opaque band being formed in June - July using marginal increment analysis. Von Bertalanffy Growth parameters for male winter skates were calculated to be $k = 0.074$, $L_\infty = 121.8$ cm TL, $t_o = -1.418$; calculated estimates for female winter skates were: $k = 0.059$, $L_\infty = 137.4$ cm, $t_o = -1.609$ (Sulikowski et al. 2003). Growth curves fit to data from this study were found to overestimate maximum total length compared to observed lengths. This may result from a low representation of maximum sized individuals. The maximum reported length is 150 cm TL. Maximum sizes examined in the Gulf of Maine were 93.2 cm total length and 94.0 cm total length for males and females, respectively (Sulikowski et al. 2003).

Frisk and Miller (2006) examined vertebral samples of winter skate from the northwestern Atlantic. Maximum observed age was 20.5 years (a male winter skate of 74 cm TL); the oldest female was estimated to be 19.5 years (76 cm TL). Von Bertalanffy curves were fit for the northwestern Atlantic ($k = 0.07$, $L_\infty = 122.1$ cm TL, $t_o = -2.07$, $p < 0.0001$, $n = 229$) and for the GOM region ($k = 0.064$, $L_\infty = 131.40$ cm TL, $t_o = -1.53$).

In the southern Gulf of St Lawrence, winter skate reached a maximum size of 68 cm total length; males and females were mature between 40 and 41 cm TL or around 5 years (Kelly and Hanson, 2013).

Winter skates are capable of reproducing year-round but exhibit one peak in the annual cycle (Sulikowski et al. 2004). Peak reproductive activity occurs during June – August. Size at maturity has been shown to vary with latitude. Size at maturity is 76cm for females and 73 cm for males (Sulikowski et al. 2005b). Sosebee (2005) used body morphometry to determine size at maturity to be approximately 65 - 73 cm TL for females and 49 - 60 cm TL for males on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras. Fecundity in the southern Gulf of St Lawrence was estimated to be low (Kelly and Hanson, 2013).

Swain et al. (2013) modeled the mortality rate of small and large winter skate and showed decreased mortality for small skate and an increase for larger skates (adults only) between the 1970s and 2000s in 4T and 4VW areas. The changes in mortality rates differed with area examined; an increase in natural mortality was hypothesized in the 4T and 4VW areas for large skates. Benoit et al. (2011) attribute the increase in natural mortality on winter skate to be due to grey seal predation.

Frisk et al (2010) investigated the increase in winter skate abundance in the 1980s and concluded that it was likely due to an increase in recruitment combined with adult migration. A stock assessment model was developed for the stock, however, the five parameter base model did not fit the observed data well.

Winter skate tend to inhabit warmer waters, when possible (Kelly and Hanson, 2013) and may migrate to deeper waters in winter to avoid colder temperatures in the southern Gulf of St. Laurence.

Winter skates are benthivorous and piscivorous, a large portion of the diet formed by forage fishes. Overall, the diet of winter skates was dominated by forage fish, squid and benthic macrofauna. Up to 80,000 mt of a particular prey item can be removed by this skate in any given year. The amount of food consumed was related to the size of the skate. Medium sized (31-60 cm TL) skates consumed approximately 2 kg per year of prey items, while large skates (>60 cm TL) consumed approximately 9 kg per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 20,000 and 180,000 mt per year. In the southern Gulf of St Lawrence, winter skate less than 40 cm TL ate mainly shrimp and gammarid amphipods; larger skates ate more fishes and Atlantic rock crab (Kelly and Hanson, 2013).

6.1.4 Discards and discard mortality

Since skate discards are high across many fisheries, the estimates of total skate catch are sensitive to the discard mortality rate assumption, and have direct implications for allowable landings in the skate fisheries. Data on immediate- and delayed (i.e. post-release) mortality rates of discarded skates and rays is extremely limited. Only six published studies have estimated discard mortality rates in these species; for an outline of these studies see the literature review in the 2012-2013 specifications package (NEFMC 2012). Benoit (2006) estimated acute discard mortality rates of winter skates caught in Canadian bottom trawl surveys, the SSC in 2009 decided to use a 50% discard mortality rate assumption for all skates and gears for the purposes of setting the Skate ACL, based on this paper.

Since the Council adopted a 50% discard mortality assumption for setting the ACL in Amendment 3, based on a literature review by the Skate PDT and advice from the Council's SSC, more relevant research data and analysis has been collected on skate mortality by sink gillnet vessels. When Amendment 3 was developed, this discard mortality assumption was largely derived from published studies, most of which were for species and locations different from those covered in the FMP because no other data existed.

The 2012 specifications package revised the assumed discard mortality rate for little and winter skate based on an experiment in progress examining discard mortality for these species in trawl gear. While the data were preliminary, the Council's SSC reviewed the methodology and the preliminary results of the new discard mortality research and determined the new discard mortality values for little skate (0.20) and winter skate (0.12) to be the best scientific information available compared to the literature review; the new values were applied to little and winter skates captured by trawls and discarded under normal commercial practices. These new data were applied to estimate total discard mortality by gear and species and the last three years of data were used to project a 36.3% dead discard mortality rate (dead discards divided by total catch) for the 2012-2013 specification cycle.

Mandelman et al. (2013) examined the immediate and short-term discard mortality rate of little, smooth, thorny and winter skates in the Gulf of Maine. Tow durations lasted 15-20 min (control), 2 h (moderate) and 4 h (extended). The PDT recommended using the pooled moderate and extended tow times as they most closely reflected commercial practices. Full details of the study can be found in the paper by Mandelman et al. (2013) and were presented to the SSC. The SSC approved revising the discard mortality rate estimates for little (22%), smooth (60%), thorny (23%) and winter (9%) skates for otter trawl, consistent with their previous recommendation to use the preliminary estimates from this study. The SSC did not support using this study to revise the assumed 50% discard mortality rate for gillnet gear.

Knotek (2015) examined the immediate and short-term discard mortality rate of little, winter, and barndoor skates in scallop dredge gear by evaluating reflex impairment and injury indexes. A total of 295 tows were conducted on 6 research cruises; tow duration ranged from 10-90 minutes. On deck exposure time ranged from 0-30 minutes. The PDT recommended using the discard mortality rate estimates for little and winter skate only, as the researchers considered the sample size was insufficient for an accurate estimate for barndoor skate. The SSC approved revising the discard mortality rate estimates for little (48%) and winter skate (34%) for scallop dredge gear based on this study.

Sulikowski et al. (in review) estimated the discard mortality of winter skate in commercial sink gillnets. A total of 28 trips were made with soak time duration varying from 2-5 days, up to 14 days (to simulate longer soak times caused by bad weather). The models provided sex-specific final discard mortality rate estimates of 11% and 17% for males and females, respectively. The PDT recommended using an average discard mortality rate of 14% because it is not possible to determine the sex ratio of winter skate from the trawl survey at this time. The SSC approved revising the discard mortality rate estimate for winter skate (14%) for sink gillnet gear based on this study.

6.1.5 Estimated discards by gear

Another way to evaluate the potential interactions between skate fishing and smooth and thorny skate distributions is to examine estimated discards. Discards were estimated through calendar year 2016 by gear (Table 3). Discards are estimated for a calendar year, rather than the fishing year, because they rely on the NMFS area allocation landings tables to expand observed discard/kept-all ratios to total based on landings by gear, area and quarter. The observed D/K-all ratios were derived from the Sea Sampling Observer and the At Sea Monitoring programs and included both sector and non-sector vessels, but were not stratified on that basis. The projected discard rate is calculated using a three-year average of the discards of skates/landings of all species.

Total estimated discards for 2014 were 42,732 mt (Table 3). Discards increase by just 0.04% over the 2013 estimates. The assumed discard rate for 2014 is 43%. Projected dead discards are estimated to be 10,095 mt. Total live and dead discards for the Northeast Skate Complex for all gear types are contrasted in Table 4. Based upon SSC recommendations in 2008, an assumed discard mortality rate of 50% is applied for all gears and species, except for otter trawl gear, which has been updated based on Mandelman et al. 2013, and scallop dredge gear, which has been updated based on Knotek (2015).

Table 3 – Estimated discards (mt) of skates (all species) by gear type from all areas combined, 1964 - 2016

	Half 1							Half 2							
Year	Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Scallop Dredge	Total Half 1		Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Scallop Dredge	Total Half 2		Grand Total
1964	361	53,514	0	12	6,434	60,321		402	37,992	0	7	8,288	46,690		107,011
1965	425	58,644	0	17	5,029	64,115		491	41,212	0	5	8,940	50,647		114,762
1966	311	62,821	0	26	5,543	68,701		625	35,869	0	7	6,524	43,025		111,726
1967	319	56,872	0	22	2,882	60,095		470	35,053	0	8	4,735	40,267		100,362
1968	224	56,209	0	37	3,672	60,142		414	34,010	0	10	4,890	39,324		99,466
1969	296	54,979	0	32	2,294	57,602		669	29,299	0	6	3,017	32,991		90,593
1970	331	43,878	0	22	1,838	46,069		584	26,802	0	7	2,742	30,135		76,204
1971	519	34,509	0	21	1,916	36,965		769	20,097	0	8	2,552	23,426		60,391
1972	525	32,161	0	31	2,000	34,718		711	17,965	0	13	2,559	21,248		55,966
1973	618	34,382	0	31	2,103	37,134		724	19,738	0	15	1,846	22,323		59,457
1974	697	36,349	0	58	1,994	39,099		778	17,754	0	24	2,845	21,401		60,499
1975	727	25,197	283	61	2,615	28,883		744	17,313	36	26	4,757	22,875		51,758
1976	514	22,435	66	99	4,086	27,200		441	19,650	0	37	8,313	28,441		55,641
1977	329	26,817	39	169	7,210	34,564		314	21,679	0	47	10,106	32,146		66,710
1978	829	35,094	0	190	9,048	45,161		661	23,484	0	66	14,452	38,662		83,823
1979	1,019	38,530	26	157	9,186	48,918		971	27,982	0	67	13,540	42,560		91,478
1980	1,056	39,819	23	195	9,900	50,993		354	29,633	0	96	11,104	41,186		92,179
1981	503	43,186	92	264	9,502	53,547		257	26,460	0	93	12,818	39,628		93,175
1982	400	43,461	117	95	7,779	51,853		197	37,880	7	84	12,572	50,740		102,593
1983	471	49,354	116	118	8,655	58,714		226	33,711	22	70	11,965	45,994		104,708
1984	378	48,449	152	126	8,337	57,442		87	31,261	53	94	9,903	41,398		98,840
1985	321	40,153	214	119	6,821	47,628		173	23,506	70	81	9,483	33,314		80,941
1986	406	36,913	256	173	7,821	45,569		171	25,517	83	88	12,080	37,938		83,508
1987	692	36,141	264	143	12,687	49,927		364	21,178	46	86	18,953	40,627		90,554
1988	638	35,353	158	166	13,791	50,106		341	21,180	46	91	19,077	40,734		90,840
1989	542	37,663	73	74	18,206	56,558		264	20,260	17	111	19,452	40,104		96,661
1990	390	49,863	223	347	17,162	67,986		273	39,008	71	73	23,458	62,883		130,869
1991	839	22,882	232	99	19,314	43,366		297	17,478	44	113	18,812	36,744		80,110
1992	2,050	13,819	255	269	13,679	30,072		1,270	19,609	0	107	22,823	43,809		73,881
1993	42	7,886	35	211	11,268	19,442		28	26,825	1	110	12,700	39,663		59,105
1994	33	57,447	11	190	6,484	64,165		28	17,856	1	230	5,621	23,735		87,900
1995	30	21,980	8	443	7,385	29,846		30	11,215	1	350	19,481	31,077		60,922
1996	28	16,222	26	414	8,376	25,066		27	30,622	8	125	11,258	42,039		67,105
1997	30	7,584	34	388	10,130	18,166		30	7,398	4	90	6,059	13,581		31,747
1998	25	6,103	9	218	9,069	15,425		30	10,488	1	252	8,543	19,314		34,739
1999	23	2,655	4	598	8,542	11,823		24	9,857	0	261	6,149	16,291		28,113
2000	14	6,783	6	181	9,024	16,009		26	18,175	0	791	4,959	23,951		39,960
2001	20	20,075	0	404	3,615	24,114		22	8,449	0	207	3,249	11,927		36,040
2002	21	12,168	1	392	6,655	19,237		25	10,067	0	2,718	8,046	20,857		40,094

Table 3 - continued

	Half 1								Half 2						
year	Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Scallop Dredge	Total Half 1		Line Trawl	Otter Trawl	Shrimp Trawl	Sink Gill Net	Scallop Dredge	Total Half 1		Grand Total
2003	38	18,258	8	522	7,222	26,048		18	17,728	0	442	7,965	26,154		52,203
2004	9	14,324	4	450	5,544	20,331		16	21,736	0	503	4,236	26,491		46,822
2005	88	14,304	2	1,041	6,412	21,848		51	19,269	0	559	4,746	24,626		46,473
2006	55	10,552	0	854	4,779	16,241		18	12,368	1	362	5,574	18,323		34,564
2007	70	14,566	0	990	5,812	21,438		22	16,214	0	756	6,488	23,481		44,919
2008	119	10,391	2	1,232	4,810	16,553		56	13,138	0	744	4,539	18,478		35,030
2009	164	11,054	1	1,634	4,903	17,756		185	14,698	0	609	4,193	19,685		37,441
2010	269	9,461	0	1,058	7,655	18,443		209	11,872	0	1,344	4,896	18,322		36,765
2011	172	11,768	3	1,976	5,063	18,982		171	14,760	0	1,205	3,642	19,777		38,759
2012	46	9,941	3	1,657	4,215	15,861		53	13,386	0	825	4,149	18,412		34,274
2013	308	14,444	0	1,401	3,647	19,800		454	16,940	0	523	4,957	22,874		42,673
2014	14	12,634	0	1,675	7,514	21,837		111	14,427	0	880	5,502	20,919		42,757
2015	60	11,596	0	976	6,099	18,731		307	14,605	0	696	3,556	19,164		37,895
2016	86	8,090	0	1,248	4,821	14,245		132	12,228	0	614	6,051	19,025		33,270

Table 4 - Total Live and Dead Discards (mt) of Skates (all species) for all gear types from 1968 - 2016

Year	Live Discards	Dead Discards
1968	99,466	21,620
1969	90,593	18,453
1970	76,204	15,914
1971	60,391	13,715
1972	55,966	12,101
1973	59,457	12,888
1974	60,499	13,357
1975	51,758	12,224
1976	55,641	14,480
1977	66,710	16,573
1978	83,823	21,348
1979	91,478	22,348
1980	92,179	21,110
1981	93,175	20,538
1982	102,593	21,499
1983	104,708	22,205
1984	98,840	20,832
1985	80,941	16,918
1986	83,508	18,471
1987	90,554	23,581
1988	90,840	22,952
1989	96,661	25,701
1990	130,869	32,887
1991	80,110	24,445
1992	73,881	24,159
1993	59,105	17,622
1994	87,900	21,565
1995	60,922	19,568
1996	67,105	18,593
1997	31,747	10,366
1998	34,739	11,316
1999	28,113	9,608
2000	39,960	12,369
2001	36,040	8,475
2002	40,094	12,132
2003	52,203	14,283
2004	46,822	11,249
2005	46,473	12,866
2006	34,564	10,134
2007	44,919	13,182
2008	35,030	10,160
2009	37,441	10,070
2010	36,765	10,523
2011	38,759	10,508
2012	34,274	10,087
2013	42,673	11,551
2014	42,757	12,673
2015	37,895	10,417
2016	33,270	10,434

6.1.6 Evaluation of Fishing Mortality and Stock Abundance

Benchmark assessment results from SAW 44 are given in NEFSC (2007a; 2007b). Because the analytic models that were attempted did not produce reliable results, the status of skate overfishing is determined based on a rate of change in the three year moving average for survey biomass. These thresholds vary by species due to normal inter-annual survey variability. Details about the overfishing reference points and how they were chosen are given in NEFSC (2000).

The latest results for 2016 (2017 spring survey for little skate) are given in Table 2. At this time, overfishing is not occurring on any skate species.

6.1.7 Non-Target Species

The skate bait fishery is prosecuted as an incidental and directed fishery; fishing effort is expended targeting more profitable species managed under separate FMPs, e.g. NE multispecies and monkfish FMPs. These fisheries have ACLs, effort controls (DAS), possession limits, gear restrictions, and other measures that constrain overall effort on skates. For a full description of the fishing impacts on trips targeting NE multispecies and monkfish please refer to Framework 56 to the NE Multispecies FMP and Framework 10 of the Monkfish FMP (www.nefmc.org). A smaller number of trips could be described as targeting skates; bycatch on these trips are limited. Monkfish and dogfish comprise the majority of this bycatch and are described below.

NE Multispecies

The Northeast Multispecies FMP manages twenty stocks under a dual management system which breaks the fishery into two components: sectors and the common pool. For stocks that permit fishing, each sector is allotted a share of the each stock's ACL that consists of the sum of individual sector member's potential sector contribution based on their annual catch entitlements. Sector allocations are strictly controlled as hard total allowable catch limits and retention is required for all stocks managed under an ACL. Overages are subject to accountability measures including payback from the sector's allocation for the following year. Common pool vessels are allocated a number of days at sea (DAS) and their effort further is controlled by a variety of measures including trip limits, closed areas, minimum fish size and gear restrictions varying between stocks. Only a very small portion of the ACL is allotted to the common pool. For more detail regarding control of fishing effort on NE Multispecies, please see Framework 56 of the NE Multispecies FMP.

Table 5 - Status of NE multispecies stocks based on 2017 Operational Assessments

Stock	2017 Assessment Overfishing?	2017 Assessment Overfished?
Georges Bank Cod	Unknown	Yes
Gulf of Maine Cod	Yes	Yes
Georges Bank Haddock	No	No
Gulf of Maine Haddock	No	No
Georges Bank Yellowtail Flounder	Unknown	Unknown
Southern New England/Mid-Atlantic Yellowtail Flounder	Yes	Yes
Cape Cod/Gulf of Maine Yellowtail Flounder	Yes	Yes
American Plaice	No	No
Witch Flounder	Yes	Yes
Georges Bank Winter Flounder	No	No
Gulf of Maine Winter Flounder	No	Unknown
Southern New England/Mid-Atlantic Winter Flounder	No	Yes
Acadian Redfish	No	No
White Hake	No	No
Pollock	No	No
Northern Windowpane Flounder	No	Yes
Southern Windowpane Flounder	No	No
Ocean Pout	No	Yes
Atlantic Halibut*	Unknown	Yes
Atlantic Wolffish	No	Yes

* Atlantic halibut not updated 2017 as part of the 2017 operational assessments.

6.1.7.1 Monkfish

Life History: Monkfish, *Lophius americanus*, also called goosefish, occur in the western North Atlantic from the Grand Banks and northern Gulf of St. Lawrence south to Cape Hatteras, North Carolina. Monkfish occur from inshore areas to depths of at least 2,953 ft. (900 m). Monkfish undergo seasonal onshore-offshore migrations. These migrations may relate to spawning or possibly to food availability.

Female monkfish begin to mature at age 4 with 50 percent of females maturing by age 5 (about 17 in [43 cm]). Males generally mature at slightly younger ages and smaller sizes (50 percent maturity at age 4.2 or 14 in [36 cm]). Spawning takes place from spring through early autumn. It progresses from south to north, with most spawning occurring during the spring and early summer. Females lay a buoyant egg raft or veil that can be as large as 39 ft. (12 m) long and 5 ft. (1.5 m) wide, and only a few mm thick. The larvae hatch after about 1 to 3 weeks, depending on water temperature. The larvae and juveniles spend several months in a pelagic phase before settling to a benthic existence at a size of about 3 in (8 cm).

Population Management and Status: NMFS implemented the Monkfish FMP in 1999 (NEFMC and MAFMC 1998). The FMP included measures to stop overfishing and rebuild the stocks through a number of measures. These measures included:

- Limiting the number of vessels with access to the fishery and allocating DAS to those vessels;
- Setting trip limits for vessels fishing for monkfish; minimum fish size limits;
- Gear restrictions;
- Mandatory time out of the fishery during the spawning season; and
- A framework adjustment process.

The Monkfish FMP defines two management areas for monkfish (northern and southern), divided roughly by an east-west line bisecting Georges Bank. Monkfish in both management regions are not overfished and overfishing is not occurring. In recent years the monkfish fishery has fallen fall short of reaching its TAL, despite a healthy stock status. In 2017, limited access monkfish vessels were allocated 45.2 DAS, of which 37 could be used in the southern management area. Additional information on monkfish management can be found on the NEFMC website (http://www.nefmc.org/monk/index.html).

6.1.7.2 Dogfish

Life History: The spiny dogfish, *Squalus acanthias*, occurs in the western North Atlantic from Labrador to Florida. Regulators consider spiny dogfish to be a unit stock off the coast of New England. In summer, dogfish migrate northward to the Gulf of Maine-Georges Bank region and into Canadian waters. They return southward in autumn and winter. Spiny dogfish tend to school by size and, when mature, by sex. The species bears live young, with a gestation period of about 18 to 22 months, and produce between 2 to 15 pups with an average of 6. Size at maturity for females is around 31 in (80 cm), but can vary from 31 to 33 in (78 cm to 85 cm) depending on the abundance of females.

Population Management and Status: The NEFMC and MAFMC jointly develop the spiny dogfish FMP for federal waters. The Atlantic States Marine Fisheries Commission (ASMFC) also developed a plan for state waters. Spawning stock biomass of spiny dogfish declined rapidly in response to a directed fishery during the 1990's. NFMS initially implemented management measures for spiny dogfish in 2001. These measures have been effective in reducing landings and fishing mortality. NMFS declared the spiny dogfish stock rebuilt for the purposes of U.S. management in May 2010.Based upon the 2015 updated stock assessment performed by the Northeast Fisheries Science Center, the spiny dogfish stock is not presently overfished and overfishing is not occurring. The spiny dogfish fishery is managed with an ACL, commercial quota, and possession limits (currently 4,000 lb per trip). Similar to skates, there is a large degree of overlap between spiny dogfish and NE Multispecies trips where dogfish are landed incidentally to groundfish.

6.2 Protected Resources

6.2.1 Species Present in the Area

Numerous protected species inhabit the environment within the monkfish FMP management unit (Table 6). These species are under NMFS jurisdiction and are afforded protection under the Endangered Species Act (ESA) of 1973 and/or the Marine Mammal Protection Act (MMPA) of 1972.

Table 6 - Species protected under the ESA and/or MMPA that may occur in the affected environment of the skate fishery. Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks.

Species	Status[2]	Potentially affected by this action?
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***Yes***
Humpback whale, West Indies DPS (*Megaptera novaeangliae*)[3]	Protected (MMPA)	Yes
Fin whale (Balaenoptera physalus)	***Endangered***	***Yes***
Sei whale (Balaenoptera borealis)	***Endangered***	***Yes***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter microcephalus)	***Endangered***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (*Globicephala spp.*)[4]	**Protected (MMPA)**	**Yes**
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes
Short Beaked Common dolphin (*Delphinus delphis*)[5]	Protected (MMPA)	Yes
Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[6]	***Protected (MMPA)***	***Yes***
Harbor porpoise *(Phocoena phocoena)*	Protected (MMPA)	Yes
Sea Turtles		
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered	Yes
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered	Yes
Green sea turtle, North Atlantic DPS (*Chelonia mydas*)[7]	Threatened	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic Ocean DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered	No
Atlantic salmon (*Salmo salar*)	Endangered	Yes
Atlantic sturgeon *(Acipenser oxyrinchus)*		
Gulf of Maine DPS	Threatened	Yes
New York Bight DPS, Chesapeake Bay DPS, Carolina DPS & South Atlantic DPS	Endangered	Yes
Cusk (*Brosme brosme)*	Candidate	Yes
Blueback herring (*Alosa aestivalis*)	Candidate	Yes
Alewife (*Alosa pseudoharengus*)	Candidate	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes

Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	Yes
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	Yes
Critical Habitat		
North Atlantic Right Whale[8]	ESA (Protected)	No
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No

Notes:
[1] A strategic stock is defined under the MMPA as a marine mammal stock for which: (1) the level of direct human-caused mortality exceeds the potential biological removal level; (2) based on the best available scientific information, is declining and is likely to be listed as a threatened species under the ESA within the foreseeable future; and/or (3) is listed as a threatened or endangered species under the ESA, or is designated as depleted under the MMPA (Section 3 of the MMPA of 1972).
[2] The status of the species is defined by whether the species is listed under the ESA as endangered (species are at risk of extinction) or threatened (species at risk of endangerment), or protected under the MMPA. Note, marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species in which ESA listing may be warranted.
[3] 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.
[4] 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 just referred to as *Globicephala spp*.
[5] Prior to 2008, this species was called "common dolphin."
[6] This includes the following Stocks of Bottlenose Dolphins: Western North Atlantic Offshore, Northern Migratory Coastal (strategic stock), and Southern Migratory Coastal (strategic stock).
[7] On April 6, 2016, a final rule was issued removing the current range-wide listing of green sea turtles and, in its place, listing eight green sea turtle DPSs as threatened and three DPSs as endangered (81 FR 20057). The green sea turtle DPS located in the Northwest Atlantic is the North Atlantic DPS of green sea turtles; this DPS is considered threatened under the ESA.
[8] Originally designated June 3, 1994 (59 FR 28805); Expanded on January 27, 2016 (81 FR 4837).

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

6.2.2 Species and Critical Habitat Not Likely Affected by the Proposed Action

Based on available information, it has been determined that this action is not likely to affect multiple ESA listed and/or marine mammal protected species or any designated critical habitat (see Table 6). This determination has been made because either the occurrence of the species is not known to overlap with the area primarily affected by the action and/or there have never been documented interactions between the species and the primary gear type (i.e., gillnet and bottom trawl) used to prosecute the monkfish

fishery (see Waring *et al*. 2014a, 2015, 2016; NMFS NEFSC FSB 2015, 2016, 2017; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html; NMFS 2013). In the case of critical habitat, this determination has been made because the action will not affect the essential physical and biological features of North Atlantic right whale or loggerhead (NWA DPS) critical habitat and therefore, will not result in the destruction or adverse modification of any species critical habitat (NMFS 2013; NMFS 2014a; NMFS 2015a,b).

6.2.3 Species Potentially Affected by the Proposed Action

Table 6 provides a list of protected species of sea turtle, marine mammal, and fish species present in the affected environment of the skate fishery, and that may also be affected by the operation of this fishery; that is, have the potential to become entangled or bycaught in the fishing gear used to prosecute the fishery. To aid in the identification of MMPA protected species potentially affected by the action, the MMPA List of Fisheries and marine mammal stock assessment reports for the Atlantic Region were referenced (http://www.nmfs.noaa.gov/pr/sars/region.htm; http://www.nmfs.noaa.gov/pr/interactions/fisheries/lof.html). To aid in identifying ESA listed species potentially affected by the action, the 2013 Biological Opinion issued by NMFS on the operation of seven commercial fisheries, including the skate) FMP, and its impact on ESA listed species was referenced (NMFS 2013). The 2013 Opinion, which considered the best available information on ESA listed species and observed or documented ESA listed species interactions with gear types used to prosecute the 7 FMPs (e.g., gillnet, bottom trawl, and pot/trap), concluded that the seven fisheries may adversely affect, but was not likely to jeopardize the continued existence of any ESA listed species. The Opinion included an incidental take statement (ITS) authorizing the take of specific numbers of ESA listed species of sea turtles, Atlantic salmon, and Atlantic sturgeon.[1] Reasonable and prudent measures and terms and conditions were also issued with the ITS to minimize impacts of any incidental take.

Up until recently, the 2013 Opinion remained in effect; however, new information on North Atlantic right whales has been made available that may reveal effects of the fisheries analyzed in the 2013 Opinion that may not have been previously considered. As a result, per an October 17, 2017, ESA 7(a)(2)/7(d) memo issued by NMFS, the 2013 Opinion has been reinitiated. However, the October 17, 2017, memo concludes that allowing these fisheries to continue during the reinitiation period will not increase the likelihood of interactions with ESA listed species above the amount that would otherwise occur if consultation had not been reinitiated, and therefore, the continuation of these fisheries during the reinitiation period would not be likely to jeopardize the continued existence of any ESA listed species. Until replaced, the skate FMP is currently covered by the incidental take statement authorized in NMFS 2013 Opinion.

As the primary concern for both MMPA protected and ESA listed species is the potential for the fishery to interact (e.g., bycatch, entanglement) with these species it is necessary to consider (1) species occurrence in the affected environment of the fishery and how the fishery will overlap in time and space with this occurrence; and (2) data and observed records of protected species interaction with particular fishing gear types, in order to understand the potential risk of an interaction. Information on species

[1] The 2013 Opinion did not authorize take of ESA listed species of whales because (1) an incidental take statement cannot be lawfully issued under the ESA for a marine mammal unless incidental take authorization exists for that marine mammal under the MMPA (see 16 U.S.C. § 1536(b)(4)(C)), and (2) the incidental take of ESA- listed whales by the black seabass fishery has not been authorized under section 101(a)(5) of the MMPA. However, the 2013 BiOp assessed interaction risks to these species and concluded that 7 FMPs assessed, may affect but would not jeopardize the continued existence of any ESA listed species of whales (NMFS 2013).

occurrence in the affected environment of the skate fishery is provided below, while information on protected species interactions with specific fishery gear is provided in Section 6.2.4.

6.2.3.1 Sea Turtles

Green (North Atlantic DPS), Kemp's ridley, leatherback, and loggerhead (Northwest Atlantic Ocean DPS) sea turtle are the four ESA listed species of sea turtles that occur in the area of operation for the 13 GAR fisheries (see Table 6). Three of the four species are considered hard-shelled turtles (i.e., green, loggerhead, and Kemp's ridley). Additional background information on the range-wide status of the other four species, as well as a description and life history of the species, can be found in a number of published documents, including sea turtle status reviews and biological reports (NMFS and USFWS 1995; Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; Conant *et al*. 2009; NMFS and USFWS 2013; NMFS and USFWS 2015; Seminoff *et al*. 2015), and recovery plans for the loggerhead sea turtle (Northwest Atlantic DPS; NMFS and USFWS 2008), leatherback sea turtle (NMFS and USFWS 1992), Kemp's ridley sea turtle (NMFS *et al.* 2011), and green sea turtle (NMFS and USFWS 1991).

Hard-shelled sea turtles

Distribution

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida (FL) to Cape Cod, Massachusetts (MA), although their presence varies with the seasons due to changes in water temperature (Shoop and Kenney 1992; Epperly *et al.* 1995a, 1995b; Braun and Epperly 1996; Mitchell *et al.* 2003; Braun-McNeill *et al.* 2008; TEWG 2009). While hard-shelled turtles are most common south of Cape Cod, MA, they are known to occur in the Gulf of Maine (GOM). Loggerheads, the most common hard-shelled sea turtle in the GAR, feed as far north as southern Canada. Loggerheads have been observed in waters with surface temperatures of 7 °C to 30 °C, but water temperatures ≥11 °C are most favorable (Shoop and Kenney 1992; Epperly *et al.* 1995b). Sea turtle presence in U.S. Atlantic waters is also influenced by water depth. While hard-shelled turtles occur in waters from the beach to beyond the continental shelf, they are most commonly found in neritic waters of the inner continental shelf (Mitchell *et al.* 2003; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Blumenthal *et al.* 2006; Hawkes *et al.* 2006; McClellan and Read 2007; Mansfield *et al.* 2009; Hawkes *et al.* 2011; Griffin *et al.* 2013).

Seasonality

Hard-shelled sea turtles occur year-round in waters off Cape Hatteras, North Carolina (NC) and south. As coastal water temperatures warm in the spring, loggerheads begin to migrate to inshore waters of the southeast United States and also move up the Atlantic Coast (Epperly *et al.* 1995a, 1995b, 1995c; Braun-McNeill and Epperly 2002; Morreale and Standora 2005; Griffin *et al.* 2013), occurring in Virginia (VA) foraging areas as early as late April and on the most northern foraging grounds in the GOM in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the GOM by September, but some remain in Mid-Atlantic and Northeast areas until late fall. By December, sea turtles have migrated south to waters offshore of NC, particularly south of Cape Hatteras, and further south (Shoop and Kenney 1992; Epperly *et al.* 1995b; Hawkes *et al.* 2011; Griffin *et al.* 2013).

Leatherback sea turtles

Leatherback sea turtles also engage in routine migrations between northern temperate and tropical waters (NMFS and USFWS 1992; James *et al*. 2005; James *et al*. 2006; Dodge *et al*. 2014). Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf (James *et al*. 2005; Eckert *et*

al. 2006; Murphy *et al*. 2006; Dodge *et al*. 2014). They have a greater tolerance for colder water than hard-shelled sea turtles (NMFS and USFWS 2013). They are also found in more northern waters later in the year, with most leaving the Northwest Atlantic shelves by mid-November (James *et al*. 2005; James *et al*. 2006; Dodge *et al*. 2014).

6.2.3.2 Marine Mammals

6.2.3.2.1 Large Whales

As provided in Table 6, as North Atlantic right, humpback, fin, sei, and minke whales are found throughout the waters of the Northwest Atlantic Ocean, these species will occur in the affected environment of the monkfish fishery. 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*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; NMFS 1991, 2005, 2010, 2011, 2012). This, however, is a simplification of whale movements, particularly as it relates to winter movements. It remains unknown if all individuals of a population migrate to low latitudes in the winter, although, increasing evidence suggests that for some species (e.g., right and humpback whales), some portion of the population remains in higher latitudes throughout the winter (Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; Khan *et al*. 2009, 2010, 2011, 2012; Brown *et al*. 2002; NOAA 2008; Cole *et al*. 2013; Clapham *et al*. 1993; Swingle *et al*. 1993; Vu *et al*. 2012). Although further research is needed to provide a clearer understanding of large whale movements and distribution in the winter, the distribution and movements of large whales to foraging grounds in the spring/summer is well understood. Movements of whales into higher latitudes coincide with peak productivity in these waters. As a result, the distribution of large whales in higher latitudes is strongly governed by prey availability and distribution, with large numbers of whales coinciding with dense patches of preferred forage (Mayo and Marx 1990; Kenney *et al*. 1986, 1995; Baumgartner *et al*. 2003; Baumgartner and Mate 2003; Payne *et al*.1986, 1990; Brown *et al.* 2002; Kenney and Hartley 2001; Schilling *et al.* 1992). For additional information on the biology, status, and range wide distribution of each whale species please refer to: Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; NMFS 1991, 2005, 2010, 2011, 2012.

To further assist in understanding how the skate fishery may overlaps in time and space with the occurrence of large whales, a general overview on species occurrence and distribution in the area of operation for the skate fishery is provided in the following table (Table 7).

Table 7 - Large whale occurrence in the area of operation for the skate fishery.

Species	Prevalence and Approximate Months of Occurrence
North Atlantic Right Whale	• Distributed throughout all continental shelf waters from the GOM to the South Atlantic Bight (SAB) throughout the year; however, increasing evidence of year round presence in the GOM. • New England waters (GOM and GB regions) = **Foraging Grounds (January through October)**. Seasonally important foraging grounds include, but not limited to: ›Cape Cod Bay (January-April); › Great South Channel (April-June);

Species	Prevalence and Approximate Months of Occurrence
	› western Gulf of Maine (April-May, and July-October); › Jordan Basin (August-October); › Wilkinson Basin (April-July); and › northern edge of GB (May-July); • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern calving grounds. • Increasing evidence of wintering areas (approximately November – January) in: › Cape Cod Bay; › Jeffreys and Cashes Ledges; › Jordan Basin; and › Massachusetts Bay (e.g., Stellwagen Bank).
Humpback	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year. • New England waters (GOM and GB regions) = **Foraging Grounds** (March-November). • Mid-Atlantic waters: Migratory pathway to/from northern (high latitude) foraging and southern (West Indies) calving grounds. • Increasing evidence of whales remaining in mid- and high-latitudes throughout the winter. Specifically, increasing evidence of wintering areas (for juveniles) in Mid-Atlantic (e.g., waters in the vicinity of Chesapeake and Delaware Bays; peak presence approximately January through March) and Southeastern coastal waters.
Fin	• Distributed throughout all continental shelf waters of the Mid-Atlantic (SNE included), GOM, and GB throughout the year. • Mid-Atlantic waters: › Migratory pathway to/from northern (high latitude) foraging and southern (low latitude) calving grounds; and › Possible offshore calving area (October-January). • New England (GOM and GB)/SNE waters = **Foraging Grounds** (greatest densities March-August; lower densities September-November).Important foraging grounds include: > Massachusetts Bay (esp. Stellwagen Bank); > Great South Channel; > Waters off Cape Cod (~40-50 meter contour); > GOM;

Species	Prevalence and Approximate Months of Occurrence
	> Perimeter (primarily eastern) of GB; and > Mid-shelf area off the east end of Long Island. • Evidence of wintering areas in mid-shelf areas east of New Jersey (NJ), Stellwagen Bank; and eastern perimeter of GB.
Sei	• Uncommon in shallow, inshore waters of the Mid-Atlantic (SNE included), GB, and GOM; however, occasional incursions during peak prey availability and abundance. • Primarily found in deep waters along the shelf edge, shelf break, and ocean basins between banks. • Spring through summer, found in greatest densities in offshore waters of the GOM and GB; sightings concentrated along the northern, eastern (into Northeast Channel) and southwestern (in the area of Hydrographer Canyon) edge of GB.
Minke	• Widely distributed throughout continental shelf waters (<100m deep) of the Mid-Atlantic (SNE included), GOM, and GB. • Most common in the EEZ from spring through fall, with greatest abundance found in New England waters.
***Sources*:** NMFS 1991, 2005, 2010, 2011, 2012; Hain *et al.* 1992; Payne *et al*. 1984; Good 2008; Pace and Merrick 2008; McLellan *et al*. 2004; Hamilton and Mayo 1990; Schevill *et al*. 1986; Watkins and Schevill 1982; Payne *et al*.1990; Winn *et al.* 1986; Kenney et al. 1986, 1995; Khan *et al*. 2009, 2010, 2011, 2012; Brown *et al*. 2002; NOAA 2008; 50 CFR 224.105; CETAP 1982; Clapham *et al*. 1993; Swingle *et al*. 1993; Vu *et al*. 2012; Baumgartner *et al*. 2011; Cole *et al*. 2013; Risch *et al*. 2013; Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 81 FR 4837(January 27, 2016); NMFS 2015b, Bort et al. 2015.	

6.2.3.2.2 Small Cetacean

As provided in Table 6, as Atlantic white sided dolphins, short and long finned pilot whales, Risso's dolphins, short beaked common dolphins, harbor porpoise, and several stocks of bottlenose dolphins are found throughout the year in the Northwest Atlantic Ocean, these species will occur in the affected environment of the monkfish fishery (Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016). Within this range; however, there are seasonal shifts in species distribution and abundance. To further assist in understanding how fisheries may overlap in time and space with the occurrence of small cetaceans, a general overview of species occurrence and distribution in the area of operation for the monkfish fishery is provided in the following table (Table 8). For additional information on the biology, status, and range wide distribution of each species please refer to Waring *et al*. (2014a), Waring *et al.* (2015), Waring *et al*. (2016), and Hayes *et al*. 2017.

Table 8 - Small cetacean occurrence in the area of operation of the skate fishery

Species	Prevalence and Approximate Months of Occurrence
Atlantic White Sided Dolphin	• Distributed throughout the continental shelf waters (primarily to 100 meter isobath) of the Mid-Atlantic (north of 35ºN), SNE, GB, and GOM ; however, most common in continental shelf waters from Hudson Canyon (~ 39ºN) to GB, and into the GOM. • **January-May**: low densities found from GB to Jeffreys Ledge. • **June-September**: Large densities found from GB, through the GOM. • **October-December**: intermediate densities found from southern GB to southern GOM. • South of GB (SNE and Mid-Atlantic), low densities found year round, with waters off Virginia (VA) and NC representing southern extent of species range during winter months.
Short Beaked Common Dolphin	• Regularly found throughout the continental shelf-edge-slope waters (primarily between the 100-2,000 meter isobaths) of the Mid-Atlantic, SNE, and GB (esp. in Oceanographer, Hydrographer, Block, and Hudson Canyons). • Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia (GA)/South Carolina (SC) border. • **January-May**: occur from waters off Cape Hatteras, NC, to GB (35º to 42ºN). • **Mid-summer-autumn**: Occur primarily on GB with small numbers present in the GOM; *Peak abundance* found on GB in the autumn.
Risso's Dolphin	• **Spring through fall**: Distributed along the continental shelf edge from Cape Hatteras, NC, to GB. • **Winter**: distributed in the Mid-Atlantic Bight, extending into oceanic waters. • Rarely seen in the GOM; primarily a Mid-Atlantic continental shelf edge species (can be found year round).
Harbor Porpoise	• Distributed throughout the continental shelf waters of the Mid-Atlantic (north of 35ºN), SNE, GB, and GOM. • **July-September**: Concentrated in the northern GOM (waters < 150 meters); low numbers can be found on GB.

Species	Prevalence and Approximate Months of Occurrence
	• **October-December**: widely dispersed in waters from NJ to Maine (ME); seen from the coastline to deep waters (>1,800 meters). • **January-March**: intermediate densities in waters off NJ to NC; low densities found in waters off New York (NY) to GOM. • **April-June**: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters).
Bottlenose Dolphin	**Western North Atlantic Offshore Stock** • Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from GB to FL. • Depths of occurrence: ≥40 meters **Western North Atlantic Northern Migratory Coastal Stock** • Warm water months (e.g., July-August): distributed from the coastal waters from the shoreline to approximately the 25-meter isobaths between the Chesapeake Bay mouth and Long Island, NY. • Cold water months (e.g., January-March): stock occupies coastal waters from Cape Lookout, NC, to the NC/VA border. **Western North Atlantic Southern Migratory Coastal Stock** • **October-December**: stock occupies waters of southern NC (south of Cape Lookout) • **January-March**: stock moves as far south as northern FL. • **April-June**: stock moves north to waters of NC. • **July-August**: stock is presumed to occupy coastal waters north of Cape Lookout, NC, to the eastern shore of VA.
Pilot Whales: *Short- and Long-Finned*	**Short- Finned Pilot Whales** • Except for area of overlap (see below), primarily occur south of 40°N (Mid-Atl and SNE waters); although low numbers have been found along the southern flank of GB, but no further than 41°N. • May through December (approximately): distributed primarily near the continental shelf break of the Mid-Atlantic and SNE;

Species	Prevalence and Approximate Months of Occurrence
	individuals begin shifting to southern waters (i.e., 35ºN and south) beginning in the fall. **<u>Long-Finned Pilot Whales</u>** • Except for area of overlap (see below), primarily occur north of 42ºN. • Winter to early spring (November through April): primarily distributed along the continental shelf edge-slope of the Mid-Atlantic, SNE, and GB. • Late spring through fall (May through October): movements and distribution shift onto/within GB, the Great South Channel, and the GOM. **<u>Area of Species Overlap:</u>** between approximately 38ºN and 41ºN.

Notes : [1]
Information presented in table is representative of small cetacean occurrence in the Northwest Atlantic continental shelf waters out to the 2,000 meter isobath.

***Sources*:** Waring *et al*. 1992, 2007**,** 2014a, 2015, 2016; Hayes *et al*. 2017; Payne and Heinemann 1993; Payne *et al.* 1984; Jefferson *et al*. 2009.

6.2.3.2.3 Pinnipeds

As provided in Table 6, harbor, gray, harp, and hooded seals will occur in the affected environment of the monkfish fishery. Specifically, pinnipeds are found in the nearshore, coastal waters of the Northwest Atlantic Ocean. They are primarily found throughout the year or seasonally from New Jersey to Maine; however, increasing evidence indicates that some species (e.g., harbor seals) may be extending their range seasonally into waters as far south as Cape Hatteras, North Carolina (35ºN) (Waring *et al*. 2007, 2014a, 2015, 2016). To further assist in understanding how the monkfish fishery may overlap in time and space with the occurrence of pinnipeds, a general overview of species occurrence and distribution in the area of operation of the monkfish fishery is provided in the following table (Table 9). For additional information on the biology, status, and range wide distribution of each species of pinniped please refer to Waring *et al*. (2007), Waring *et al*. (2014a), Waring *et al*. (2015), Waring *et al*. (2016), and Hayes *et al*. 2017.

Table 9 - Pinniped occurrence in the area of operation of the skate fishery.

Species	Prevalence
Harbor Seal	• Primarily distributed in waters from NJ to ME; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35ºN). • **Year Round**: Waters of ME • **September-May**: Waters from New England to NJ.
Gray Seal	• Distributed in waters from NJ to ME. • **Year Round**: Waters from ME to MA. • **September-May**: Waters from Rhode Island to NJ.
Harp Seal	• Winter-Spring (approximately January-May): Waters from ME to NJ.
Hooded Seal	• Winter-Spring (approximately January-May): Waters of New England.
***Sources*:** Waring *et al*. 2007 (for hooded seals); Waring *et al*. 2014a; Waring *et al*. 2015;Waring *et al*. 2016; and Hayes *et al*. 2017.	

6.2.3.3 Atlantic Sturgeon

Table 6 lists the 5 DPSs of Atlantic sturgeon that occur in the affected environment of the monkfish fishery and that may be affected by the operation of this fishery. The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. All five DPSs of Atlantic sturgeon have the potential to be located anywhere in this marine range; in fact, results from genetic studies show that, regardless of location, multiple DPSs can be found at any one location along the Northwest Atlantic coast (ASSRT 2007; Dovel and Berggren 1983; Dadswell *et al*. 1984; Kynard *et al*. 2000; Stein *et al*. 2004a; Dadswell 2006; Laney *et al*. 2007; Dunton *et al*. 2010; Dunton *et al*. 2012; Dunton *et al*. 2015; Erickson *et al*. 2011; Wirgin *et al*. 2012; O'Leary *et al*. 2014; Waldman *et al*. 2013; Wirgin *et al*. 2015).

Based on fishery- independent and dependent data, as well as data collected from tracking and tagging studies, in the marine environment, Atlantic sturgeon appear to primarily occur inshore of the 50 meter depth contour (Stein *et al*. 2004 a,b; Erickson *et al*. 2011; Dunton *et al*. 2010); however, Atlantic sturgeon are not restricted to these depths, as excursions into deeper continental shelf waters have been documented (Timoshkin 1968; Collins and Smith 1997; Stein *et al*. 2004a,b; Dunton *et al*. 2010; Erickson *et al*. 2011). Data from fishery-independent surveys and tagging and tracking studies also indicate that some Atlantic sturgeon may undertake seasonal movements along the coast (Erickson *et al*. 2011; Dunton *et al*. 2010; Wipplehauser 2012). For instance, tagging and tracking studies found that satellite-tagged adult sturgeon from the Hudson River concentrated in the southern part of the Mid-Atlantic Bight, at depths greater than 20 meters, during winter and spring, while in the summer and fall, Atlantic sturgeon concentrations shifted to the northern portion of the Mid-Atlantic Bight at depths less than 20 meters (Erickson *et al*. 2011).

Within the marine range of Atlantic sturgeon, several marine aggregation areas have been identified adjacent to estuaries and/or coastal features formed by bay mouths and inlets along the U.S. eastern

seaboard (i.e., waters off North Carolina, Chesapeake Bay, and Delaware Bay; New York Bight; Massachusetts Bay; Long Island Sound; and Connecticut and Kennebec River Estuaries); depths in these areas are generally no greater than 25 meters (Bain *et al.* 2000; Savoy and Pacileo 2003; Stein *et al*. 2004a; Laney *et al*. 2007; Dunton *et al*. 2010; Erickson *et al*. 2011; Oliver *et al*. 2013; Waldman *et al.* 2013; O'Leary *et al*. 2014). Although additional studies are still needed to clarify why these particular sites are chosen by Atlantic sturgeon, there is some indication that they may serve as thermal refuge, wintering sites, or marine foraging areas (Stein *et al*. 2004a; Dunton *et al*. 2010; Erickson *et al*. 2011).

6.2.3.4 Atlantic Salmon (Gulf of Maine DPS)

The wild populations of Atlantic salmon are listed as endangered under the ESA. Their freshwater range occurs in the watersheds from the Androscoggin River northward along the Maine coast to the Dennys River, while the marine range of the GOM DPS extends from the GOM (primarily northern portion of the GOM), to the coast of Greenland (Fay *et al*. 2006; NMFS & USFWS 2005, 2016). In general, smolts, post-smolts, and adult Atlantic salmon may be present in the GOM and coastal waters of Maine in the spring (beginning in April), and adults may be present throughout the summer and fall months (Baum 1997; Fay *et al*. 2006; Hyvarinen *et al*. 2006; Lacroix & Knox 2005; Lacroix & McCurdy 1996; Lacroix *et al*. 2004; NMFS & USFWS 2005, 2016; Reddin 1985; Reddin & Friedland 1993; Reddin & Short 1991). For additional information on the on the biology, status, and range wide distribution of the GOM DPS of Atlantic salmon, refer to NMFS and USFWS (2005; 2016); and Fay et al. (2006). Based on the above information, as the monkfish fishery operates throughout the year, and is known to operate in the GOM, it is possible that the fishery will overlap in time and space with Atlantic salmon migrating northeasterly between U.S. and Canadian waters.

6.2.4 Interactions Between Gear and Protected Resources

Protected species are vulnerable to interactions with various types of fishing gear, with interaction risks associated with gear type, quantity, and soak or tow time. Available information on gear interactions with a given species (or species group) is provided in the sections below. These sections are not a comprehensive review of all fishing gear types known to interact with a given species; emphasis is only being placed on the primary gear types used to prosecute the monkfish fishery (i.e., sink gillnet and bottom trawl gear).

6.2.4.1 Marine Mammals

Depending on species, marine mammals have been observed seriously injured or killed in bottom trawl and/or sink gillnet gear. Pursuant to the MMPA, NMFS publishes a List of Fisheries (LOF) annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injuries and/or mortalities of marine mammals in each fishery (i.e., Category I=frequent; Category II=occasional; Category III=remote likelihood or no known interactions). In the Northwest Atlantic, the 2017 LOF (82 FR 3655 (January 12, 2017)) categorizes commercial gillnet fisheries (Northeast or Mid-Atlantic) as Category I fisheries and commercial bottom trawl fisheries (Northeast or Mid-Atlantic) as Category II fisheries.

6.2.4.1.1 Large Cetaceans

Bottom Trawl Gear

With the exception of minke whales, there have been no observed interactions with large whales and bottom trawl gear. In bottom trawl gear, to date, interactions have only been observed in the northeast bottom trawl fisheries. From the period of 2008-2012, the estimated annual mortality attributed to this fishery was 7.8 minke whales for 2008, and zero minke whales from 2009-2012; no serious injuries were reported during this time (Waring *et al*. 2015). Based on this information, from 2008-2012, the estimated annual average minke whale mortality and serious injury attributed to the northeast bottom trawl fishery was 1.6 (CV=0.69) whales (Waring *et al*. 2015). Lyssikatos (2015) estimated that from 2008-2013, mean annual serious injuries and mortalities from the northeast bottom trawl fishery were 1.40 (CV=0.58) minke whales. Serious injury and mortality records for minke whales in U.S. waters from 2010-2014 showed zero interactions with bottom trawl (northeast or Mid-Atlantic) gear (Henry *et al*. 2016; Hayes *et al*. 2017). Based on this information, bottom trawl gear is likely to pose a low interaction risk to any large whale species. However, should an interaction occur, serious injury or mortality to any large whale is possible; however, relative to other gear types discussed below (i.e., fixed gear), trawl gear represents a low source serious injury or mortality to any large whale.

Fixed Fishing Gear (e.g., Sink Gillnet Gear)

The greatest entanglement risk to large whales is posed by fixed fishing gear (e.g., sink gillnet and trap/pot gear) comprised of lines (vertical or ground) that rise into the water column. Any line can become entangled in the mouth (baleen), flippers, and/or tail of the whale when the animal is transiting or foraging through the water column (Johnson *et al*. 2005; NMFS 2014b; Kenney and Hartley 2001; Hartley *et al*. 2003; Whittingham *et al*. 2005a,b). For instance, in a study of right and humpback whale entanglements, Johnson *et al*. (2005) attributed: (1) 89% of entanglement cases, where gear could be identified, to fixed gear consisting of pot and gillnets and (2) entanglement of one or more body parts of large whales (e.g., mouth and/or tail regions) to four different types of line associated with fixed gear (the buoy line, groundline, floatline, and surface system lines).[2] Although available data, such as Johnson *et al*. (2005), provides insight into large whale entanglement risks with fixed fishing gear, to date, due to uncertainties surrounding the nature of the entanglement event, as well as unknown biases associated with reporting effort and the lack of information about the types and amounts of gear being used, determining which part of fixed gear creates the most entanglement risk for large whales is difficult (Johnson *et al.* 2005). As a result, any type or part of fixed gear is considered to create an entanglement risk to large whales and should be considered potentially dangerous to large whale species (Johnson *et al.* 2005).

The effects of entanglement to large whales range from no injury to death (NMFS 2014b; Johnson *et al*. 2005; Angliss and Demaster 1998; Moore and Van der Hoop 2012). The risk of injury or death in the event of an entanglement may depend on the characteristics of the whale involved (species, size, age, health, etc.), the nature of the gear (e.g., whether the gear incorporates weak links designed to help a whale free itself), human intervention (e.g., the feasibility or success of disentanglement efforts), or other variables (NMFS 2014b). Although the interrelationships among these factors are not fully understood, and the data needed to provide a more complete characterization of risk are not available, to date, available data indicates that entanglement in fishing gear is a significant source of serious injury or mortality for Atlantic large whales (Table 10; Henry *et al*. 2016; Hayes *et al*. 2017).

Table 10 summarizes confirmed human-caused injury and mortality to humpback, fin, sei, minke, and North Atlantic right whales along the Gulf of Mexico Coast, U.S. East Coast, and Atlantic Canadian Provinces from 2010 to 2014 (Henry *et al.* 2016); the data provided in Table 10 is specific to confirmed

[2] Buoy line connects the gear at the bottom to the surface system. Groundline in trap/pot gear connects traps/pots to each other to form trawls; in gillnet gear, groundline connects a gillnet, or gillnet bridle to an anchor or buoy line. Floatline is the portion of gillnet gear from which the mesh portion of the net is hung. The surface system includes buoys and high-flyers, as well as the lines that connect these components to the buoy line.

injury or mortality to whales from entanglement in fishing gear. As many entanglement events go unobserved, and because the gear type, fishery, and/or country of origin for reported entanglement events are often not traceable, it is important to recognize that the information presented in Table 10 likely underestimates the rate of large whale serious injury and mortality due to entanglement. Further studies looking at scar rates for right whales and humpbacks suggests that entanglements may be occurring more frequently than the observed incidences indicate (NMFS 2014b; Robbins 2009; Knowlton *et al.* 2012).

Table 10 - Summary of confirmed human-caused injury or mortality to fin, minke, humpback, sei, and North Atlantic right whales from 2010-2014 due to entanglement in fishing gear.[1]

Species	Total Confirmed Entanglement: Serious Injury[2]	Total Confirmed Entanglement: Non-Serious Injury	Total Confirmed Entanglement: Mortality	Entanglement Events: Total Average Annual Injury and Mortality Rate (US waters/Canadian waters/unassigned waters)
North Atlantic Right Whale	16	31	8	4.65 (0.4/0/4.25)
Humpback Whale	30	53	8	6.85 (1.55/0/5.3)
Fin Whale	6	1	4	1.8 (0.2/0.8/0.8)
Sei Whale	0	0	0	0
Minke Whale	20	11	16	6.4 (1.7/2.45/2.25)

Notes:
[1]Information presented in Table 10 is based on confirmed human-caused injury and mortality events along the Gulf of Mexico Coast, US East Coast, and Atlantic Canadian Provinces; it is not specific to US waters only.
[2] NMFS defines a serious injury as an injury that is more likely than not to result in mortality (for additional details see: http://www.nmfs.noaa.gov/pr/pdfs/serious_injury_procedure.pdf)

***Source*:** Henry *et al.* 2016

As noted in section 6.2.4.1, pursuant to the MMPA, NMFS publishes a LOF annually, classifying U.S. commercial fisheries into one of three categories based on the relative frequency of incidental serious injurious and mortalities of marine mammals in each fishery. Large whales, in particular, humpback, fin, minke, and North Atlantic right whales, are known to interact with Category I and II fisheries in the (Northwest) Atlantic Ocean. As fin and North Atlantic right whales are listed as endangered under the ESA, these species are considered strategic stocks under the MMPA (see Table 6). Section 118(f)(1) of the MMPA requires the preparation and implementation of a Take Reduction Plan (TRP) for any strategic marine mammal stock that interacts with Category I or II fisheries. In response to its obligations under the MMPA, in 1996, NMFS established the Atlantic Large Whale Take Reduction Team (ALWTRT) to develop a plan (Atlantic Large Whale Take Reduction Plan (ALWTRP or Plan)) to reduce serious injury to, or mortality of large whales, specifically, humpback, fin, and North Atlantic right whales, due to

incidental entanglement in U.S. commercial fishing gear.[3] In 1997, the ALWTRP was implemented; however, since 1997, the Plan has been modified; recent adjustments include the Sinking Groundline Rule and Vertical Line Rules (72 FR 57104, October 5, 2007; 79 FR 36586, June 27, 2014; 79 FR 73848, December 12, 2014; 80 FR 14345, March 19, 2015; 80 FR 30367, May 28, 2015).

The Plan consists of regulatory (e.g., universal gear requirements, modifications, and requirements; area- and season- specific gear modification requirements and restrictions; time/area closures) and non-regulatory measures (e.g., gear research and development, disentanglement, education and outreach) that, in combination, seek to assist in the recovery of North Atlantic right, humpback, and fin whales by addressing and mitigating the risk of entanglement in gear employed by commercial fisheries, specifically trap/pot and gillnet fisheries (http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/; 73 FR 51228; 79 FR 36586; 79 FR 73848; 80 FR 14345; 80 FR 30367). The Plan recognizes trap/pot and gillnet Management Areas in Northeast, Mid-Atlantic, and Southeast regions of the U.S, and identifies gear modification requirements and restrictions for Category I and II gillnet and trap/pot fisheries in these regions; these Category I and II fisheries must comply with all regulations of the Plan.[4] For further details on the ALWTRP please see: http://www.greateratlantic.fisheries.noaa.gov/Protected/whaletrp/.

6.2.4.1.2 Small Cetaceans and Pinnipeds

Sink Gillnet and Bottom Trawl Gear

Small cetaceans and pinnipeds are vulnerable to interactions with sink gillnet and bottom trawl gear. Species that have been observed incidentally injured and/or killed by MMPA LOF Category I (frequent interactions) and/or II (occasional interactions) gillnet or trawl fisheries that operate in the affected environment of Greater Atlantic Region (GAR) fisheries are provided in Table 11 (Waring *et al*. 2014a,b; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)).[5] Of the species provided in Table 11, gray seals, followed by harbor seals, harbor porpoises, short beaked common dolphins, harps seals, and Atlantic white sided dolphins are the most frequently bycaught small cetacean and pinnipeds in sink gillnet gear in the GAR (Hatch and Orphanides 2014, 2015, 2016). In terms of bottom trawl gear, short-beaked common dolphins and Atlantic white-sided dolphins are the most frequently observed bycaught marine mammal species in the GAR, followed by gray seals, long-finned pilot whales, and risso's dolphins, bottlenose dolphin (offshore), harbor porpoise, and harp seals (Lyssikatos 2015). Incidental bycatch of these latter species, as well as those provided in Table 11, have been observed in the skate fishery (Hatch and Orphanides 2014, 2015, 2016; Lyssikatos 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html), which is comprised of Category I Northeast and Mid-Atlantic sink gillnet and Category II Northeast and Mid-Atlantic bottom trawl fisheries (82 FR 3655 (January 12, 2017)). Specifically, observed bycatch in sink gillnet hauls primarily targeting monkfish, and also landing skates, has shown that interactions primarily occur in sink gillnet gear with mesh sizes >11 inches, and with soak duration ≥ 50 hours (Hatch and Orphanides 2014, 2015). In regards to bottom trawl

[3] The measures identified in the ALWTRP are also beneficial to the survival of the minke whale, which are also known to be incidentally taken in commercial fishing gear.

[4] The fisheries currently regulated under the ALWTRP include: Northeast/Mid-Atlantic American lobster trap/pot; Atlantic blue crab trap/pot; Atlantic mixed species trap/pot; Northeast sink gillnet; Northeast anchored float gillnet; Northeast drift gillnet; Mid-Atlantic gillnet; Southeastern U.S. Atlantic shark gillnet; and Southeast Atlantic gillnet (NMFS 2014c).

[5] "GAR Fisheries" are in reference to the 13 fisheries in the Greater Atlantic Region (GAR) (i.e., Northeast multispecies (including the whiting/small mesh multispecies complex); monkfish; spiny dogfish; Atlantic bluefish; northeast skate complex; mackerel/squid/butterfish; summer flounder/scup/black sea bass; American lobster; Atlantic herring; Atlantic sea scallop; red crab; surfclam/ocean quahog; and golden tilefish) in which fishery management plans (FMPs) have been developed and authorized; the NMFS-Greater Atlantic Regional Fisheries Office, in association with the New England and Mid-Atlantic Fisheries Management Councils (FMCs), is charged with conserving and managing these FMPs.

hauls, regardless of target fish species, general tow time and net mesh size associated with observed bycatch of small cetaceans and pinnipeds are not available (Lyssikatos 2015; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html).

Based on the best available information provided in Table 11, Waring *et al*. (2014a,b), Waring *et al*. (2015), Waring *et al*. (2016), and the January 12, 2017, LOF (82 FR 3655), of the gear types primarily used to prosecute fisheries in the GAR (i.e., bottom trawl; mid-water trawl; gillnets (sink); scallop dredge; trap/pot; bottom longline; hydraulic clam dredge; purse seine; and hook and line), Northeast and Mid-Atlantic gillnet fisheries, followed by the Northeast and Mid-Atlantic bottom trawl fisheries (Category I and II fisheries, respectively) pose the greatest risks of serious injury and mortality to small cetaceans and pinnipeds (i.e., approximately 80.6% of the estimated total mean annual mortality to marine mammals [small cetaceans + seals, large whales excluded] is attributed to gillnet fisheries, 18.9% attributed to bottom trawl, 0.14% attributed to mid-water trawl; 0.16% attributed to pot/trap (bottlenose dolphin stocks only); and 0.12% attributed to hook and line (bottlenose dolphin stocks only); Figure 1).[6]

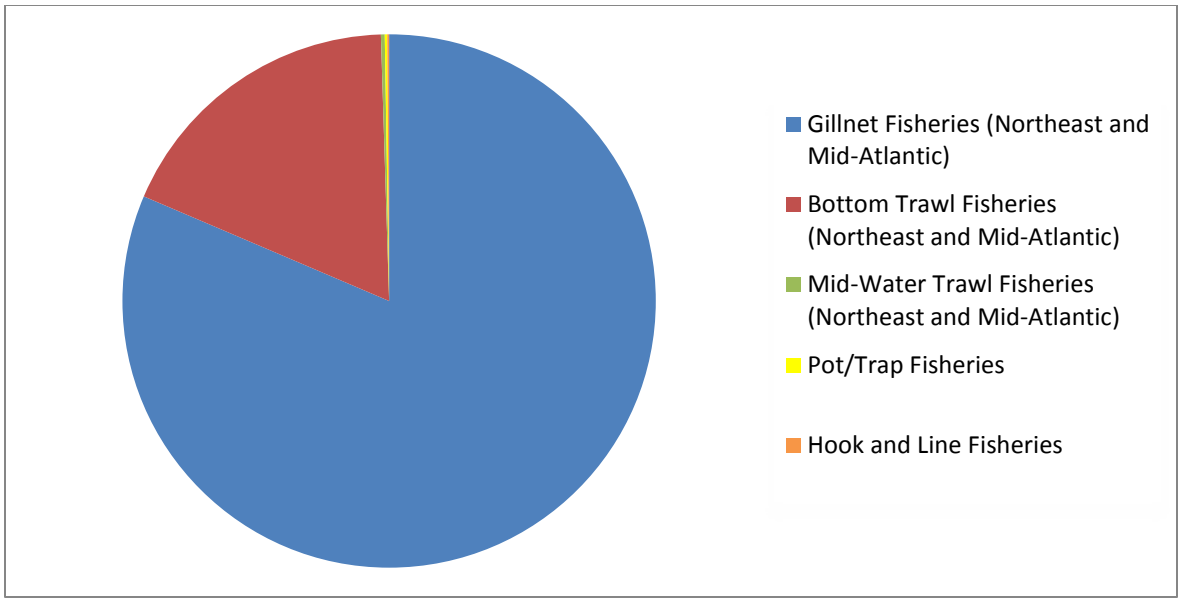
Table 11 - Small cetacean and pinniped species observed seriously injured and/or killed by Category I and II gillnet or trawl fisheries in the affected environment of GAR fisheries.

Fishery	Category	Species Observed or reported Injured/Killed
Northeast Sink Gillnet	I	Bottlenose dolphin (offshore)
		Harbor porpoise
		Atlantic white sided dolphin
		Short-beaked common dolphin
		Risso's dolphin
		Pilot whales (spp)
		Harbor seal
		Hooded seal
		Gray seal
		Harp seal
Mid-Atlantic Gillnet		Bottlenose dolphin (Northern Migratory coastal)
		Bottlenose dolphin (Southern Migratory coastal)
		Bottlenose dolphin (offshore)
		White-sided dolphin
		Harbor porpoise
		Short-beaked common dolphin

[6] Data used in the assessment was from 2009-2013 (Waring *et al*. 2016; MMPA LOF 82 FR 3655). Northeast anchored float gillnet, Southeast Atlantic gillnet, and Southeastern U.S. Atlantic shark gillnet fisheries were not included in the analysis as mean annual mortality estimates have not been provided for the species affected by these fisheries (Waring *et al*. 2016). As there are no known small cetaceans or pinniped interactions with bottom longlines, hydraulic clam dredges, or sea scallop dredges, these fishing gear types were also not included in the assessment. In addition, for harp seals, the assessment used data from Waring *et al.* (2014a) as serious injury and mortality estimates for harp seals have not been updated since Waring *et al*. (2014a).

		Risso's dolphin
		Harbor seal
		Harp seal
		Gray seal
Mid-Atlantic Mid-Water Trawl-Including Pair Trawl	II	Risso's dolphin
		White-sided dolphin
		Harbor seal
		Pilot whales (spp)
		Gray seal
Northeast Mid-Water Trawl-Including Pair Trawl	II	Short-beaked common dolphin
		Pilot whales (spp)
		Gray seal
		Harbor seal
Northeast Bottom Trawl	II	Harp seal
		Harbor seal
		Gray seal
		Long-finned pilot whales
		Short-beaked common dolphin
		White-sided dolphin
		Harbor porpoise
		Bottlenose dolphin (offshore)
		Risso's dolphin
Mid-Atlantic Bottom Trawl	II	White-sided dolphin
		Pilot whales (spp)
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
Northeast Anchored Float Gillnet	II	Harbor seal
		White-sided dolphin
Sources: Waring *et al*. 2014a,b; Waring *et al*. 2015; Waring *et al*. 2016; LOF 82 FR 3655 (January 12, 2017).		

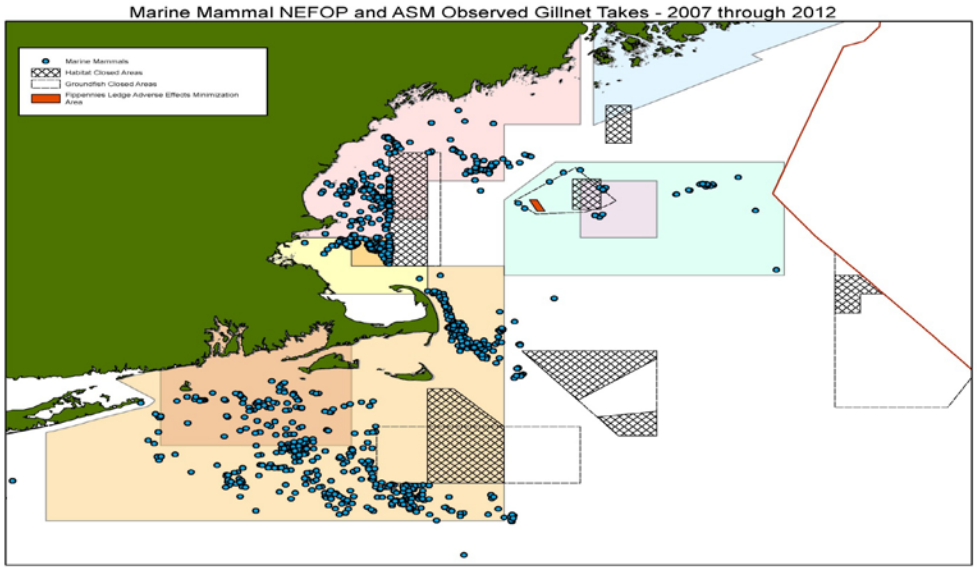
Figure 1 - Estimated total mean annual mortality of small cetaceans and pinnipeds by GAR fisheries from 2009-2013 (*source* Waring *et al*. 2014a, b; Waring *et al*. 2015; Waring *et al*. 2016).



Although there are multiple Category I and II fisheries that have the potential to result in the serious injury and morality of small cetaceans and pinnipeds in the GAR, the risk of an interaction with a specific fishery is affected by multiple factors, including where and when fishing effort is focused, the type of gear being used, and how effort overlaps in time and space with specific species in the affected area. For instance, the following figures (Figure 2 and Figure 3) depict observed marine mammal takes (large whales excluded) in gillnet and trawl gear in waters of the GOM, GB, and SNE from 2007-2012 or 2007-2011, respectively.[7] As depicted in Figure 2 and Figure 3, over the last 5 years, there appears to be particular areas in the GOM, GB, and SNE where fishing effort is overlapping in time and space with small cetacean or pinniped occurrence. Although uncertainties, such as shifting fishing effort patterns and data on true density (or even presence/absence) for some species remain, the available observer data, as depicted in Figure 2 and Figure 3, does provide some insight into areas in the ocean where the likelihood of interacting with a particular species is high and therefore, provides a means to consider potential impacts of future shifts or changes in fishing effort on small cetaceans and pinnipeds. For additional maps depicting observed small cetacean and pinniped interactions with Northeast or Mid-Atlantic bottom trawl or gillnet gear, please see Appendix III in Waring *et al*. (2014a,b), Waring *et al*. (2015), Waring *et al*. (2016), and Hayes *et al*. 2017.

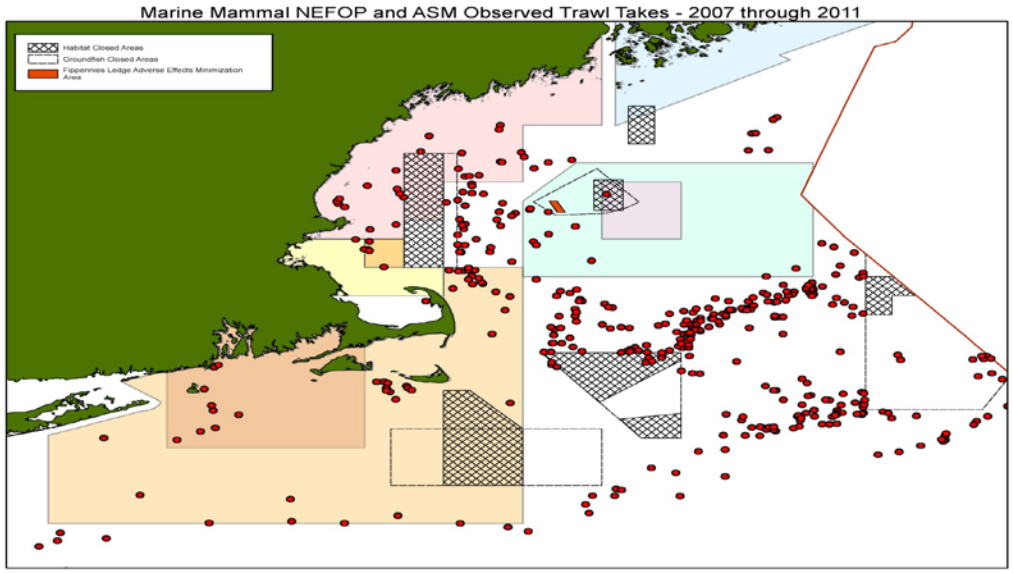
Figure 2 - Map of marine mammal bycatch in gillnet gear in the New England region (excluding large whales) observed by Northeast Fisheries Observer Program (NEFOP) and At Sea Monitoring (ASM) program between 2007 and 2012.

[7] For harp seals, mean annual mortality estimates from 2007-2011 were considered as serious injury and mortality estimates have not been updated since Waring *et al.* (2014a).



Notes: Small cetacean and pinnipeds have been observed taken primarily in: (1) the waters west of the GOM Habitat/Groundfish closed area: Harbor seals, harp seals, and harbor porpoise; (2) off of Cape Cod, MA: Gray seals, harbor seals, and harbor porpoise; (3) west of the Nantucket Lightship Closed Area: Harbor porpoise, short-beaked common dolphin, gray seals, harp seals, and harbor seals; and (4) waters off southern MA and RI: Gray seals and harbor seals, and some harbor porpoise and short-beaked common dolphin.

Figure 3 - Map of marine mammal bycatch in trawl gear in the New England region (excluding large whales) observed by the Northeast Fisheries Observer Program (NEFOP) and At Sea Monitoring (ASM) program between 2007 and 2011.



***Notes*:** Small cetacean and pinnipeds observed taken primarily in: (1) the waters between and around CA I and CA II (Groundfish closed areas): Short-beaked common dolphin, pilot whales, white-sided dolphins, gray seals, and some risso's dolphins and harbor porpoise; and (2) eastern side of the GOM Habitat/Groundfish closed area: White-sided dolphins, and some pilot whales and harbor seals.

As noted above, numerous species of small cetaceans and pinnipeds interact with Category I and II fisheries in the GAR; however, several species in Table 11 have experienced such great losses to their

populations as a result of interactions with Category I and/or II fisheries that they are now considered strategic stocks under the MMPA (see Table 6). These species include several stocks of bottlenose dolphins, and until recently, the harbor porpoise.[8] Section 118(f)(1) of the MMPA requires the preparation and implementation of a TRP for any strategic marine mammal stock that interacts with Category I or II fisheries. As a result, the Harbor Porpoise TRP (HPTRP) and the Bottlenose Dolphin TRP (BDTRP) were developed and implemented for these species.[9] In addition, due to the incidental mortality and serious injury of small cetaceans incidental to bottom and mid-water trawl fisheries operating in both the Northeast and Mid-Atlantic regions, the Atlantic Trawl Gear Take Reduction Strategy (ATGTRS) was implemented. The following provides a brief overview and summary for each HPTRP, BDTRP, and ATGTRS; however, additional information on each TRP can be found at:
http://www.greateratlantic.fisheries.noaa.gov/protected/porptrp/ or
http://www.nmfs.noaa.gov/pr/interactions/trt/bdtrp.htm
http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/

Harbor Porpoise Take Reduction Plan (HPTRP)

To address the high levels of incidental take of harbor porpoise in the groundfish sink gillnet fishery, a Take Reduction Team was formed in 1996. A rule (63 FR 66464) to implement the Harbor Porpoise Take Reduction Plan, and therefore, to reduce harbor porpoise bycatch in U.S. Atlantic gillnets was published on December 2, 1998, and became effective on January 1, 1999; the Plan was amended on February 19, 2010 (75 FR 7383), and October 4, 2013 (78 FR 61821). Since gillnet operations differ between the New England and Mid-Atlantic regions, the follow sets of measures were devised for each region:

- **New England Region**: The New England component of the HPTRP pertains to all fishing with sink gillnets and other gillnets capable of catching multispecies in New England waters from Maine through Rhode Island. It includes five management areas and three closure areas. Per specified periods of time, fishing with sink gillnets is restricted in closed areas. In management areas, depending on location, seasonal restrictions include complete closure to sink gillnet fishing to closures to sink gillnet fishing unless pingers are used in the manner prescribed in the TRP regulations.

- **Mid-Atlantic Region:** The Mid-Atlantic portion of the HPTRP pertains to the Mid-Atlantic shoreline from the southern shoreline of Long Island, New York to the North Carolina/South Carolina border. It includes four management areas, each with time and area closures to sink gillnet fishing unless the gear meets certain specifications (e.g., floatline length, twine size, tie downs, net size, net number, nets in a string). Additionally, during regulated periods, sink gillnet fishing in each management area of the Mid-Atlantic is regulated differently for small mesh (> 5 inches to < 7 inches) and large (7-18 inches) mesh gear. The Plan also includes some time and area closures in which sink gillnet fishing is prohibited regardless of the gear specifications.

Bottlenose Take Reduction Plan (BDTRP)

In April 2006, NMFS published a final rule to implement the BDTRP for the WNA coastal stock of bottlenose dolphin (April 26, 2006, 71 FR 24776) to reduce the incidental mortality and serious injury in the Mid-Atlantic gillnet fishery and eight other coastal fisheries operating within the dolphin's

[8] In the most recent U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment (Waring *et al*. 2016); harbor porpoise are no longer designated as a strategic stock.
[9] Although the most recent U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessment (Waring *et al.* 2016) no longer designates harbor porpoise as a strategic stock, HPTRP regulations are still in place per the mandates provided in Section 118(f)(1).

distributional range.[10] The measures contained in the BDTRP include gillnet effort reduction, gear proximity requirements, gear or gear deployment modifications, and outreach and educational measures to reduce dolphin bycatch below the marine mammals stock's PBR. On July 31, 2012 (77 FR 45268), the BDTRP was amended to permanently continue nighttime fishing restrictions of medium mesh gillnets operating in North Carolina coastal state waters. The Bottlenose Dolphin TRP was most recently amended on February 9, 2015 (80 FR 6925) to reduce the incidental serious injury and mortality of strategic stocks of bottlenose dolphins in Virginia pound net fishing gear, and to provide consistent state and federal regulations for Virginia pound net fishing gear.

Atlantic Trawl Gear Take Reduction Strategy (ATGTRS)

In addition to the HPTRP and the BDTRP, in 2006, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened to address the incidental mortality and serious injury of long-finned pilot whales (*Globicephala melas*), short-finned pilot whales (*Globicephala macrorhynchus*), common dolphins (*Delphinus delphis*), and white sided dolphins (*Lagenorhynchus acutus*) incidental to bottom and mid-water trawl fisheries operating in both the Northeast and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock," nor do they currently interact with a Category I fishery, it was determined at the time that development of a take reduction plan was not necessary.[11]

In lieu of a take reduction plan, the ATGTRT agreed to develop an ATGTRS. The ATGTRS identifies informational and research tasks, as well as education and outreach needs the ATGTRT believes are necessary, to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero mortality and serious injury rates. 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.

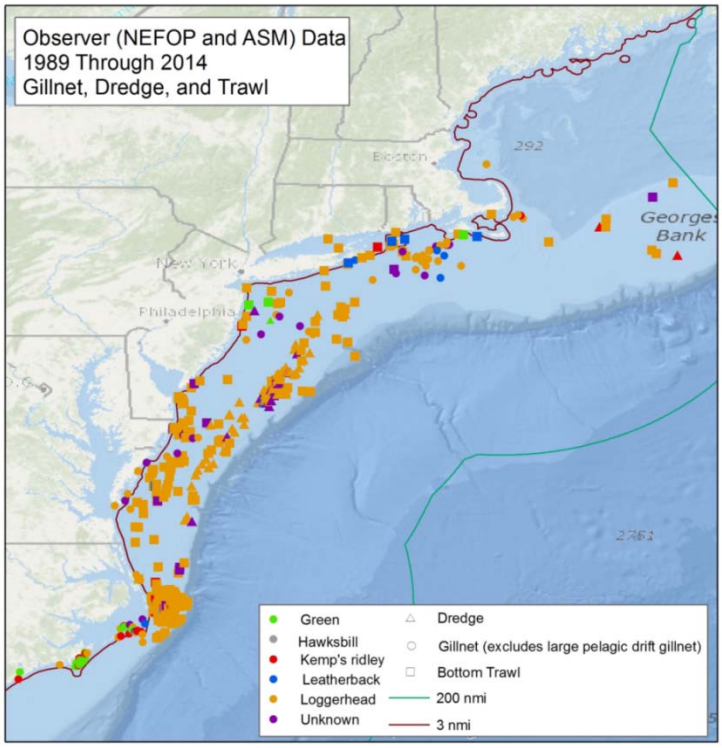
6.2.4.2 Sea Turtles

As provided in Figure 4, sea turtle interactions with gillnet, bottom trawl, and other bottom tending gear have been observed in the GOM, GB, and the Mid-Atlantic; however, most of the observed interactions have occurred in the Mid-Atlantic (see Warden 2011a,b; Murray 2013; Murray 2015). As few sea turtle interactions have been observed in the GOM and GB regions of the Northwest Atlantic, there is insufficient data available to conduct a robust model-based analysis on sea turtle interactions with gillnet or bottom trawl gear in these regions and therefore, produce a bycatch estimate for these regions. As a result, the bycatch estimates and the discussion below are based on observed sea turtle interactions in gillnet or bottom trawl gear in the Mid-Atlantic.

Figure 4 - Observed locations of turtle interactions in bottom tending gears in the GAR from 1989-2014.

[10] The final rule issued on April 26, 2006, for the BDTRP also revised the large mesh size restriction under the Mid-Atlantic large mesh gillnet rule for conservation of endangered and threatened sea turtles to provide consistency among Federal and state management measures.

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



Bottom Trawl Gear

Green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles have been documented interacting with bottom trawl gear. However, estimates are available only for loggerhead sea turtles. Warden (2011a,b) estimated that from 2005-2008, the average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic was 292 (CV=0.13, 95% CI=221-369), with an additional 61 loggerheads (CV=0.17, 95% CI=41-83) interacting with trawls, but released through a Turtle Excluder Device (TED).[12] The 292 average annual observable loggerhead interactions equates to approximately 44 adult equivalents (Warden 2011a,b). Most recently, Murray (2015) estimated that from 2009-2013, the total average annual loggerhead interactions in bottom trawl gear in the Mid-Atlantic was 231 (CV=0.13, 95% CI=182-298); this equates to approximately 33 adult equivalents (Murray 2015). Bycatch estimates provided in Warden (2011a) and Murray (2015b) are a decrease from the average annual loggerhead bycatch in bottom otter trawls during 1996-2004, which Murray (2008) estimated at 616 sea turtles (CV=0.23, 95% CI over the nine-year period: 367-890). This decrease is likely due to decreased fishing effort in high-interaction areas (Warden 2011a,b).

Sink Gillnet Gear

Murray (2013) conducted an assessment of loggerhead and unidentified hard-shell turtle interactions in Mid-Atlantic gillnet gear from 2007-2011. Based on Northeast Fisheries Observer Program data from 2007-2011, interactions between loggerhead and hard-shelled sea turtles (loggerheads plus unidentified hard-shelled) and commercial gillnet gear in the Mid-Atlantic averaged 95 hard-shelled turtles and 89

[12] TEDs allow sea turtles to escape the trawl net, reducing injury and mortality resulting from capture in the net. Approved TEDs are required in the shrimp and summer trawl fishery. For further information on TEDs see 50 CFR 223.206 and 68 FR 8456 (February 21, 2003).

loggerheads (equivalent to 9 adults) annually (Murray 2013).[13] However, average estimated interactions in large mesh gear in warm, southern Mid-Atlantic waters have declined relative to those from 1996-2006 (Murray 2009), as did the total commercial effort (Murray 2013). Murray (2013) also estimated interactions by managed species landed in (Mid-Atlantic) gillnet gear from 2007-2011. For instance, an estimated average annual bycatch of loggerhead and non-loggerhead hard shelled sea turtles for trips primarily landing skate was 16 loggerheads (95% CI =9-23) and one non-loggerhead hard shelled sea turtles (95% CI=1-2).

6.2.4.3 Atlantic Sturgeon

Sink Gillnet and Bottom Trawl Gear

Atlantic sturgeon interactions (i.e., bycatch) with sink gillnet and bottom trawl gear have been observed since 1989; these interactions have the potential to result in the injury or mortality of Atlantic sturgeon (NMFS NEFSC FSB 2015, 2016, 2017). Three documents, covering three time periods, that use data collected by the Northeast Fisheries Observer Program to describe bycatch of Atlantic sturgeon in gillnet and bottom trawl gear: Stein et al. (2004b) for 1989-2000; ASMFC (2007) for 2001-2006; and Miller and Shepard (2011) for 2006-2010; none of these documents provide estimates of Atlantic sturgeon bycatch by Distinct Population Segment. Miller and Shepard (2011), the most of the three documents, analyzed fishery observer data and VTR data in order to estimate the average annual number of Atlantic sturgeon interactions in gillnet and otter trawl in the Northeast Atlantic that occurred from 2006 to 2010. This timeframe included the most recent, complete data and as a result, Miller and Shepard (2011) is considered to represent the most accurate predictor of annual Atlantic sturgeon interactions in the Northeast gillnet and bottom trawl fisheries (NMFS 2013).

Based on the findings of Miller and Shepard (2011), NMFS (2013) estimated that the annual bycatch of Atlantic sturgeon in gillnets to be 1,239 sturgeon and 1,342 sturgeon in bottom otter trawl gear. Miller and Shepard (2011) observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes, as well as gillnet gear with small (< 5.5 inches), large (5.5 to 8 inches), and extra-large mesh (>8 inches) sizes. Although Atlantic sturgeon were observed to interact with trawl and gillnet gear with various mesh sizes, Miller and Shepard (2011) concluded that, based on NEFOP observed sturgeon mortalities, gillnet gear, in general, posed a greater risk of mortality to Atlantic sturgeon than did trawl gear. Estimated mortality rates in gillnet gear were 20.0%, while those in otter trawl gear were 5.0% (Miller and Shepard 2011; NMFS 2013). Similar conclusions were reached in Stein et al. (2004b) and ASMFC (2007) reports; after review of observer data from 1989-2000 and 2001-2006, both studies concluded that observed mortality is much higher in gillnet gear than in trawl gear. However, an important consideration to these findings is that observed mortality is considered a minimum of what actually occurs and therefore, the conclusions reached by Stein et al. (2004b), ASMFC (2007), and Miller and Shepard (2011) are not reflective of the total mortality associated with either gear type. To date, total Atlantic sturgeon mortality associated with gillnet or trawl gear remains uncertain.

6.2.4.4 Atlantic Salmon

Sink Gillnet and Bottom Trawl Gear

Atlantic salmon interactions (i.e., bycatch) with gillnet and bottom trawl have been observed since 1989; in many instances, these interactions have resulted in the injury and mortality of Atlantic salmon (NMFS NEFSC FSB 2015, 2016, 2017). According to the Biological Opinion issued by NMFS Greater Atlantic

[13] At Sea Monitoring (ASM) data was also considered in Murray (2013); however, as the ASM program began 1 May 2010, trips (1,085 hauls), trips observed by at-sea monitors from May 2010 – December 2011 were pooled with the NEFOP data. Further, as most of the ASM trips occur in the Gulf of Maine, only a small portion (9%) of ASM data was used in the Murray (2013) analysis.

Regional Fisheries Office on December 16, 2013, NMFS Northeast Fisheries Science Center's (NEFSC) Northeast Fisheries Observer and At-Sea Monitoring Programs documented a total of 15 individual salmon incidentally caught on more than 60,000 observed commercial fishing trips from 1989 through August 2013 (NMFS 2013; Kocik *et al*. 2014). Atlantic salmon were observed caught in gillnet (11/15)[14] and bottom otter trawl gear (4/15), with 10 of the incidentally caught salmon listed as "discarded" and five reported as mortalities (Kocik (NEFSC), pers. comm (February 11, 2013) in NMFS 2013).The genetic identity of these captured salmon is unknown; however, the NMFS 2013 Biological Opinion considers all 15 fish to be part of the Gulf of Maine Distinct Population Segment, although some may have originated from the Connecticut River restocking program (i.e., those caught south of Cape Cod, Massachusetts). Since 2013, no additional Atlantic salmon have been observed in gillnet or bottom trawl (NMFS NEFSC FSB 2015, 2016, 2017). Based on the above information, interactions with Atlantic salmon are likely rare (Kocik *et al*. 2014).

[14] Of the 11 observed Atlantic salmon in gillnet gear, 10/11 Atlantic salmon were observed in sink gillnet gear; only one Atlantic salmon was observed in drift gillnet gear (NMFS NEFSC FSB 2015, 2016, 2017).

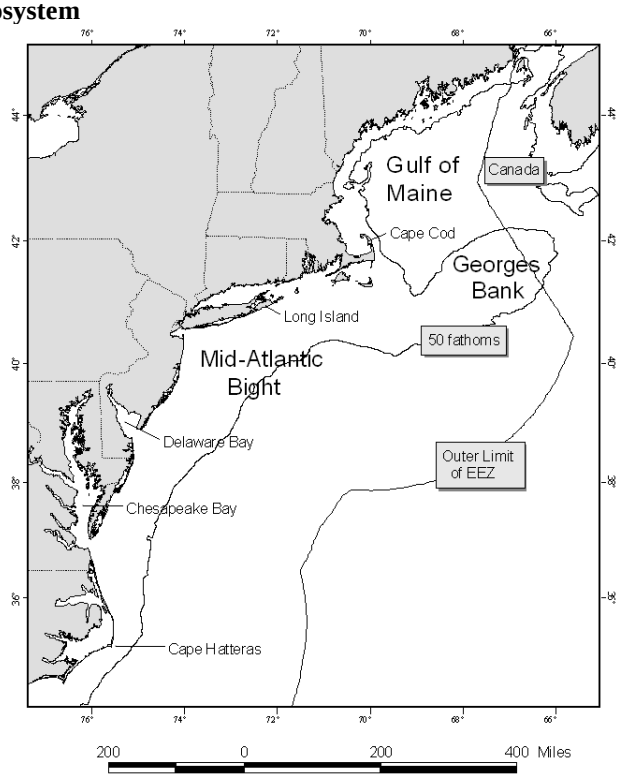
6.3 Physical Environment

The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream. The continental slope includes the area east of the shelf, out to a depth of 2000 m. Four distinct sub-regions comprise the NOAA Fisheries Northeast Region: the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight, and the continental slope (see Map 1 and Map 2).

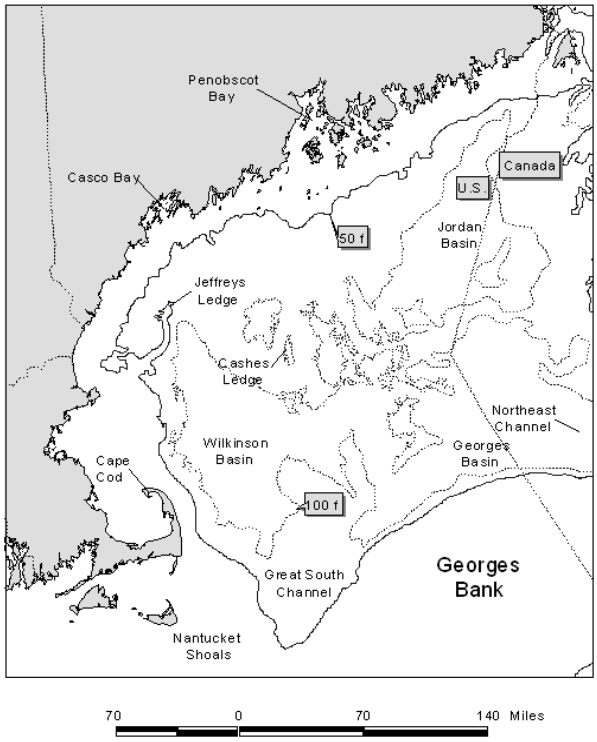
The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern edge. It is characterized by highly productive, well-mixed waters and strong currents. The Mid-Atlantic Bight is comprised of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, NC. The continental slope begins at the continental shelf break and continues eastward with increasing depth until it becomes the continental rise. It is fairly homogenous, with exceptions at the shelf break, some of the canyons, the Hudson Shelf Valley, and in areas of glacially rafted hard bottom.

Pertinent physical characteristics of the sub-regions that could potentially be affected by this action are described in this section. Information included in this document was extracted from Stevenson et al. (2004).

Map 1 - Northeast shelf ecosystem



Map 2 - Gulf of Maine.



Gulf of Maine

Although not obvious in appearance, the Gulf of Maine (GOM) is actually an enclosed coastal sea, bounded on the east by Browns Bank, on the north by the Nova Scotian (Scotian) Shelf, on the west by the New England states, and on the south by Cape Cod and Georges Bank. The GOM was glacially derived, and is characterized by a system of deep basins, moraines and rocky protrusions with limited access to the open ocean. This geomorphology influences complex oceanographic processes that result in a rich biological community.

The GOM is topographically unlike any other part of the continental border along the U.S. Atlantic coast. The GOM's geologic features, when coupled with the vertical variation in water properties, result in a great diversity of habitat types. It contains twenty-one distinct basins separated by ridges, banks, and swells. The three largest basins are Wilkinson, Georges, and Jordan. Depths in the basins exceed 250 meters (m), with a maximum depth of 350 m in Georges Basin, just north of Georges Bank. The Northeast Channel between Georges Bank and Browns Bank leads into Georges Basin, and is one of the primary avenues for exchange of water between the GOM and the North Atlantic Ocean.

High points within the Gulf include irregular ridges, such as Cashes Ledge, which peaks at 9 m below the surface, as well as lower flat topped banks and gentle swells. Some of these rises are remnants of the sedimentary shelf that was left after most of it was removed by the glaciers. Others are glacial moraines and a few, like Cashes Ledge, are outcroppings of bedrock. Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the GOM, particularly in its deep basins. These mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains. Some shallower basins are covered with mud as well, including some in coastal waters. In the rises between the basins, other materials are usually at the surface. Unsorted glacial till covers some morainal areas, as on Sewell Ridge to the north of Georges Basin and on Truxton Swell to the south of Jordan Basin. Sand predominates on some high areas and gravel, sometimes with boulders, predominates on others.

Coastal sediments exhibit a high degree of small-scale variability. Bedrock is the predominant substrate along the western edge of the GOM north of Cape Cod in a narrow band out to a depth of about 60 m. Rocky areas become less common with increasing depth, but some rock outcrops poke through the mud covering the deeper sea floor. Mud is the second most common substrate on the inner continental shelf. Mud predominates in coastal valleys and basins that often abruptly border rocky substrates. Many of these basins extend without interruption into deeper water. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Large expanses of gravel are not common, but do occur near reworked glacial moraines and in areas where the seabed has been scoured by bottom currents. Gravel is most abundant at depths of 20 - 40 m, except in eastern Maine where a gravel-covered plain exists to depths of at least 100 m. Bottom currents are stronger in eastern Maine where the mean tidal range exceeds 5 m. Sandy areas are relatively rare along the inner shelf of the western GOM, but are more common south of Casco Bay, especially offshore of sandy beaches.

Georges Bank

Georges Bank is a shallow (3 - 150 m depth), elongate (161 km wide by 322 km long) extension of the continental shelf that was formed by the Wisconsinian glacial episode. It is characterized by a steep slope on its northern edge and a broad, flat, gently sloping southern flank. The Great South Channel lies to the west. Natural processes continue to erode and rework the sediments on Georges Bank. It is anticipated that erosion and reworking of sediments will reduce the amount of sand available to the sand sheets, and cause an overall coarsening of the bottom sediments (Valentine and Lough 1991).

Glacial retreat during the late Pleistocene deposited the bottom sediments currently observed on the eastern section of Georges Bank, and the sediments have been continuously reworked and redistributed by the action of rising sea level, and by tidal, storm and other currents. The strong, erosive currents affect the character of the biological community. Bottom topography on eastern Georges Bank is characterized by linear ridges in the western shoal areas; a relatively smooth, gently dipping sea floor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement; and steeper and smoother topography incised by submarine canyons on the southeastern margin.

The central region of the Bank is shallow, and the bottom is characterized by shoals and troughs, with sand dunes superimposed upon them. The two most prominent elevations on the ridge and trough area are Cultivator and Georges Shoals. This shoal and trough area is a region of strong currents, with average flood and ebb tidal currents greater than 4 km/h, and as high as 7 km/h. The dunes migrate at variable rates, and the ridges may also move. In an area that lies between the central part and Northeast Peak, Almeida *et al.* (2000) identified high-energy areas as between 35 - 65 m deep, where sand is transported on a daily basis by tidal currents, and a low-energy area at depths > 65 m that is affected only by storm currents.

The area west of the Great South Channel, known as Nantucket Shoals, is similar in nature to the central region of the Bank. Currents in these areas are strongest where water depth is shallower than 50 m. This type of traveling dune and swale morphology is also found in the Mid-Atlantic Bight, and further described in that section of the document. The Great South Channel separates the main part of Georges Bank from Nantucket Shoals. Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm generated ripples, and scattered shell and mussel beds. Tidal and storm currents range from moderate to strong, depending upon location and storm activity (Valentine, pers. comm.).

Mid-Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream. Like the rest of the continental shelf, the topography of the Mid-Atlantic Bight was shaped largely by sea level fluctuations caused by past ice ages. The shelf's basic morphology and sediments derive from the retreat of the last ice sheet, and the subsequent rise in sea level. Since that time, currents and waves have modified this basic structure.

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

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

extensive deposition at a cape or estuary mouth. Massifs were also formed as estuaries retreated across the shelf.

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

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

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

The northern portion of the Mid-Atlantic Bight is sometimes referred to as southern New England. Most of this area was discussed under Georges Bank; however, one other formation of this region deserves note. The mud patch is located just southwest of Nantucket Shoals and southeast of Long Island and Rhode Island. Tidal currents in this area slow significantly, which allows silts and clays to settle out. The mud is mixed with sand, and is occasionally resuspended by large storms. This habitat is an anomaly of the outer continental shelf.

Artificial reefs are another significant Mid-Atlantic habitat, formed much more recently on the geologic time scale than other regional habitat types. These localized areas of hard structure have been formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle and Zetlin 2000). While some of materials have been deposited specifically for use as fish habitat, most have an alternative primary purpose; however, they have all become an integral part of the coastal and shelf ecosystem. It is expected that the increase in these materials has had an impact on living marine resources and fisheries, but these effects are not well known.

In general, reefs are important for attachment sites, shelter, and food for many species, and fish predators such as tunas may be attracted by prey aggregations, or may be behaviorally attracted to the reef structure.

6.4 Essential Fish Habitat

EFH descriptions and maps for the skate species can be found in the FMP for the Skate Complex and for the other NEFMC-managed species in the NEFMC's 1998 Omnibus EFH amendment. Skate EFH maps are also available for viewing via the Essential Fish Habitat Mapper: http://sharpfin.nmfs.noaa.gov/website/EFH_Mapper/map.aspx. The current EFH text descriptions are linked from this location.

A more detailed discussion of habitat types, as well as biological and physical effects of fishing by various gears in the skate fishery is provided in the 2008 SAFE Report, or Section 7.4.6 of Skate Amendment 3 (NEFMC 2009). An up-dated summary of gear effects research studies that are relevant to the NE region will be included in the revised gear effects section of the NEFMC Omnibus EFH Amendment 2 (Phase 2), which is currently being developed.

6.5 Human Communities/Socio-Economic Environment

The purpose of this section is to describe and characterize the bait fishery in which skates are caught. Descriptive information on the fishery is included, and where possible, quantitative commercial fishery and economic information is presented.

6.5.1 Overview of the Skate Fishery

The seven species in the Northeast Region skate complex (Maine to North Carolina) are distributed along the coast of the northeast United States from near the tide line to depths exceeding 700 m (383 fathoms). Skates are not known to undertake large-scale migrations, but they do move seasonally in response to changes in water temperature, moving offshore in summer and early autumn and returning inshore during winter and spring. Members of the skate family lay eggs that are enclosed in a hard, leathery case commonly called a mermaid's purse. Incubation time is six to twelve months, with the young having the adult form at the time of hatching (Bigelow and Schroeder 1953). A description of the available biological information about these species can be found in Section 6.1.

Skates are harvested in two very different fisheries, one for lobster bait and one for wings for food. Small, whole skates are among the preferred baits for the regional American lobster (*Homarus americanus*) fishery. The fishery for lobster bait is a more historical and directed skate fishery, involving vessels primarily from Southern New England ports that target a combination of little skates (>90%) and, to a much lesser extent, juvenile winter skates (<10%). The catch of juvenile winter skates mixed with little skates is difficult to differentiate due to their nearly identical appearance.

The bait fishery is largely based out of Rhode Island with other ports (New Bedford, Martha's Vineyard, Block Island, Long Island, Stonington, Chatham and Provincetown) also identified as participants in the directed bait fishery. There is also a seasonal gillnet incidental catch fishery as part of the directed monkfish gillnet fishery, in which skates (mostly winter skates) are sold both for lobster bait and as cut wings for processing. Fishermen have indicated that the market for skates as lobster bait has been relatively consistent. The directed skate fishery by Rhode Island vessels occurs primarily in federal waters less than 40 fathoms from the Rhode Island/Connecticut/New York state waters boundary east to the waters south of Martha's Vineyard and Nantucket out to approximately 69 degrees. The vast majority of the landings are caught south of Block Island in federal waters. Effort on skates increases in state

waters seasonally to accommodate the amplified effort in the spring through fall lobster fishery. Skates caught for lobster bait are landed whole by otter trawlers and either sold 1) fresh, 2) fresh salted, or 3) salted and strung or bagged for bait by the barrel. Inshore lobster boats usually use 2 – 3 skates per string, while offshore boats may use 3 – 5 per string. Offshore boats may actually "double bait" the pots during the winter months when anticipated weather conditions prevent the gear from being regularly tended. The presence of sand fleas and parasites, water temperature, and anticipated soak time between trips are determining factors when factoring in the amount of bait per pot.

Size is a factor that drives the dockside price for bait skates. For the lobster bait market, a "dinner plate" is the preferable size to be strung and placed inside lobster pots. Little and winter skates are rarely sorted prior to landing, as fishermen acknowledge that species identification between little skates and small winter skates is very difficult. Quality and cleanliness of the skate are also factors in determining the price paid by the dealer, rather than just supply and demand. The quantity of skates landed on a particular day has little effect on price because there has been ready supply of skates available for bait from the major dealers, and the demand for lobster bait has been relatively consistent. Numerous draggers and lobster vessels have historically worked out seasonal cooperative business arrangements with a stable pricing agreement for skates.

Due to direct, independent contracts between draggers and lobster vessels landings of skates are estimated to be under-documented. While bait skates are always landed (rather than transferred at sea) they are not always reported because they can be sold directly to lobster vessels by non-federally permitted vessels, which are not required to report as dealers.

Lobster bait usage varies regionally and from port to port, based upon preference and availability. Some lobstermen in the northern area (north of Cape Cod) prefer herring, mackerel, menhaden and hakes (whiting and red hake) for bait, which hold up in colder water temperatures; however, the larger offshore lobster vessels still indicate a preference for skates and Acadian redfish in their pots. Some offshore boats have indicated they will use soft bait during the summer months when their soak time is shorter. Skates used by the Gulf of Maine vessels are caught by vessels fishing in the southern New England area.

6.5.1.1 Catch

The skate fishery caught 105% of the overall ACL in FY 2016 (Table 12Table 13); this was an increase on FY 2015 landings (Table 13). No AMs were triggered in FY 2015 as there was no overage. The bait fishery caught 100.9% of the bait TAL. State landings in FY 2015 were 941 mt. Total live discards in 2015 were 37,895 mt and dead discards were 10,417.

Table 12 - FY 2016 Catch and Landings of Skates Compared to Management Specifications

Management Specification	Specification Amount	Catch/Landings (mt)	Percent Landed or Caught
ABC/ACL	31,081	24,549	79%
ACT (75% of ABC)	23,311	24,549	110%
Assumed Discards + State Landings	10,721	10,310	NA
TAL Bait	4,218	4,262	101%
TAL Wings	8,372	8,268	98.8%

Table 13 – Skate catch and landings (mt) in FY 2015

Management Specification	Specification Amount	Catch/Landings (mt)	Percent Landed or Caught
ABC/ACL	35,479	28,111	79.2%
ACT (75% of ABC)	26,609	28,111	106%
Assumed Discards + State Landings	10,224	11,781	NA
TAL Bait	5,489	5,541	100.9%
TAL Wings	10,896	8,911	81.8%

6.5.1.2 Recreational skate catches

In general, skates have little to no recreational value and are not intentionally pursued in any recreational fisheries. For the most recent available catch information (2010-2014) for Atlantic coast skates from MRIP refer to Framework 3 (NEFMC, 2016).

6.5.1.3 Landings by fishery and DAS declaration

Note that NMFS estimates commercial skate landings from the dealer weighout database and reports total skate landings according to *live weight* (i.e., the weight of the whole skate). This means that a conversion factor is applied to all wing landings so that the estimated weight of the entire skate is reported and not just the wings. While *live weight* is necessary to consider from a biological and stock assessment perspective, it is important to remember that vessels' revenues associated with skate landings are for *landed weight* (vessels in the wing fishery only make money for the weight of wings they sell, not the weight of the entire skate from which the wings came).

Due to the relative absence of recreational skate fisheries, virtually all skate landings are derived from regional commercial fisheries. Skates have been reported in New England fishery landings since the late 1800s. However, commercial fishery landings never exceeded several hundred metric tons until the advent of distant-water fleets during the 1960s (for a full description of historic landings please refer to Amendment 3, NEFMC, 2009). Total skate landings have fluctuated between two levels between FY 2010 and 2016, with the series low occurring in 2016 (Table 14). The fluctuations in landings are largely attributable to the wing fishery as landings in the bait fishery have remained relatively stable (Table 15).

Table 14 – Total Landings in the Skate Fisheries. Source: dealer data

Fishing Year	Landings (in lbs)
2010	32,844,238
2011	41,306,613
2012	33,196,290
2013	31,006,552
2014	34,504,146
2015	33,952,540
2016	30,521,612

Table 15 – Bait Landings between 2010 and 2016

FY	Landings (in lbs)
2010	10,020,271
2011	10,861,122
2012	10,789,031
2013	11,245,043
2014	9,386,666
2015	12,214,846
2016	10,181,728

Total fishing revenue from all species on active skate vessels increased slightly in 2016 (Table 16).

Table 16 - Total fishing revenue (all species) from active skate vessels

Year	Total Revenue
2010	198,924,262
2011	235,439,028
2012	194,252,170
2013	165,798,785
2014	173,074,746
2015	172,801,405
2016	184,729,451

Landings by DAS declaration indicate that a large portion of bait is landed while on a multispecies (sector and common pool) trip (Table 17). Landings under a monkfish declaration may be underestimated because of reporting. A large amount of total skate landings have no associated declaration.

Table 17 - Total skate landings (lbs live weight) by DAS program, FY2016

VMS Declaration	Bait
Mults Sector	2,116,142
Mults Common	1,953,895
Monkfish	22,425
Scallop	NA
Unmatched/No Declaration	3,255,435
DOF	2,833,613
Total	10,181,510

Source: NMFS, Fisheries Statistics Office

6.5.1.4 Trends in number of vessels

The number of skate permits has declined between FY 2009 and 2016. On a broader time scale, between FY2003 and 2016, there was an increase in skate permits with a high occurring in 2007 (Table 18).

Table 18 - Number of Skate Permits issued

AP_Year	Number of skate permits issued
2003	1,968
2004	2,391
2005	2,632
2006	2,675
2007	2,685
2008	2,633
2009	2,574
2010	2,503
2011	2,326
2012	2,265
2013	2,202
2014	2,147
2015	2,084
2016	2,074

The number of active skate permits has decreased between 2010 and 2016 (Table 19).

Table 19 - Number of Active Skate Permits between 2010 and 2016. Active is defined as a vessel landing more than 1 lb of skate

FY	Number of active skate permits
2010	551
2011	569
2012	527
2013	455
2014	450
2015	440
2016	415

6.5.1.5 Trends in revenue

Skate revenue decreased in FY2016, and may have been affected by the lower wing and bait TALs in FY2016 (Table 20). Bait skate revenue has remained relatively stable between 2010 and 2016 (Table 21).

Table 20 – Total Skate Revenue

FY	Revenue
2010	$ 6,318,464
2011	$ 9,339,118
2012	$ 7,554,998
2013	$ 7,663,276
2014	$ 9,302,431
2015	$ 6,336,348
2016	$ 5,503,413

Table 21 - Total Skate Revenue for Skate Bait Fishery between 2010 and 2016

FY	Revenue
2010	$ 1,161,331
2011	$ 1,711,431
2012	$ 1,391,065
2013	$ 1,199,273
2014	$ 1,161,520
2015	$ 1,128,315
2016	$ 1,120,241

6.5.2 Fishing Communities

There are over 100 communities that are homeport to one or more Northeast groundfish fishing vessels. These ports occur throughout the coastal northeast and mid-Atlantic. Consideration of the social impacts on these communities from proposed fishery regulations is required as part of the National Environmental Policy Act (NEPA) of 1969 and the Magnuson Stevens Fishery Conservation and Management Act, 1976. Before any agency of the federal government may take "actions significantly affecting the quality of the human environment," that agency must prepare an Environmental Assessment (EA) that includes the integrated use of the social sciences (NEPA Section 102(2)(C)). National Standard 8 of the MSA stipulates that "conservation and management measures shall, consistent with the conservation requirements of this Act (including the prevention of overfishing and rebuilding of overfished stocks), take into account the importance of fishery resources to fishing communities in order to (A) provide for the sustained participation of such communities, and (B) to the extent practicable, minimize adverse economic impacts on such communities" (16 U.S.C. § 1851(a)(8)).

A "fishing community" is defined in the Magnuson-Stevens Act, as amended in 1996, as "a community which is substantially dependent on or substantially engaged in the harvesting or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew and United States fish processors that are based in such community" (16 U.S.C. § 1802(17)). Determining which fishing communities are "substantially dependent" on, and "substantially engaged" in, the groundfish fishery can be difficult. In recent amendments to the fishery management plan the council has categorized communities dependent on the groundfish resource into primary and secondary port groups so that community data can be cross-referenced with other demographic information. Descriptions of 24 of the most important communities involved in the multispecies fishery and further descriptions of North East fishing communities in general can be found on North East Fisheries Science Center's website (http://www.nefsc.noaa.gov/read/socialsci/community_profiles/).

Although it is useful to narrow the focus to individual communities in the analysis of fishing dependence there are a number of potential issues with the confidential nature of the information. There are privacy concerns with presenting the data in such a way that proprietary information (landings, revenue, etc.) can be attributed to an individual vessel or a small group of vessels. This is particularly difficult when presenting information on small ports and communities that may only have a small number of vessels and that information can easily be attributed to a particular vessel or individual.

6.5.2.1 Overview of Ports

There were a total of 14 ports where bait skate were landed in 2016. Ports where skate bait are landed from Maine to Maryland. Skate bait was landed in 14 ports in 2015. The bait fishery decreased in terms of landings and number of ports (17 ports in 2014). Point Judith dominates skate bait landings.

Only 6 ports received at least $10,000 in FY 2016 from skate bait; 3 ports received at least $100,000 per year. Point Judith, RI, New London, CT, and Newport, RI were the highest grossing ports. There are 10 ports that landed at least 10,000 lbs of skate bait. As expected the top ports in landings were Point Judith, New London, and Newport.

Table 22 outlines commercial landings of skate bait by individual states from FY2012 – FY2016. Rhode Island continues to dominate the skate fishery, while Connecticut has increased landings during this time period. Skate bait was landed primarily in Point Judith, New London, Newport, and Belford in FY2016. Point Judith's landings have accounted for 45-69% of bait landings between 2012 and 2016. New London landings have increased somewhat in recent years, while landings in Fall River and New Bedford have decreased. Other ports such as Montauk have individual vessels which sell skate directly to lobster and other pot fishermen for bait, though there are no major skate bait dealers here. Bait skate is primarily landed by trawlers, often as a secondary species while targeting monkfish or groundfish. Since 2003, with the implementation of the original Skate FMP, all vessels landing skate must be on a groundfish Day-at-Sea (DAS).

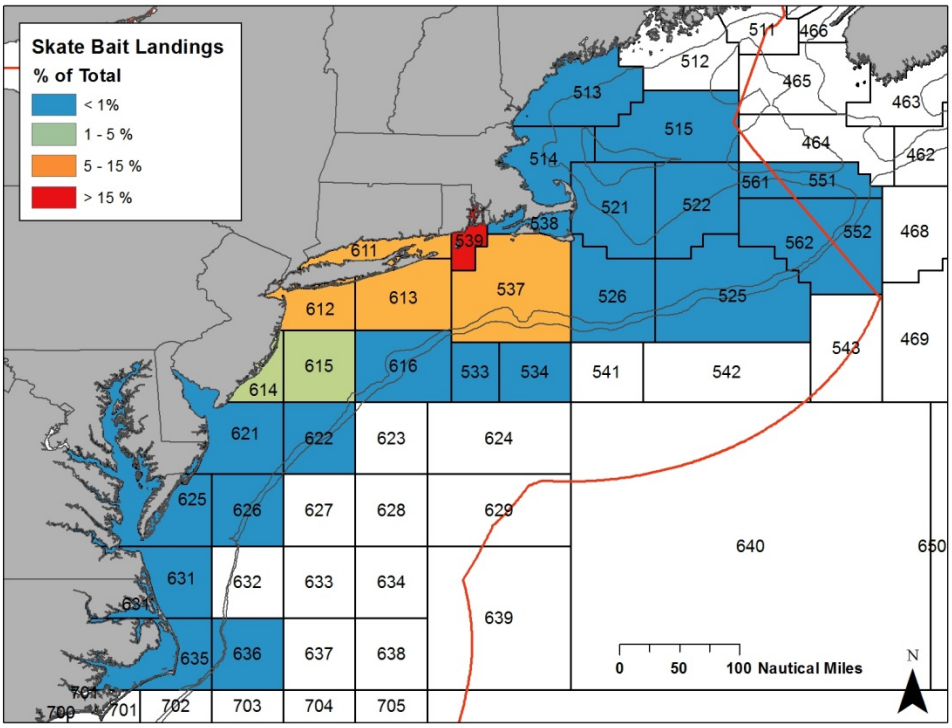
Table 22 - Total Skate landings by fishery and state

FY	Disposition	State	Revenue (in $)	Landings (in lbs)
2012	Bait	CT		
		MA	195,418	1,533,632
		MD	104	10,400
		NJ	326,497	753,598
		NY	62	357
		RI	868,893	8,467,734
		VA	91	905
	Bait Total		1,391,065	10,766,626
2013	Bait	CT	42	500
		MA	217,023	1,856,490
		MD	619	14,591
		NJ	144,865	998,360
		NY	15	68
		RI	836,709	8,306,442
	Bait Total		1,199,273	11,176,451
2014	Bait	CT	56,557	557,668
		MA	11,173	91,007
		MD	402	18,660
		NJ	299,547	780,849
		NY	472	9,186
		RI	793,369	7,929,296
	Bait Total		1,161,520	9,386,666
2015	Bait	CT	260,840	2,579,600
		MA	41,194	398,260
		MD	143	9,614
		ME	645	2,658
		NJ	65,115	737,093
		NY	302	6,515
		RI	760,076	7,149,250
	Bait Total		1,128,315	10,882,990
2016	Bait	CT	375,781	3,692,900
		MA	19,422	188,575
		MD	121	11,764
		NJ	64,009	707,726
		NY	669	11,010
		RI	660,239	5,534,233
	Bait Total		1,120,241	10,146,208

6.5.3 Skate Fishing Areas

Vessels landing bait skate generally fish in the inshore waters of SNE, are most often trawlers, and frequently fish in an exempted fishery (Figure 5).

Figure 5 - Skate bait landings by statistical area for FY 2014



Intentionally Blank

7.0 Environmental Consequences of the Alternatives

7.1 Biological Impacts

7.1.1 Modifications to Bait Skate Fishery Effort Controls

7.1.1.1 Option 1: No Action

This alternative would maintain current bait skate effort controls including the incidental possession limit, the skate bait trigger (90%), and the skate bait possession limit at 25,000 lbs, with a Letter of Authorization. Under Option 1, a second incidental possession limit could further limit the bait fishery if the incidental possession limit was also triggered for the skate wing fishery. If both incidental possession limits are in effect, this would effectively stop fishing in the bait fishery, as observed in FY2016, by reducing the limit to 500 lb (or 1135 lb whole weight).

The skate specifications were designed to prevent overfishing of the complex. The combination of the incidental possession limit and the trigger reduces the likelihood that the TAL would be exceeded. The large buffer between the TAL and the ABC also helps to ensure the ABC is not reached or exceeded. The bait fishery has not exceeded its TAL in recent years (Figure 6). In FY2016, the incidental possession limit was implemented in Seasons 1 and 3 in the bait fishery (Hermsen, 2017). However, the skate bait fishery was subject to lower specifications in FY2016.

Skate bait effort controls have typically been effective at keeping catch below the TAL and could be considered to have a moderately positive effect on the skate resource. In 2016, the bait fishery was essentially closed when the wing fishery was also reduced to its incidental possession limit, helping keep bait fishing under its TAL. If only the bait incidental possession limit was in place, fishing would continue at 9,307 lb in Season 3, and could potentially allow the bait fishery to exceed its TAL. If the TAL continues to drop or fishing continues at a higher rate in season 3, it is possible the TAL could be exceeded under this alternative, having a minor negative impact. Therefore, we expect No Action to continue to have a moderately positive impact on the skate resource, although the possibility exists for a slight negative impact if fishing continues after the incidental bait trigger is reached and the incidental wing trigger is not.

An analysis conducted in FW1 indicated that mortality decreased as possession limits decreased. Therefore, the higher possession limits in No Action and Option 3 would be expected to have low negative impacts on the skate complex relative to Options 2 and 4. However, the incidental possession limit and trigger would be expected to mitigate this effect by controlling total mortality.

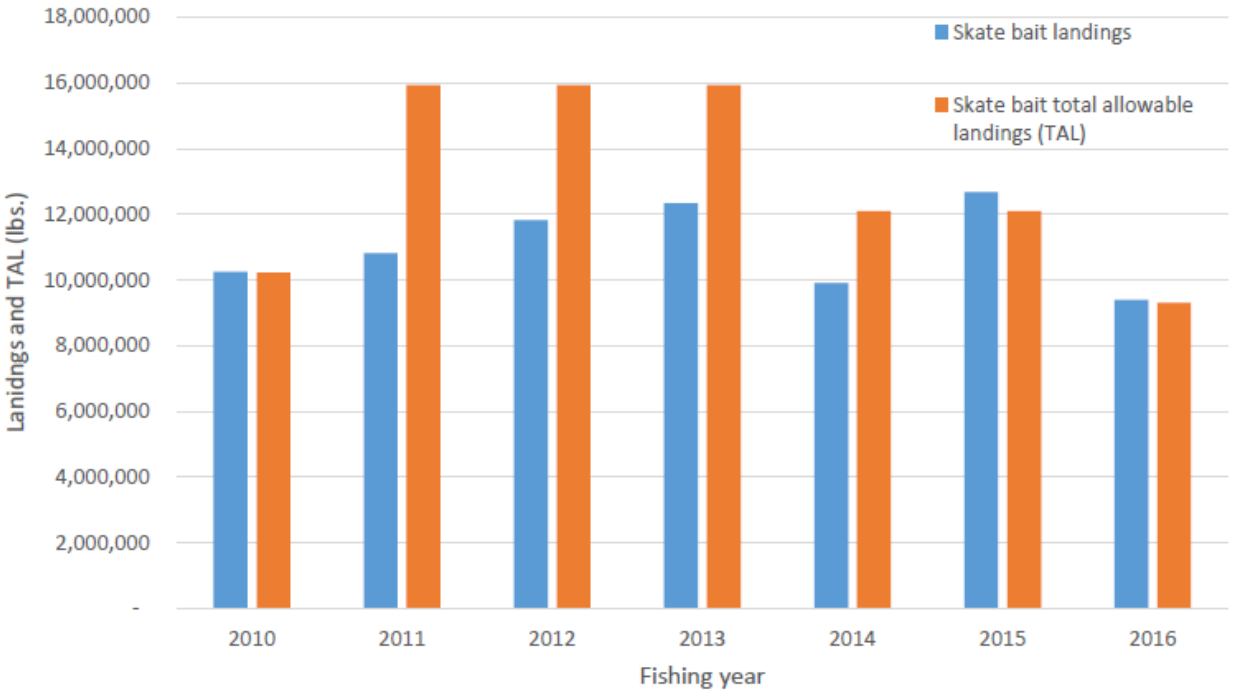


Figure 6 - Skate bait landings and total allowable landings by fishing year, FY2010-2016 (from Hermsen, 2017)

7.1.1.2 Option 2: Revised Skate Bait Possession Limit and Backstop

Option 2 would revise the skate bait possession limit for season 3 from 25,000 lb to 12,000 lb. An analysis conducted in FW1 indicated that mortality decreased as possession limits decreased. Because this alternative would reduce the possession limit a small reduction in mortality would be expected. The bait fishery exceeded its TAL twice (by 1-5%) in the last 7 fishing years (Figure 6). In order to achieve its TAL, the bait fishery may compensate for the reduced possession limit by increasing the number of trips taken, depending on the level of costs associated with extra trips and availability of DAS for more profitable fishing activity. If the number of trips increased, this would counteract the positive effects of lowering the possession limit in Season 3.

The majority of trips that occur land less than 6000 lb (Figure 7). The reduction in possession limit will affect the directed fishery, as evidenced by the reduction in fishing effort in FY2016 when the skate bait and skate wing incidental possession limits were both implemented (Figure 8). The 90% trigger would reduce directed fishing pressure, reducing the likelihood of the TAL being exceeded. The closure of the bait fishery would have a positive biological impact because the TAL could not be greatly exceeded.

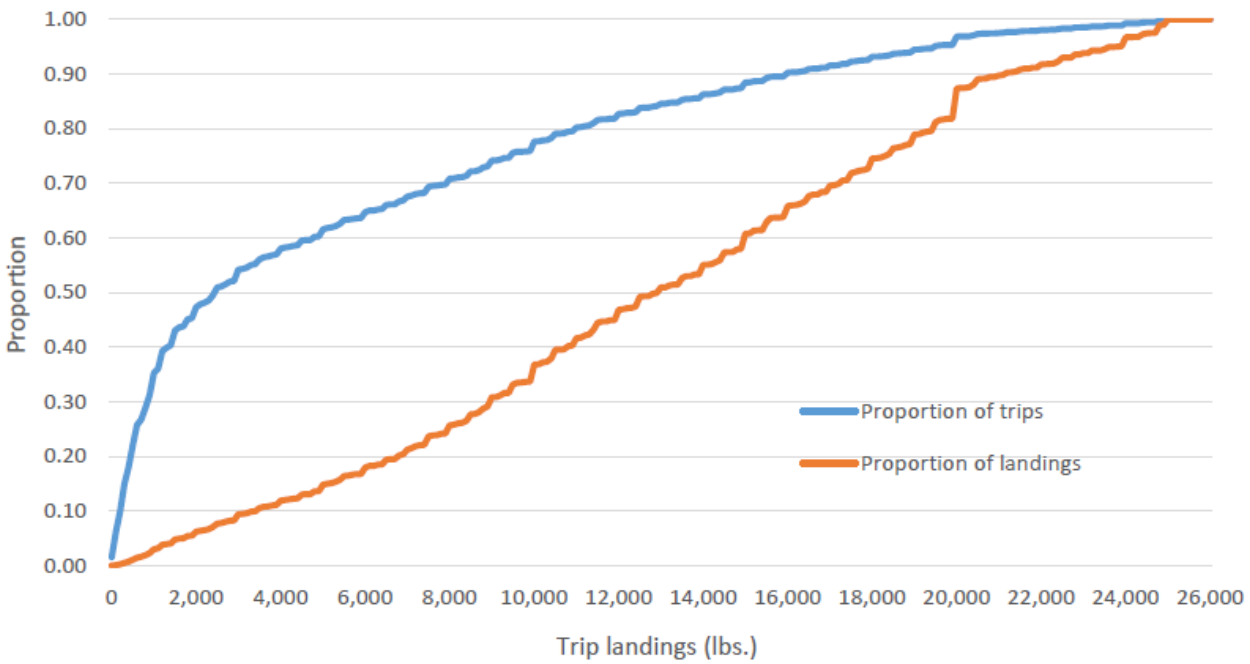


Figure 7 - Empirical cumulative distribution function of the proportion of trips and landings by landed pounds, FY2010-2016, all seasons (from Hermsen, 2017)

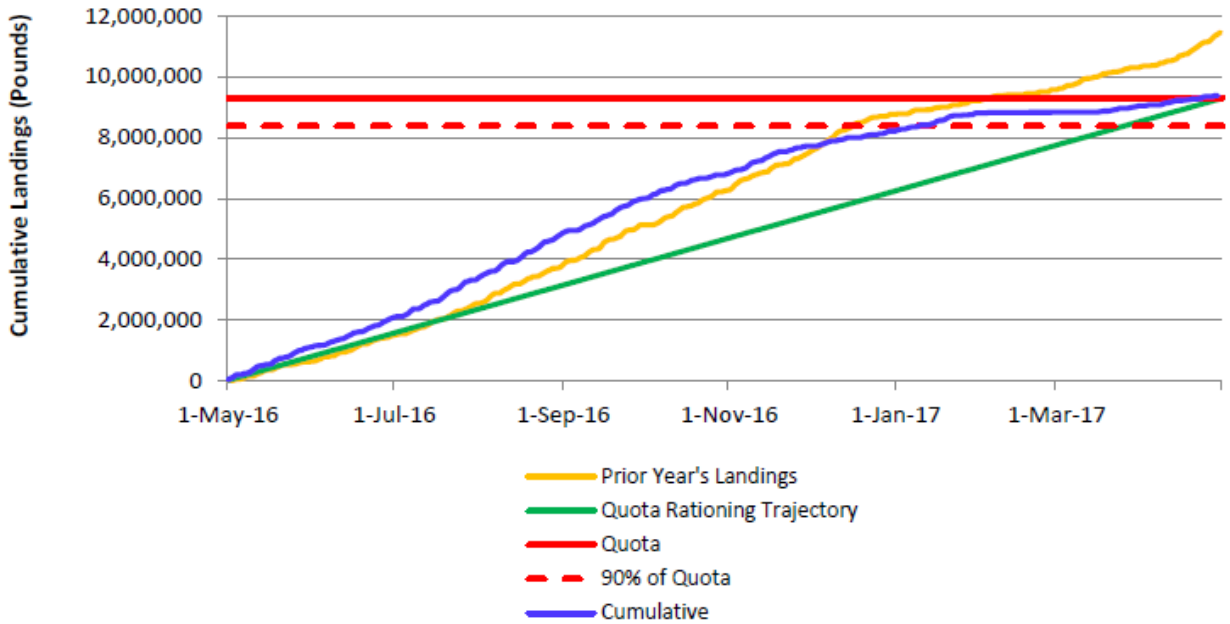


Figure 8 - Northeast Skate Complex Bait Fishery Weekly Report for week ending April 29, 2017

All the measures contained in this option would work together to keep bait skate landings below the TAL, which would have a positive biological impact. The TAL was analyzed as part of Framework 3 (NEFMC, 2016). Modifications of effort controls that enable full achievement of the TAL would not modify the neutral to low positive impact on the skate resource determined in Framework 3 (NEFMC, 2016).

This alternative therefore is expected to have low positive impacts on the skate complex when compared to No Action. The revised skate bait possession limit would increase the likelihood that the fishery would fully achieve its TAL, but depending on fishing behavior, it may not necessarily prevent the TAL from

being exceeded. The resultant closure from fully achieving the TAL, implemented by this option, would provide additional positive biological impacts.

Overall, this alternative would have neutral to low positive impacts on the complex because the combination of measures would prevent the TAL from being exceeded. Option 2 would have similar neutral to low positive impacts compared Options 3 and 4 but more positive impacts compared to Option 1.

7.1.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Backstop

Option 3 would maintain the current possession limit of 25,000 lb with a Letter of Authorization. It would reduce the trigger to 75%, with a closure once 100% of the TAL was achieved, and set the skate bait incidental limit as 9,307 lb.

This option relies on the closure once the bait skate TAL is fully achieved to provide positive biological impacts. The incidental possession limit and reduced trigger act more as mechanisms to prolong the fishery and reduce the likelihood of a closure occurring, providing socio-economic benefits. If the trigger is reached and the fishery was projected to exceed its TAL, the incidental possession limit would reduce directed fishing effort. Additionally, the skate specifications were designed to prevent overfishing of the complex. The large buffer between the TAL and the ABC also helps to ensure the ABC is not reached or exceeded. The closure, by making sure the TAL was not exceeded, would provide low positive biological impacts, similar to Option 2.

Overall, this alternative would have neutral to low positive impacts on the complex because it would prevent the TAL, and therefore the ABC, from being exceeded. Option 3 would have similar neutral to low positive impacts compared Options 2 and 4 but more positive impacts compared to Option 1.

7.1.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

Option 4 would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12, 000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons.

Because this alternative would reduce the possession limit, from 25,000 lb to 12,000 lb in Season 3, a small reduction in mortality would be expected. This alternative therefore is expected to have low positive impacts on the skate complex when compared to Option 1. The revised skate bait possession limit would increase the likelihood that the fishery would fully achieve its TAL, but depending on fishing behavior, it may not necessarily prevent the TAL from being exceeded.

The incidental possession limit and reduced trigger act more as mechanisms to prolong the fishery and reduce the likelihood of a closure occurring, providing socio-economic benefits. If the trigger is reached and the fishery was projected to exceed its TAL, the incidental possession limit would reduce directed fishing effort. Additionally, the skate specifications were designed to prevent overfishing of the complex. The large buffer between the TAL and the ABC also helps to ensure the ABC is not reached or exceeded. The closure, by making sure the TAL was not exceeded, would provide low positive biological impacts, similar to Options 2 and 3. The resultant closure from fully achieving the TAL, implemented by this option, would provide positive biological impacts.

The majority of trips that occur land less than 6000 lb (Figure 7). The reduction in possession limit will affect the directed fishery, as evidenced by the reduction in fishing effort in FY2016 when the skate bait and skate wing incidental possession limits were both implemented (Figure 8). The closure of the bait fishery, once the TAL was achieved, would have a positive biological impact because the TAL could not be greatly exceeded.

All the measures contained in this option would work together to keep bait skate landings below the TAL, which would have a positive biological impact. The TAL was analyzed as part of Framework 4 (NEFMC, 2016). Modifications of effort controls that enable full achievement of the TAL would not modify the neutral to low positive impact on the skate resource determined in Framework 3 (NEFMC, 2016).

Overall, this alternative would have neutral to low positive impacts on the complex because it would prevent the TAL, and therefore the ABC, from being exceeded. Option 4 would have similar neutral to low positive impacts compared Options 2 and 3 but more positive impacts compared to Option 1.

7.2 Biological Impact on non-target species and other discarded species

7.2.1 Modifications to Bait Skate Fishery Effort Controls

Analysis of the frequency of trips landing bait by weight for fishing effort in FYs 2012 - 2016 indicated a wide range of landings occurring (Figure 7). The bait possession limit alternatives are expected to have negligible impacts to non-skate species above those already analyzed for actions in the other FMPs (see Monkfish FW 10 [NEFMC, 2017], and NE Multispecies FW56 [NEFMC, 2017]). Monkfish FW 10 concluded that all actions combined (both current and future) would still result in Northern Fishery Management Area (NFMA) and Southern Fishery Management Area (SFMA) monkfish being considered rebuilt and not subject to overfishing and managed in a manner that would preserve the sustainability of the fishery over the long term. Monkfish FW10 resulted in minor changes and no significant cumulative impacts were expected for monkfish. NE Multispecies FW56 concluded that past and present impacts were expected to continue rebuild and maintain sustainable multispecies stocks, and yield positive non-significant impacts to managed resources in the long term. The proposed action is not expected to shift timing in fishing effort – the intention is to modify skate bait effort controls to allow fishing to occur throughout the fishing year. However, the addition of the closure once the bait TAL is achieved may have low positive impacts on non-target species if triggered, unless it results in unforeseen shifts to other fisheries.

7.3 Essential Fish Habitat (EFH) Impacts

7.3.1 Modifications to Bait Skate Fishery Effort Controls

7.3.1.1 Option 1: No Action

Option 1 would maintain current bait skate effort controls.

This alternative would maintain the existing possession limit, incidental possession limit, and trigger for the bait skate fishery. Vessels that obtain a Skate Bait Letter of Authorization would be able to retain up to 25,000 lb of whole skates. Incidental limits would be triggered at 90% of the season or annual limit (if the TAL was projected to be exceeded), and the whole weight equivalent of the wing possession limit would then apply. There would be no closure if 100% of the TAL is estimated. Option 1 would have low negative impacts on EFH because fishing effort would not be reduced in Season 3 in a fishery that uses a mobile bottom tending gear. However, fishing effort would not be expected to increase above currently observed levels. Option 1 may have low negative impacts on EFH compared to Options 2, 3, and 4 as fishing effort would not be reduced under this Option.

7.3.1.2 Option 2: Revised Skate Bait Possession Limit and Backstop

This alternative would reduce the Season 3 skate bait possession limit from 25,000 lb to 12,000 lb in Season 3, maintain the skate bait trigger and incidental possession limits linked to the wing fishery, and establish a closure for when 100% of the annual bait skate TAL was achieved.

The bait fishery is largely conducted on an as needed basis. The majority of trips attributed to the bait fishery use a NE Multispecies DAS as part of a sector or common pool trip, which is typically associated with trawl gear. A range of fishery responses to the reduced possession limit are possible. One possible outcome is that overall effort will be similar to effort under the higher possession limit, but spread over a longer period. However, it is difficult to predict changes in fishing behavior, and it is also possible that the lower bait limit may decrease effort in the bait fishery or result in an increased number of trips taken. While orders may remain high, such that same landings could be achieved during a larger number of trips, per-trip costs incurred by fishing may limit effort. If the lowest incidental limit of 1,153 lb per trip is triggered, effort will likely be reduced substantially, as occurred during January 2017. If effort is similar to that under no action, but spread more evenly across Season 3, impacts to habitat will likely be similar to current impacts as described under Option 1, i.e. low negative. A reduction in the usage of trawl gear, a mobile bottom-tending gear, would reduce interactions with habitat.

Under the no action alternative, fishing can continue at incidental amounts until the end of the fishing year, which continues impacts on habitat. Under Option 2, the fishery would close once 100% of the bait skate TAL was achieved, which could reduce interactions with habitat. Thus, impacts to EFH would likely decline under these lower limits, unless the total number of trips taken increased, and the backstop relative to No Action limits. However, impacts on EFH would be expected to be low negative as trawl gear is a mobile bottom tending gear and overall fishing effort would not be expected to significantly change.

Option 2 would have low positive impacts on EFH compared to Option 1, as fishing effort would likely be reduced under this Option. Option 2 would have similar low positive impacts compared to Options 3 and 4. Given that landings have been close to the TAL in recent years, it seems reasonable to assume that landings and effort will be similar across all options. Thus, the difference in impacts to habitat between the four options will likely be slight.

7.3.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Backstop

This alternative would maintain the existing 25,000 lb possession limit with a Letter of Authorization, but reduce the skate bait trigger by 10-15%, redefine the skate bait incidental possession limit to 9,307 lb, and establish a closure for when 100% of the annual bait skate TAL was achieved.

As for Option 3, a range of fishery responses are possible. Since the trigger is reduced, the incidental possession limit may be implemented earlier in the fishing year. This would reduce directed fishing effort, which would have low positive impacts on habitat since it would result from a reduction in the use of mobile bottom tending gear. However, an incidental limit of 9,307 lb is likely to support some level of directed fishing, and will not reduce effort the way a much lower limit of 1,135 lb might. Option 3 would also establish a backstop, which would stop skate bait fishing once 100% of the TAL was achieved instead of allowing incidental fishing to continue. This would further restrict directed fishing in the event the TAL was projected to be exceeded. Closing the bait fishery would reduce fishing effort, which would have low positive impacts on EFH. Overall impacts would be neutral to low positive because it would not affect EFH if it was not implemented.

Option 3 would have similar neutral to low positive impacts compared to Options 2 and 4. This option would have low positive impacts when compared to Option 1. As noted above, it seems reasonable to assume that landings and effort will be similar across all options since landings will likely approach the TAL. Thus, the difference in impacts to habitat between the four options will likely be slight.

7.3.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

Option 4 would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12, 000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons. As described for Option 2, the lower 12,000 lb bait limit during Season 3 would probably decrease effort in the bait fishery, which is largely conducted on an order by order basis. A reduction in the usage of trawl gear will reduce interactions with habitat. It is possible that orders will remain high and an increased number of trips will be necessary to achieve the TAL, however, per-trip costs incurred by fishing may limit effort. The reduction in the Season 3 trigger by 10% would allow for the potential for the incidental possession limit to be implemented earlier in the fishing year, therefore further reducing directed fishing effort. Similar to Option 3, a higher incidental limit will allow the directed bait fishery to continue, and will not reduce effort in the bait fishery the way a 1,135 lb trip limit would. In addition, fishery closure once 100% of the bait skate TAL was achieved could continue to reduce interactions with habitat. Under the no action alternative, fishing can continue at incidental amounts, possibly in excess of the TAL. However, impacts on EFH would be expected to be low negative as trawl gear is a mobile bottom tending gear and overall fishing effort would not be expected to significantly change.

Overall, the impacts to EFH would likely decline under Option 4 relative to No Action limits. Option 4 would have similar neutral to low positive impacts compared to Options 2 and 3. Again, it seems reasonable to assume that landings and effort will be similar across all options since landings will likely approach the TAL. Thus, the difference in impacts to habitat between the four options will likely be slight.

7.4 Impacts on Endangered and Other Protected Species (ESA, MMPA)

The protected resources that may be impacted by interactions with fishing gear used to catch skates are identified in Section 6.2**Error! Reference source not found.**.

7.4.1 Modifications to Bait Skate Fishery Effort Controls

7.4.1.1 Option 1: No Action

The No Action alternative would maintain the existing bait skate fishery effort controls, i.e. the existing possession limit, incidental possession limit, and trigger for the bait skate fishery, as those established in Framework 3 (NEFMC, 2016). The No Action alternative would also maintain the current trip limit of 25,000 lb with a Letter of Authorization. As a result, fishing effort and behavior would remain similar to current operating conditions (e.g., no spatial or temporal shifts in effort; no changes in gear type, quantity, or relative soak/tow time). The fishery is allowed to fish year-round for bait skate, restrictions on fishing throughout the fishing year result from the fishery being projected to exceed its seasonal or annual TAL resulting in the incidental possession limit being implemented. Under No Action, this does not close the fishery, unless the incidental possession limit is too low for a trip to be economically viable. It is difficult to predict when an incidental possession limit will be implemented and its effect on fishing behavior but previous closures have been for relatively short time periods, e.g. 6 weeks in FY2016. Following a closure, fishing behavior will resume, with no expected changes in effort relative to current operating conditions, as was seen in FY2016 when fishing resumed after the effective closure at a pace that achieved the bait TAL.

Significant changes in effort (e.g., gear quantity, soak/tow time, area fished), even if a closure occurs, are not expected under Option 1. As a result, fishing behavior is expected to remain similar to current operating conditions. Understanding expected fishing behavior/effort in a fishery informs potential interaction risks with protected species. Specifically, interaction risks with protected species are strongly associated with amount, time, and location of gear in the water; vulnerability of an interaction increases with increases, relative to respective fisheries current operating conditions, of any or all of these factors. Taking into consideration the latter, as well as fishing behavior/effort under the No Action (Option 1), impacts of the No Action to protected species are provided below:

MMPA (Non-ESA Listed) Protected Species Impacts

Impacts of the No Action on non-ESA listed marine mammals (i.e., species of cetaceans and pinnipeds) are somewhat uncertain as quantitative analysis has not been performed. However, we have considered, to the best of our ability, the most recent (2010-2014) information on non-ESA listed marine mammal interactions with commercial fisheries, of which, the skate fishery is a component (Hayes *et al*. 2017). Aside from pilot whales and several stocks of bottlenose dolphin, there has been no indication that takes of non-ESA listed species of marine mammals in commercial fisheries has gone above and beyond levels which would result in the inability of each species population to sustain itself (Hayes *et al*. 2017). Specifically, aside from pilot whales and several stocks of bottlenose dolphin, potential biological removal (PBR) has not been exceeded for any of the non-ESA listed marine mammal species identified in section 6.4 (Hayes *et al*. 2017). Although pilot whales and several stocks of bottlenose dolphin have experienced levels of take that have resulted in the exceedance of each species PBR, take reduction strategies and/or plans have been implemented to reduce bycatch in the fisheries affecting these species (Atlantic Trawl Gear Take Reduction Strategy, Pelagic Longline Take Reduction Plan effective May 19, 2009 (74 FR 23349); Bottlenose Dolphin Take Reduction Plan (BDTRP), effective April 26, 2006 (71 FR 24776)). These efforts are still in place and are continuing to assist in decreasing bycatch levels for these

species. Although the most recent five years of information presented in Hayes et al. (2017) is a collective representation of commercial fisheries interactions with non-ESA listed species of marine mammals, and does not address the effects of the skate fishery specifically, the information does demonstrate that thus far, operation of the skate fishery, or any other fishery, has not resulted in a collective level of take that threatens the continued existence of non-ESA listed marine mammal populations.

Based on the above information, and the fact that the skate fishery must comply with specific take reduction plans (i.e., HPTRP, BDTRP); and that voluntary measures exist that reduce serious injury and mortality to marine mammal species incidentally caught in trawl fisheries (see the Atlantic Trawl Gear Take Reduction Team), the No Action is expected to have low negative impacts on non-ESA listed species of marine mammals. However, as provided above, should closures occur in the fishery, as they have in the past under similar operating conditions as the No Action, some benefit to non-ESA listed species of marine mammals may be experienced. As any resultant closure in the fishery will result in zero effort in the bait fishery, we can conclude that there will be some reduction in the amount of gear being present in the water for a specific period of time. As provided above, interaction risks with protected species are strongly associated with amount, time, and location of gear in the water, with vulnerability of an interaction increasing with increases of any or all of these factors. Based on this information, any closure has the potential to reduce interaction risks with marine mammal species, thereby providing some benefit to marine mammals. However, the magnitude of this reduction in interactions is dependent on the period of time the closure is in place. Based on this uncertainty, at best we can conservatively say, should a closure occur, some low positive effect to these non-ESA listed marine mammal species will be experienced.

ESA Listed Species

The skate fishery is prosecuted with sink gillnet and bottom trawl gear. As provided in section 6.2, ESA listed species of whales, sea turtles, Atlantic sturgeon, and Atlantic salmon are vulnerable to interactions with this gear type, with interactions often resulting in the serious injury or mortality to the species. Based on this, the skate fishery is likely to result in some level some level of negative impacts to ESA listed species. Taking into consideration fishing behavior/effort under the No Action, as well the fact that interaction risks with protected species are strongly associated with amount, time, and location of gear in the water (with vulnerability of an interaction increasing with increases in of any or all of these factors), we determined the level of negative impacts to ESA listed species to be low. Below, we provide support for this determination.

As provided above, the No Action alternative will maintain the existing bait skate fishery effort controls, as well as the current trip limit of 25,000 lb with a Letter of Authorization. As a result, fishing behavior and effort in the skate fishery is expected to remain similar to what has been observed in the fishery over the last 5 or more years. Specifically, the number of bottom trawls or sink gillnets, tow or soak times, and area fished are not expected change significantly from current operating conditions. As noted above, interactions risks with protected species are strongly associated with amount, time, and location of gear in the water. Continuation of “status quo” fishing behavior/effort is not expected to change any of these operating conditions and therefore, the impacts of the No Action alternative on ESA listed species is expected to be low negative. However, as provided above, should closures occur in the fishery, as they have in the past under similar operating conditions as the No Action, some benefit to listed species may be experienced. As any resultant closure in the fishery will result in zero effort in the bait fishery, we can conclude that there will be some reduction in the amount of gear being present in the water for a specific period of time. As provided above, interaction risks with protected species are strongly associated with amount, time, and location of gear in the water, with vulnerability of an interaction increasing with increases of any or all of these factors. Based on this information, any closure has the potential to reduce

interaction risks with listed species, thereby providing some benefit to listed species. However, the magnitude of this reduction in interactions is dependent on the period of time the closure is in place. Based on this uncertainty, at best we can conservatively say, should a closure occur, some low positive effect to listed species will be experienced.

Overall Impacts to Protected Species

Based on the above protected species impact analysis, overall impacts of Option 1 on protected species (ESA listed and MMPA protected) are expected to range from low negative to low positive. Relative to Options 2 and 3, Option 1 may result in neutral to more negative impacts to protected species as fewer measures to reduce directed fishing once the TAL has been achieved could result in continued fishing effort, which may equate to increased interactions with protected species.

7.4.1.2 Option 2: Revised Skate Bait Possession Limit and Backstop

Option 2 would reduce the Season 3 skate bait possession limit, maintain the skate bait trigger, and establish a closure for when 100% of the annual bait skate TAL was achieved. The reduction in the possession limits may result in less, or restricted, directed fishing effort. The implementation of the closure when 100% of the TAL was achieved would end fishing for skate bait at that point and reduce interactions with protected resources at that point. Further, since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish DAS, fishing effort on skates are largely constrained by other FMPs. As a result, fishing effort would not only be restricted by the specifications, but also by the above nature of the fishery and the associated AMs that account for any overage of ACLs. However, as only a small number of trips land the full bait trip limit in a fishing year, the likelihood that any changes in possession limit, as proposed by Option 2, would result in changes in fishing behavior that differ from status quo conditions is unlikely. The intention of Option 2 is to reduce the likelihood of the incidental possession limit or backstop from being implemented and truncating the fishing year. Option 2 is designed to maximize the potential to allow fishing to continue throughout the entire fishing year and therefore no temporal shifts in fishing would be expected. The fishery is allowed to fish year-round for bait skate, restrictions on fishing throughout the fishing year result from the fishery being projected to exceed its seasonal or annual TAL resulting in the incidental possession limit being implemented or the backstop being implemented. Under Option 2, the fishery would close if 100% of the TAL was landed before the end of the fishing year. Despite this option being specifically designed to prevent the TAL from being fully achieved before the end of the fishing year, it is still possible for the backstop to be utilized.

Based on this information, impacts to protected species are not expected to be any greater than those under status quo conditions (see Option 1, Section 7.4.1.1), and in fact, may be less than status quo conditions. Specifically, fishing effort is likely to remain similar to status quo conditions or potentially decrease; the latter potentially equates to less fishing time, and therefore, gear being present in the water for a shorter trip duration. As protected species (ESA listed and MMPA species) interactions with gear, regardless of listing status, is greatly influenced by the amount of gear, and the duration of time gear is in the water, any decrease in either of these factors will reduce the potential for protected species interactions with gear and therefore, reduce the potential for serious injury or mortality to these species. As any resultant closure in the fishery will result in zero effort in the bait fishery, we can conclude that there will be some reduction in the amount of gear being present in the water for a specific period of time. Based on this information, any closure has the potential to reduce interaction risks with listed species, thereby providing some benefit to listed species. However, the magnitude of this reduction in interactions is dependent on the period of time the closure is in place. Based on this uncertainty, at best we can conservatively say, should a closure occur, some low positive effect to listed species will be experienced. As a result, Option 2 may have some positive impacts on protected species by incorporating a closure

once the TAL is reached and by the nature of Option 2 in of itself (i.e., reduction in the possession limits may result in less, or restricted, directed fishing effort). Taking this into consideration, relative to Option 1, impacts of Option 2 could be neutral to moderately positive. As provided above, as only a small number of trips land the full bait trip limit in a fishing year, the likelihood that any changes in possession limit, as proposed by Option 2, would result in large scale changes in fishing behavior that differ from status quo conditions is unlikely. Instead impacts of the lower possession limit would be felt by the vessels directing on bait skate. If fishing effort decreases as a result of a reduction in directed trips under a lower possession limit, and/ or a closure is put into effect, relative to Option 1, Option 2 would have more of a positive impact on protected species. Relative to Options 3 and 4, Option 2 would have neutral impacts to protected species as both options would modify skate bait effort controls to reduce the likelihood that the TAL would be exceeded resulting in similar possible changes in fishing behavior/effort and therefore, similar potential impacts to protected species (i.e., potential reduction in interactions).

7.4.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Backstop

Option 3 would maintain the existing 25,000 lb possession limit with a Letter of Authorization. However, the skate bait trigger would be reduced by 10-15%. This allows for the potential for the incidental possession limit to be implemented earlier in the fishing year, therefore reducing directed fishing effort. Option 3 would also establish a backstop, which would stop skate bait fishing once 100% of the TAL was achieved instead of allowing incidental fishing to continue. This would further restrict directed fishing in the event the TAL was projected to be exceeded. In addition, Option 3, would close the fishery if 100% of the TAL was landed before the end of the fishing year.

Based on this information, impacts to protected species are not expected to be any greater than those under status quo conditions (see Option 1, Section 7.4.1.17.1.1.1), and in fact, may be less than status quo conditions. Specifically, fishing effort is likely to remain similar to status quo conditions or potentially decrease as the measures under Option 3, if implemented, have the potential to constrain effort. The latter potentially equates to less fishing time, and therefore, gear being present in the water for a shorter duration. As protected species (ESA listed and MMPA species) interactions with gear, is greatly influenced by the amount of gear, and the duration of time gear is in the water, any decrease in either of these factors will reduce the potential for protected species interactions with gear and therefore, reduce the potential for serious injury or mortality to these species. As any resultant closure in the fishery will result in zero effort in the bait fishery, we can conclude that there will be some reduction in the amount of gear being present in the water for a specific period of time. Based on this information, any closure has the potential to reduce interaction risks with listed species, thereby providing some benefit to listed species. However, the magnitude of this reduction in interactions is dependent on the period of time the closure is in place. Based on this uncertainty, at best we can conservatively say, should a closure occur, some low positive effect to listed species will be experienced. As a result, Option 3 may have some positive impacts on protected species. Based on this information, relative to Option 1, Option 3 would have a neutral to moderately positive impact on protected resources because its measures, if implemented, constrain fishing effort and therefore, have a greater potential to reduce interactions with protected species relative to Option 1. Relative to Option 2 and 4, Option 3 would have neutral impacts to protected species as both options would modify skate bait effort controls to reduce the likelihood that the TAL would be exceeded resulting in similar possible changes in fishing behavior/effort and therefore, similar potential impacts to protected species (i.e., potential reduction in interactions).

7.4.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

Option 4 would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12, 000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons.

Option 4 would reduce the Season 3 skate bait possession limit, maintain the skate bait trigger, and establish a closure for when 100% of the annual bait skate TAL was achieved. The reduction in the possession limits may result in less, or restricted, directed fishing effort. The implementation of the closure when 100% of the TAL was achieved would end fishing for skate bait at that point and reduce interactions with protected resources at that point. Further, since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish DAS, fishing effort on skates are largely constrained by other FMPs. As a result, fishing effort would not only be restricted by the specifications, but also by the above nature of the fishery and the associated AMs that account for any overage of ACLs. However, as only a small number of trips land the full bait trip limit in a fishing year, the likelihood that any changes in possession limit, as proposed by Option 4, would result in changes in fishing behavior that differ from status quo conditions is unlikely.

The reduction in the skate bait trigger by 10% in Season 3 would allow for the potential for the incidental possession limit to be implemented earlier in the fishing year, therefore reducing directed fishing effort.

The fishery is allowed to fish year-round for bait skate, restrictions on fishing throughout the fishing result from the fishery being projected to exceed its seasonal or annual TAL resulting in the incidental possession limit being implemented or the backstop being implemented. Under Option 4, the fishery would close if 100% of the TAL was landed before the end of the fishing year. Despite this option being specifically designed to prevent the TAL from being fully achieved before the end of the fishing year, it is still possible for the backstop to be utilized. This would be expected to have a positive effect on protected resources because it would reduce interactions with protected resources. However, if the possession limits perform well, the fishing would not be closed for a long period of time and any positive effect would be minor given the timeframe.

Based on this information, impacts to protected species are not expected to be any greater than those under status quo conditions (see Option 1, Section 7.4.1.17.1.1.1), and in fact, may be less than status quo conditions. Specifically, fishing effort is likely to remain similar to status quo conditions or potentially decrease; the latter potentially equates to less fishing time, and therefore, gear being present in the water for a shorter duration. As protected species (ESA listed and MMPA species) interactions with gear, regardless of listing status, is greatly influenced by the amount of gear, and the duration of time gear is in the water, any decrease in either of these factors will reduce the potential for protected species interactions with gear and therefore, reduce the potential for serious injury or mortality to these species. As any resultant closure in the fishery will result in zero effort in the bait fishery, we can conclude that there will be some reduction in the amount of gear being present in the water for a specific period of time. Based on this information, any closure has the potential to reduce interaction risks with listed species, thereby providing some benefit to listed species. However, the magnitude of this reduction in interactions is dependent on the period of time the closure is in place. Based on this uncertainty, at best we can conservatively say, should a closure occur, some low positive effect to listed species will be experienced. As a result, Option 4 may have some positive impacts on protected species. Taking this into consideration, relative to Option 1, impacts of Option 4 could be neutral to low positive impacts. As provided above, as only a small number of trips land the full bait trip limit in a fishing year, the likelihood that any changes in possession limit, as proposed by Option 4, would result in large scale changes in fishing behavior that differ from status quo conditions is unlikely. Instead impacts of the lower possession limit would be felt by the vessels directing on bait skate. If fishing effort decreases as a result of a reduction in directed trips under a lower possession limit, relative to Option 1, Option 4 would have more

of a positive impact on protected species. Relative to Options 2 and 3, Option 4 would have neutral impacts to protected species as both options would modify skate bait effort controls to reduce the likelihood that the TAL would be exceeded resulting in similar possible changes in fishing behavior/effort and therefore, similar potential impacts to protected species (i.e., potential reduction in interactions).

7.5 Economic Impacts

7.5.1 Modifications to Bait Skate Fishery Effort Controls

Alternatives for modifying the bait skate effort controls are described in Section 4.1.

7.5.1.1 Option 1: No Action

This action would keep the skate bait possession limit constant at 25,000 lb. For the bait fishery, 101% and 105% of the TAL was achieved in FY2015 and FY2016, respectively, under status quo possession limits. Total federally-reported skate bait landings in FY2014, FY2015, and FY2016 were 4,497 mt, 5,749 mt, and 4,264 mt respectively. The incidental possession limit trigger was reached twice in FY2016, at the end of Season 1 and in Season 3 (in January 2017). The TAL was lower in FY2016 than in FY2015 and appeared to be restricting to fishing effort because the implementation of the incidental possession limit in Season 3 resulted in an effective closure of the bait skate fishery. Between FY2012 and FY2015, less than 5% of total trips landed within 1,000 lb of the possession limit (Figure 7). Approximately 50% of the trips occurring are landing less than 5,000 lb of skate bait. Option 1 would be expected to have low negative impacts because the fishery would be expected to trigger the incidental possession limit early in Season 3, which would reduce directed effort. The negative economic impacts would be increased if the wing fishery had also triggered its incidental limit at the same time as the bait fishery, which was observed to effectively close the skate bait fishery in FY2016.

Compared to Options 2, 3, and 4, Option 1 would have more negative economic impacts because it would not reduce the likelihood of the incidental possession limit being implemented, which would result in an effective closure of the fishery.

7.5.1.2 Option 2: Revised Skate Bait Possession Limit

This action would reduce the Season 3 skate bait possession limit, maintain the skate bait trigger, and establish a closure for when 100% of the annual bait skate TAL was achieved. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial fishing year because of a closure. The additional trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. The lowest possible incidental possession limit was shown to effectively close the fishery in F2016; the closure once the TAL was reach would have the same effect. This would have a negative economic impact. However, it would only happen once the TAL was fully achieved. The lower seasonal possession limit is intended to reduce the likelihood of closing the fishery, while allowing the TAL to be fully achieved. Overall, low positive impacts would be expected from Option 2 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year.

Option 2 would have similar low positive impacts compared to Options 3 and 4 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 2 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

7.5.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Backstop

This action would maintain the existing skate bait possession limit, reduce the skate bait trigger, redefine the skate bait incidental possession limit, and establish a closure for when 100% of the annual bait skate TAL was achieved. The higher seasonal possession limit would allow vessels to continue to optimize revenues while the fishery is open. The combination of this higher seasonal possession limit and the low TAL in FY2017, in the short term this may result in low negative economic impacts if the lower trigger is reached. However, the revised incidental limit would be higher and may not be economically distinct compared to the 12,000 lb possession limit proposed in Option 2. The closure of the fishery once 100 % of the TAL was achieved would also have similar negative impacts when compared to Option 2. If fishing patterns in FY2017 follow a similar trend to those in FY2016, the incidental possession limit could be expected to be implemented in Season 3. The modified trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. The lowest possible incidental possession limit was shown to effectively close the fishery in F2016; the closure once the TAL was reach would have the same effect. This would have a negative economic impact. However, it would only happen once the TAL was fully achieved. The lower seasonal possession limit is intended to reduce the likelihood of closing the fishery, while allowing the TAL to be fully achieved. Overall, low positive impacts would be expected from Option 2 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year.

Option 3 would have similar low positive impacts compared to Options 2 and 4 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 3 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

The data from Biological Impacts, section 7.1 of this document, are the basis for this economic analysis. The Fishing Year 2015 (FY2015) is used for simulation, because it is the most recent year during which incidental possession limits and closures do not occur.

The data are composed of bait skate fishing trips from both Dealer (CFDBS) and Vessel Trip Report (VTR) NOAA databases. The Dealer data are subset, and monthly prices are calculated. These monthly prices are merged with the VTR data, and skate revenues are generated for each trip. A sequence of programs is run, for each option, for each season, to determine the day that incidental possession limits are imposed, and when the bait fishery is closed. Cumulative live landings are compared with the seasonal quotas, and for Season 3 they are measured against the annual TAL, to make these determinations. Each bait trip's skate landings are adjusted, if necessary, for the incidental possession limit or closure, and skate revenues recalculated. Adjusted landings and revenues are subtracted from the actual numbers, for FY2015, to simulate the expected losses for each option. No adjustment is made to any by-catch of other species.

The losses generated in this manner represent the impact on bait skate trips only. The vessels involved in this fishery may also have wing skate trips and other fishery trips, during the fishing year.

Table 23 examines the economic impact on bait skate fleet, using the combination data described above and trip level Dealer data for FY 2015. There are over 4,000 fishing vessels in the Dealer database from May 2015 to April 2016, of which 435 land some skate (see Table 23, first two rows). These 435 vessels land over 153 million pounds of fish, worth over 173 million dollars (average price, $1.13). These same 435 vessels make skate trips, both wing and bait, and land 20 million pounds worth 5.5 million. Finally, 63 of these vessels land 11.9 million pounds of bait skate, worth 1,781 thousand dollars (average price,

$0.15). Notice that these 63 bait skate vessels have a higher proportion of landings and revenues from bait skate trips, compared to their total landings and revenues, as do all 435 skate vessels.

Table 23 - Skate vessel landings, revenues, and prices FY2015

CFDBS:	**Number of vessels**	**Landings***	**Revenues**	**Price**
All trips, all species	435	153,064,605	173,492,252	$1.13
All trips, all skates	435	20,003,244	5,558,816	$0.28
Bait vessels, total	63	25,849,958	13,182,764	$0.51
Bait vessels, all skates	63	11,899,846	1,781,428	$0.15
TAL FY2017		**9,299,002**		
*Bait skate landing limit analysis**:*				
Bait trips, skates	71	12,684,103	1,318,160	$0.10
Option 2	71	9,257,408	955,096	$0.10
Option 2, loss	28	3,426,695	363,064	$0.11
Option 3 – 75%	71	9,296,199	958,015	$0.10
Option 3-75, loss	28	3,387,904	360,144	$0.11
Option 3 – 80%	71	9,298,764	957,020	$0.10
Option 3-80, loss	31	3,385,339	361,140	$0.11

*Landed pounds of wings and bait
**see section 7.1

Below the **TAL** row in Table 23 are the combination data from the Bait skate landing limit analysis, as adjusted above. Seventy-one bait skate vessels are found in this database, because 8 vessels have trips recorded in the VTR but not the Dealer database, for FY 2015. These 71 vessels landed 12,684,103 pounds worth $1,318,160, with an average price of 10 cents. Simulating Option 2 results in 9,257,408 pounds and $955,096, or a loss of 3,426,695 pounds and $363,064, for the bait skate fleet. While this loss in expected revenues is 27.5 % of the $1.3 million from bait skate trips, it is only 2.7 % of their total revenues from all fishing trips (even with 8 boats missing from the total).

However, only 28 of the 71 bait skate vessels bear the entire loss. For a closer look at those vessels most affected, see the Initial Regulatory Flexibility Analysis (IRFA).

Option 3 has two simulations, one with a trigger of 75 % of the seasonal/annual TAL, and one with a trigger of 80 %. The numbers may be interpreted as for Option 2 above. Option 3 – 75% has a 27.3 % loss of revenues from bait trips and a 2.7 % loss from total trips; Option 3 – 80% has losses of 27.4 % and 2.7 %, respectively. Option 3 – 80% also affects a few more boats; 31 bait skate vessels suffer losses.

Comparing the prices as different types of fishing trips are added is of some interest. The bait skate fishery averages 10 to 11 cents per pound during FY 2015 (bottom section of Table 23). When all skate trips, wing and bait, are included the price increases, for the bait vessels, to 15 cents per pound. And when all fishing trips taken by the bait skate vessels during FY 2015 are included, the average price is 51 cents per pound. By comparison, the entire skate fishery (both wing and bait) of 435 vessels receives and average price of 28 cents per pound on skate trips, and $1.13 for all fishing trips.

Table 24 - Revenues, landings, and percent TAL achieved for all options with alternative trip possession limits (FY2015)

Option	*Limits*	*Threshold Date*	*Closure*	*Revenue Loss*	*Percent Loss*	*Truncated Landings*	*Percent of TAL*
2	25,000 12,000/ 8,000	Oct. 15 Dec. 7	Oct. 27 Apr. 13	$363,063	27.5%	9,257,408	99.5%
3 – 75% Trigger	25,000/ 9307	Jul. 22 Oct. 5 Nov. 21	 Mar. 20	$360,144	27.3%	9,296,199	99.9%
3 – 80% Trigger	25,000/ 9307	Jul. 25 Oct. 8 Nov. 28	 Oct. 31 Mar. 13	$361,139	27.4%	9,298,764	99.99%

Actual revenues = $1,318,159 Actual landings = 12,684,103 TAL = 9,299,002

Only Option 2 has more than one initial possession limit, which includes a limit of 12,000 pounds to start Season 3 in November. The incidental limit, however, is lower for Option 2; 8000 pounds versus 9307 for the two Option 3 alternatives. Closures are similar for Options 2 and 3(80%), with a difference of one month between the Season 3 closure (April 13 versus March 13, respectively). Option 3 (75%) only has one closure, starting on March 20. Revenue losses are extremely similar, as mentioned above, as are the Percent of TAL expected to be landed. Option 2 is slightly farther from the TAL.

As the differences between the percentage of lost revenues are negligible, the operational features of the three options may be of interest, and are presented in Table 24.

7.5.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

Option 4 would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12, 000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons.

These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial fishing year because of a closure. The reduced trigger in Season 3, revised incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented.

The revised incidental limit would prevent an effective closure from occurring if the wing incidental possession limit was also in place. This would have low positive economic impacts because it would allow fishing to continue at a lower level. The closure of the fishery once 100 % of the TAL was achieved would also have similar negative impacts when compared to Options 2 and 3. If fishing patterns in FY2017 follow a similar trend to those in FY2016, the incidental possession limit could be expected to be

implemented in Season 3. The modified trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. The lower seasonal possession limit is intended to reduce the likelihood of closing the fishery, while allowing the TAL to be fully achieved. Overall, low positive impacts would be expected from Option 4 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year.

Option 4 would have similar low positive impacts compared to Options 2 and 3 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 4 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

7.6 Social Impacts

7.6.1 Modifications to Bait Skate Fishery Effort Controls

Bait skate effort controls are described in Section 4.1 and include decreases in the possession limit and trigger, and an increase in the incidental possession limit.

7.6.1.1 Option 1: No Action

This action would keep the skate bait possession limit constant at 25,000 lb For the bait fishery, 101% and 105% of the TAL was achieved in FY2015 and FY2016, respectively, under status quo possession limits. Total federally-reported skate bait landings in FY2014, FY2015, and FY2016 were 4,497 mt, 5,749 mt, and 4,264 mt respectively. The incidental possession limit trigger was reached twice in FY2016, at the end of Season 1 and in Season 3 (in January 2017). The TAL was lower in FY2016 than in FY2015 and appeared to be restricting to fishing effort. The implementation of the incidental possession limit in Season 3 resulted in an effective closure of the bait skate fishery. Between FY2012 and FY2015, less than 5% of total trips landed within 1,000 lb of the possession limit (Figure 7). Approximately 50% of the trips occurring are landing less than 5,000 lb of skate bait. Option 1 would be expected to have low negative social impacts because the fishery would be expected to trigger the incidental possession limit early in Season 3, which would reduce directed effort. The negative impacts would be increased if the wing fishery had also triggered its incidental limit at the same time as the bait fishery, which was observed to effectively close the skate bait fishery in FY2016. Any closures in the bait fishery would be expected to negatively affect Rhode Island because the majority of landings occur in that state.

Compared to Options 2, 3, and 4, Option 1 would have more negative social impacts because Option 1 does not reduce the likelihood of the incidental possession limit being implemented, which would result in an effective closure of the fishery.

7.6.1.2 Option 2: Revised Skate Bait Possession Limit

This action would reduce the Season 3 skate bait possession limit, maintain the skate bait trigger, and establish a closure for when 100% of the annual bait skate TAL was achieved. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts and therefore social impacts because this would spread revenues throughout the fishing year as opposed to a partial fishing year because of a closure. The additional trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an impact if they were implemented. The lowest possible incidental possession limit was shown to effectively close the fishery in F2016; the closure once the TAL was reach would have the same effect. However, it would only happen once the TAL was fully achieved. Overall, low positive impacts would be expected from Option 2 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year.

Option 2 would have similar low positive impacts compared to Options 3 and 4 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 2 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

7.6.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Backstop

This action would maintain the existing skate bait possession limit, reduce the skate bait trigger, redefine the skate bait incidental possession limit, and establish a closure for when 100% of the annual bait skate TAL was achieved. The higher seasonal possession limit would allow vessels to continue to optimize revenues while the fishery is open. The combination of this higher seasonal possession limit and the low TAL in FY2017, in the short term this may result in low negative social impacts if the lower trigger is reached. However, the revised incidental limit would be higher and may not be economically distinct compared to the 12,000 lb possession limit proposed in Option 2. The closure of the fishery once 100% of the TAL was achieved would also have similar negative impacts when compared to Option 2. However, it would only happen once the TAL was fully achieved. The lower seasonal possession limit in intended to reduce the likelihood of closing the fishery, while allowing the TAL to be fully achieved. Overall, low positive impacts would be expected from Option 2 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year

Option 3 would have similar low positive impacts compared to Options 2 and 4 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 3 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

7.6.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

Option 4 would maintain the 25,000 lb possession limit and 90% trigger in Seasons 1 and 2. It would reduce the Season 3 possession limit to 12, 000 lb, reduce the trigger in Season 3 to 80%, and implement a closure once 100% of the TAL was achieved. This option would also redefine the incidental possession limit to be 8,000 lb in all seasons. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts and therefore social impacts because this would spread revenues throughout the fishing year as opposed to a partial fishing year because of a closure. The reduced trigger in Season 3, revised incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented.

The revised incidental limit would prevent an effective closure from occurring if the wing incidental possession limit was also in place. This would have low positive economic impacts because it would allow fishing to continue at a lower level. The closure of the fishery once 100 % of the TAL was achieved would also have similar negative impacts when compared to Options 2 and 3. The modified trigger, incidental possession limit, and closure measures would ensure that the TAL was not exceeded and would only have an economic impact if they were implemented. The lower seasonal possession limit is intended to reduce the likelihood of closing the fishery, while allowing the TAL to be fully achieved. Overall, low positive impacts would be expected from Option 4 because it would increase the likelihood that the fishery could be prosecuted for the entire fishing year.

Option 4 would have similar low positive impacts compared to Options 2 and 3 because these 3 alternatives are intended to reduce negative economic impacts caused by an effective closure of the fishery. Option 4 would have more positive impacts compared to Option 1 because Option 1 does not reduce the likelihood that the incidental possession limit would be implemented, which would result in an effective closure.

7.7 Cumulative Effects Analysis

The need for a cumulative effects analysis (CEA) is referenced in the CEQ regulations implementing NEPA (40 CFR Part 1508.25). CEQ regulations define cumulative impacts as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other action." The purpose of this CEA is to consider the effects of the Proposed Action and the combined effects of many other actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective; rather, the intent is to focus on those effects that are truly meaningful. This section serves to examine the potential direct and indirect effects of the alternatives in Framework 3 together with past, present, and reasonably foreseeable future actions that affect the skate environment. It should also be noted that the predictions of potential synergistic effects from multiple actions, past, present and/or future will generally be qualitative in nature.

Valued Ecosystem Components (VECs): The CEA focuses on VECs, specifically including:

- Physical environment/habitat (including EFH);
- Regulated stocks (skate complex);
- Non-target species and bycatch;
- Protected resources/endangered species; and
- Human communities.

Temporal and Geographic Scope of the Analysis: The temporal range that will be considered for habitat, allocated target species, non-allocated target species and bycatch, and human communities, extends from 2010, the year that Amendment 3 was implemented, through May 1, 2020, the beginning of the 2020 specifications cycle. While the effects of actions prior to Amendment 3 are considered (see Amendment 3 for a full cumulative effects analysis), the cumulative effects analysis for this action is focused primarily on Amendment 3 and subsequent actions because Amendment 3 implemented ACLs for skates and included major changes to management of the skate fishery. For endangered and protected species, the context is largely focused on the 1980s and 1990s, when NMFS began generating stock assessments for marine mammals and turtles that inhabit waters of the U.S. EEZ. In terms of future actions, this analysis examines the period between the expected implementation of this framework (May 1, 2018) and 2023.

The broad geographic scope considered for cumulative effects to habitat, allocated target species, and non-allocated target species and bycatch consists of the range of species, primary ports, and geographic areas (habitat) discussed in Section 6.0 (Affected Environment) of the document. Similarly, the range of each endangered and protected species as presented in Section 6.2 of this document will be the broad geographic scope for that VEC, however, the most likely geographic scope for all cumulative effects will be the Gulf of Maine, Georges Bank, and Southern New England waters where most of the skate fishery occurs. The geographic scope for the human communities will consist of those primary port communities from which vessels fishing for skates originate.

7.7.1 Summary of Direct/Indirect Impacts of the Proposed Action

The direct and indirect effects on the VECs from the revised ACL analyzed in this supplemental EA (Preferred Alternative) compared to what the impacts would be if the skate bait possession limits are those described in the No Action Alternative are summarized in Table 25 below. The nomenclature used is the following:

- Physical Environment: positive = actions that improve or reduce disturbance of habitat; negative = actions that degrade or increase disturbance of habitat;
- Biological Environment: positive = actions that increase stock size; negative = actions that decrease stock size;
- Human Communities: positive = actions that increase revenue and well-being of fishermen and/or associated businesses; negative = actions that decrease revenue and well-being of fishermen and/or associated businesses

Table 25 - Summary of Direct and Indirect Effects of the Alternatives

Alternative	Valued Ecosystem Components (VECs)				
	Physical Env	Biological Environment			Human Communities
	Habitat/EFH	Allocated Target Species	Non-Allocated Target Species and Bycatch	Protected Resources	Skate fishery participants
Skate bait possession limit alternatives described in Section Error! Reference source not found.					
No-Action Alternative	Low Negative	Low Negative	Negligible	Low Negative	Low Negative
Proposed Alternative 1	No Effect to Low Positive	No Effect to Low Positive	Negligible	No Effect to Low Positive	Low Positive
Proposed Alternative 2	No Effect to Low Positive	No Effect to Low Positive	Negligible	No Effect to Low Positive	Low Positive
Proposed Alternative 3	No Effect to Low Positive	No Effect to Low Positive	Negligible	No Effect to Low Positive	Low Positive

Impacts to the physical and biological environment from the proposed action were assessed and found to be neutral to low positive. In general, the modified skate bait possession limits are not likely to result in considerable changes in fishing effort as overall effort is limited by the specifications. Fishing effort for skates is largely controlled by DAS in the groundfish, monkfish, and scallop fisheries. The amount of fishing effort in the fishery in FY 2017-2018 is likely to be similar FY 2012-2016 effort and will be within the scope of fishing effort analyzed in Amendment 3 and FW1, as well as in recent actions in the DAS fisheries noted above.

7.7.2 Past, Present and Reasonably Foreseeable Future Actions

Detailed information on the past, present, and reasonably foreseeable future actions that may impact this action can be found in the FEIS for Amendment 3 and in the FW1 EA (Section 6.6.10). The information on relevant past, present and reasonably foreseeable future actions and their impacts are summarized in this section.

Other Fishing Effects: Past, Present and Reasonably Foreseeable Future Skate and Related Management Actions

The following is a summary of the past, present, and reasonably foreseeable future fishing actions and effects thought most likely to impact this cumulative effects assessment. The three FMP's that have had the greatest impact on skate fishery VECs, other than the Skate FMP, are the Atlantic Sea Scallop, Monkfish, and NE Multispecies FMPs, because of the spatial overlap of the fisheries, the relatively high level of incidental catch of skate in those fisheries, and the fact that more than 90 percent of the skate permit holders are also permitted in one or the other of those three fisheries. For additional information

on the cumulative effects and to view the complete summary of the history of the Skate FMP, please see Amendment 3 (NEFMC 2009) and Section 6.6.10 of the FW1 EA (NEMFC 2011).

Past and Present Actions:

Skates. Amendment 3 to the Skate FMP implemented an ACL and AMs for the skate complex and was designed to reduce skate discards and landings sufficiently to rebuild stocks of thorny and smooth skates, and to prevent other skates from becoming overfished. Skate FW1, implemented in May 2011, reduced skate possession limits and adjusted other measures to lengthen the fishing season for the directed skate wing fishery. Skate FW2, implemented in September 2014, reduced skate specifications and revised the skate dealer and VTR codes in order to improve species specific reporting. Skate FW3, implemented in August 2016, reduced skate specifications and implemented a new seasonal quota allocation for the wing fishery.

NE Multispecies. Amendment 16 and FW 44 to the NE Multispecies FMP are regulations that have effectively reduced fishing effort for skates as well as other targeted groundfish. FW 45 implemented a variety of measures including revision of biological reference points, updated ACLs for several groundfish stocks, and established new closed areas to protect spawning cod. Framework 46 was implemented in September 14, 2011 and modified the provisions that restrict mid-water trawl catches of haddock. Framework Adjustment 47 was implemented May 1, 2012 and set specifications for some groundfish stocks for FY 2012-2014, modified AMs for the groundfish fishery and the administration of the scallop fishery AMs, revised common pool management measures. Framework Adjustment 48 (FW 48) was partially implemented on September 30, 2013. That action proposed revised status determination criteria for several stocks, modified the sub-ACL system, adjusted monitoring measures for the groundfish fishery, and changed several accountability measures (AMs). Framework Adjustment 50 was also implemented on September 30, 2013 which set specifications for many groundfish stocks and modified the rebuilding program for SNE/MA winter flounder. Framework Adjustment 53 incorporated any status changes for groundfish stocks, set specifications for several groundfish stocks, re-configured the GOM cod rolling closures, prohibited possession of GOM cod for the recreational fishery, established a mechanism for setting default catch limits in the event a future management action was delayed, and specified that the maximum available carryover may be reduced if up to 10 percent of the unused sector sub-ACL, plus the total ACL for the upcoming fishing year exceeds the ABC. Framework 55 was effective on May 1, 2016, which set specifications for FYs 2016-2018 all 20 groundfish stocks, modified industry-funded sector at-sea monitoring program, approved a new sector, modified the sector approval process, adjusted selective trawl gear requirements, removed the GOM cod prohibition for recreational anglers, and implemented a mechanism or sectors to transfer GB cod quota from the Eastern US/Canada Area to the western area. Framework 56 set 2017 quotas for three shared U.S./ Canada stocks (Eastern Georges Bank (GB) cod, Eastern GB haddock, and GB yellowtail flounder; 2017–2019 catch limits for witch flounder; an allocation of northern windowpane flounder for the scallop fishery; a revised trigger for the scallop fishery's accountability measures for GB yellowtail flounder and northern windowpane flounder; and an increase in the GB haddock allocation for the midwater trawl fishery. Framework 56 also, under Regional Administrator authority, adjusted the fishing year 2017 trip limits for witch flounder and American plaice for the common pool fishery, and announced accountability measures (AMs) for northern and southern windowpane flounder that are triggered due to overages of fishing year 2015 catch limits for both stocks Framework 57 is currently being developed and is expected to be implemented in 2018. Framework 57 updates status determination criteria, sets specifications, evaluates the common pool trimester total allowable catches (TACs), modifies Atlantic halibut management, modifies the Southern windowpane flounder accountability measures for the large-mesh non-groundfish fisheries (e.g., scup and summer flounder), and revises the recreational management measures process.

Monkfish. Monkfish Amendment 5 implemented ACL and AMs for the monkfish fishery, and updated the biological reference points for monkfish stocks. FW 7 reduced the ACT for the monkfish Northern Fishery Management Area (NFMA) and increased the allocated DAS to 40 days per vessel; possession limits for the NFMA for permit categories A and C were set at 1,250 lbs tail weight and 600 lbs tail weight for B and D permit categories. Monkfish FW8, implemented in July 2014, increased monkfish DAS allocations and landings limits, allowed vessels issued a limited access monkfish Category H permit to fish throughout the Southern Fishery Management Area, enabled vessels to use an allocated monkfish-only DAS at any time throughout the fishing year, and revised biological reference points for the monkfish stocks in the Northern and Southern Fishery Management Areas based on the updated stock assessment. Monkfish Framework 10, expected to be implemented in 2017, set specifications for FYs 2017-2019, increased DAS and possession limits in the SFMA, and increased the incidental possession limit for monkfish in the NFMA.

Atlantic Sea Scallops. Amendment 15 to the Scallop FMP implemented ACLs and AMs for the scallop fishery. It also included updates to EFH, biological reference points, the research set-aside program, and other measures to improve the limited access general category fishery. Framework 21 set specifications and area access programs for FY2010. FW 22 implemented fishery specifications for 2011 and 2012 to prevent overfishing on scallops and help improve the yield-per-recruit in the resource. It built upon the measures implemented by Amendment 15, and adjusted DAS and access area trip allocations, and implemented measures to minimize fishery interactions with endangered sea turtles. FW 23 had provisions to improve the effectiveness of the accountability measure adopted under A15 for the yellowtail flounder sub-ACL, to consider specific changes to the general category NGOM management program to address potential inconsistencies, to consider modifications to the vessel monitoring system to improve fleet operations, and included measures to minimize impacts on sea turtles with a turtle deflector dredge. Groundfish FW 49/Scallop FW adjustment 24 is a joint Northeast Multispecies/Atlantic Sea Scallop action that modifies the dates for scallop vessel access to the year-round groundfish closed areas; this action was implemented on May 20, 2013. Framework 25, implemented June 2014, set specifications for the Atlantic sea scallop fishery for fishing year 2014, including days-at-sea allocations, individual fishing quotas, and sea scallop access area trip allocations. Framework 26, implemented May 2016, including days-at-sea allocations, individual fishing quotas, and sea scallop access area trip allocations; creates a new rotational closed area south of Closed Area 2 to protect small scallops; opens the northern portion of the Nantucket Lightship Access Area to the Limited Access General Category fleet; transfers 19 percent of the Limited Access General Category access area trips from the Mid-Atlantic Access Area to the northern portion of the Nantucket Lightship Access Area; and implements an accountability measure to the fishing year 2016 Northern Gulf of Maine Total Allowable Catch as a result of a fishing year 2015 catch overage. FW 27 set specifications for FY2016 and closed a portion of the Elephant Trunk Access Area and extended the boundaries of the Nantucket Lightship Access Area, adjusted the State Waters Exemption Program, allowed for Vessel Monitoring System declaration changes, implemented a proactive AM to protect windowpane and yellowtail flounder, aligned two gear measures, and implemented other measures. Framework 28, effective in 2017, set specifications for FY2016, revised the method for allocating catch to the limited access general category individual fishing quota fleet, and implemented a 50-bushel shell stock possession limit for limited access vessels inshore of the DAS demarcation line north of 42° 20’ N. lat.

Spiny Dogfish. Along with skates, spiny dogfish are one of the primary incidental species in the NE multispecies fishery. Spiny dogfish have historically been landed more with bottom gillnets rather than bottom trawls. Specifications for FY 2010 and 2011 included an overall commercial quota (15 million lbs in 2010; 20 million lbs in 2011) and a 3,000-lb trip limit. Fishing effort is largely constrained by NE Multispecies and Monkfish DAS. A3 to the spiny dogfish FMP established a research set aside program, updated EFH definitions, and included year-end rollover of management measures and revisions to the quota allocation scheme. Specifications for FY2014 and 2015 included an overall commercial quota

(25,073 mt in 2014; 24,976 in 2015) and a 4,000 lb trip limit. Specifications for FY2016 and 2017 included an overall commercial quota (23,617 mt in 2016; 23,045 mt in 2017) and a 6,000 lb trip limit.

American Lobster. Since the skate bait fishery supplies a large proportion of bait to lobster trap fisheries, regulations affecting lobster fishing effort may influence demand for skate products. NMFS is in rulemaking to limit future access and control trap fishing effort in Lobster Management areas 2 (southern MA and RI waters) and the Outer Cape Area (east of Cape Cod, MA). This action will address measures to: implement a trap transferability system in these areas, as well as Area 3 (the offshore Area from ME to NC); allow trap transfers among qualifiers; and impose a trap reduction or conservation tax on any trap transfers. Another action proposes to limit future access into the lobster trap fishery in Lobster Area 1 (the inshore Gulf of Maine). This action is intended to discourage lobster non-trap vessels from entering the lobster trap fishery, and discourage lobster trap vessels fishing in other lobster management areas from entering the Area 1 lobster trap fishery. NMFS also modified the timing of the Lobster Conservation Management Area 4 seasonal closure, effective December 2015, in order to reduce fishing effort in Area 4 consistent with ASMFC's Interstate FMP for American Lobster.

Atlantic Herring. The impacts of the herring fishery on skates catch is considered negligible. However, the 2013-2015 herring specifications increase the ABC to 114,000 mt. Herring are often used as lobster bait in the Gulf of Maine and the Area 1A TAC increased to 29,775 mt. As the supply of herring bait for the lobster fishery declines, it could result in increased demand for skate bait.

Mid-Atlantic Species. Skates are occasionally caught as bycatch in various fisheries managed by the Mid-Atlantic Fishery Management Council (e.g., summer flounder, scup, black sea bass, bluefish). NMFS has recently proposed regulations implementing the Mid-Atlantic ACL Omnibus Amendment, which will implement ACLs and AMs for all species managed by the Mid-Atlantic Council. As many of these fisheries are jointly managed with the Atlantic States Marine Fisheries Commission (ASMFC), seasons, quotas, trip limits, and other measures are specified by state agencies. The implementation of ACLs and AMs for these fisheries will help constrain total catch of these species, as well as bycatch of non-target species like skates.

Large Whales. The Atlantic Large Whale Take Reduction Program (ALWTRP) requires the use of sinking groundlines, which may have a negligible to low negative impact on habitat due to associated bottom sweep by the groundline. In addition, required use of weak links in gillnets may result in floating "ghost gear," which could snag on and damage bottom habitat.

Future Actions:

Skates. Skate fishery specifications for FY 2018 and FY 2019 would replace the management measures implemented by FW3. Without approval of the proposed action in this specifications document, the ACL specifications would revert back to ones set by FW3. The Council prioritized an action to consider limiting access to the skate fishery; control dates for skate uses other than bait and for the bait fishery have previously been set. The Council also prioritized the removal of the prohibition on landing barndoor skate.

NE Multispecies. FW 57, if approved by NMFS, would update status determination criteria and set specifications for all groundfish stocks and stocks managed by the U.S./Canada Resource Sharing agreement (Eastern Georges Bank cod, Eastern Georges Bank haddock, and Georges Bank yellowtail flounder). FW57 also would evaluate the common pool trimester total allowable catches, modify Atlantic halibut management, revise the recreational management measures process, and revise the Southern windowpane flounder AMS for large-mesh non-groundfish fisheries including an analysis of modifying existing AMs including modifying size and location of AM timing, trigger or biomass criteria.

Monkfish. No actions are expected until 2019.

Atlantic Sea Scallops. The Council is currently developing FW 27 to the Scallop FMP. The action is expected to set specifications for FY 2016 and default measures for FY 2017 including OFL, ABC, scallop ACLs and associated set-asides, day-at-sea allocations, general category fishing allocations, and area rotation schedule and allocations for the 2014 fishing year.

Spiny Dogfish. No actions are expected until 2018.

Essential Fish Habitat. Reasonably foreseeable future actions that will likely affect habitat include the EFH Omnibus Amendment (undergoing final revisions to the EIS at this time). The EFH Omnibus Amendment will provide for a review and update of EFH designations, identify HAPCs, as well as provide an update on the status of current knowledge of gear impacts. It will also include new proposals for management measures for minimizing the adverse impact of fishing on EFH that will affect all species managed by the NEFMC. The Council is also developing a deep-sea coral amendment to protect deep-sea coral habitats throughout the New England region from the negative impacts of fishing gears. The amendment is expected to be implemented in 2018.

Sea Turtles. The Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico ("Strategy") is a gear-based approach to addressing sea turtle bycatch. NMFS is considering increasing the size of the escape opening for Turtle Excluder Devices (TEDs) in the summer flounder fishery, expanding the use of TEDs to other trawl fisheries, and modifying the geographic scope of the TED requirements (74 FR 88 May 8, 2009).

Atlantic Sturgeon. Atlantic sturgeon has been proposed for listing under the Endangered Species Act (ESA). The Biological Opinion regarding Atlantic Sturgeon issued on December 16, 2013 did not find listing of sturgeon or any additional measures to reduce interactions with sturgeon to be necessary.

Non-Fishing Effects: Past, Present and Reasonably Foreseeable Future Actions

Non-fishing activities that occur in the marine nearshore and offshore environments and their watersheds can cause the loss or degradation of habitat and/or affect the species that reside in those areas. Section 6.6.10.2 in the FW1 EA provides a summary of past, present, and reasonably foreseeable non-fishing activities and their expected effects on VECs in the affected environment. The following discussions of impacts are based on past assessments of activities and assume these activities will likely continue into the future as projects are proposed.

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 harvesting (fishing) and other non-fishing human activities and stressors (described in this section).

Results from the Northeast Fisheries Climate Vulnerability Assessment (Hare et al. 2016) for New England 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 (Gaichas et al. 2016). 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.

Construction/Development Activities and Projects: Construction and development activities include, but are not limited to, point source pollution, agricultural and urban runoff, land (roads, shoreline development, wetland loss) and water-based (beach nourishment, piers, jetties) coastal development, marine transportation (port maintenance, shipping, marinas), marine mining, dredging and disposal of dredged material and energy-related facilities. These activities can introduce pollutants (through point and non-point sources), cause changes in water quality (temperature, salinity, dissolved oxygen, suspended solids), modify the physical characteristics of a habitat or remove/replace the habitat altogether. Many of these impacts have occurred in the past and present and their effects would likely continue in the reasonably foreseeable future. It is likely that these projects would have negative impacts caused from disturbance, construction, and operational activities in the area immediately around the affected project area. However, given the wide distribution of the affected species, minor overall negative effects to offshore habitat, protected resources, allocated target stocks, and non-allocated target species and bycatch are anticipated since the affected areas are localized to the project sites, which involve a small percentage of the fish populations and their habitat. Thus, these activities for most biological VECs would likely have an overall low negative effect due to limited exposure to the population or habitat as a whole. Any impacts to inshore water quality from these permitted projects, including impacts to planktonic, juvenile, and adult life stages, are uncertain but likely minor due to the transient and limited exposure. It should be noted that 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 allocated target stocks, non-allocated target species and bycatch, and protected resources.

Restoration Projects: Other regional projects that are restorative or beneficial in nature include estuarine wetland restoration; offshore artificial reef creation, which provides structure and habitat for many aquatic species; and eelgrass (*Zostera marina*) restoration, which provides habitat for many juvenile fishes. Due to past and present adverse impacts from human activities on these types of habitat, restorative projects likely have slightly positive effects at the local level.

Protected Resources Rules: The NMFS final Rule on Ship Strike Reduction Measures (73 FR 60173, October 10, 2008) is a non-fishing action in the US-controlled North Atlantic that is likely to affect endangered species and protected resources. The goal of this rule is to significantly reduce the threat of ship strikes on North Atlantic right whales and other whale species in the region. Ship strikes are considered the main threat to North Atlantic right whales; therefore, NMFS anticipates this regulation will result in population improvements to this critically endangered species.

Energy Projects: Deepwater Wind (DWW) has received leases for two sites in the Rhode Island/ Massachusetts region. The South Fork Project has completed a Site Assessment Plan (SAP). The Construction and Operation Plan is currently under development. No site assessment activities have been conducted within the area for the Revolution Wind project. Two leases have been issued within the Massachusetts wind Energy Area (WEA): Vineyard Wind and Bay State Wind. The SAP for the Vineyard Wind site is currently being evaluated; the SAP for Bay State Wind has been approved. Two unleased areas are still available within the WEA. BOEM is expected to publish a Public Sale Notice, followed by an action for the two remaining lease areas in 2018. The potential impacts associated with offshore wind energy projects include the construction, operation, and removal of turbine platforms and transmission cables; thermal and vibration impacts; and changes to species assemblages within the area from the

introduction of vertical structures. Further information regarding these projects can be found at www.boem.gov/Renewable-Energy/.

7.7.3 Summary of Cumulative Effects

The following analysis summarizes the cumulative effects of past, present, and reasonably foreseeable future actions in combination with the proposed action on the VECs identified in this section.

Physical Environment/Habitat/EFH

The management measures described above in the NE Multispecies, Scallop, Monkfish, and Skate FMPs, largely have positive effects on habitat due to reduced fishing efforts, consequently reducing gear interaction with habitat. The other FMP actions that reduce fishing effort generally result in fewer habitat and gear interactions, resulting in low positive effects on habitat. The ALWTRP resulted in low negative to negligible effects on habitat due to the possibility of groundline sweep on the bottom and "ghost gear." The proposed TED requirements would possibly have negative effects on habitat due to potential slight increases in towing time. However, this gear is still being tested. The effects of the proposed action on habitat are considered neutral. Overall, the cumulative effect of past, present, and reasonably foreseeable future fishing actions has resulted in low positive effects on habitat.

Climate change is expected to have an impact on the physical characteristics and habitat aspects of marine ecosystems, and possibly change the very nature of these ecosystems. Increased frequency and intensity of extreme weather events, like hurricanes, may change the physical structure of coastal areas. Water circulation, currents, and the proportion of source waters/freshwater intrusion have been observed to be changing (Ecosystem Status Report, NEFSC, 2011) which influences salinity, water column stratification, transport of nutrients, and food web processes. All of these factors, in addition to others like ocean acidification and changes to water chemistry (Rebuck et al. in prep), threaten living elements of the marine environment, such as corals and shellfish, and may be related to the observed shifts in the planktonic community structure that forms the basis of the marine food web (ecosystem status report).

While the impact analysis in this action is focused on direct and indirect impacts to the physical environment and EFH, there are a number of non-fishing impacts that must be considered when assessing cumulative impacts. Many of these activities are concentrated near-shore and likely work either additively or synergistically to decrease habitat quality. Other non-fishing factors such as climate change and ocean acidification are also thought to play a role in the degradation of habitat. The effects of these actions, combined with impacts resulting from years of commercial fishing activity, have negatively affected habitat. However, impacts from the proposed action were found to be negligible. Therefore, when considering the cumulative effects of this action in combination with past, present, and reasonably foreseeable future actions, impacts will remain low positive and no significant impacts to the physical environment, habitat or EFH from the proposed action are expected.

Target Species

The management measures described above are expected to have overall neutral to low positive impacts on target species (skates), in contrast to impacts prior to management began in 2003. Effort limits in the NE Multispecies, Monkfish, and Scallop FMPs are likely to constrain skate catches, while the Skate FMP and the proposed action are likely to convert more skate dead discards into landings (relatively neutral fishing mortality) and divert some fishing activity to trips targeting skates.

Future measures that will likely restrict fishing effort (EFH Omnibus) will also have positive effects on target species. Future measures such as the TED requirements would likely result in positive effects to

target species because they may help reduce bycatch. Overall, the cumulative effect of past, present, and reasonably foreseeable future fishing actions has resulted in positive effects on target species. The decline in allowable herring landings could open up new markets for alternative lobster baits, some of it filled by either whole skate landings or by the carcasses of skates landed for the wing market.

Climate change is already impacting fishery resources by shifting distributions, abundances, and phenology of species and the communities that depend on them. For example, cold water species are shifting northward. Some of these shifts are in response to warming waters and some are in response to changes in population abundance and age-structure. Water temperatures are known to exert significant influence different life stages, on reproductive and developmental processes, growth rates, and increase the likelihood of disease. With shifting species distribution, loss of habitat, and changes in mortality, the ability of some fish stocks to respond to harvesting pressure may be reduced, while the ability of some fish stocks may be increased.

These impacts are expected to intensify in the future, increasing the need for a better understanding of which fishery resources are the most vulnerable. NMFS has developed a tool for rapidly assessing and indexing the vulnerability of fish stocks to climate change. The index can help fishery managers identify high vulnerability stocks and more effectively target limited research and assessment resources on stocks of highest concern. The methodology combines a stock's exposure and sensitivity (which includes adaptive capacity) to estimate overall vulnerability. The methodology was published in October 2015 (Morrison, et. al., 2015). Pilot tests have found the methodology to be robust across temperate and tropical ecosystems. A full assessment was expected to be run in the northeast U.S. for all managed fish and shellfish species in the Spring of 2014 (Nelson et al. in prep) but is not available at this time.

As found in the cumulative effects analysis for FW1, the long-term trend has been positive for cumulative impacts to target species. While thorny skate remains overfished, effort reductions in the NE Multispecies, Monkfish, and Scallop FMPs have allowed other skate stocks to rebuild, and the rebuilding process for others is underway. Barndoor skate was declared to be rebuilt in 2016. Prior to 2003, skates were not managed and the unlimited catch of skates likely contributed to the overfished status of thorny skate. Due to differences in effort and species distributions, only marginal increases in barndoor, smooth, and thorny skates catch is expected to result from the proposed action, certainly not enough to cause a stock to become overfished and not enough to derail increases in stock biomass for rebuilding stocks. Further, indirect impacts from the effort reductions in other FMPs are also thought to contribute to skate mortality reductions. These factors, when considered in conjunction with the proposed action which would have negligible impacts to target species due to the implementation of the recommended ACL, would not have any significant cumulative impacts.

Non-Target Species and Bycatch

Actions that reduce fishing effort have had positive effects on non-target species and bycatch because in general, less fishing effort results in less impact to non-allocated target species and bycatch. Conversely, actions that increase fishing effort are considered to have low negative effects on non-target species and bycatch because more fishing generally results in more bycatch. Increases in directed skate fishing effort are likely to come from diverted fishing activity targeting other species, due in part to the requirement to have a multispecies, scallop, or monkfish DAS limited access permit. And when this occurs, it would decrease catch of non-target species that occur more frequently in other areas than those where vessels fish for skates.

Catch of primary non-target species in the skate fishery is monitored and controlled through other FMPs. TED requirements would likely have a positive effect on non-target species and bycatch and discards as they would likely exclude some of these species from capture in the cod end. Overall, the cumulative

effect of past, present, and reasonably foreseeable future fishing actions has resulted in positive effects on non-target species and bycatch.

Skates are typically harvested incidentally to fishing for other more valuable species. The primary non-target and bycatch species analyzed for the purposes of this EA are monkfish, spiny dogfish, groundfish, and prohibited skates (barndoor, thorny, and smooth). Management efforts in the past have led to these species being managed under their own FMP. While some groundfish stocks remain in an overfished condition, or subject to overfishing, actions in the NE Multispecies FMP (e.g. Amendment 16) are attempting to control mortality on these stocks. Monkfish, spiny dogfish, barndoor skate, and smooth skate are no longer overfished or experiencing overfishing. Only thorny skate remains overfished but is no longer experiencing overfishing, however, there is little overlap between skate or groundfish fishing effort and thorny skate distribution (e.g. deep basins in the Gulf of Maine) (NEFMC 2009). Mortality and effort controls such as NE Multispecies, Monkfish, and Scallop DAS collectively help reduce bycatch of non-target species. Impacts to all of these species from the proposed action were found to be negligible, and the proposed action would not result in any significant cumulative direct or indirect impacts.

Protected Resources

Past and present actions in fisheries that catch skates (groundfish, monkfish, scallop) have had negligible or positive effects on protected resources. Management plans for marine mammals have implemented effort restrictions and had positive affects by reducing injuries and deaths. Future positive impacts are likely.

For sea turtles, changes to both their marine and terrestrial environment due to climate change pose a challenge. Recent studies suggest that warming temperatures at nesting beaches could have the strongest impacts on sea turtle populations due to reduced nest success and recruitment (Santidrian-Tomillo et al. 2012; Saba et al. 2012). Additionally, increased severity of extreme weather events may create erosion and damage to turtle nest and nesting sites (Goldenberg et al 2001; Webster et al 2005, IPCC 2007), resulting in a further reduction in nest success and recruitment. These potential declines in the success of nesting could have profound effects on the abundance and distribution of sea turtles. Moreover, warming air temperature can also affect the demography of sea turtle populations because the sex ratio of hatchling sea turtles is determined by the temperature during incubation in nesting beaches. Female offspring are produced at warmer temperatures and thus climate change could lead to a lower ratio of males in the population. Changes in water circulation near nesting beaches could affect the early life history stages of sea turtles by transporting passively-drifting hatchlings to waters that may have increased predation rates (Shillinger et al. 2012). Furthermore, prey availability and quality may also be affected by climate change but these projections are far less certain.

Marine mammals are subject to impacts from global climate change through climate variability, water temperature changes, changes to ocean currents, changes in impact primary productivity and prey species availability. For example, shifts in zooplankton patch formation, which have already been observed, could affect the feeding opportunities and therefore populations of North Atlantic Right Whales (NEQ website). Susceptibility to disease, changes in toxicant exposure, and decreased reproductive success with rising ocean temperatures and related climate-ecosystem changes is also of concern (Burek et. al, 2008). Species that migrate to feeding grounds in polar regions (including many baleen whale populations) may be more susceptible to climate change in the near-term since conditions in the polar regions are changing more rapidly than in temperate regions.

The proposed action is not expected to increase the potential for gear interactions with protected species. This action would likely have neutral to low positive impacts on protected resources. Historically, the implementation of FMPs has resulted in reductions in fishing effort and as a result, past fishery

management actions are thought to have had a slightly positive impact on strategies to protect protected species. Gear entanglement continues to be a source of injury or mortality, resulting in some adverse effects on most protected species to varying degrees. One of the goals of future management measures will be to decrease the number of marine mammal interactions with commercial fishing operations. The cumulative result of these actions to meet mortality objectives will be slightly positive for protected resources. The effects from non-fishing actions are also expected to be low negative as the potential for localized harm to VECs exists. The combination of these past actions along with future initiatives to reduce turtle interactions through the Sea Turtle Strategy when considered with the proposed action would not result in significant cumulative impacts.

Human Communities

The effects of past, present, and reasonably foreseeable future fishery management actions have been slightly positive on nearly all VECs with the exception of human communities. Mandated reductions in fishing effort have resulted in negative economic impacts to human communities. Management measures designed to benefit protected resources and restrict fishing effort have low negative effects on the human communities. However, the implementation of annual catch limits and expansion of opportunities through numerous sectors and achievement of the larger goal of fishing groundfish stocks at sustainable rates and rebuilding groundfish stocks to of scallops, spiny dogfish, and monkfish have also helped increase revenue and positive economic impacts. Overall, the cumulative effect of past, present, and reasonably foreseeable future fishing actions has resulted in negative effects on human communities.

As both the physical and ecological elements of the coastal and marine environments change through the impacts described in this section, there will be increasing challenges for the communities and individuals that depend on healthy and productive coasts and marine fisheries. The dynamics of certain fisheries may change entirely. Human communities also face a variety of other threats from changing climate including to human health concerns, energy, transportation, water resources, and food production.

The proposed action would have neutral impacts on human communities; the decrease in allowable landings of skates reduces landings to levels observed in recent fishing years. The status quo possession limits would allow the fisheries to maximize potential of achieving the TAL. Therefore, the proposed action when taken into consideration with past, present, and reasonably foreseeable future actions is not expected to have significant cumulative impacts. Table 26 summarizes the cumulative effects resulting from implementation of the proposed action and CEA baseline.

Table 26 - Cumulative Effects resulting from implementation of the proposed action and CEA Baseline.

		Biological Impacts				
		Habitat Impacts	Allocated Target Species	Non-allocated Target Species and Bycatch	Endangered/ Protected Species	Human Community Impacts
Cumulative Effect Baseline	Effects of Past, Present, and Reasonably Foreseeable Future Non-Fishing Actions	Low negative / negligible	Low negative / negligible	Low negative / negligible	Low negative / negligible	Low negative / negligible
	Effects of Past, Present, and Reasonably Foreseeable Future Fishing Actions	Positive	Positive	Positive	Negligible / positive	Negative
Direct and Indirect Effects of Proposed /Supplemental Action		Negligible	Negligible	Negligible	Negligible	Negligible
Cumulative Effects Summary of Effects from implementation of Proposed Action and Cumulative Effect Baseline		Negligible	Negligible	Negligible	Negligible	Negligible

8.0 Applicable Law

8.1 MAGNUSON-STEVENS FISHERY MANAGEMENT AND CONSERVATION ACT (MSA)

Section 301 of the Magnuson-Stevens Act requires that FMPs contain conservation and management measures that are consistent with the ten National Standards. The most recent Skate FMP changes implemented by Amendment 3 and FW1 address how the proposed management actions comply with the National Standards (refer to Section 6.1 of Amendment 3 and Section 7.1 of the FW1 EA). Under Amendment 3, the NEFMC adopted conservation and management measures that would rebuild overfished skate stocks to achieve, on a continuing basis, the optimum yield for US fishing industry using the best scientific information available consistent with National Standards 1 and 2. The Skate FMP and implementing regulations manage all seven skate species throughout their entire US range, as required by National Standard 3. Amendment 3 (Section 6.1) and FW1 (Section 7.1) describes how the measures implemented under that action do not discriminate among residents of different states consistent with National Standard 4, do not have economic allocation as their sole purpose (National Standard 5), account for variations in these fisheries (National Standard 6), avoid unnecessary duplication (National Standard 7), take into account fishing communities (National Standard 8), addresses bycatch in fisheries (National Standard 9), and promote safety at sea (National Standard 10). By proposing to meet the National Standards requirements of the Magnuson-Stevens Act through future FMP amendments and framework actions, the NEFMC will ensure that overfishing is prevented, overfished stocks are rebuilt, and the maximum benefits possible accrue to the ports and communities that depend on these fisheries and the Nation as a whole.

The proposed action would comply with all elements of the Magnuson-Stevens Act, including the National Standards, and the Skate FMP. This action is being taken in response to new data that indicate an increase in skate biomass, new research on little and winter skate discard mortality, and new information about how the wing fishery responds to various possession limits. The FW1 EA, completed prior to the development of the updated skate ACL, did not contain an analysis of the revised ACL and associated catch limits. Therefore, this EA analyzes the impacts of the revised ABC, ACL, and TALs for skates and adjustments to wing and bait fishery possession limits, in compliance with applicable laws requirement for an analysis of proposed measures.

8.2 National Environmental Policy Act (NEPA)

8.2.1 Finding of No Significant Impacts (FONSI)

The Council on Environmental Quality (CEQ) Regulations state that the determination of significance using an analysis of effects requires examination of both context and intensity, and lists ten criteria for intensity (40 CFR 1508.27). In addition, the Companion Manual for National Oceanic and Atmospheric Administration Administrative Order 216-6A provides sixteen criteria, the same ten as the CEQ Regulations and six additional, for determining whether the impacts of a proposed action are significant. Each criterion is discussed below with respect to the proposed action and considered individually as well as in combination with the others.

1. Can the proposed action reasonably be expected to cause both beneficial and adverse impacts that overall may result in a significant effect, even if the effect will be beneficial?

Response: The Proposed Action would maintain possession limits at a level that is likely to enable the skate fishery to remain open year around. This would provide social and economic benefits for fishing industry members who fish for skates if the proposed action allowed the skate bait fishery to remain open year round. The Proposed Action is not expected to result in a significant effect on target or non-target species. As stated in Section 7.7, impacts on resources encompassing skates, groundfish, and other stocks is expected to be minimal.

2. Can the proposed action reasonably be expected to significantly affect public health or safety?

Response: The Proposed Action is not expected to have a substantial adverse impact on public health and safety. The modified skate bait effort controls are projected to lengthen the fishing year based on landings in recent years. Increased fishing duration limits competition for fish and allows operators the flexibility to avoid poor weather conditions, resulting in fewer safety concerns overall.

3. Can the proposed action reasonably be expected to result in significant impacts to unique characteristics of the geographic area, such as proximity to historic or cultural resources, park lands, prime farmlands, wetlands, wild and scenic rivers, or ecologically critical areas?

Response: This action merely revises effort controls for the skate bait fishery starting in fishing year 2017 and continuing until modified, as needed, in the next specifications package for FYs 2018 and 2019. Other types of commercial fishing already occur in this area and although it is possible that historic or cultural resources such as shipwrecks could be present, vessels try to avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would result in substantial impacts to unique areas.

4. Are the proposed action's effects on the quality of the human environment likely to be highly controversial?

Response: The effects of the Proposed Action on the quality of human environment are not expected to be highly controversial. The Proposed Action would not modify the majority of measures proposed by FW3, primarily focused on the skate bait effort controls. The Proposed Action is not expected to negatively impact habitat, allocated target species, non-allocated target species and bycatch, or protected resources.

5. Are the proposed action's effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

Response: The effects of the Proposed Action on the human environment are not expected to be highly uncertain or involve unique or unknown risks. Vessels fishing for skates will primarily use trawl and gillnet gear, and maintain traditional fishing practices which will have no greater impact on habitat, protected species, and limit bycatch species than under current conditions. The skate fishery has been successfully managed under the FMP, and the trends in biomass for nearly all managed skates are encouraging. Therefore, the effects on the human environment are not uncertain or involve unique or unknown risks.

6. Can the proposed action reasonably be expected to establish a precedent for future actions with significant effects or represent a decision in principle about a future consideration?

Response: Amendment 3 established a process in the Skate FMP to estimate ACL, associated catch limits, and effort controls for skates. The skate bait effort controls were designed to help prevent fishing effort from exceeding the catch limits as updated in FW3. These catch limits are determined in relation to

estimates of skate catch and biomass trends. Significant effects are unlikely, because any future changes to catch limits are constrained by the biomass estimates, and a sustainable proportion of catch from the resource. Most other direct and indirect impacts of the proposed action are not likely to establish any precedents for future actions with significant effects.

7. Is the proposed action related to other actions that when considered together will have individually insignificant but cumulatively significant impacts?

Response: The cumulative effects analysis presented in Section 7.7 considers the impacts of the Proposed Action in combination with relevant past, present, and reasonably foreseeable future actions and concludes that no significant cumulative impacts are expected from the approval of the revised skate bait effort controls. Further, the Proposed Action would not have any significant impacts when considered individually or in conjunction with any of the other actions presented (fishing related and non-fishing related).

8. Can the proposed action reasonably be expected 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?

Response: The impacts of the proposed measures on the human environment are described in Section 7.6 of the EA. This action merely revises effort controls for the skate bait fishery starting in fishing year 2017 and continuing until modified, as needed, in the next specifications package for FYs 2018 and 2019. Although there are shipwrecks in the area where fishing occurs, including some registered on the National Register of Historic Places, vessels typically avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would adversely affect the historic resources listed above.

9. Can the proposed action reasonably be expected to have a significant impact on endangered or threatened species, or their critical habitat as defined under the Endangered Species Act of 1973?

Response: The proposed action is not expected to alter overall fishing operations, lead to a substantial increase of fishing effort, or alter the spatial and/or temporal distribution of current fishing effort in a manner that would increase interaction rates with protected species *(section 6.0)*.

This action falls within the range of impacts considered in the Batched Fisheries Biological Opinion for the skate fishery (December 16, 2013). However, in a memorandum dated October 17, 2017, GARFO's Protected Resources Division reinitiated consultation on the Batched Biological Opinion. As part of the reinitiation, it was determined that allowing this fishery to continue during the reinitiation period will not violate ESA sections 7(a)(2) and 7(d) because it will not increase the likelihood of interactions with protected species above the amount that was previously considered in the 2013 Batched Biological Opinion. Therefore, conducting the proposed action during the reinitiation period would not be likely to jeopardize the continued existence of any whale, sea turtle, Atlantic salmon, or sturgeon species.

As described in section 6.2, the proposed action is not likely to adversely affect any designated critical habitat. The skate fishery will not affect the essential physical and biological features of North Atlantic right whales or loggerhead (Northwest Atlantic Ocean DPS) critical habitat and therefore, will not result in the destruction or adverse modification of critical habitat (NMFS 2014a;NMFS2015a,b).

10. Can the proposed action reasonably be expected to threaten a violation of Federal, state, or local law or requirements imposed for environmental protection?

Response: The Proposed Action is not expected to threaten a violation of federal, state, or local law or requirements imposed for the protection of the environment. Vessels fishing for skates are required to comply with all local, regional, and national laws and permitting requirements.

11. Can the proposed action reasonably be expected to adversely affect stocks of marine mammals as defined in the Marine Mammal Protection Act?

Response: The proposed action is not expected to alter overall fishing operations, lead to a substantial increase of fishing effort, or alter the spatial and/or temporal distribution of current fishing effort in a manner that would increase interaction rates with protected species *(section 6.0)*.

This action falls within the range of impacts considered in the Batched Fisheries Biological Opinion for the skate fishery (December 16, 2013). However, in a memorandum dated October 17, 2017, GARFO's Protected Resources Division reinitiated consultation on the Batched Biological Opinion. As part of the reinitiation, it was determined that allowing this fishery to continue during the reinitiation period will not violate ESA sections 7(a)(2) and 7(d) because it will not increase the likelihood of interactions with protected species above the amount that was previously considered in the 2013 Batched Biological Opinion. Therefore, conducting the proposed action during the reinitiation period would not be likely to jeopardize the continued existence of any whale, sea turtle, Atlantic salmon, or sturgeon species.

As described in section 6.2, the proposed action is not likely to adversely affect any designated critical habitat. The skate fishery will not affect the essential physical and biological features of North Atlantic right whales or loggerhead (Northwest Atlantic Ocean DPS) critical habitat and therefore, will not result in the destruction or adverse modification of critical habitat (NMFS 2014a;NMFS2015a,b).

12. Can the proposed action reasonably be expected to adversely affect managed fish species?

Response: The Proposed Action would not jeopardize the sustainability of any of the target species (primarily winter and little skates) affected by the action. The Preferred Alternative modifies bait skate effort controls that are consistent with target fishing levels that have been identified as promoting rebuilding and/or sustaining stock sizes, and not overall catch limits (Section 7.1). The Proposed Action is not expected to jeopardize the sustainability of any non-target species (Section 7.2). Fishing for skates is typically done on trips targeting more valuable species such as groundfish and monkfish. Effort and catch in these fisheries are controlled by DAS and/or sectors and trip limits. Changes in skate bait effort controls, therefore, are not expected to influence the sustainability of other species caught on trips that land skates.

13. Can the proposed action reasonably be expected to adversely affect essential fish habitat as defined under the Magnuson-Stevens Fishery Conservation and Management Act?

Response: The Proposed Action is not expected to allow substantial damage to the ocean and coastal habitats and/or Essential Fish Habitat (EFH) as defined under the Magnuson-Stevens Act and identified in the FMP (Section 7.3). This action is not expected to result in increases in total fishing effort but may result in shifts to/from areas where vessels target skates depending on the level of TAL caught.

14. Can the proposed action reasonably be expected to adversely affect vulnerable marine or coastal ecosystems, including but not limited to, deep coral ecosystems?

Response: The Proposed Action is not expected to allow substantial damage to vulnerable marine or coastal ecosystems (Section 7.7.3). This action is not expected to result in increases in total fishing effort but may result in shifts to/from areas where vessels target skates depending on the level of TAL caught.

15. Can the proposed action reasonably be expected to adversely affect biodiversity or ecosystem functioning (e.g., benthic productivity, predator-prey relationships, etc.)?

Response: The Proposed Action is not expected to have a substantial impact on biodiversity and ecosystem function within the Gulf of Maine, Georges Bank, or Southern New England regions, where the skate fishery primarily occurs. The proposed action is not expected to increase fishing effort in the directed skate fishery or in any of the fisheries that catch skate. Effort restrictions in the multispecies, monkfish, and scallop fisheries have proven effective at limiting the impacts of fishing.

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

Response: No non-indigenous species would be introduced during the Proposed Action because the modification of skate bait effort controls affects the scope of current fishing practices and does not introduce new methods. No non-indigenous species would be used or transported during fishing activities. Therefore, the Proposed Action would not be expected to result in the introduction or spread of a non-indigenous species.

FONSI STATEMENT:

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment prepared for Framework Adjustment 4 to the Northeast Skate Complex Fishery Management Plan, it is hereby determined that Framework Adjustment 4 will not significantly impact the quality of the human environment as described above and in the supporting Environmental Assessment. 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 Environmental Impact Statement for this action is not required.

Regional Administrator, Greater Atlantic Regional Fisheries Office, NOAA	Date

8.2.2 List of preparers; point of contact

Questions concerning this document may be addressed to:
Mr. Thomas Nies, Executive Director
New England Fishery Management Council
50 Water Street, Mill 2
Newburyport, MA 01950
(978) 465-0492

The information contained in this document was prepared throughout the cooperative efforts of the Skate Plan Development Team members, and other members of the staffs of NMFS and the New England Fishery Management Council. Contributors are:

- Walter Anoushian, National Marine Fisheries Service (NMFS)
- Michelle Bachmann, New England Fishery Management Council (NEFMC)
- Tobey Curtis, NMFS Greater Atlantic Regional Fisheries Office (GARFO)
- Lou Goodreau, NEFMC
- Jerome Hermsen, Ph.D., GARFO
- Fiona Hogan, Ph.D., NEFMC
- Danielle Palmer, GARFO
- Eric Reid, RI Department of Environmental Management (RI DEM)
- Katherine Richardson, GARFO
- Kathy Sosebee, NEFSC

8.2.3 Agencies consulted

This proposed action was developed by the New England Fishery Management Council in coordination with the National Marine Fisheries Service.

8.2.4 Opportunity for public comment

The Preferred Alternatives were developed during the period April 2017 through June 2017 and were discussed at the following meetings. Opportunities for public comment were provided at each of these meetings.

Date	Meeting Type	Location
4/4/2017	Skate Committee Meeting	Wentworth by the Sea, New Castle, NH
4/18 - 4/20/2017	Council Meeting	Hilton Hotel, Mystic, CT
4/21/2017	Skate PDT Conference Call	
5/3/2017	Skate PDT Conference Call	
6/3/2017	Skate PDT Conference Call	
6/12/2017	Skate Advisory Panel Meeting	Holiday Inn, Mansfield, MA
6/13/2017	Skate Committee Meeting	Holiday Inn, Mansfield, MA
6/20 - 6/22/2017	Council Meeting	Holiday Inn by the Bay, Portland, ME

8.3 Endangered Species Act (ESA)

The batched fisheries Biological Opinion completed on December 16, 2013, concluded that the actions considered would not jeopardize the continued existence of any listed species. On October 17, 2017, NMFS reinitiated consultation on the batched Biological Opinion due to updated information on the decline of Atlantic right whale abundance.

Section 7(d) of the ESA prohibits Federal agencies from making any irreversible or irretrievable commitment of resources with respect to the agency action that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives during the consultation period. This prohibition is in force until the requirements of section 7(a)(2) have been satisfied. Section 7(d) does not prohibit all aspects of an agency action from proceeding during consultation; non-jeopardizing activities may proceed as long as their implementation would not violate section 7(d). Per the October 17, 2017, memo, it was concluded that allowing those fisheries specified in the batched Biological Opinion to continue during the reinitiation period will not increase the likelihood of interactions with ESA listed species above the amount that would otherwise occur if consultation had not been reinitiated. Based on this, the memo concluded that the continuation of these fisheries during the reinitiation period would not be likely to jeopardize the continued existence of any ESA listed species. Taking this, as well as our analysis of the proposed action into consideration, we do not expect the proposed action, in conjunction with other activities, to result in jeopardy to any ESA listed species.

This action does not represent any irreversible or irretrievable commitment of resources with respect to the FMP that would affect the development or implementation of reasonable and prudent measures during the consultation period. NMFS has discretion to amend its Magnuson-Stevens Act and ESA regulations and may do so at any time subject to the Administrative Procedure Act and other applicable laws. As a result, the Council has preliminarily determined that fishing activities conducted pursuant to this action will not affect endangered and threatened species or critical habitat in any manner beyond what has been considered in prior consultations on this fishery.

8.4 Marine Mammal Protection Act (MMPA)

NMFS has reviewed the impacts of FW3 and the Skate FMP on marine mammals and concluded that the specifications are consistent with the provisions of the MMPA and would not alter existing measures to protect the species likely to inhabit the management unit of the Skate FMP. For further information on the potential impacts of the proposed management action, see Section 7.4 of this document.

8.5 Coastal Zone Management Act (CZMA)

Section 307(c)(1) of the CZMA requires that all Federal activities which affect any coastal use or resource be consistent with approved state coastal zone management programs (CZMP) to the maximum extent practicable. NMFS has reviewed the relevant enforceable policies of each coastal state in the NE region for this action and has determined that this action is incremental and repetitive, without any cumulative effects, and is consistent to the maximum extent practicable with the enforceable policies of the CZMP of the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and North Carolina. NMFS finds this action to be consistent with the enforceable policies to manage, preserve, and protect the coastal natural resources

including fish and wildlife, and to provide recreational opportunities through public access to waters off the coastal areas. Pursuant to the general consistency determination provision under Section 307 of the CZMA and codified at 15 CFR 930.36(c), NMFS sent a general consistency determination applying to Amendment 3 to the Skate FMP, and all routine Federal actions carried out in accordance with the FMP, to the following states: Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Pennsylvania, Maryland, Virginia, and North Carolina on December 18, 2009. New Hampshire, Connecticut, Pennsylvania, New Jersey, Delaware, Virginia, and North Carolina have concurred with this determination. For the remaining states that have not responded, consistency has been inferred pursuant to the consistency letter.

8.6 Administrative Procedure Act

Section 553 of the APA establishes procedural requirements applicable to rulemaking by federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process and to give the public adequate notice and opportunity for comment. At this time, no abridgement of the rulemaking process for this action is being requested.

8.7 Information Quality Act (IQA)

Pursuant to NOAA guidelines implementing Section 515 of Public Law 106-554 (the Information Quality Act), all information products released to the public must first undergo a Pre-Dissemination Review to ensure and maximize the quality, objectivity, utility, and integrity of the information (including statistical information) disseminated by or for federal agencies. The following section addresses these requirements.

Utility

The information presented in this document is helpful to the intended users (the affected public) by presenting a clear description of the purpose and need of the proposed action, the measures proposed, and the impacts of those measures. A discussion of the reasons for selecting the proposed action is included so that intended users may have a full understanding of the proposed action and its implications.

This document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The development of this document and the decisions made by NMFS to propose this action are the result of a multi-stage public process.

The *Federal Register* notice that implements the proposed revision to the skate catch limits would be made available in printed publication and on the NMFS NE Regional Office website. Instructions for obtaining a copy of this supplemental EA are included in the *Federal Register* notice.

Integrity

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, “Security of Automated Information Resources,” of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles

13, 15, and 22 of the United States Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity

For the purposes of the Pre-Dissemination Review, this supplemental EA is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the EFH Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the NEPA.

This information product uses information of known quality from sources acceptable to the relevant scientific and technical communities. Stock status (including estimates of biomass) and the recommended ACL reported in this product are based on the results of the NEFSC bottom trawl survey and catch statistics reported to NMFS, and were subject to peer-review through the Council's Skate PDT and SSC. These methods were developed and peer-reviewed during the 2008 Northeast Data Poor Stocks Working Group stock assessment of the skate complex (NEFSC 2009). These reports are developed using an approved, scientifically valid sampling process. Original analyses in this supplemental EA build upon the analyses contained in Amendment 3 and the FW1 EA, and were prepared using data from accepted sources, and the analyses have been reviewed by NOAA.

Despite current data limitations, the measures proposed for this action were selected based upon the best scientific information available (NEFMC 2011). The principal author of this document is a professional fishery scientist employed by the Council, the chair of the Council's Skate Plan Development Team, and is familiar with the available data and information relevant to the state of the regulated fisheries under the FMP, fishing techniques in the NE Region, biology of skates, and the socioeconomic impacts of the fisheries on impacted communities.

The policy choices are clearly articulated in Section 4.0, of this document, as the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described, or incorporated by reference, in Sections 6.0 and 7.0 of this supplemental EA. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency.

The review process used in preparation of this supplemental EA involves the Northeast Fisheries Science Center, the Northeast Regional Office, and NMFS Headquarters. The Center's technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, demersal resources, population biology, and the social sciences. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the action proposed in this supplemental EA and clearance of any rules prepared to implement resulting regulations is conducted by staff at NMFS Headquarters, the Department of Commerce, and the United States Office of Management and Budget.

8.8 Executive Order 13132 (Federalism)

This E.O. established nine fundamental federalism principles for Federal agencies to follow when developing and implementing actions with federalism implications. The E.O. also lists a series of policy making criteria to which Federal agencies must adhere when formulating and implementing policies that have federalism implications. However, no federalism issues or implications have been identified relative to the measures proposed in the proposed action. This action does not contain policies with federalism implications sufficient to warrant preparation of an assessment under E.O. 13132. The affected states have been closely involved in the development of the proposed management measures through their representation on the Council (all affected states are represented as voting members of at least one Regional Fishery Management Council). No comments were received from any state officials relative to any federalism implications that may be associated with this action.

8.9 Executive Order 13158 (Marine Protected Areas)

The Executive Order on Marine Protected Areas requires each federal agency whose actions affect the natural or cultural resources that are protected by an MPA to identify such actions, and, to the extent permitted by law and to the maximum extent practicable, in taking such actions, avoid harm to the natural and cultural resources that are protected by an MPA. The E.O. directs federal agencies to refer to the MPAs identified in a list of MPAs that meet the definition of MPA for the purposes of the Order. The E.O. requires that the Departments of Commerce and the Interior jointly publish and maintain such a list of MPAs. As of the date of submission of this Amendment, the list of MPA sites has not been developed by the departments. No further guidance related to this Executive Order is available at this time.

8.10 Paperwork Reduction Act

The purpose of the PRA is to control and, to the extent possible, minimize the paperwork burden for individuals, small businesses, nonprofit institutions, and other persons resulting from the collection of information by, or for, the Federal Government. PRA for data collections relating to the Skate FMP have been considered and evaluated under the original Skate FMP implemented in 2003, and approved by the Office of Management and Budget (OMB). This action relies upon the existing collections, including those approved by the OMB under the original FMP, and does not propose to modify any existing collections or to add any new collections. Therefore, no review under the PRA is necessary for this action.

8.11 Regulatory Impact Review

8.11.1 Executive Order 12866

The purpose of E.O 12866 is to enhance planning and coordination with respect to new and existing regulations. This E.O. requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant." Section 7.5 of this document represents the RIR, which includes an assessment of the costs and benefits of the Proposed Action in accordance with the guidelines established by E.O. 12866.

E.O. 12866 requires a review of proposed regulations to determine whether or not the expected effects would be significant, where a significant action is any regulatory action that may:

1. Have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety, or State, local, or tribal governments or communities;

2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

A more detailed discussion of economic impact is provided in Section 7.5. The discussion to follow provides a summary of those findings.

8.11.1.1 Objectives

The goals and objectives of Framework Adjustment 4 are the same as those detailed in the original Northeast Skate Complex FMP and are as follows:

> **Goal**: Consistent with the requirements of the Magnuson-Stevens Fishery Conservation and Management Act and other applicable laws, to develop a Fishery Management Plan to research and manage the Northeast Skate Complex at long-term sustainable levels
> **Objective 1**: Collect information critical for substantially improving knowledge of skate fisheries by species and for monitoring: (a) the status of skate fisheries, resources, and related markets and (b) the effectiveness of skate management approaches
> **Objective 2**: Implement measures to: protect the two currently overfished species of skates (barndoor and thorny) and increase their biomass to target levels, reduce fishing mortality on winter skate, and prevent overfishing of the other species in the Northeast skate complex – this may be accomplished through management measures in other FMPs (groundfish, monkfish, scallops), skate-specific management measures, or a combination of both as necessary.
> **Objective 3**: Develop a skate permit system, coordinate data collection with appropriate state agencies for vessels fishing for skates or catching skates as bycatch only in state waters, and work with the fishing industry to establish a catch reporting system consistent with industry capabilities, including the use of study fleets.

Objective 4: Minimize the bycatch and discard mortality rates for skates caught in both directed and on-directed fisheries through the promotion and encouragement of experimentation, conservation engineering, and gear development.
Objective 5: Promote and encourage research for critical biological, ecological, and fishery information based on the research needs identified in the Skate SAFE Report and scoping document, including the development and dissemination of a skate species identification guide.
Objective 6: Minimize, to the extent possible, the impacts of skate management approaches on fisheries for other species on which New England and Mid-Atlantic fishermen depend (for example, groundfish, monkfish, scallops, and fluke), recognizing the interconnected nature of skate and other fisheries in the Northeast Region.
Objective 7: To the extent possible, manage clearnose and rosette skates separately from the other five species in the skate complex, recognizing that these two species are distributed primarily in the Mid-Atlantic and South Atlantic regions.

8.11.1.2 Description

A description of the entities affected by this Framework Adjustment, specifically the stakeholders of the Northeast Skate Fishery, is provided in Section 6.5 of this document.

8.11.1.3 Problem Statement

The need and purpose of the actions proposed in this Framework Adjustment are in Section 3.2 of this document and are incorporated here by reference.

8.11.1.4 Analysis of Alternatives

This section provides an analysis of each proposed alternative of FW4 as mandated by EO 12866. The focus is on the expected changes 1) in net benefits and costs to stakeholders of the Northeast Skate fishery, 2) changes to the distribution of benefits and costs within the industry, 3) changes in income and employment, 4) cumulative impacts of the regulation, and 5) changes in other social concerns. Much of this information is captured already in the detailed economic impacts and social impacts analyses of Sections 7.5 and 7.6 of this document. This RIR will summarize and highlight the major findings of the economic impacts analysis provided in Section 7.5 of this document, as mandated by EO 12866. For social impacts of each alternative, see Section 7.6.

8.11.1.4.1 Modifications to Bait Skate Fishery Effort Controls

A detailed description of this alternative can be found in Section 4.1 of this document.

8.11.1.4.1.1 Option 1: No Action

Under the no Action Alternative, no changes in possession limit, incidental possession limit, or trigger for the bait fishery would occur. Given the trend in bait landings in FY2016 resulted in the incidental possession limit being implemented, this alternative has a higher likelihood of the TAL being exceeded and the incidental possession limit being triggered. In the long run, this option may lead to future declines in biomass and catch, more restrictive regulation and the failure to reach optimum yield, which would result in a negative and potentially significant economic impact to the fishery.

8.11.1.4.1.2 Option 2: Revised Skate Bait Possession Limit and Closure

Under this alternative, this alternative would reduce the Season 3 skate bait possession limit from 25,000 lb to **12,000** lb would also close the skate bait fishery once 100% of the TAL was projected to be achieved. The lower Season 3 possession limit was projected to allow the TAL to be fully achieved while reducing the likelihood of the incidental possession limit being triggered. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial fishing year because of a closure. The closure once the TAL was fully achieved would have low negative impacts but only if it occurred early in the fishing year.

8.11.1.4.1.3 Option 3: Revised Skate Bait Trigger and Incidental Possession Limit, and Closure

This alternative would maintain the skate bait possession limit at 25,000 lbs for all three seasons, incidental skate bait possession limit would be implemented when 75% of the seasonal quotas have been reached in Seasons 1 or 2, or when 75% of the annual skate bait TAL has been landed, unless the annual TAL was not expected to be achieved, and incidental skate bait possession limit would be set at 9,307 lb.

In the short-term, this option may result in low negative economic impacts if the lower trigger is reached. The higher possession limit combined with the low TAL in FY2017 would increase the likelihood that the TAL would be achieved before the end of the fishing year, resulting in a closure.

8.11.1.4.1.4 Option 4: Revised Season 3 Skate Bait Possession Limit and Trigger, Closure, and Revised Incidental Possession Limit (***Preferred Alternative***)

This alternative would reduce the Season 3 skate bait possession limit from 25,000 lb to **12,000** lb, reduce the in-season adjustment of skate bait possession limits from 90% to **80**% in Season 3, and incidental skate bait possession limit would be set at 8,000 lb. These measures would be expected to prolong the skate bait fishing year by allowing participating vessels to continue to direct effort on skate bait but at a reduced level for Season 3. This would have low positive economic impacts as fishing for the entire year could generate more revenue than a partial fishing year because of a closure. Therefore, Option 4 represents the net-benefit maximizing alternative.

8.11.1.5 Determination of Significance

The analysis included in this document shows that this action is not a “significant regulatory action” because it will not affect in a material way the economy or a sector of the economy. The preferred Modification to Bait Skate Fishery Effort Controls Alternative would adopt the possession limit, including incidental, and in-season adjustment, and therefore would allow the TAL associated with the optimum yield to be reached, maximizing long-run benefits.

8.11.2 Initial Regulatory Flexibility Analysis (IRFA)

8.11.2.1 Introduction

The IRFA requires agencies to assess the impacts of their proposed regulations on small entities. The Regulatory Flexibility Act Analysis (RFAA) determines whether the proposed action would have a significant economic impact on a substantial number of small entities. The Small Business Administration (SBA) size standards define whether a business entity is small and, thus, eligible for Government programs and preferences reserved for "small business" concerns. Size standards have been established for all for-profit economic activities or industries in the North American Industry Classification System (NAICS). NMFS established a small business size standard of $11 million in annual gross receipts for all businesses primarily engaged in the commercial fishing industry (NAICS 11411).

This section provides an assessment and discussion of the potential economic impacts of the proposed action, as required of the RFA. The objective of the RFA is to require consideration of the capacity of those affected by regulations to bear the direct and indirect costs of regulation. The Final Regulatory Flexibility Analysis (FRFA) must identify the number and types of businesses that would be regulated, indicate how many of these entities that are small businesses, explain the expected economic impact of the regulation on small businesses, and describe any feasible alternatives that would minimize the economic impacts.

8.11.2.2 Description of the Reasons Why Action by Agency is Being Considered

The need and purpose of the actions are set forth in Section 3.2 of this document and are incorporated herein by reference.

8.11.2.3 Statement of the Objectives and Legal Basis for the Proposed Action

The need and purpose of the actions are set forth in Section 3.2 of this document and are incorporated herein by reference.

The goals and objectives of Framework Adjustment 4 are the same as those detailed in Amendment 3 and original Northeast Skate Complex FMP. In general, FW 4 is intended to modify management measures to ensure that overfishing does not occur, while at the same time achieving optimal yield (OY).

8.11.2.4 Description and Estimate of the Number of Small Entities to which the Proposed Rule will apply

The proposed modifications to skate bait fishery effort controls would impact vessels that hold Federal open access commercial skate permits that participate in the skate fishery or affiliated groups that hold multiple open access commercial skate permits that participate in the skate fishery. Within the skate bait fishery, the majority of affiliate groups consist of a single permit-holder, or 71 vessels in fishing year 2015. The remaining 4 vessels belong to affiliate groups that hold two or more permits. Aggregate group records in the NOAA dealer database are removed from these numbers.

The economic analysis in Section 7.5 simulates impacts for the fishing year 2015 (higher resource; no closures; constant possession limit) conditions, and is used to compare to the NOAA Affiliates database. The affiliates data are assembled by NOAA, as of June 1st each year, for analysis required by the

Regulatory Flexibility Act. Fishing vessels (permits) are linked together, an industry determination is made (finfish, shellfish, no revenue), and firms are classified as small or large based on SBA guidelines. Per SBA guidelines, a 3 year average is used to make the "small" determination, as well as measure affiliate group total revenues.

The Affiliates database indicates the maximum number of small fishing entities (as defined by the Small Business Administration (SBA)) that may be affected by this action is 69 entities (71 vessels), in 2015 (Table 27). During fishing year 2015, only 69 affiliate groups landed any amount of skate for bait. At the permit level, every skate landing permit is defined as a small business according to SBA standards; the top five vessels have total revenues between $600,000 and $1.9 million in 2015. At the affiliate group level, all 69 entities are defined as small businesses based on 2016 landings.

Table 27 - Skate fishery summary data for 2015 fishing year (Source: NMFS Dealer data), and affiliate groups for 2016 calendar year (Source: NOAA Affiliates database)

Number of individual permits landing skates for bait, or selling skates for bait at sea	71
Number of vessels without affiliation	67
Number of vessels in affiliate groups	4
Total entities in Affiliates Database	69

8.11.2.5 Reporting, Recordkeeping and Other Compliance Requirements

This action does not introduce any introduce any new reporting, recordkeeping, or other compliance requirements. This action does not alter currently available reporting codes and does not create any additional reporting, record-keeping or other compliance requirements. This proposed action does not duplicate, overlap, or conflict with other Federal rules.

8.11.2.6 Description of Steps the Agency Has Taken to Minimize the Significant Economic Impact on Small Entities Consistent with the Stated Objectives of Applicable Statutes

During the development of FW4, NMFS and the Council considered ways to reduce the regulatory burden on and provide flexibility to the regulated community. The measures implemented by the FW4 final rule minimize the long-term economic impacts on small entities to the extent practicable. The proposed action maintains the total allowable landings (TAL), but season 3 bait possession limits are reduced in an effort to allow the fisheries to achieve the full available TAL at minimum economic impact. This is expected to allow the fishery to land the TAL with a low possibility of triggering the incidental trip limit in seasons 1 and 2. Based on FY2015 data, less than half these entities would see some decline in total landings revenue. For example, the incidental trip limit is expected during the last two weeks of season 2, and a closure during the last four days. In season 3, the incidental trip limit is expected in the second month (December 7) and a closure during the last two weeks. Overall, long term impacts of FW4 rule, as well as the related actions of the Skate FMP, are minimized by ensuring that management measures and catch levels are sustainable and contribute to rebuilding stocks and, therefore, maximizing yield, as well as providing additional flexibility for fishing operations in the short term.

8.11.2.7 Economic Impacts on Small Entities Resulting from Proposed Action

The economic impact resulting from this action on these small entities is associated with the possession limit. Based on recent landing information the fishery is more likely to land close to the full amount of skates allowable under the quotas. The Preferred Alternative is certain to result in greater revenue from

skate landings when compared to the other wing possession limit options that would lower possession limit or increase it to a level that was highly likely to trigger an AM (see Section Economic Analysis)..

The economic impact resulting from this action on these small entities is associated with triggering incidental possession limits that effectively close the directed fishery. Based on the trip limit analysis, the preferred alternative is less likely, than No Action, to trigger the incidental possession limit under the current ACL. Based on recent landing information the fishery is more likely to land close to the full amount of the ACL. The Preferred Alternative is certain to result in greater revenue from skate landings when compared to No Action, which would keep the 25,000 pound possession limit during all three seasons, but trigger much lower incidental limits and result in an effective closure, as in FY 2016 (see Section 7.5). Not enough is known about the economic status of this fishery to determine what level of revenue loss would result in small entities falling below break-even.

Based on fishing year 2015 data and assuming no mitigating shifts in seasonal effort (a worst-case scenario), the preferred alternative is expected to result in a reduction of over 5 percent of total landings revenue for 5 affiliate groups. Two affiliate groups do have a revenue loss between 20 and 30 percent, but these data may not be reported due to confidentiality concerns. All 27 affiliate groups are considered "small" and represent 42.4% of all skate landings. Table 28 shows more detail about these impacts, from the Affiliate database:

Table 28 - Summary of estimated revenue loss based on 2015 fishing conditions

REVENUE LOSS:	0%	0-1%	1-5%	Over 5%	10-20%	20-30%
Number of Affiliates	42	18	4	5	0	*
Skate; $1000	572	305	354	651	0	*
% of total Skate $	30.3	16.2	18.7	34.6	0	*

Impacts cannot be disproportionate as all affiliate-level entities in the skate bait fishery are considered "small." It is possible that, knowing what the possession limit will be in season 3, some entities would shift their skate fishing to the beginning of the next fishing year when possession limits are more economic.

Further analysis (Figure 9) shows the distribution of total revenues after the loss of skate revenue due to the preferred alternative, under 2015 conditions, for these small businesses. About 22 affiliate groups operate at a level below $400,000 (average revenue, $227,000). Five affiliate groups operate above $400,000) and average $778,000.

All 27 affected affiliate groups are considered "small." Furthermore, the impact cannot be disproportionately borne by small entities (they are all small); the impact from regulation would occur in season 3 and in all seasons where the AMs are triggered; the impact from regulation could be mitigated by individual entities by shifting effort earlier into the season; and a greater impact would likely result from the selection of any other alternative (and certainly No Action).

Figure 9 – Number of affiliates by affiliate revenue group based on average revenues ($1000) 2014-2016, and skate revenue loss ($1000) FY2015

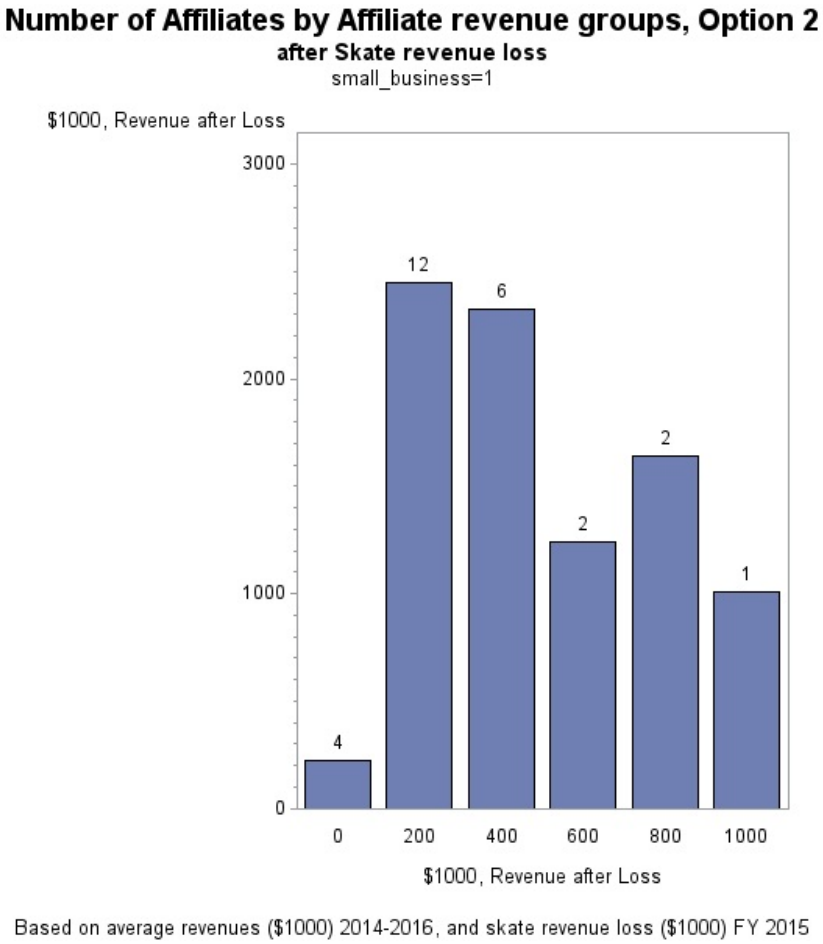
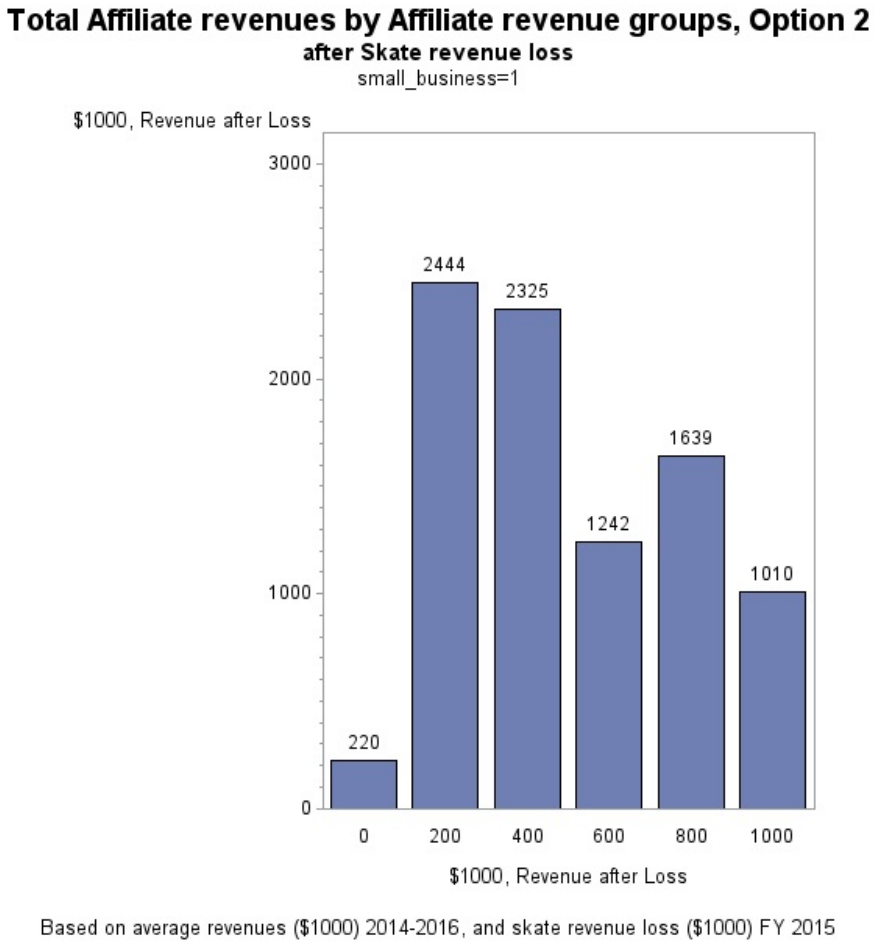


Figure 10 – Total Affiliate revenues by affiliate revenue group based on average revenues ($1000) 2014-2016, and skate revenue loss ($1000) FY2015



9.0 References

9.1 Glossary

ABC – "Acceptable biological catch" means a level of a stock or stock complex's annual catch that accounts for the scientific uncertainty in the estimate of OFL.

ACL – "Annual catch limit" is the level of annual catch of a stock or stock complex that serves as the basis for invoking accountability measures (AMs).

ACT – "Annual catch target" is an amount of annual catch of a stock or stock complex that is the management target of the fishery.

Adult stage – One of several marked phases or periods in the development and growth of many animals. In vertebrates, the life history stage where the animal is capable of reproducing, as opposed to the juvenile stage.

Adverse effect – Any impact that reduces quality and/or quantity of EFH. May include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside of EFH and may include sites-specific of habitat wide impacts, including individual, cumulative, or synergistic consequences of actions.

Aggregation – A group of animals or plants occurring together in a particular location or region.

AMs – "Accountability measures" are management controls that prevent ACLs or sector ACLs from being exceeded, where possible, and correct or mitigate overages if they occur.

Amendment – a formal change to a fishery management plan (FMP). The Council prepares amendments and submits them to the Secretary of Commerce for review and approval. The Council may also change FMPs through a "framework adjustment procedure".

Availability – refers to the distribution of fish of different ages or sizes relative to that taken in the fishery.

Benthic community – Benthic means the bottom habitat of the ocean, and can mean anything as shallow as a salt marsh or the intertidal zone, to areas of the bottom that are several miles deep in the ocean. Benthic community refers to those organisms that live in and on the bottom.

Biological Reference Points – specific values for the variables that describe the state of a fishery system which are used to evaluate its status. Reference points are most often specified in terms of fishing mortality rate and/or spawning stock biomass.

Biomass – The total mass of living matter in a given unit area or the weight of a fish stock or portion thereof. Biomass can be listed for beginning of year (Jan-1), Mid-Year, or mean (average during the entire year). In addition, biomass can be listed by age group (numbers at age * average weight at age) or summarized by groupings (e.g., age 1+, ages 4+ 5, etc.). See also spawning stock biomass, exploitable biomass, and mean biomass.

Biota – All the plant and animal life of a particular region.

Bivalve – A class of mollusks having a soft body with platelike gills enclosed within two shells hinged together; e.g., clams, mussels.

Bottom tending mobile gear – All fishing gear that operates on or near the ocean bottom that is actively worked in order to capture fish or other marine species. Some examples of bottom tending mobile gear are otter trawls and dredges.

Bottom tending static gear – All fishing gear that operates on or near the ocean bottom that is not actively worked; instead, the effectiveness of this gear depends on species moving to the gear which is set in a particular manner by a vessel, and later retrieved. Some examples of bottom tending static gear are gillnets, traps, and pots.

B_{MSY} – the stock biomass that would produce maximum sustainable yield (MSY) when fished at a level equal to F_{MSY}. For most stocks, B_{MSY} is about ½ of the carrying capacity.

B_{target} – A desirable biomass to maintain fishery stocks. This is usually synonymous with BMSY or its proxy, and was set in the original Monkfish FMP as the median of the 3-yr. running average of the 1965-1981 autumn trawl survey biomass index.

$B_{threshold}$ – 1) A limit reference point for biomass that defines an unacceptably low biomass i.e., puts a stock at high risk (recruitment failure, depensation, collapse, reduced long term yields, etc). 2) A biomass threshold that the SFA requires for defining when a stock is overfished. A stock is overfished if its biomass is below Bthreshold. A determination of overfished triggers the SFA requirement for a rebuilding plan to achieve Btarget as soon as possible, usually not to exceed 10 years except certain requirements are met. For monkfish, Bthreshold was specified in Framework 2 as 1/2BTarget (see below).

Bycatch – (v.) the capture of nontarget species in directed fisheries which occurs because fishing gear and methods are not selective enough to catch only target species; (n.) fish which are harvested in a fishery but are not sold or kept for personal use, including economic discards and regulatory discards but not fish released alive under a recreational catch and release fishery management program.

Capacity – the level of output a fishing fleet is able to produce given specified conditions and constraints. Maximum fishing capacity results when all fishing capital is applied over the maximum amount of available (or permitted) fishing time, assuming that all variable inputs are utilized efficiently.

Catch – The sum total of fish killed in a fishery in a given period. Catch is given in either weight or number of fish and may include landings, unreported landings, discards, and incidental deaths.

Coarse sediment – Sediment generally of the sand and gravel classes; not sediment composed primarily of mud; but the meaning depends on the context, e.g. within the mud class, silt is coarser than clay.

Continental shelf waters – The waters overlying the continental shelf, which extends seaward from the shoreline and deepens gradually to the point where the sea floor begins a slightly steeper descent to the deep ocean floor; the depth of the shelf edge varies, but is approximately 200 meters in many regions.

Council – New England Fishery Management Council (NEFMC).

CPUE – Catch per unit effort. This measure includes landings and discards (live and dead), often expressed per hour of fishing time, per day fished, or per day-at-sea.

DAS – A day-at-sea is an allocation of time that a vessel may be at-sea on a fishing trip. For vessels with VMS equipment, it is the cumulative time that a vessel is seaward of the VMS demarcation line. For vessels without VMS equipment, it is the cumulative time between when a fisherman calls in to leave port to the time that the fisherman calls in to report that the vessel has returned to port.

Days absent – an estimate by port agents of trip length. This data was collected as part of the NMFS weighout system prior to May 1, 1994.

Demersal species – Most often refers to fish that live on or near the ocean bottom. They are often called benthic fish, groundfish, or bottom fish.

Discards – animals returned to sea after being caught; see Bycatch (n.)

Environmental Impact Statement (EIS) – an analysis of the expected impacts of a fishery management plan (or some other proposed federal action) on the environment and on people, initially prepared as a "Draft" (DEIS) for public comment. The Final EIS is referred to as the Final Environmental Impact Statement (FEIS).

Essential Fish Habitat (EFH) – Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are described in the Habitat Omnibus Amendment (1998).

Exclusive Economic Zone (EEZ) – for the purposes of the Magnuson-Stevens Fishery Conservation and Management Act, the area from the seaward boundary of each of the coastal states to 200 nautical miles from the baseline.

Exempted fisheries – Any fishery determined by the Regional Director to have less than 5 percent regulated species as a bycatch (by weight) of total catch according to 50 CFR 648.80(a)(7).

Exploitation Rate – the percentage of catchable fish killed by fishing every year. If a fish stock has 1,000,000 fish large enough to be caught by fishing gear and 550,000 are killed by fishing during the year, the annual exploitation rate is 55%.

Fathom – A measure of length, containing six feet; the space to which a man can extend his arms; used chiefly in measuring cables, cordage, and the depth of navigable water by soundings.

Fishing effort – the amount of time and fishing power used to harvest fish. Fishing power is a function of gear size, boat size and horsepower.

Fishing Mortality (F) – (see also exploitation rate) a measurement of the rate of removal of fish from a population by fishing. F is that rate at which fish are harvested at any given point in time. ("Exploitation rate" is an annual rate of removal, "F" is an instantaneous rate.)

$\mathbf{F_{0.1}}$ – F at which the increase in yield-per-recruit in weight for an increase in a unit-of effort is only 10% of that produced in an unexploited stock; usually considered a conservative target fishing mortality rate.

$\mathbf{F_{MSY}}$ – a fishing mortality rate that would produce the maximum sustainable yield from a stock when the stock biomass is at a level capable of producing MSY on a continuing basis.

$\mathbf{F_{MAX}}$ – the fishing mortality rate that produces the maximum level of yield per recruit. This is the point beyond which growth overfishing begins.

$\mathbf{F_{target}}$ – the fishing mortality that management measures are designed to achieve.

FMP (Fishery Management Plan) – a document that describes a fishery and establishes measures to manage it. This document forms the basis for federal regulations for fisheries managed under the

regional Fishery Management Councils. The New England Fishery Management Council prepares FMPs and submits them to the Secretary of Commerce for approval and implementation.

Framework adjustments: adjustments within a range of measures previously specified in a fishery management plan (FMP). A change usually can be made more quickly and easily by a framework adjustment than through an amendment. For plans developed by the New England Council, the procedure requires at least two Council meetings including at least one public hearing and an evaluation of environmental impacts not already analyzed as part of the FMP.

$F_{threshold}$ – 1) The maximum fishing mortality rate allowed on a stock and used to define overfishing for status determination. 2) The maximum fishing mortality rate allowed for a given biomass as defined by a control rule.

Growth Overfishing – the situation existing when the rate of fishing mortality is above F_{MAX} and then the loss in fish weight due to mortality exceeds the gain in fish weight due to growth.

ICL – Interim catch limit is the maximum amount of skate catch, including landings and dead discards, that has been chosen to promote skate rebuilding. This limit has been calculated as the product of the median catch/biomass index for the time series and the latest 3 year moving average of the applicable survey biomass (spring survey for little skate; fall survey for all other managed skates).

Individual Fishing Quota (IFQ) – A Federal permit under a limited access system to harvest a quantity of fish, expressed by a unit or units representing a percentage of the total allowable catch of a fishery that may be received or held for exclusive use by an individual person or entity

Landings – The portion of the catch that is harvested for personal use or sold.

Larvae (or Larval) stage – One of several marked phases or periods in the development and growth of many animals. The first stage of development after hatching from the egg for many fish and invertebrates. This life stage looks fundamentally different than the juvenile and adult stages, and is incapable of reproduction; it must undergo metamorphosis into the juvenile or adult shape or form.

Limited Access – a management system that limits the number of participants in a fishery. Usually, qualification for this system is based on historic participation, and the participants remain constant over time (with the exception of attrition).

Limited-access permit – A permit issued to vessels that met certain qualification criteria by a specified date (the "control date").

LPUE – Landings per unit effort. This measure is the same as CPUE, but excludes discards.

Maximum Sustainable Yield (MSY) – the largest average catch that can be taken from a stock under existing environmental conditions.

Mesh selectivity (ogive) – A mathematical model used to describe the selectivity of a mesh size (proportion of fish at a specific length retained by mesh) for the entire population. L25 is the length where 25% of the fish encountered are retained by the mesh. L50 is the length where 50% of the fish encountered are retained by the mesh.

Meter – A measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part

of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

Metric ton – A unit of weight equal to a thousand kilograms (1kgs = 2.2 lb). A metric ton is equivalent to 2,204.6 lb A thousand metric tons is equivalent to 2.204 million lb.

Minimum Biomass Level – the minimum stock size (or biomass) below which there is a significantly lower chance that the stock will produce enough new fish to sustain itself over the long-term.

Mortality – Noun, either referring to fishing mortality (F) or total mortality (Z).

Multispecies – the group of species managed under the Northeast Multispecies Fishery Management Plan. This group includes whiting, red hake and ocean pout plus the regulated species (cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish).

Natural Mortality (M) – a measurement of the rate of fish deaths from all causes other than fishing such as predation, cannibalism, disease, starvation, and pollution; the rate of natural mortality may vary from species to species

Northeast Shelf Ecosystem – The Northeast U.S. Shelf Ecosystem has been described as including the area from the Gulf of Maine south to Cape Hatteras, extending from the coast seaward to the edge of the continental shelf, including the slope sea offshore to the Gulf Stream.

Observer – Any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under this Act

OFL – "Overfishing limit" means the annual amount of catch that corresponds to the estimate of the maximum fishing mortality threshold applied to a stock or stock complex's abundance and is expressed in terms of numbers or weight of fish.

Open access – Describes a fishery or permit for which there is no qualification criteria to participate. Open-access permits may be issued with restrictions on fishing (for example, the type of gear that may be used or the amount of fish that may be caught).

Optimum Yield (OY) – the amount of fish which-

(a) will provide the greatest overall benefit to the Nation, particularly with respect to food production and recreational opportunities, and taking into account the protection of marine ecosystems;

(b) is prescribed as such on the basis of the maximum sustainable yield from the fishery, as reduced by any relevant economic, social, or ecological factor; and

(c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the maximum sustainable yield in such fishery.

Overfished – A conditioned defined when stock biomass is below minimum biomass threshold and the probability of successful spawning production is low.

Overfishing – A level or rate of fishing mortality that jeopardizes the long-term capacity of a stock or stock complex to produce MSY on a continuing basis.

PDT (Plan Development Team) – a group of technical experts responsible for developing and analyzing management measures under the direction of the Council; the Council has a Skate PDT that meets to discuss the development of this FMP.

Proposed Rule – a federal regulation is often published in the Federal Register as a proposed rule with a time period for public comment. After the comment period closes, the proposed regulation may

be changed or withdrawn before it is published as a final rule, along with its date of implementation and response to comments.

Rebuilding Plan – a plan designed to increase stock biomass to the B_{MSY} level within no more than ten years (or 10 years plus one mean generation period) when a stock has been declared overfished.

Recruitment overfishing – fishing at an exploitation rate that reduces the population biomass to a point where recruitment is substantially reduced.

Recruitment – the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in one year would be the recruitment to the fishery. "Recruitment" also refers to new year classes entering the population (prior to recruiting to the fishery).

Regulated groundfish species – cod, haddock, pollock, yellowtail flounder, winter flounder, witch flounder, American plaice, windowpane flounder, white hake and redfish. These species are usually targeted with large-mesh net gear.

Relative exploitation – an index of exploitation derived by dividing landings by trawl survey biomass. This variable does not provide an estimate of the proportion of removals from the stock due to fishing, but allows for general statements about trends in exploitation.

Sediment – Material deposited by water, wind, or glaciers.

Spawning stock biomass (SSB) – the total weight of fish in a stock that sexually mature, i.e., are old enough to reproduce.

Status Determination Criteria – objective and measurable criteria used to determine if overfishing is occurring or if a stock is in an overfished condition according to the National Standard Guidelines.

Stock assessment – An analysis for determining the number (abundance/biomass) and status (life-history characteristics, including age distribution, natural mortality rate, age at maturity, fecundity as a function of age) of individuals in a stock

Stock – A grouping of fish usually based on genetic relationship, geographic distribution and movement patterns. A region may have more than one stock of a species (for example, Gulf of Maine cod and Georges Bank cod). A species, subspecies, geographical grouping, or other category of fish capable of management as a unit.

Surplus production models – A family of analytical models used to describe stock dynamics based on catch in weight and CPUE time series (fishery dependent or survey) to construct stock biomass history. These models do not require catch at age information. Model outputs may include trends in stock biomass, biomass weighted fishing mortality rates, MSY, FMSY, BMSY, K, (maximum population biomass where stock growth and natural deaths are balanced) and r (intrinsic rate of increase).

Surplus production – Production of new stock biomass defined by recruitment plus somatic growth minus biomass loss due to natural deaths. The rate of surplus production is directly proportional to stock biomass and its relative distance from the maximum stock size at carrying capacity (K). BMSY is often defined as the biomass that maximizes surplus production rate.

Survival rate (S) – Rate of survival expressed as the fraction of a cohort surviving the a period compared to number alive at the beginning of the period (# survivors at the end of the year / numbers alive at the beginning of the year). Pessimists convert survival rates into annual total mortality rate using the relationship A=1-S.

Survival ratio (R/SSB) – an index of the survivability from egg to age-of-recruitment. Declining ratios suggest that the survival rate from egg to age-of-recruitment is declining.

TAC – Total allowable catch is equivalent to the ICL.

TAL – Total allowable landings, which for skate management is equivalent to 75% of the TAC minus the dead discard rate.

Ten-minute- "squares" of latitude and longitude (TMS) – A measure of geographic space. The actual size of a ten-minute-square varies depending on where it is on the surface of the earth, but in general each square is approximately 70-80 square nautical miles at 40° of latitude. This is the spatial area that EFH designations, biomass data, and some of the effort data have been classified or grouped for analysis.

Total mortality – The rate of mortality from all sources (fishing, natural, pollution) Total mortality can be expressed as an instantaneous rate (called Z and equal to F + M) or Annual rate (called A and calculated as the ratio of total deaths in a year divided by number alive at the beginning of the year)

Yearclass (or cohort) – Fish that were spawned in the same year. By convention, the "birth date" is set to January 1st and a fish must experience a summer before turning 1. For example, winter flounder that were spawned in February-April 1997 are all part of the 1997 cohort (or year-class). They would be considered age 0 in 1997, age 1 in 1998, etc. A summer flounder spawned in October 1997 would have its birth date set to the following January 1 and would be considered age 0 in 1998, age 1 in 1999, etc.

Yield-per-recruit (YPR) – the expected yield (weight) of individual fish calculated for a given fishing mortality rate and exploitation pattern and incorporating the growth characteristics and natural mortality.

9.2 References

Almeida, F., L. Arlen, P. Auster, J. Cross, J. Lindholm, J. Link, D. Packer, A, Paulson, R. Reid, and P. Valentine. 2000. The effects of marine protected areas on fish and benthic fauna: the Georges Bank closed area II example. Poster presented at Am. Fish. Soc. 130th Ann. Meet. St. Louis, MO, August 20-24, 2000.

Angliss, R. P., & DeMaster, D. P. (1998). *Differentiating Serious and Non-serious Injury of Marine Mammals Taken Incidental to Commerical Fishing Operations: Report of the Serious Injury Workshop, 1-2 April 1997, Silver Spring, Maryland* (Vol. 13). US Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

ASMFC TC (Atlantic States Marine Fisheries Commission Technical Committee). 2007. Special Report to the Atlantic Sturgeon Management Board: Estimation of Atlantic sturgeon bycatch in coastal Atlantic commercial fisheries of New England and the Mid-Atlantic. August 2007. 95 pp.

ASSRT (Atlantic Sturgeon Status Review Team). 2007. Status review of Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*). National Marine Fisheries Service. February 23, 2007. 188 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 dieand tidal time scales. Mar. Ecol. Prog. Ser. 264: 155–166.

Baumgartner, M.F. and B.R. Mate. 2003. Summertime foraging ecology of North Atlantic right whales. Mar. Ecol. Prog. Ser. 264: 123–135.

Benoit, HP. 2006. Estimated discards of winter skate (*Leucoraja ocellata*) in the southern Gulf of St. Lawrence, 1971-2004. Canadian Science Advisory Secretariat Research Document 2006/002. 43 p.

Benoit, H.P., D.P. Swain, W.D. Bowen, G.A. Breed, M.O. Hammill & V. Harvey. 2011. Evaluating the potential for grey seal predation to explain elevated natural mortality in three fish species in the southern Gulf of St. Lawrence. Marine Ecology Progress Series. 442: 149-167.

Bigelow and Schroeder.1953. Fishes of the Gulf of Maine.

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). Mar. Fish. Rev. 64(4):50-56.

Broadhurst M. K., P. Suuronen, and A. Hulme. 2006. Estimating collateral mortality from towed fishing gear. Fish Fish. 7:180–218.

Brown, M.W., O.C. Nichols, M.K. Marx, and J.N. Ciano. 2002. Surveillance of North Atlantic right whales in Cape Cod Bay and adjacent waters—2002. Final Report to the Division of Marine Fisheries, Commonwealth of Massachusetts. 29pp.

Cicia, A.M., L.S. Schlenker, J.A. Sulikowski & J.W. Mandelman. 2012. Comparative Biochemistry and Physiology, Part A. 162: 130-138.

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(2): 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. Endang Species Res 21: 55–64.

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, August 2009. 222 pp.

Coutré, K., T. Gedamke, D.B. Rudders, W.B. Driggers III, D.M. Koester and J.A. Sulikowski. 2013. Indication of density-dependent changes in growth and maturity of the Barndoor Skate on Georges Bank. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 5(1): 260-269.

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.

Davis, M. W. 2002. Key principles for understanding fish bycatch discard mortality. Canadian Journal of Fisheries and Aquatic Sciences 59:1834– 1843.

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.

Dunton, K.J., A. Jordaan, D. O. Conover, K.A. McKown, L. A. Bonacci, and M. G. Frisk. 2015. Marine Distribution and Habitat Use of Atlantic Sturgeon in New York Lead to Fisheries Interactions and Bycatch. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science 7:18–32.

Dunton, K.J., A. Jordaan, K.A. McKown, D.O. Conover, and M.G. Frisk. 2010. Abundance and distribution of Atlantic sturgeon (*Acipenser oxyrinchus*) within the Northwest Atlantic Ocean determined from five fishery-independent surveys. Fish. Bull. 108:450-465.

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. J. Appl. Ichthyol. 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. 294 pages.

Frisk, M.G., S.J.D. Martell, T.J. Miller & K. Sosebee. 2010. Exploring the population dynamics of winter skate (*Leucoraja ocellata*) in the Georges Bank region using a statistical catch-at-age model incorporating length, migration, and recruitment process errors. Canadian Journal of Fisheries and Aquatic Sciences. 67(5): 774-792.

Frisk, Michael G., & Thomas J. Miller. 2006. Age, growth and latitudinal patterns of two rajidae species in the northwestern Atlantic: Little skate (*Leucoraja erinacea*) and winter skate (*Leucoraja ocellata*). Canadian Journal of Fisheries and Aquatic Sciences. **63**: 1078 – 1091.

Frisk, Michael G., Thomas J. Miller, and Michael J. Fogarty. 2001. Estimation and analysis of biological parameters in elasmobranch fishes: A comparative life history study. Canadian Journal of Fisheries and Aquatic Sciences. **58**: 969-- 981.

Gedamke, Todd, William D. DuPaul, & John A. Musick. 2005. Observations on the life history of the barndoor skate, *Dipturus* laevis, on Georges bank (western north Atlantic). Journal of Northwest Atlantic Fishery Science. **35**: 67 - 78.

Gelsleichter, JJ. 1998. Vertebral Cartilage of the Clearnose Skate, *Raja eglanteria*: Development, Structure, Ageing, and Hormonal Regulation of Growth. Dissertation. College of William and Mary.

Hain, J.H.W., M.J. Ratnaswamy, R.D. Kenney, and H.E. Winn. 1992. The fin whale, *Balaenoptera physalus*, in waters of the northeastern United States continental shelf. Reports of the International Whaling Commission 42: 653-669.

Hamilton, P.K., and C.A. Mayo. 1990. Population characteristics of right whales (*Eubalaena glacialis*) observed in Cape Cod and Massachusetts Bays, 1978-1986. Reports of the International Whaling Commission, Special Issue No. 12: 203-208.

Hayes, S.A., E. Josephson , K. Maze-Foley , and P. E. Rosel. 2017. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments 2016. NOAA Technical Memorandum NMFS-NE-241.

Hilborn, R., & Walters, C. J. (1992). Quantitative fisheries stock assessment: choice, dynamics and uncertainty. *Reviews in Fish Biology and Fisheries*, *2*(2), 177-178.

Hirth, H.F. 1997. Synopsis of the biological data of the green turtle, *Chelonia mydas* (Linnaeus 1758). USFWS Biological Report 97(1). 120pp.

James, M.C., R.A. Myers, and C.A. Ottenmeyer. 2005. Behavior of leatherback sea turtles, *Dermochelys coriacea*, during the migratory cycle. Proc. R. Soc. B, 272: 1547-1555.

Jefferson, T.A., D. Fertl, J. Bolanos-Jimenez and A.N. Zerbini. 2009. Distribution of common dolphins (*Delphinus spp.*) in the western North Atlantic: a critical re-examination. Mar. Biol. 156:1109-1124.

Johnson, A., G. Salvador, J. Kenney, J. Robbins, S. Kraus, S. Landry, and P. Clapham. 2005. Fishing gear involved in entanglements of right and humpback whales. Mar. Mamm. Sci. 21(4): 635-645.

Kelly, J.T. & J.M. Hanson. 2013. Abundance, distribution and habitat characteristics of witner skate *Leucoraja ocellata* in the southern Gulf of St Lawrence: a population on the brink of extirpation? Journal of Fish Biology. 1-16.

Kenney, R.D. 2001. Anomalous 1992 spring and summer right whale (*Eubalaena glacialis*) distribution in the Gulf of Maine. Journal of Cetacean Research and Management (special Issue) 2: 209-23.

Kenney, R.D. 2002. North Atlantic, North Pacific and Southern Right Whales. pp. 806-813, *In*: W.F. Perrin, B. Würsig, and J.G.M. Thewissen (eds.). Encyclopedia of Marine Mammals. Academic Press, San Diego, CA.

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. Mar. Mamm. Sci. 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*). Cont. Shelf Res. 15: 385–414.

Khan, C., T.V.N. Cole, P. Duley, A. Glass, M. Niemeyer, and C. Christman. 2009. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2008 Results Summary. NEFSC Reference Document 09-05. 7 pp.

Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2010. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2009 Results Summary. NEFSC Reference Document 10-07. 7 pp.

Khan, C., T. Cole, P. Duley, A. Glass, and J. Gatzke. 2011. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2010 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-05. 6 pp.

Khan C., T. Cole, P. Duley, A. Glass, and J. Gatzke, J. Corkeron. 2012. North Atlantic Right Whale Sighting Survey (NARWSS) and Right Whale Sighting Advisory System (RWSAS) 2011 Results Summary. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 12-09; 6 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at http://nefsc.noaa.gov/publications/

Kneebone, Jeff, Darren E. Ferguson, James A. Sulikowski, & Paul C. W. Tsang. 2007. Endocrinological investigation into the reproductive cycles of two sympatric skate species, M*alacoraja senta* and

A*mblyraja radiata*, in the western Gulf of Maine. Environmental Biology of Fishes. **80**: 257 - 265.

Knotek, R.J. 2015. The survival of rajids discarded in the New England scallop dredge fisheries. Masters thesis. 83 pp.

Laney, R.W., J.E. Hightower, B.R. Versak, M.F. Mangold, W.W. Cole Jr., and S.E. Winslow. 2007. Distribution, habitat use, and size of Atlantic sturgeon captured during cooperative winter tagging cruises, 1988-2006. In Anadromous sturgeons: habitats, threats, and management (J. Munro, D. Hatin, J.E. Hightower, K. McKown, K.J. Sulak, A.W. Kahnle, and F. Caron (eds.)), p. 167-182. Am. Fish. Soc. Symp. 56, Bethesda, MD.

Link, Jason A., and Katherine Sosebee. 2008. Estimates and Implications of Skate Consumption in the Northeast U.S. Continental Shelf Ecosystem. North American Journal of Fisheries Management 28:649–662, 2008.

Listing Endangered and Threatened Wildlife and Plants; 90-Day Finding on Petitions to List the Thorny Skate (*Amblyraja radiata*) Under the Endangered Species Act.

Mandelman, J.W., A.M. Cicia, G.W. Ingram Jr., W.B. Driggers III, K.M. Coutre & J.A. Sulikowski. 2013. Short-term post-release mortality of skates (family Rajidae) discarded in a western North Atlantic commercial otter trawl fishery. Fisheries Research. 139: 76-84.

Mayo, C.A. and M.K. Marx. 1990. Surface foraging behaviour of the North Atlantic right whale, *Eubalaena glacialis*, and associated zooplankton characteristics. Can. J. Zool. 68: 2214–2220.

Moore, M. J., & Van der Hoop, J. M. (2012). The painful side of trap and fixed net fisheries: chronic entanglement of large whales. *Journal of Marine Biology, 2012*.

Morreale, S.J. and E.A. Standora. 2005. Western North Atlantic waters: Crucial developmental habitat for Kemp's ridley and loggerhead sea turtles. Chel. Conserv. Biol. 4(4):872-882.

Murray, K.T. 2009. Characteristics and magnitude of sea turtle bycatch in U.S. Mid-Atlantic gillnet gear. Endangered Species Research 8:211-224.

Murray, K. T. (2013). Estimated Loggerhead and Unidentified Hard-shelled Turtle Interactions in Mid-Atlantic Gillnet Gear, 2007-2011. *NOAA Tech Memo NMFS-NE, 225*, 20p.

Murray, K.T. and Orphanides, C.D. 2013. Estimating the risk of loggerhead turtle *Caretta caretta* bycatch in the US mid-Atlantic using fishery-independent and -dependent data. Mar.Ecol. Prog. Ser. 477:259-270.

Murray, K.T. 2015. The importance of location and operational fishing factors inestimating and reducing loggerhead turtle (*Caretta caretta*)interactions in U.S. bottom trawl gear. Fisheries Research 172: 440–451.

Natanson, Lisa J., James A. Sulikowski, Jeff R. Kneebone, & Paul C. Tsang. 2007. Age and growth estimates for the smooth skate, M*alacoraja senta*, in the Gulf of Maine. Environmental Biology of Fishes. **80**: 293 - 308.

National Marine Fisheries Service (NMFS). 1991a. Final recovery plan for the humpback whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the national Marine Fisheries Service, Silver Spring, Maryland. 105 pp.

National Marine Fisheries Service (NMFS). 1991b. Final recovery plan for the North Atlantic right whale (*Eubalaena glacialis*). Prepared by the Right Whale Recovery Team for the National Marine Fisheries Service, Silver Spring, Maryland. 86 pp.

National Marine Fisheries Service (NMFS). 1998. Recovery Plan for the blue whale (*Balaenoptera musculus*). Prepared by R.R. Reeves, P.J. Clapham, R.L. Brownell, Jr., and G.K. Silber for the National Marine Fisheries Service, Silver Spring, MD. 42pp.

National Marine Fisheries Service (NMFS). 2005. Recovery Plan for the North Atlantic right whale (*Eubalaena glacialis*). National Marine Fisheries Service, Silver Spring, MD. 137pp.

National Marine Fisheries Service (NMFS). 2010b. Final recovery plan for the fin whale (*Balaenoptera physalus*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 121 pp.

National Marine Fisheries Service (NMFS). 2011. Final recovery plan for the sei whale (*Balaenoptera borealis*). Prepared by the Office of Protected Resources National Marine Fisheries Service, Silver Spring, MD. 108 pp.

National Marine Fisheries Service (NMFS). 2012. North Atlantic Right Whale (*Eubalaena glacialis*) five year review: summary and evaluation. NOAA Fisheries Service, Northeast Regional Office, Gloucester, MA. 36pp.

NMFS. 2017. Memo: Reinitiating Section 7 Consultation on the Batched Fisheries, American Lobster, and Atlantic Deep-Sea Red Crab Biological Opinions and associated Fishery Management Plans. NMFS GARFO, October 17, 2017.

National Marine Fisheries Service (NMFS) Northeast Fisheries Science Center (NEFSC) Fisheries Sampling Branch (FSB). 2017. Northeast Fisheries Observer Program (NEFOP) and At-Sea Monitoring (ASM) Program: Incidental Take Reports for Sea Turtles, Sturgeon, and Salmon. Omnibus data request + supplemental data from 1989-2016. Data compiled on May 10 and 15, 2017.

National Marine Fisheries Service (NMFS) Southeast Fisheries Science Center (SEFSC). 2001. Stock assessments of loggerhead and leatherback sea turtles and an assessment of the impact of the pelagic longline fishery on the loggerhead and leatherback sea turtles of the Western North Atlantic. NOAA Technical Memorandum NMFS-SEFSC-455. 343 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1991a. Recovery plan for U.S. population of loggerhead turtle. National Marine Fisheries Service, Washington, D.C. 64 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 1991b. Recovery plan for U.S. population of Atlantic green turtle. National Marine Fisheries Service, Washington, D.C. 58 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery plan for the Kemp's ridley sea turtle. National Marine Fisheries Service, Washington, D.C. 40 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1992. Recovery plan for leatherback turtles in the U.S. Caribbean, Atlantic, and Gulf of Mexico. National Marine Fisheries Service, Washington, D.C. 65 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 1995. Status reviews for sea turtles listed under the Endangered Species Act of 1973. National Marine Fisheries Service, Silver Spring, Maryland. 139 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 2007a. Loggerhead sea turtle (*Caretta caretta*) 5 year review: summary and evaluation. National Marine Fisheries Service, Silver Spring, Maryland. 65 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 2007b. Leatherback sea turtle (*Dermochelys coriacea*) 5 year review: summary and evaluation. National Marine Fisheries Service, Silver Spring, Maryland. 79 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 2007c. Kemp's ridley sea turtle (*Lepidochelys kempii*) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 50 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 2007d. Green sea turtle (*Chelonia mydas*) 5 year review: summary and evaluation. Silver Spring, Maryland: National Marine Fisheries Service. 102 pp.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS).. 2008. Recovery plan for the Northwest Atlantic population of the loggerhead turtle (*Caretta caretta*), Second revision. Washington, D.C.: National Marine Fisheries Service. 325 pp.

National Research Council (NRC). 1990. Decline of seat turtles: causes and prevention. National Academy Press, Washington D.C. 259 pages.

New England Fishery Management Council (NEFMC). 2003. Final Amendment 13 to the Northeast Multispecies Fishery Management Plan, including a Final Supplemental Environmental Impact Statement and an Initial Regulatory Flexibility Analysis. Vols I and II, submitted Dec 1 2003 http://www.nefmc.org/nemulti/planamen/amend13_dec03.htm.

New England Fishery Management Council (NEFMC). 2009. Final Amendment 3 to the Fishery Management Plan (FMP) for the Northeast Skate Complex and Final Environmental Impact Statement (FEIS) with an Initial Regulatory Flexibility Act Analysis. 456 pp. http://www.nefmc.org/skates/planamen/amend3/final/Skate%20Amendment%203%20FEIS.pdf.

New England Fishery Management Council (NEFMC). 2011. Framework Adjustment 1 to the Fishery Management Plan for the Northeast Skate Complex Including an Environmental Assessment and an Initial Regulatory Flexibility Analysis. 171 pp. http://www.nefmc.org/skates/frame/fw%201/Final%20FW1%20Submission%20revised%20EA%20-%20all.pdf.

New England Fishery Management Council (NEFMC). 2012. 2012-2013 Northeast Skate Complex Specifications Environmental Assessment, Regulatory Impact Review, and Initial Regulatory Flexibility Analysis. Available from: New England Fishery Management Council, 50 Water Street, Newburyport, MA 01950, or online at: http://www.nefmc.org

New England Fishery Management Council (NEFMC). 2014. Framework Adjustment 2 to the Northeast Skate Complex Fishery Management Plan. Available from: New England Fishery Management Council, 50 Water Street, Newburyport, MA 01950, or online at: http://www.nefmc.org

New England Fishery Management Council (NEFMC). 2016. Framework Adjustment 3 to the Northeast Skate Complex Fishery Management Plan. Available from: New England Fishery Management Council, 50 Water Street, Newburyport, MA 01950, or online at: http://www.nefmc.org

Northeast Fishery Science Center (NEFSC). 2007a. Skate Complex Assessment Summary for 2006. IN: 44th Northeast Regional Stock Assessment Workshop (44th SAW) assessment summary report. US Dep Commer, Northeast Fish Sci Cent Ref Doc. 07-03; 58 p http://www.nefsc.noaa.gov/publications/crd/crd0703/pdfs/b.pdf.

Northeast Fishery Science Center (NEFSC). 2007b. Assessment Of Northeast Skate Species Complex. IN: 44th Northeast Regional Stock Assessment Workshop (44th SAW): 44th SAW assessment report. US Dep Commer, Northeast Fish Sci Cent Ref Doc 07-10; 661 p. http://www.nefsc.noaa.gov/publications/crd/crd0710/pdfs/b.pdf

Northeast Fishery Science Center (NEFSC). 2000. Skate Complex Assessment Summary for 1999. IN: 30th Northeast Regional Stock Assessment Workshop (30th SAW) assessment summary report. US Dep Commer, Northeast Fish Sci Cent Ref Doc. 00-04; 58 p http://www.nefsc.noaa.gov/publications/crd/pdfs/crd0004.pdf.

Northeast Fishery Science Center (NEFSC). 2007. 44th Northeast Regional Stock Assessment Workshop (44th SAW): 44th SAW assessment report. US Dept. Commerce, Northeast Fish Sci. Cent. Ref. Doc. 07-10; 661 p. Also available at http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0710/.

Northeast Fishery Science Center (NEFSC). 2000. 30th Northeast Regional Stock Assessment Workshop (30th SAW) Stock Assessment Review Committee (SARC) Consensus Summary of Assessments. NEFSC Ref. Doc. 00-03, 477 p.

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. Conserv Genet: DOI 10.1007/s10592-014-0609-9; ISSN 1566-0621.

Packer DB, Zetlin CA, Vitaliano JJ. 2003a. Essential fish habitat source document: barndoor skate, *Dipturus laevis*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-173.

Packer DB, Zetlin CA, Vitaliano JJ. 2003b. Essential fish habitat source document: clearnose skate, *Raja eglanteria*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-174.

Packer DB, Zetlin CA, Vitaliano JJ. 2003c. Essential fish habitat source document: little skate, *Leucoraja erinacea*, life history and habitat characteristics. NOAA Technical Memorandum NMFS-NE-175.

Palm, B.D., D.M. Koester, W.B. Driggers III, & J.A. Sulikowski. 2011. Seasonal variation in fecundity, egg case viability, gestation, and neonate size for little skates, *Leucoraja erinacea*, in the Gulf of Maine. Environmental Biology of Fishes. 92(4) 585-589.

Parent, Serge, Serge Pepin, Jean-Pierre Genet, Laurent Misserey, and Salvador Rojas. 2008. Captive Breeding of the Barndoor Skate (*Dipturus laevis*) at the Montreal Biodome, With Comparison Notes on Two Other Captive-Bred Skate Species. Zoo Biology 27:145–153.

Payne, P.M. and D.W. Heinemann. 1993. The distribution of pilot whales (*Globicephala sp*.) in shelf/shelf edge and slope waters of the northeastern United States, 1978-1988. Rep. Int. Whal. Comm. (Special Issue) 14: 51- 68.

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*. Fish. Bull. 84: 271-277.

Payne, P.M., L. A**.** Selzer, and A. R. Knowlton. 1984. Distribution and density of cetaceans, marine turtles, and seabirds in the shelf waters of the northeastern United States, June 1980 - December 1983, based on shipboard observations. National Marine Fisheries Service-NEFSC, Woods Hole, MA. 294pp.

Payne, P.M., 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. Fish. Bull. 88: 687-696.

Risch, D., Clark, C. W., Dugan, P. J., Popescu, M., Siebert, U., & Van Parijs, S. M. (2013). Minke whale acoustic behavior and multi-year seasonal and diel vocalization patterns in Massachusetts Bay, USA. *Mar Ecol Prog Ser, 489*, 279-295.

Robbins, J. (2009). Scar-based inference into Gulf of Maine humpback whale entanglement: 2003-2006. *Report to the Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, Massachusetts, USA http://www. nefsc. noaa. gov/psb/docs/HUWHScarring% 28Robbins2009, 29*.

Schevill, W.E., W.A. Watkins, and K.E. Moore. 1986. Status of *Eubalaena glacialis* off Cape Cod. Report of the International Whaling Commission, Special Issue 10: 79-82.

Schilling, M. R., I. Seipt, M. T. Weinrich, S. E. Frohock, A. E. Kuhlberg, and P. J. Clapham. 1992. Behavior of individually-identified sei whales *Balaenoptera borealis* during an episodic influx into the southern Gulf of Maine in 1986. Fishery Bulletin 90:749–755.

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. Herpetol. Monogr. 6: 43-67.

Sosebee, K.A. 2005. Maturity of skates in northeast United States waters. E-Journal of Northwest Atlantic Fishery Science. **35**(9).

Steimle, F.W. and C. Zetlin. 2000. Reef habitats in the middle Atlantic bight: abundance, distribution, associated biological communities, and fishery resource use. Mar. Fish. Rev. 62: 24-42.

Stein, A. B., K. D. Friedland, and M. Sutherland. 2004a. Atlantic sturgeon marine bycatch and mortality on the continental shelf of the Northeast United States. North American Journal of Fisheries Management 24: 171-183.

Stein, A.B., K. D. Friedland, and M. Sutherland. 2004b. Atlantic sturgeon marine distribution and habitat use along the northeastern coast of the United States. Transaction of the American Fisheries Society 133:527-537.

Stevenson, D., L. Chiarella, D. Stephan, R. Reid, K. Wilhelm, J. McCarthy, and M. Pentony. 2004. Characterization of the fishing practices and marine benthic ecosystems of the northeast U.S. shelf, and an evaluation of the potential effects of fishing on essential fish habitat. NOAA Tech. Memo. NMFS-NE-181. 179 p.

Sulikowski, J. A., J. Kneebone, S. Elzey, J. Jurek, W. H. Howell, & P. C. W. Tsang. 2006. Using the composite variables of reproductive morphology, histology and steroid hormones to determine age and size at sexual maturity for the thorny skate *Amblyraja radiata* in the western Gulf of Maine. Journal of Fish Biology. **69**: 1449 - 1465.

Sulikowski, J.A., P. C. W. Tsang, & W. Huntting Howell. 2004. An annual cycle of steroid hormone concentrations and gonad development in the winter skate, Leucoraja ocellata, from the western Gulf of Maine. Marine Biology. **144**: 845 - 853.

Sulikowski, James A., Jeff Kneebone, Scott Elzey, Joe Jurek, Patrick D. Danley, W. Huntting Howell, and Paul C.W. Tsang. 2005a. Age and growth estimates of the thorny skate (*Amblyraja radiata*) in the western gulf of Maine. Fishery Bulletin. **103**: 161 - 168.

Sulikowski, James A., Michael D. Morin, Seung H. Suk, and W. Huntting Howell. 2003. Age and growth estimates of the winter skate (*Leucoraja ocellata*) in the western gulf of Maine. Fishery Bulletin. **101**: 405 - 413.

Sulikowski, James A., Paul C.W. Tsang & W. Huntting Howell. 2005b. Age and size at sexual maturity for the winter skate, *Leucoraja ocellata*, in the western Gulf of Maine based on morphological, histological and steroid hormone analyses. Environmental Biology of Fishes. **72**: 429 - 441.

Sulikowski, James A., Scott Elzey, Jeff Kneebone, Joe Jurek, W. Huntting Howell and Paul C. W. Tsang. 2007. The reproductive cycle of the smooth skate, *Malacoraja senta*, in the Gulf of Maine. Marine and Freshwater Researc*h*. **58**, 98–103

Swain, D.P., I.D. Jonsen, J.E. Simon & T.D. Davies. 2013. Contrasting decadal trends in mortality between large and small individuals in skate populations in Atlantic Canada. Canadian Journal of Fish and Aquatic Sciences. 70: 74-89.

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. Mar. Mamm. Sci. 9: 309-315.

Turtle Expert Working Group (TEWG). 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. 96 pp.

Turtle Expert Working Group (TEWG). 2000. Assessment update for the Kemp's ridley and loggerhead sea turtle populations in the western North Atlantic. U.S. Dep. Commer. NOAA Tech. Mem. NMFS-SEFSC-444, 115 pp.

Turtle Expert Working Group (TEWG). 2009. An assessment of the loggerhead turtle population in the Western North Atlantic Ocean. NOAA Technical Memorandum NMFS-SEFSC-575:1-131.

USFWS. 1997. Synopsis of the biological data on the green turtle, *Chelonia mydas* (Linnaeus 1758). Biological Report 97(1). U.S. Fish and Wildlife Service, Washington, D.C. 120 pp.

USFWS (U.S. Fish and Wildlife Service) and NMFS (National Marine Fisheries Service). 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). St. Petersburg, Florida: National Marine Fisheries Service. 40 pp.

USFWS and NMFS. 1992. Recovery plan for the Kemp's ridley sea turtle (*Lepidochelys kempii*). NMFS, St. Petersburg, Florida.

Waring, G.T., E. Josephson, K. Maze-Foley, and P.E. Rosel, editors. 2014. U.S. Atlantic and Gulf of Mexico marine mammal stock assessments—2013. NOAA Tech Memo NMFS- NE-228. 475 pp.

Valentine, P.C. and R.G. Lough. 1991. The sea floor environment and the fishery of eastern Georges bank. U.S. Dep. Interior, U.S. Geol. Sur. Open File Rep. 91-439. 25 p.

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. Aq. Biol.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.

Watkins, W.A., and W.E. Schevill. 1982. Observations of right whales (*Eubalaena glacialis*) in Cape Cod waters. Fish. Bull. 80(4):875-880.

Whittingham, A., D. Hartley, J. Kenney, T. Cole, and E. Pomfret. 2005a. Large Whale Entanglement Report 2002. Report to the National Marine Fisheries Service, updated March 2005.

Whittingham, A., M. Garron, J. Kenney, and D. Hartley. 2005b. Large Whale Entanglement Report 2003. Report to the National Marine Fisheries Service, updated June 2005.

Williams, L.J., M.D. Campbell, P.C.W. Tsang & J.A. Sulikowski. 2013. Using estradiol and progesterone concentrations to assess individual variability in the reproductive cyclicity of captive female little skates, *Leucoraja erinacea*, from the western Gulf of Maine. Fish physiology and biochemistry. 1-11.

Winn, H.E., C.A. Price, and P.W. Sorensen. 1986. The distributional biology of the right whale (*Eubalaena glacialis*) in the western North Atlantic. Reports of the International Whaling Commission (Special issue). 10: 129-138.

Wirgin, I., L. Maceda, J.R. Waldman, S. Wehrell, M. Dadswell, and T. King. 2012. Stock origin of migratory Atlantic sturgeon in the Minas Basin, Inner Bay of Fundy, Canada, determined by microsatellite and mitochondrial DNA analyses.

9.3 Index