Framework Adjustment 6
To the
Northeast Skate Complex FMP

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

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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 (MSA). The Northeast Skate Complex Fishery Management Plan (FMP) specifies the 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. Amendment 3 to the FMP established a control rule for setting the Skate acceptable biological catch (ABC) based on survey biomass indices and median exploitation ratios; the ABC was set to equal the annual catch limit (ACL).

This framework adjustment would implement changes to specifications based on updated data and research and would add a new seasonal allocation of the skate wing fishery TAL.

The need for this action is to meet regulatory requirements and adjust management measures that are necessary to prevent overfishing, ensure rebuilding, and help achieve optimum yield in the fishery consistent with the status of stocks and the requirements of MSA of 2006, and to provide flexibility for vessels fishing in the NAFO Regulated Area to maximize skate retention and to land skate in the US. There are several purposes: to adopt fishing specifications for FY 2018 and FY 2019 for skates, to develop a possession limit for barndoor skate based on updated stock information, and to minimize regulatory obstacles, through exemptions, for vessels utilizing the US quota of groundfish and other species in the NRA.

Proposed Action

Under the provision of the MSA, 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.

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:

- *Modification to the Uncertainty Buffer*

Summary of Environmental Consequences

The environmental impacts of all of the alternatives under consideration are described in detail in Section 7.0.

Biological Impacts

Essential Fish Habitat (EFH) Impacts

Impacts on Endangered and Other Protected Species

Socio-Economic 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.

- *Modification to the Uncertainty Buffer*
    - *Reduction in the Uncertainty Buffer Alternatives*.

Impacts of Alternatives to the Proposed Action

Biological Impacts

Essential Fish Habitat (EFH) Impacts

Impacts on Endangered and Other Protected Species

Socio-Economic Impacts

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ABC	Acceptable 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
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	maximum sustainable yield
NEFMC	New England Fishery Management Council
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NLSA	Nantucket Lightship closed area
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
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
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
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	Western 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 has been updated through a series of amendments and framework adjustments.

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. Framework Adjustment 1 set a seasonal skate wing possession limit to keep the fishery open year round. Specifications for FY 2012 and FY 2013 were set in the 2012 Specifications package that resulted in an increase in ACL for the complex. Framework Adjustment 2 set specifications for FY 2014 and FY 2015, which decreased the ACL for the complex, and also modified the VTR and dealer reporting codes for the skate wing and bait fisheries. Framework Adjustment 3 set specifications for FY2016 and FY2017 for the skate wing and bait fisheries and established seasonal management for the wing fishery. Framework Adjustment 4 modified effort controls for the skate bait fishery. Framework Adjustment 5 set specifications for FYs 2018 and 2019, allowed barndoor skate to be landed, and established exemptions from most skate regulations for vessels fishing in the NAFO Regulated Area.

Skates are harvested in two 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 (AMs). This framework is primarily intended to set specifications for FY 2018 and FY 2019, to remove the prohibition on possessing barndoor skate and to establish the NAFO Regulated Area Exemption Program.

3.2 Purpose and Need for the Action

The measures analyzed in this environmental assessment are intended to meet the goals and many of the objectives of the Skate FMP. Periodic frameworks are used to adjust strategies in response to the evaluations that adjust rebuilding plans and overfishing. The need for this action is to adjust management measures that are necessary to prevent overfishing, ensure rebuilding, and help achieve optimum yield in the fishery consistent with the status of stocks and the requirements of MSA of 2006.

The primary *purpose* of FW 6 is to reduce the uncertainty buffer, which would prolong the duration of the fishing year for both the wing and bait fisheries and support their shoreside infrastructure.

To better demonstrate the link between the purpose and need for this action, Table 1 summarizes the need for the action and corresponding purposes.

Table 1 - Purpose and Need for Framework Adjustment 5

Need for Framework 5	Corresponding Purpose for Framework 5
Achieve optimum yield	Reduce the uncertainty buffer

3.3 Brief History of the Northeast Skate Complex Management Plan

Table 2 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 2 - 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.

Skates are harvested in two different fisheries, one for lobster bait and one for wings for food. 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 fishery for skate wings evolved in the 1990s as skates were promoted as “underutilized species,” and fishermen shifted effort from groundfish and other troubled fisheries to skates and dogfish. The wing fishery is largely an incidental fishery that includes a larger number of vessels located throughout the region, with a smaller portion of fishery targeting skate wings. Vessels tend to catch skates when targeting other species like groundfish, monkfish, and scallops and land them if the price is high enough. However, a smaller component of the fishery targets skates and account for a large amount of landings. A description of available information about these fisheries can be found in Section 6.5.1.

In 1999, the 30th Northeast Stock Assessment Workshop (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 occurring on winter skate (NEFSC, 2000). The FMP initially set limits on fishing related to the amount of groundfish, scallop, and monkfish days-at-sea (DAS) and measures in these and other FMPs to control the catch of skates.

In 2010, 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. Skate FW4 modified skate bait effort controls. Skate FW5 increased skate specifications, set barndoor skate possession limits, and established an exemption program for the NAFO Regulated Area.

3.4 Maximum Sustainable Yield (MSY) and Optimum Yield (OY)

Principally, due to problems with species identification in commercial catches, the Skate FMP did not derive or propose an MSY estimate for skate species or for the skate complex. Catch histories for individual species were unreliable and probably underreported. Furthermore, the population dynamics of skates was largely unknown so measures of carrying capacity or productivity were not available on which to base estimates of MSY.

One of the major purposes of Amendment 3 was to set catch limits to prevent overfishing. If overfishing is defined as an unsustainable level of exploitation, then a suitable candidate for MSY is the catch that when exceeded generally leads to declines in biomass MSY. This value, estimated by the Skate PDT and approved as an ABC by the SSC, is the median exploitation ratio (catch/relative biomass). If and when the biomass of skates is at the target, the maximum catch that would not exceed the median exploitation ratio can serve as a proxy for MSY (Hilborn and Walters 1992).

Table 3 **-** Exploitation ratios and survey values for managed skates, with estimates of annual catch limits, and maximum sustainable yield that take into account the 2016-2017 discard rate using DPWS catch data using the selectivity ogive method to assign species to catch[1].

	Catch/biomass index (thousand mt catch/kg per tow)	Stratified mean survey weight (kg/tow)	
Species	Median	2014-2016	MSY Target
Barndoor	2.76	1.60	1.57
Clearnose	2.94	0.59	0.66
Little	2.14	5.49	6.15
Rosette	2.25	0.047	0.048
Smooth	2.68	0.25	0.27
Thorny	1.44	0.18	4.13
Winter	1.87	6.65	5.66
Annual Catch Limit (ACL/ABC)		31,327	
MSY			36,794

Because the numeric estimates of MSY were unavailable in the Skate FMP, a quantitative estimate of optimum yield was also not previously specified. The Skate FMP defined optimum yield as equating “to the yield of skates that results from effective implementation of the Skate FMP.”

Although the Skate FMP had no quantitative estimate of MSY, it defined optimum yield as equating “to the yield of skates that results from effective implementation of the Skate FMP.” Amendment 3 redefined the estimate of optimum yield as 75% of MSY. Thus using the updated catch/biomass exploitation ratios and adjusted survey biomass values, the revised estimate of optimum yield is 27,596 mt.

At current skate biomass, the ACT will be set at 23,495 mt, allowing for a 25% buffer from the ACL to account for scientific and management uncertainty. Deducting the 2014-2016 discards to account for bycatch results in an aggregate TAL of 13,281 mt.

3.5 ABC and ACL Specifications

ABC and ACL specifications are derived from the median catch/biomass exploitation ratio for time series up to 2016 and the three year average stratified mean biomass for skates, using the 2015-2017 spring survey data for little skate and the 2014-2016 fall survey data for other managed skate stocks. For skates, the Council set the ACL equal to the ABC because the skate ABC is inherently conservative and the associated exploitation ratio is less than that which is risk neutral (and theoretically equivalent to F_{MSY}). TALs are set according to Amendment 3 procedures that assume that future discards will be equivalent to the average rate from the most recent three years (2014-2016).

The updated specifications are presented in Section 4.1.1 and the analysis of the data is presented in Section 7.0. The new data include survey biomass tow data collected by the FSV Bigelow, which have been calibrated to the FSV Albatross IV units using peer reviewed methods. The catch data include new estimates of discard mortality for winter skate captured by sink gillnet gear.

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[1] The survey biomass value for little skate is the arithmetic average of the 2015-2017 spring surveys.

3.6 Stock Status

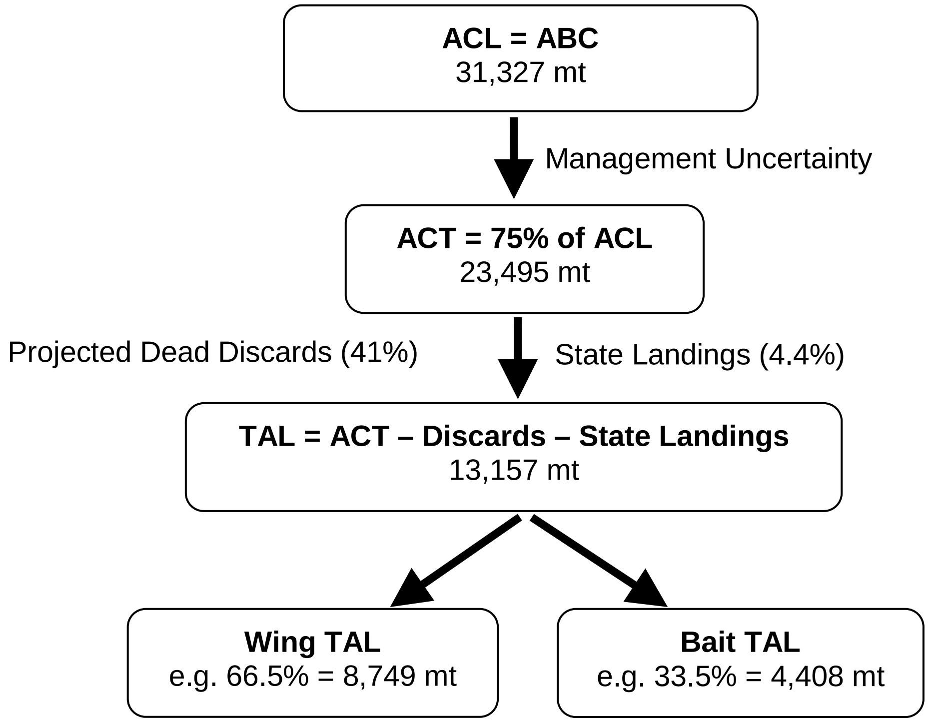
Stock status is described in more detail in Section 6.1.2. Based on survey data through spring 2017 and catch data through calendar year 2016, barndoor and winter skate biomass are above the target, and clearnose, little, rosette, and smooth skate biomass are between the threshold and target. Thorny skate biomass is well below the threshold and is therefore overfished, a status that has existed since 1987 (if "overfished" had been defined at that time).

4.0 Alternatives Under Consideration

4.1 Modification to the Uncertainty Buffer

4.1.1 Option 1: No Action

The uncertainty buffer between the ACL and the ACT parameters would remain unchanged from the final ACL specifications for the 2018-2019 fishing years (see diagram below) in the final regulations for the specifications package.

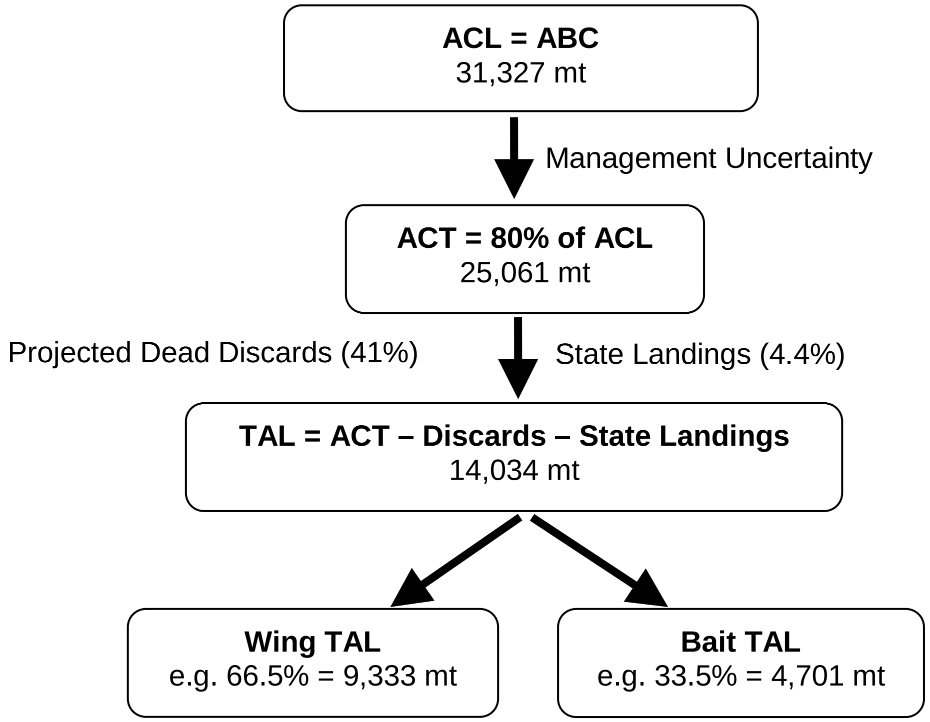


Rationale: The No Action alternative would not reduce the buffer between the ACL and the ACT. The buffer would be maintained at 25% in order to reduce the risk of the ACL being exceeded.

4.1.2 Option 2: Reduction in the Uncertainty Buffer to 20%

The buffer between the ACL and the ACT would be reduced from 25% to **20%**. The ABC/ACL would remain the same but the ACT and TALs would be adjusted.

The ACT would increase to **25,061** mt. After deducting amounts for projected dead discards and state landings, the TAL would increase to **14,034** mt.



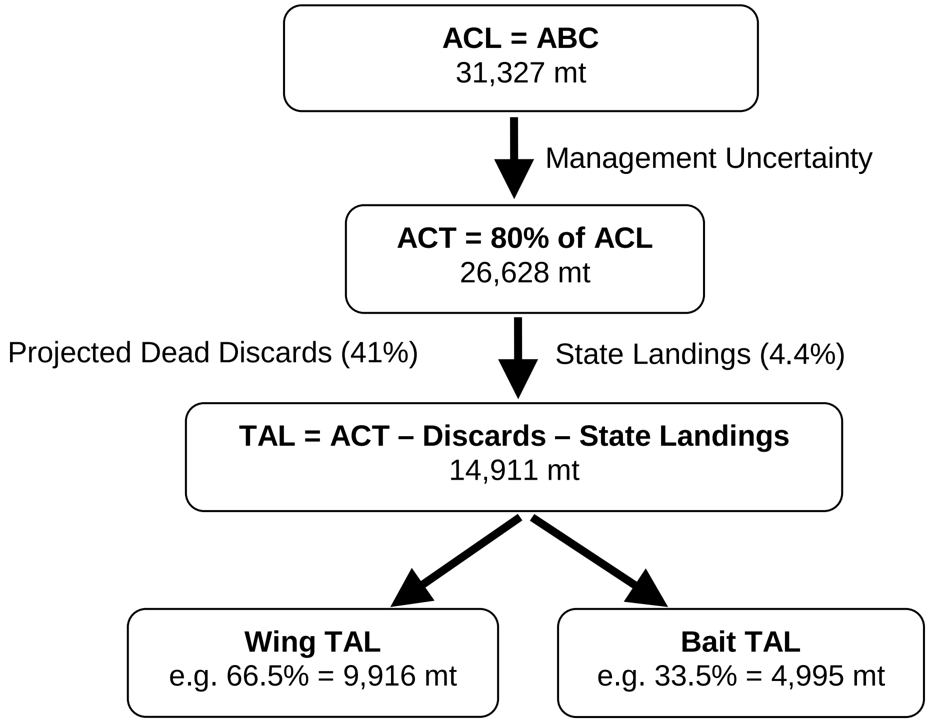
Rationale: A buffer is recommended to reduce the likelihood of the ACL from being exceeded. The overfishing limit is currently not defined for the Northeast Skate Complex. The skate complex has proven unsuitable for traditional stock assessment models to be used, resulting in an empirical assessment based on the Northeast Fishery Science Center Trawl Survey indices that are used as biomass proxies. This contributes to the uncertainty surrounding the specifications process. The calculation of ABC uses the median C/B (rather than a higher percentile). This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship. Other sources of uncertainty within the ABC calculation include: species-specific landings, species-specific estimates of discards, overall estimates of discards, discard mortality rates, and the relationship between catch and survey biomass. Table 5 summarizes sources of uncertainty and any improvements made since the implementation of Amendment 3. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards.

This alternative would reduce the uncertainty buffer reflecting the improvements made in factors affecting scientific uncertainty, e.g., post-release discard mortality research for some species, and management uncertainty, e.g., species-specific reporting, minimal quota overages.

4.1.3 Option 3: Reduction in the Uncertainty Buffer to 15%

The buffer between the ACL and the ACT would be reduced from 25% to **15%**. The ABC/ACL would remain the same but the ACT and TALs would be adjusted.

The ACT would increase to **26,628** mt. After deducting amounts for projected dead discards and state landings, the TAL would increase to **14,911** mt.



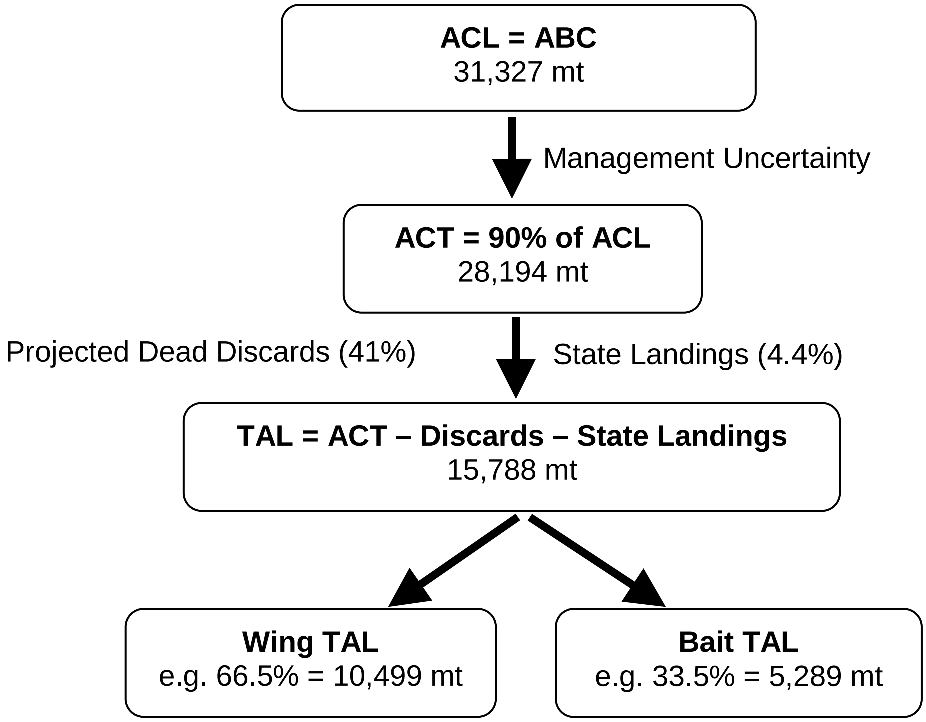
Rationale: A buffer is recommended to reduce the likelihood of the ACL from being exceeded. The overfishing limit is currently not defined for the Northeast Skate Complex. The skate complex has proven unsuitable for traditional stock assessment models to be used, resulting in an empirical assessment based on the Northeast Fishery Science Center Trawl Survey indices that are used as biomass proxies. This contributes to the uncertainty surrounding the specifications process. The calculation of ABC uses the median C/B (rather than a higher percentile). This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship. Other sources of uncertainty within the ABC calculation include: species-specific landings, species-specific estimates of discards, overall estimates of discards, discard mortality rates, and the relationship between catch and survey biomass. Table 5 summarizes sources of uncertainty and any improvements made since the implementation of Amendment 3. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards.

This alternative would reduce the uncertainty buffer reflecting the improvements made in factors affecting scientific uncertainty, e.g., post-release discard mortality research for some species, and management uncertainty, e.g., species-specific reporting, minimal quota overages.

4.1.4 Option 4: Reduction in the Uncertainty Buffer to 10% (*Committee preferred alternative*)

The buffer between the ACL and the ACT would be reduced from 25% to **10%**. The ABC/ACL would remain the same but the ACT and TALs would be adjusted.

The ACT would increase to **28,194** mt. After deducting amounts for projected dead discards and state landings, the TAL would increase to **15,788** mt.



Rationale: A buffer is recommended to reduce the likelihood of the ACL from being exceeded. The overfishing limit is currently not defined for the Northeast Skate Complex. The skate complex has proven unsuitable for traditional stock assessment models to be used, resulting in an empirical assessment based on the Northeast Fishery Science Center Trawl Survey indices that are used as biomass proxies. This contributes to the uncertainty surrounding the specifications process. The calculation of ABC uses the median C/B (rather than a higher percentile). This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship. Other sources of uncertainty within the ABC calculation include: species-specific landings, species-specific estimates of discards, overall estimates of discards, discard mortality rates, and the relationship between catch and survey biomass. Table 5 summarizes sources of uncertainty and any improvements made since the implementation of Amendment 3. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards.

This alternative would reduce the uncertainty buffer reflecting the improvements made in factors affecting scientific uncertainty, e.g., post-release discard mortality research for some species, and management uncertainty, e.g., species-specific reporting, minimal quota overages.

4.2 Skate Wing Possession Limit Alternatives (*Committee recommended moving to considered but rejected*)

4.2.1 Option 1: No Action

The No Action alternative would not modify the current seasonal possession limits last evaluated in Framework 3 (NEFMC, 2016).

Rationale: This alternative would allow for additional rebuilding of barndoor skate to continue.

4.2.2 Option 2: Seasonal Intermediate Skate Wing Possession Limit

This alternative would establish a seasonal intermediate skate wing possession limit once XX% of the Season 1 TAL was reached or the annual TAL was reached. The intermediate skate wing possession limit would be set at 1,300 lb in Season 1 (May 1 – Aug 31) and 2,050 lb in Season 2 (Sep 1 – Apr 30). The Regional Administrator (RA) would have the discretion to implement the seasonal intermediate skate wing possession limits if the fishery was projected to exceed 90% of the relevant TAL before the end of Season 1 or the end of the fishing year. If the fishery was not projected to exceed 90%, the RA is not required to implement the intermediate skate wing possession limit. This alternative would not modify the existing 90% threshold and the 500 lb incidental limit.

Rationale: This alternative would help to prolong the fishery for as long as possible. The existing management strategy for the skate wing fishery does not close the fishery once 100% of the TAL has been landed. The incidental possession limit of 500 lb was intended to allow the fishery to continue to operate at a low level, and to reduce negative impacts on other fisheries, e.g. groundfish and monkfish, that experience high interactions with skate. However, the incidental possession limit can result in an effective closure in the fishery, especially for vessels that target skate, which can negatively impact shoreside infrastructure. The intermediate skate wing possession limits would be expected to slow landing of skate sufficiently, when needed, to minimize negative impacts on fishermen and shoreside infrastructure.

5.0 Considered but Rejected Alternatives

No management alternatives were considered during the development of this action that were not adopted as alternatives by the Council.

6.0 AFFECTED ENVIRONMENT (SAFE Report /EA)

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 this framework adjustment.

In 2010, Amendment 3 implemented a new ACL management framework that capped catches at levels determined from survey biomass indices and median exploitation ratios. 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) lbs. of skate wings, established a 20,000 lbs. 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.

Framework Adjustment 1 evaluated alternatives for setting a lower skate wing possession limit to keep landings below the 9,209 mt TAL and keep the fishery open year around. As a result of the Framework Adjustment 1 analysis, the Council set a 2,600 lbs. skate wing possession limit from May 1 to Aug 31, 2011 and a 4,100 lbs. skate wing possession limit from Sep 1, 2011 to Apr 30, 2011.

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 Regional Administrator (RA) 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 FY2016 and FY 2017 also following the Amendment 3 ACL methodology. It also incorporated final discard mortality rate estimates for little (48%) and winter skates (34%). Seasonal management was also established in the wing fishery that apportioned the TAL between two seasons: Season 1 (May 1 – August 31) and Season 2 (September 1 – April 30).

Framework Adjustment 4 (NEFMC, 2017) modified skate bait effort controls by reducing the Season 3 (November 1 – April 30) bait skate possession limit to 12,000 lb, reducing the in-season adjustment trigger to 80%, redefining the bait fishery incidental possession limit to be 8,000 lb, and allowing the fishery to close once 100% of the TAL was achieved.

Table 2 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 coefficient of variation (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 **Error! Not a valid bookmark self-reference.**. Except for little skates, the abundance and biomass trends are best represented by the fall survey, which has been updated through 2014 (**Error! Not a valid bookmark self-reference.**). Little skate abundance and biomass trends are best represented by the spring survey, which has been updated through 2015 (**Error! Not a valid bookmark self-reference.**). 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 (**Error! Not a valid bookmark self-reference.**).

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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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) [**Error! Not a valid bookmark self-reference.**]. 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 4 - 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.

6.1.3 Uncertainty Buffer

Amendment 3 established the annual catch limit framework currently used to set specifications for the NE Skate Complex (NEFMC, 2010). The uncertainty buffer was set at 25% in Amendment 3, and considers both management and scientific uncertainty. Table 5 summarizes the sources of uncertainty considered to affect the NE Skate Complex and any improvements made since Amendment 3 was implemented.

Table 5 – Summary of factors affecting uncertainty in the skate fishery and any improvements made.

Issue	Starting point (2003 – 2009)	Improvements	Impacts on Uncertainty
-Fishery dependent data	-Landings reported largely as unclassified	-Unclassified reporting reduced in VTR codes; Outreach to aid in identifying skate species	Positive impact
-Observer data	-Somewhat unreliable in terms of ID -Variance/coverage	-Improved identification data -Improved since 2008	-Positive impact
Discard estimation - Overall observed discards overlaid with survey - Discard mortality rate estimates	-Observed total discards are speciated with survey data -Assumed 50% across gear types	-No change -Improvements for some species and gear types: Trawl: little, smooth, thorny, winter Dredge: little, winter Gillnet: winter	-No change but contributes to uncertainty -Improvement in species specific info with positive impact
Stock assessment	Data-poor Relationship between catch and survey biomass	Data-poor	- No improvements in available models/methodology but recent issues with survey vessel reliability, and therefore coverage (& different vessel Pisces), may introduce uncertainty
Catch accounting		- FW2 – Fishing vessels and dealers no longer allowed to report “unclassified” skates. The number of	- Neutral

		"Unclassified skates" have been reduced in VTR data, but still exist. - Annual monitoring reports	
Management controls		- FW4 allows in season closure of bait fishery once TAL reached - 500 lb incidental limit in wing fishery once trigger has been reached - Open permit fishery can contribute to unexpected increases in effort - Seasonal management for wing fishery introduced by FW3 - Fishery specific trigger points for implementing adjustments to possession limits	- Most points positive for uncertainty - Open permit fishery makes it uncertain how much effort will be experienced in any one year adding uncertainty
OFL	None	None	- Scientific uncertainty - Should be accounted for in buffer since no buffer between ABC and OFL exists

6.1.4 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. And a detailed summary of the biological and life history characteristics was included in the FEIS for Amendment 3 (NEFMC 2009).

Barndoor Skate

Barndoor skates have been reported to reach a maximum size of 152 cm and 20 kg weight (Bigelow & Schroeder, 1953). The maximum observed length in the NEFSC trawl survey was 140 cm total length in the 2007 survey. In a study conducted in Georges Bank Closed Area II the largest individual observed was 133.5 cm, with total lengths ranging from 20.0 to 133.5 cm.

Gedamke et al. (2005) examined barndoor skates in the southern section of Georges Bank Closed Area II. Length at 50% maturity was 116.3 cm TL and 107.9 cm TL for females and males, respectively. The oldest age observed was 11 years. Age at maturity was estimated to be 6.5 years and 5.8 years for females and males, respectively. The von Bertalanffy parameters were also determined: $L_\infty = 166.3$ cm TL; $k = 0.1414$ yr^{-1}; $t_o = -1.2912$ yr. Coutré et al. (2013) re-examined life history parameters of barndoor skate in the Closed Areas I and II on Georges Bank; changes occurred in von Bertalanffy parameters (L_∞ = 155 cm TL; $k = 0.10$ yr^{-1}) and an increase in age at 50% maturity compared to Gedamke et al. (2005). Coutré et al. (2013) suggest barndoor skate are subject to density dependence effects based on the plasticity in life history parameters observed in the 10 year gap between studies. Based on the predictive equations from Frisk *et al*. (2001) and the Northeast Fisheries Science Center (NEFSC) survey maximum observed length of 136 cm TL, L_{mat} is estimated at 102 cm TL and A_{mat} is estimated at 8 years (NEFSC, 2000). In another study, clasper length measurements on males from Georges Bank show that male sexual maturity occurs at approximately 100 cm TL.

Sosebee (2005) used body morphometry to determine the size of maturity (females: 96 to 105 cm TL; males: 100 cm TL) on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to

Cape Hatteras. Egg production is estimated to range between 69 – 85 eggs/female/year (Parent et al. 2008). As part of a captive breeding program, the egg incubation was determined to range from 342 – 494 days. As part of the same study, successful hatch rate was 73% (Parent et al. 2008). Previous fecundity estimates were 47 eggs per year (Packer et al. 2003a). Hatchlings range in size from 193 mm TL, 128 mm disk width and 32 g body mass.

Barndoor skates are benthivorous and piscivorous, a large portion of the diet formed by forage fishes. Overall, the diet of barndoor skates was dominated by herrings Pandalid shrimps and *Cancer* crabs. Up to 8,000 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. Small skates (<=80 cm TL) consumed approximately 5 kg per year of prey items, while large skates (>80 cm TL) consumed approximately 10 to 20 kg per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 4,000 and 16,000 mt per year, with total consumption dominated by mature skates.

Clearnose Skate

Gelsleichter (1998) examined the vertebral centra of clearnose skates that were collected from Chesapeake Bay and the northwest Atlantic Ocean. The oldest male was aged at 5+ years, with the oldest female being 7+ years. This study suggests that clearnose skate experience rapid growth over during a relatively short life span.

Sosebee (2005) used body morphometry to determine size at maturity (females: 59 to 65 cm TL; males: 56 cm TL) on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras. Fecundity was estimated to be 35 eggs/year (Packer et al. 2003b).

Clearnose skates are benthivorous, a large portion of the diet comprised of benthic megafauna (crabs and miscellaneous crustaceans). Overall, the diet of clearnose skates was dominated by other crabs, *Cancer* crabs and squids. Up to 8,000 – 10,000 mt of a particular prey item can be removed by this skate in any given year, but values are typically on the order of 2,000 to 4,000 mt. Small skates (<= 60 cm TL consumed approximately 1 - 2 kg per year of prey items, while large skates (>60cm TL) consumed approximately 5 kg per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 2,000 and 18,000 mt per year, with total consumption dominated by mature skates.

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.

Smooth Skate

Natanson et al. (2007) aged smooth skate from New Hampshire and Massachusetts waters. Maximum ages were estimated to be 14 and 15 years for females and males respectively. Longevity was estimated to be 23 years for females and 24 years for males. Male and females exhibited significantly different growth rates. Accordingly different growth models were required to fit the male and female growth data. Parameters for the von Bertalanffy equation for the males were determined to be k = 0.12, L_∞ = 75.4 cm TL, with L_o required to be set at 11 cm TL (Natanson et al. 2007). Growth models applied to females overestimated the size at birth thus requiring the use of back-calculated data resulting in von Bertalanffy parameters of: k = 0.12, L_∞ = 69.6 cm TL, L_o = 10 TL (Natanson et al. 2007). Sulikowski et al. (2007) determined, in a study conducted in the Gulf of Maine that in their sample mature females ranged in size from 508 to 630 mm TL and for males 550 to 660 mm TL. Based on morphological characteristics in females (ovary weight, shell gland weight, diameter of largest follicles, and pattern of ovarian follicle development) and histological analysis of males (mature spermatocysts in testes) Sulikowski et al. (2007) determined that in the Gulf of Maine smooth skate are capable of reproducing year round.

The reproductive cycles of the two sexes are thought to be synchronous (Sulikowski et al. 2007). Kneebone et al. (2007) examined hormonal concentrations of male and female smooth skate in the Gulf of Maine further confirming the ability of this species to reproduce throughout the year. Information is needed on the fecundity and egg survival of this species.

Sosebee (2005) used body morphometry to determine size at maturity to be approximately 33 – 49 cm TL for females and 49 cm TL for males on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras.

Swain et al. (2013) modeled the mortality rate of small and large smooth skate and showed decreased mortality for small skate and an increase for larger skates (larger juveniles 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.

Smooth skates are benthivorous, a large portion of the diet comprised of benthic megafauna (pandalids and euphausiids). Overall, the diet of smooth skates was dominated by pandalid shrimp and euphausiids. Up to 2,000 mt of a particular prey item can be removed by this skate in any given year, but values are typically on the order of 500 to 1,000 mt. The amount of food consumed was related to the size of the skate. Small skates (<= 30 cm TL) consumed approximately 0.5 - 1 kg per year of prey items, while large skates (>30 cm TL) consumed approximately 2 - 3 kg per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 1,000 and 5,000 mt per year, with total consumption dominated by mature skates.

Rosette Skate

Sosebee (2005) used body morphometry to determine size at maturity (males = 33 cm TL; females = 33 – 35 cm TL) on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras. Age and growth data are currently unavailable for rosette skate, as is information on the fecundity and egg survival.

Rosette skates are benthivorous, a large portion of the diet comprised of benthic macrofauna (amphipods and polychaetes) and benthic megafauna (crabs and shrimps). Overall, the diet of rosette skates was dominated by benthic macrofauna and to a lesser extent pandalid shrimps, squids and *Cancer* crabs. Up to 70 mt of a particular prey item can be removed by this skate in any given year, but more typically 10 – 30 mt. Small skates (<=30 cm TL) consumed approximately 200 g per year of prey items, while large skates (>30 cm TL) consumed approximately 800 g per year (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 50 and 500 mt per year, with total consumption dominated by mature skates.

Thorny Skate

Sulikowski et al (2005a) aged thorny skate in western Gulf of Maine and found oldest age estimated to be 16 years for both females and males (corresponding length – 105 cm and 103 cm). Von Bertalanffy Growth parameters for male thorny skates were calculated to be k = 0.11, L_∞ = 127 cm TL, t_o = -0.37; calculated estimates for female thorny skates were: k = 0.13, L_∞ = 120 cm TL, t_o = -0.4 (Sulikowski et al. 2005a). The maximum observed length from the NEFSC trawl survey is 111cm TL. Maximum sizes examined in the Gulf of Maine were 103 cm TL and 105 cm TL for males and females, respectively (Sulikowski et al. 2005a).

Sulikowski et al. (2006) used morphological and hormonal criteria to determine the age and size at sexual maturity in the western Gulf of Maine. For females, 50% maturity occurred at approximately 11 years and 875 mm TL; while for males approximately 10.90 years and 865 mm TL. This species is capable of reproducing year round (Sulikowski et al. 2005a) based on morphological characteristics.

Sosebee (2005) used body morphometry to determine size at maturity to be approximately 36 - 38 cm TL for females and 49 cm TL for males on samples obtained from the NEFSC trawl survey ranging from Gulf of Maine to Cape Hatteras.

Parent et al. (2008) estimated mean annual fecundity to be 40.5 eggs per year based on 2 captive females producing 81 eggs in 1 year. The observed hatching success is 37.5% (Parent et al. 2008).

Swain et al. (2013) modeled the mortality rate of small and large thorny skate and showed decreased mortality for small skate and an increase for larger skates (adults and larger juveniles) 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.

Thorny skates are benthivorous and their piscivorous, a large portion of the diet formed by forage fishes. Overall, the diet of thorny skates was dominated by herrings, squid, polychaetes, silver hake and other fish. 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. Small skates (<=30 cm TL) consumed approximately 500 g per year of prey items, while medium (30-60 cm TL) and large skates (>60 cm TL) consumed approximately 1.5 kg and 12 kg per year, respectively (Link and Sosebee, 2008). The total consumptive demand for this species is estimated to range between 10,000 and 40,000 mt per year.

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).

6.1.5 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 scallop dredge 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.

6.1.6 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 6). 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 2016 were 33,270 mt (Table 6). Discards decreased by 12.2% over the 2015 estimates. The assumed discard rate for 2016 is 41%. Projected dead discards are estimated to be 10,436 mt. Total live and dead discards for the Northeast Skate Complex for all gear types are contrasted in Table 7. 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, scallop dredge gear, which has been updated based on Knotek (2015), and sink gillnet gear, which has been updated based on Sulikowski et al (in review).

Table 6 – 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 6 - 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 7 - Total Live and Dead Discards (mt) of Skates (all species) for all gear types from 1968 - 2016

Year	Live Discards	Dead Discards
1968	99466	21620
1969	90593	18454
1970	76204	15914
1971	60391	13715
1972	55966	12102
1973	59457	12888
1974	60499	13357
1975	51758	12225
1976	55641	14481
1977	66710	16575
1978	83823	21350
1979	91478	22366
1980	92179	21131
1981	93175	20552
1982	102593	21514
1983	104708	22221
1984	98840	20856
1985	80941	16931
1986	83508	18493
1987	90554	23599
1988	90840	22969
1989	96661	25729
1990	130869	32904
1991	80110	24462
1992	73881	24182
1993	59105	17657
1994	87903	21617
1995	60924	19670
1996	67107	18683
1997	31748	10423
1998	34740	11364
1999	28154	9732
2000	39961	12631
2001	36041	8589
2002	40094	13095
2003	52204	14442
2004	46823	11397
2005	46474	13028
2006	34565	10290
2007	44920	13483
2008	35031	10367
2009	37441	10515
2010	36766	10953
2011	38760	11119
2012	34274	10452
2013	42674	11834
2014	42758	13023
2015	37894	10708
2016	33262	10703

6.1.7 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 4. At this time, overfishing is not occurring on any skate species.

6.1.8 Non-Target Species

The skate wing fishery is largely an incidental fishery, with a small portion of the fishery directing on skate wings; 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 small 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 57 of the NE Multispecies FMP.

6.1.8.1 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).

6.1.8.2 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 6,000 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 8). 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 8 - 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 8). 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 8 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.[2] 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

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[2] 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 8). 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 8, 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 9).

Table 9 - 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 8, 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 10). 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 10 - Small cetacean occurrence in the area of operation of the monkfish 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. **Long-Finned Pilot Whales** • 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. **Area of Species Overlap:** 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 8, 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 11). 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 11 - Pinniped occurrence in the area of operation of the monkfish 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 8 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).[3] 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 12; Henry *et al*. 2016; Hayes *et al.* 2017).

Table 12 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 12 is specific to confirmed 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 12 likely

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[3] 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.

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 12 - 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 12 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 8). 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.[4] In 1997, the ALWTRP was implemented; however, since 1997, the Plan has been modified; recent adjustments include the Sinking Groundline

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[4] 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.

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.[5] 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 13 (Waring *et al*. 2014a,b; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)).[6] Of the species provided in Table 13, 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 13, 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 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).

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[5] 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).

[6] "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.

Based on the best available information provided in Table 13, 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).[7]

Table 13 - 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
		Risso’s dolphin
		Harbor seal
		Harp seal
		Gray seal

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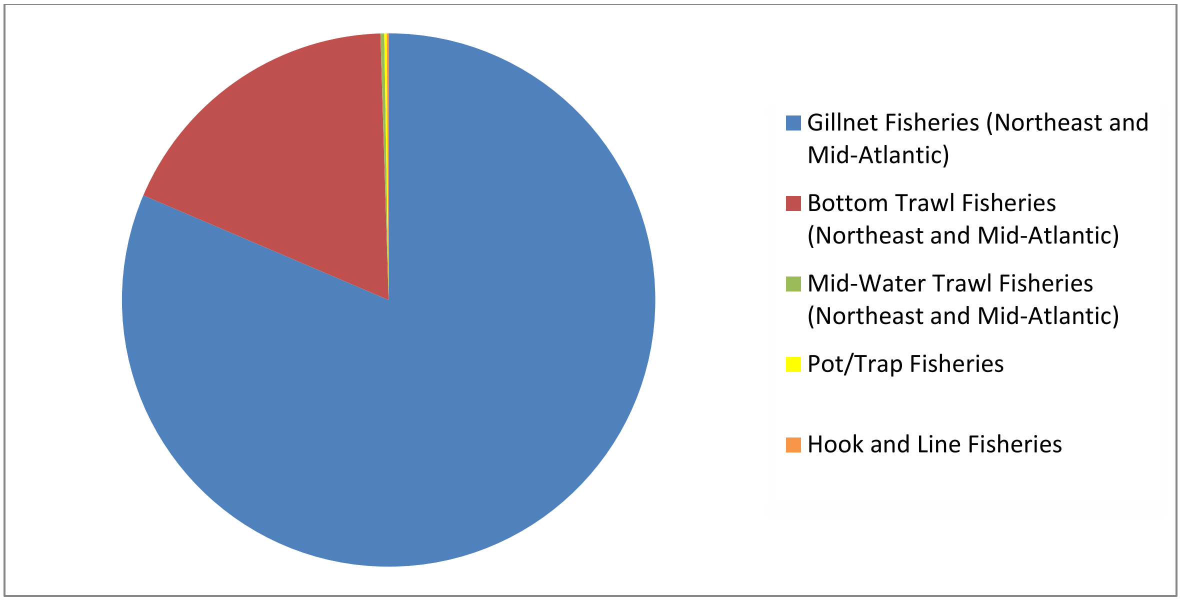
[7] Data used in the assessment was from 2009-2013 (Waring *et al*. 2016; MMPA LOF 82 FR 3655). Northeast anchored float gillnet, Southeast Atlantic gillnet, and Southeastern U.S. Atlantic shark gillnet fisheries were not included in the analysis as mean annual mortality estimates have not been provided 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).

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.[8] 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.

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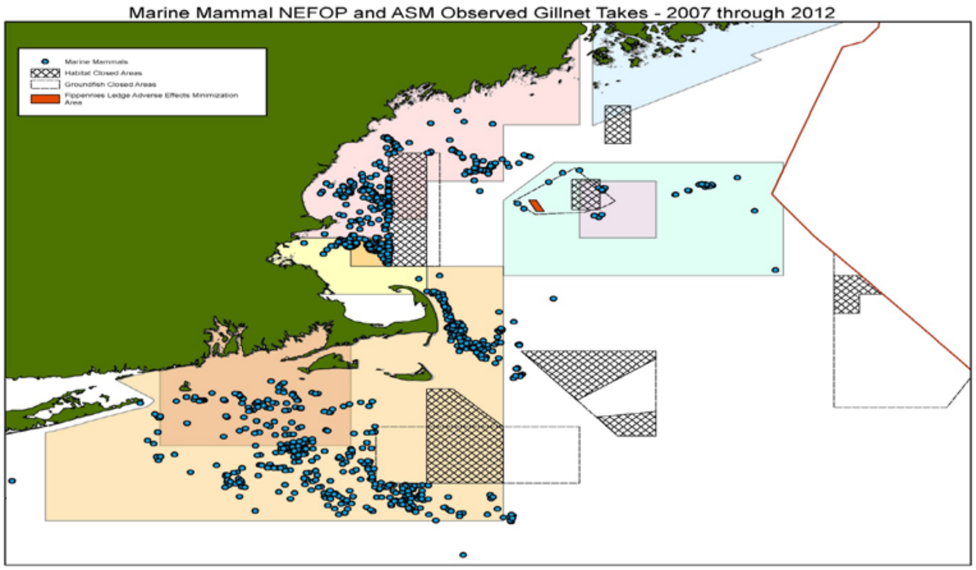
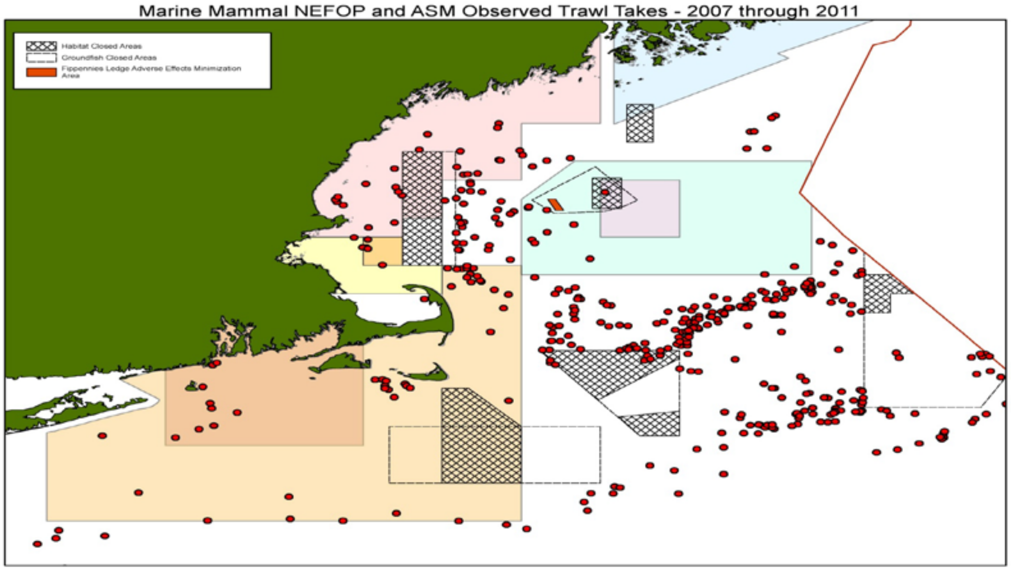
[7] For harp seals, mean annual mortality estimates from 2007-2011 were considered as serious injury and mortality estimates have not been updated since Waring *et al.* (2014a).



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 13 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 8). These species include several stocks of bottlenose dolphins, and until recently, the harbor porpoise.[9] 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.[10] 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

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[9] 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.

[10] 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).

the Mid-Atlantic gillnet fishery and eight other coastal fisheries operating within the dolphin's distributional range.[11] 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.[12]

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.

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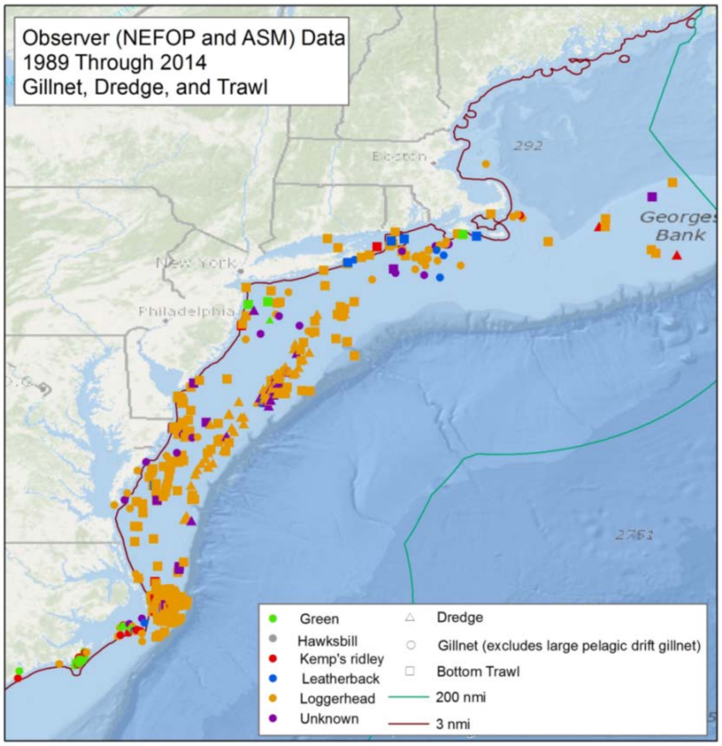
[11] The final rule issued on April 26, 2006, for the BDTRP also revised the large mesh size restriction under the Mid-Atlantic large mesh gillnet rule for conservation of endangered and threatened sea turtles to provide consistency among Federal and state management measures.

[12] 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).[13] 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

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[13] 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).[14] 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

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[14] 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.

issued by NMFS Greater Atlantic 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)[15] 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).

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[15] 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).

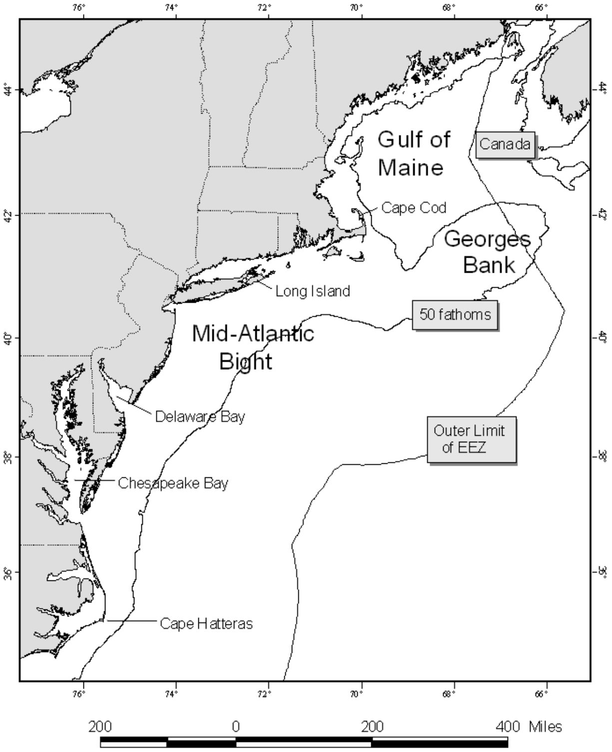
6.3 Physical Environment

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).

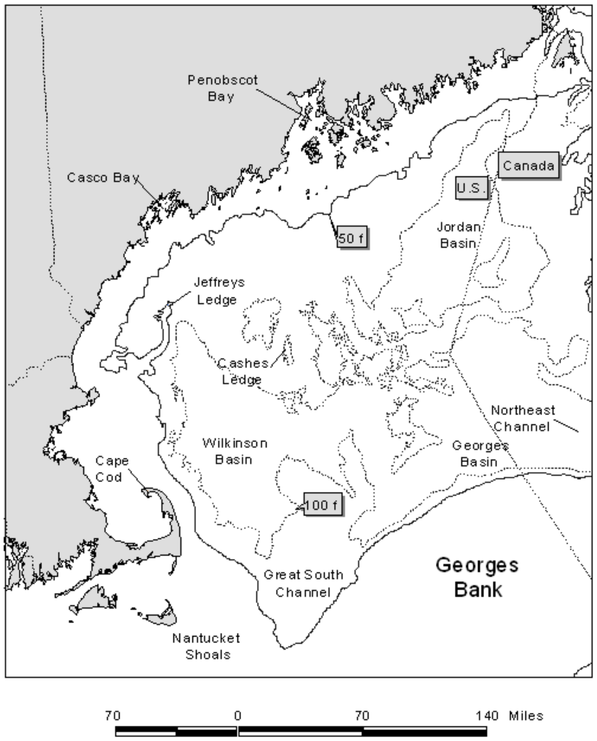
The Gulf of Maine is an enclosed coastal sea, characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. Georges Bank is a relatively shallow coastal plateau that slopes gently from north to south and has steep submarine canyons on its eastern and southeastern 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 various fisheries in which skates are caught. Descriptive information on the fisheries 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.

The other primary market for skates in the region is the wing market. Larger skates, mostly captured by trawl gear, have their pectoral flaps, or wings, cut off and sold into this market. The fishery for skate wings evolved in the 1990s as skates were promoted as “underutilized species,” and fishermen shifted effort from groundfish and other troubled fisheries to skates and dogfish. Attempts to develop domestic markets were short-lived, and the bulk of the skate wing market remains overseas. Winter, thorny, and barndoor skates are considered sufficient in size for processing of wings, but due to their overfished status, possession and landing of thorny and barndoor skates has been prohibited since 2003. Winter skate is therefore the dominant component of the wing fishery, but illegal thorny and barndoor wings still occasionally occur in landings (90 day finding for Thorny Skate). The assumed effectiveness of prohibition regulations is thought to be 98% based on recent work that examined port sampling data (90 day finding for Thorny Skate). That means 98% or more of the skates being landed for the wing market are winter skates, so regulations for the wing fishery primarily have an impact on that species.

The wing fishery is a more incidental fishery that involves a larger number of vessels located throughout the region. Vessels tend to catch skates when targeting other species like groundfish, monkfish, and scallops and land them if the price is high enough.

The southern New England sink gillnet fishery targets winter skates seasonally along with monkfish. Highest catch rates are in the early spring and late fall when the boats are targeting monkfish, at about a 5:1 average ratio of skates to monkfish. Little skates are also caught incidentally year-round in gillnets and sold for bait. Several gillnetters indicated that they keep the bodies of the winter skates cut for wings and also salt them for bait. Gillnetters have become more dependent upon incidental skate catch due to cutbacks in their fishery mandated by both the Monkfish and Multispecies FMPs. Gillnet vessels use 12-inch mesh when fishing for monkfish, and catch larger skates. Southern New England fishermen have reported increased catches of barndoor skates in the last few years.

Only in recent years have skate wing landings been identified separately from general skate landings. Landed skate wings are seldom identified to species by dealers. Skate processors buy whole, hand-cut, and/or onboard machine-cut skates from vessels primarily out of Massachusetts and Rhode Island. Because of the need to cut the wings, it is relatively labor-intensive to fish for skates. Participation in the skate wing fishery, however, has recently grown due to increasing restrictions on other, more profitable groundfish species. It is assumed that more vessels land skate wings as an incidental catch in mixed fisheries than as a targeted species.

New Bedford emerged early-on as the leader in production, both in landed and processed skate wings, although skate wings are landed in ports throughout the Gulf of Maine and extending down into the Mid-Atlantic. New Bedford still lands and processes the greatest share of skate wings. Vessels landing skate wings in ports like Portland, ME, Portsmouth, NH, and Gloucester, MA are likely to land them incidentally while fishing for species like groundfish and monkfish.

The current market for skate wings remains primarily an export market. France, Korea, and Greece are the leading importers. There is a limited domestic demand for processed skate wings from the white tablecloth restaurant business. Winter skates landed by gillnet vessels are reported to go almost exclusively to the wing market. Fishermen indicate that dealers prefer large-sized winter skates for the wing market (over three pounds live weight).

6.5.1.1 Catch

The skate fishery caught 79% of the overall ACL in FY 2016 (Table 15); this was a slight decrease on FY 2015 landings (Table 14). No AMs were triggered in FY 2016 as the TALs were not exceeded by more than 5%. The wing fishery caught 98.8% of the wing TAL; the bait fishery also caught 101% of the bait TAL. State landings in FY 2016 were 544 mt (not shown in table), and recreational catch was 12 mt (Table 16). Total live discards in 2016 were 33,271 mt and dead discards were 10,436 mt.

Table 14 - FY 2015 Catch and Landings of Skates Compared to Management Specifications

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	105.6 %
Assumed Discards + State Landings	10,224	12,130	NA
TAL Bait	5,489	5,214	94.9 %
TAL Wings	10,896	10,350	94.9 %

Table 15 – Skate catch and landings (mt) in FY 2016

Management Specification	Specification Amount	Catch/Landings (mt)	Percent Landed or Caught
ABC/ACL	31,081	25,549	79%
ACT (75% of ABC)	23,311	25,549	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%

*preliminary

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. Catch information (2010-2016) for Atlantic coast skates from MRIP is presented in Table 16. Recreational skate catches have fluctuated between 2010 and 2014 with a high of 51,962 lbs occurring in 2013 (Table 16).

Recreational *harvest* of skates (MRFSS A+B1 data), where skates were retained and/or killed by the angler, vary by species and state (please refer to the MRIP website for these data http://www.st.nmfs.noaa.gov/st1/recreational/queries/). The vast majority of skates caught by recreational anglers are considered released alive, but do not account for post-release mortality caused by hooking and handling.

New Jersey, New York, Rhode Island, and Virginia reported the largest recreational skate catches over the time series (please refer to the MRIP website for these data http://www.st.nmfs.noaa.gov/st1/recreational/queries/). Recreational fishers in Maine did not report catching any skates between 2009 and 2013. Landings by species varied by state; clearnose skate was caught by more states further south (please refer to the MRIP website for these data http://www.st.nmfs.noaa.gov/st1/recreational/queries/).

Reliability of skate recreational catch estimates from MRFSS is a concern. Total catch estimates (A+B1+B2), however, appear to be more reliable than harvest estimates (A+B1 only). Since skates are not valuable and heavily-fished recreational species, the number of MRFSS intercepts from which these estimates are derived is likely to have been very low. The fewer intercepts from which to extrapolate total catch estimates there are, the less reliable the total catch estimates will be.

Table 16 - Estimated recreational skate harvest (lbs) by species, 2010-2016 (A+B1)

	Winter	Smooth	Clearnose	Little	Total
2010	4,505	0	45,432	0	49,937
2011	0	173	37,130	1,423	38,726
2012	1,772	0	4,818	0	6,590
2013	359	0	31,949	21,589	53,897
2014	110	0	7,755	39,543	47,408
2015	21,296		33,924	13,607	68,827
2016	15,226		11,523	422	27,171

Source: NMFS/MRIP (PSE >50 for all values indicating imprecise estimates)
http://www.st.nmfs.noaa.gov/recreational-fisheries/access-data/run-a-data-query/index
No reported harvest for species not listed.

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 (Table 17). The fluctuations in landings are largely attributable to the wing fishery as landings in the bait fishery have remained relatively stable (Table 18). It is not clear what is driving the trend in wing landings as quota is not thought to be limiting to the fishery. One potential explanation is the decrease in winter skate survey index that suggests fewer winter skate were available to the fishery.

Table 17 – Total Landings in the Skate Fisheries

Fishing Year	Landings (in live lbs)
2010	32,698,753
2011	41,302,586
2012	33,193,745
2013	30,896,762
2014	34,090,696
2015	33,825,878
2016	30,354,217

Grand Total	236,362,637

Table 18 – Landings by Skate Fishery Type

FY	Disposition	Landings (in live lbs)
2010	Bait	9,698,695
	Wing	23,000,058
2011	Bait	10,837,172
	Wing	30,465,414
2012	Bait	10,766,626
	Wing	22,427,119
2013	Bait	11,176,451
	Wing	19,720,311
2014	Bait	9,386,666
	Wing	24,704,030
2015	Bait	10,882,990
	Wing	22,942,888
2016	Bait	10,146,208
	Wing	20,208,009
Grand Total		236,362,637

Total fishing revenue from all species on active skate vessels increased in 2016 (Table 19).

Table 19 - 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
Grand Total	1,325,019,847

Landings by DAS declaration show that, during FY2016, a large portion of bait is landed while on a multispecies (sector and common pool) trip (Table 19). Landings under a monkfish declaration may be underestimated because of reporting. A large amount of total skate landings had no associated declaration. The majority of wing landings are associated with multispecies trips, however, those associated with monkfish trips closely followed. The skate wing fishery is predominantly an incidental fishery, where skate wings are harvested on trawl and gillnet trips primarily targeting more valuable NE multispecies (cod, haddock, flounders, etc.) and/or monkfish but a small portion of the fleet does direct on skate wings. Therefore, the fishing effort associated with the skate wing fishery can be directly tied to effort patterns and constraints in these other fisheries. Fishing effort for skate wings will tend to only increase when DAS allocations and usage increase (and vice versa), which may occur independently of skate quotas.

Similarly, the rate and magnitude of skates discarded by these fisheries are directly proportional to DAS usage.

Table 20 - Total skate landings (lbs live weight) by DAS program, FY2016

VMS Declaration	Bait	Wing
Mults Sector	2,116,142	4,145,869
Mults Common	1,953,895	125,807
Monkfish	22,425	3,581,693
Scallop	NA	20,906
Herring	NA	1,819
Unmatched/No Declaration	3,255,435	1,894,828
DOF	2,833,613	457,221
Total	10,181,510	10,228,143

Source: NMFS, Fisheries Statistics Office

6.5.1.4 Trends in number of vessels

The number of skate permits continues to decline 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 21).

Table 21 - 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	2,148
2015	2,084
2016	2,074
2017	1,919

The number of active permits has decreased between 2009 and 2016 (Table 22). This decrease may contribute to the observed trend in wing landings shown in Table 18, with fewer active permits in years with lower landings.

Table 22 - Number of Active Permits between 2009 and 2016

FY	Number of active permits
2009	572

2010	550
2011	567
2012	527
2013	455
2014	452
2015	440
2016	415

6.5.1.5 Trends in revenue

Skate revenue increased until FY2014, and was likely driven by the high percentage of the wing TAL being achieved (Table 23). The increase in revenue is largely attributable to changes in wing revenue and landings (Table 24), with subsequent declines during 2015 and 2016.

Table 23 – Total Skate Revenue

FY	Revenue
2010	$ 6,298,968
2011	$ 9,338,329
2012	$ 7,554,998
2013	$ 7,593,669
2014	$ 8,991,842
2015	$ 6,269,341
2016	$ 5,433,469
Grand Total	$ 51,480,616

Table 24 - Total Skate Revenue by Fishery (Bait and Wing)

FY	Disposition	Revenue
2010	Bait	$ 1,161,331
	Wing	$ 5,137,637
2011	Bait	$ 1,711,431
	Wing	$ 7,626,898
2012	Bait	$ 1,391,065
	Wing	$ 6,163,933
2013	Bait	$ 1,199,273
	Wing	$ 6,394,396
2014	Bait	$ 1,161,520
	Wing	$ 7,830,322
2014	Bait	$ 1,128,315
	Wing	$ 5,141,026
2016	Bait	$ 1,120,241
	Wing	$ 4,313,228
Grand Total		$ 51,480,616

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, dealer, or individual.

6.5.2.1 Overview of Ports

There were a total of 78 ports where skate were landed for food, and 16 ports where skates were landed for bait, during 2015-2016. They include ports from all states in the Northeast Skate Complex management area (ME to NC). This represented a decrease in revenues (from $14.2 million to $9.5 million) and number of ports for the wing fishery during 2015-2016, while the bait fishery decreased slightly in terms of revenues (from $2.3 million to $2.2 million) and number of ports. Skate bait was landed in 19 ports during 2013-2014, with skate wings landed in 86 ports. Landings held steady, around 21 million pounds, for both bait and food fisheries, during these two periods. Chatham and New Bedford dominate skate wing landings, while Point Judith dominates skate bait landings.

Only 23 ports received at least $10,000 during FY 2016 from skate for food; 10 ports received at least $100,000 per year. Point Judith, RI, Chatham, MA, New Bedford, MA, were the highest grossing ports. There are 6 ports that landed at least 10,000 lbs of skate for bait, in FY 2016. The top ports in bait landings were Point Judith, New London, and Newport.

Table 25 outlines commercial landings of skates by individual states from FY2010 – FY2016. Massachusetts and Rhode Island continue to dominate the skate fishery. Skate landings fluctuate by year in both fisheries. Skate bait was landed primarily in Point Judith, Newport, Sea Isle City, and New London, during 2010-2016. Point Judith's landings have accounted for 42% of bait landings between 2012 and 2016. New London landings have increased somewhat in recent years, while landings in Point Judith, Newport, 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, because there are no major skate bait dealers there. 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).

Chatham is one of the major skate wing or food skate ports. Skate wings are also landed significantly in Point Judith and New Bedford. Both trawlers and gillnets catch food skate. Some trawlers target skate, with others catching skate as a bycatch. Most of the gillnet vessels are targeting skate and are based largely in Chatham but also in New Bedford. There is a very small skate wing fleet in Virginia, though it has dramatically declined in recent years. Most of these are monkfish gillnets though some draggers caught skate as a bycatch at the height of the fishery.

Table 25 - Total Skate landings by fishery and state

FY	Disposition	State	Revenue (in $)	Landings (in lbs)
2012	Bait	CT	5,394	23,425
		MA	195,430	1,533,632
		MD	104	10,400
		NJ	326,415	752,578
		NY	62	357
		RI	868,893	8,467,734
		VA	91	905
	Bait Total		1,396,389	10,789,031
	Food	CT	147,345	644,500
		MA	2,932,446	11,788,996
		MD	8,664	23,433
		ME	1,182	3,707
		NC	114	411
		NH	1,592	4,737
		NJ	394,687	1,551,747
		NY	515,501	2,182,001
		RI	1,376,632	5,220,311
		VA	81,920	359,282
	Food Total		5,460,083	21,779,125
2013	Bait	CT	13,265	68,572
		MA	217,023	1,856,490
		MD	619	14,591
		NJ	144,415	998,360
		NY	15	68
		RI	836,709	8,306,442
		VA		

	Bait Total		**1,212,046**	**11,244,523**
	Food	**CT**	**171,096**	**605,048**
		MA	**3,106,360**	**9,398,122**
		MD	**13,835**	**47,618**
		ME	**451**	**651**
		NC	**6,806**	**17,766**
		NH	**13,247**	**1,030**
		NJ	**515,258**	**2,004,837**
		NY	**515,603**	**1,889,876**
		RI	**1,495,381**	**4,779,463**
		VA	**113,296**	**442,659**
	Food Total		**5,951,333**	**19,187,070**
2014	**Bait**	**CT**	**56,557**	**557,668**
		MA	**11,173**	**91,007**
		MD	**402**	**18,660**
		NJ	**288,027**	**780,849**
		NY	**472**	**9,186**
		RI	**793,369**	**7,929,296**
		VA		
	Bait Total		**1,150,000**	**9,386,666**
	Food	**CT**	**142,925**	**493,959**
		MA	**4,446,038**	**13,335,943**
		MD	**9,066**	**28,237**
		ME	**201**	**511**
		NC	**13,644**	**46,701**
		NH	**37,338**	**47,892**
		NJ	**603,064**	**2,032,391**
		NY	**648,489**	**2,088,751**
		RI	**1,818,667**	**6,026,349**
		VA	**47,316**	**210,670**
	Food Total		**7,766,748**	**24,311,404**
2015	**Bait**	**CT**	**260,840**	**2,579,600**
		MA	**41,194**	**398,260**
		MD	**143**	**9,614**
		ME	**645**	**1,171**
		NJ	**65,115**	**737,093**
		NY	**302**	**2,872**
		RI	**760,076**	**7,149,250**
	Bait Total		**1,128,315**	**10,877,860**
	Food	**CT**	**477,327**	**1,759,158**
		MA	**2,747,403**	**5,708,286**
		MD	**5,702**	**18,560**
		ME	**456**	**899**
		NC	**9,317**	**21,483**
		NH	**2,564**	**13,196**
		NJ	**402,446**	**943,156**

		NY	**518,015**	**1,017,647**
		RI	**935,281**	**2,085,362**
		VA	**42,515**	**93,014**
	Food Total		**5,141,026**	**11,660,761**
2016	**Bait**	**CT**	**375,781**	**3,732,800**
		MA	**19,422**	**188,575**
		MD	**121**	**11,764**
		NJ	**64,009**	**707,726**
		NY	**669**	**6,630**
		RI	**660,239**	**5,534,233**
	Bait Total		**1,120,241**	**10,181,728**
	Food	**CT**	**373,634**	**988,672**
		MA	**2,344,838**	**5,263,566**
		MD	**20,501**	**54.473**
		NC	**9,973**	**21,889**
		NH	**3,758**	**14,274**
		NJ	**269,802**	**690,985**
		NY	**374,346**	**793,008**
		RI	**884,932**	**2,429,642**
		VA	**31,444**	**74,021**
	Food Total		**4,313,228**	**10,330,530**

7.0 Environmental Consequences of the Alternatives

7.1 Biological Impacts

7.1.1 Modification to the Uncertainty Buffer

7.1.1.1 Option 1: No Action

The No Action alternative would maintain the 25% uncertainty buffer, and therefore the TALs, as established in Framework 5 (NEFMC, 2018). This would not affect the ability of the bait and wing fisheries to fully achieve their existing TALs. Therefore, fishing effort would not be expected to be lower than the levels analyzed in Framework 5 (NEFMC, 2018), which increased the TALs and had a low negative biological impact on the skate complex.

In relation to Options 2 and 3, Option 1 would have a positive biological impact because it would not increase the TALs and therefore fishing effort would not be expected to increase.

7.1.1.2 Option 2: Reduction in the Uncertainty Buffer to 20%

Option 2 would reduce the uncertainty buffer set in Framework 5 (NEFMC, 2018) from 25% to 20%. This would not adjust the Acceptable Biological Catch (ABC), however, it would increase the TAL. This option would allow for some increased fishing pressure to occur, which could have low negative impacts as more skates would be harvested.

The buffer functions as a proactive measure to reduce the likelihood of the ABC/ACL from being exceeded. The NE Skate Complex is a data poor stock, which has failed to be modeled by traditional stock assessment models. Biological reference points are currently set based on changes in biomass proxies, which are derived from the Northeast Fisheries Science Center trawl survey. The ABC calculation is based on the survey indices and the median catch/biomass ratio. This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship.

Landings and discards have not been generally reported by species and therefore species specific landings and discards must be estimated using length composition from trawl survey data and applying it to the length composition of each portion of the catch. This method allows for landings (on paper) of prohibited species and there is currently no way to change this. Species specific catch has been required by the FMP since 2003 but a large portion of landings continue to be reported as unclassified. Framework 3 (NEFMC, 2016) removed the unclassified VTR codes for the skate wing and bait fisheries in an effort to improve species specific reporting.

Section 6.1.5 discusses the assumed discard mortality rate that was established in Amendment 3 (NEFMC, 2010) and subsequent research that has improved the data incorporated into specifications for some species. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards. However, in some recent years, catch has exceeded the ACT (Table 26), which highlighted the usefulness of the buffer. Table 6 provides total skate discards by gear type between years 1964 – 2016. Discard estimates can fluctuate by year, which is difficult to account for when a hindcast of discards is used to calculate the proportion of dead discards for future fishing years.

Table 26 – ACLs from FYs 2011 – 2016 and percent of ACL achieved

Fishing Year	ACL	Percent of ACL
2011	50,435	64%
2012	50,435	56%
2013	50,435	55.8
2014	35,479	81.2
2015	35,479	79.2
2016	31,081	79

7.1.1.3 Option 3: Reduction in the Uncertainty Buffer to 15%

Option 3 would reduce the uncertainty buffer set in Framework 5 (NEFMC, 2018) from 25% to 15%. This would not adjust the Acceptable Biological Catch (ABC), however, it would increase the TAL. This option would allow for some increased fishing pressure to occur, which could have low negative impacts as more skates would be harvested.

The buffer functions as a proactive measure to reduce the likelihood of the ABC/ACL from being exceeded. The NE Skate Complex is a data poor stock, which has failed to be modeled by traditional stock assessment models. Biological reference points are currently set based on changes in biomass proxies, which are derived from the Northeast Fisheries Science Center trawl survey. The ABC calculation is based on the survey indices and the median catch/biomass ratio. This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship.

Landings and discards have not been generally reported by species and therefore must be estimated using length composition of the survey applied to the length composition of each portion of the catch. This method allows for landings of prohibited species and there is currently no way to change this. Species specific catch has been required by the FMP since 2003 but a large portion of landings continue to be reported as unclassified. Framework 3 (NEFMC, 2016) removed the unclassified VTR codes for the skate wing and bait fisheries in an effort to improve species specific reporting.

Section 6.1.5 discusses the assumed discard mortality rate that was established in Amendment 3 (NEFMC, 2010) and subsequent research that has improved the data incorporated into specifications for some species. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards. However, in some recent years, catch has exceeded the ACT (Table 26), which highlighted the usefulness of the buffer. Table 6 provides total skate discards by gear type between years 1964 – 2016. Discard estimates can fluctuate by year, which is difficult to account for when a hindcast of discards is used to calculate the proportion of dead discards for future fishing years.

7.1.1.4 Option 4: Reduction in the Uncertainty Buffer to 10%

Option 4 would reduce the uncertainty buffer set in Framework 5 (NEFMC, 2018) from 25% to 10%. This would not adjust the Acceptable Biological Catch (ABC), however, it would increase the TAL. This option would allow for some increased fishing pressure to occur, which could have low negative impacts as more skates would be harvested.

The buffer functions as a proactive measure to reduce the likelihood of the ABC/ACL from being exceeded. The NE Skate Complex is a data poor stock, which has failed to be modeled by traditional stock assessment models. Biological reference points are currently set based on changes in biomass proxies, which are derived from the Northeast Fisheries Science Center trawl survey. The ABC calculation is based on the survey indices and the median catch/biomass ratio. This was considered risk-averse and captures the scientific uncertainty in the catch/biomass relationship.

Landings and discards have not been generally reported by species and therefore must be estimated using length composition of the survey applied to the length composition of each portion of the catch. This method allows for landings of prohibited species and there is currently no way to change this. Species specific catch has been required by the FMP since 2003 but a large portion of landings continue to be reported as unclassified. Framework 3 (NEFMC, 2016) removed the unclassified VTR codes for the skate wing and bait fisheries in an effort to improve species specific reporting.

Section 6.1.5 discusses the assumed discard mortality rate that was established in Amendment 3 (NEFMC, 2010) and subsequent research that has improved the data incorporated into specifications for some species. The magnitude of discards, and fluctuations in the estimates, represents another source of uncertainty. Skates are encountered in a range of fisheries and gear types and a large portion of biomass is set aside to account for projected dead discards. However, in some recent years, catch has exceeded the ACT (Table 26), which highlighted the usefulness of the buffer. Table 6 provides total skate discards by gear type between years 1964 – 2016. Discard estimates can fluctuate by year, which is difficult to account for when a hindcast of discards is used to calculate the proportion of dead discards for future fishing years.

7.1.2 Skate Wing Possession Limit Alternatives

7.1.2.1 Option 1: No Action

7.1.2.2 Option 2: Intermediate Skate Wing Possession Limit

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

7.2.1 Modification to the Uncertainty Buffer

The skate wing fishery is largely an incidental fishery prosecuted during fishing under other FMPs as described in Section 3.3. Of just over 23,000 trips landing skate wings, approximately 1,000 trips landed the full skate wing possession limit in Season 1 and 200 trips in Season 2, however, these trips landed a higher portion of the TAL than the incidental trips. Catch of non-skate species on trips landing skates are controlled by the DAS limits, sector rules, or other discard limiting measures in other FMPs. For information regarding recent limits in other fisheries, please refer to the discussion of cumulative effects (Section 7.6). On the small portion of trips where skates are directly targeted, common non-target species include monkfish and spiny dogfish. The increase in the TALs resulting from lowering the uncertainty buffer would not be expected to significantly increase catch of non-target species. These alternatives would have a low negative impact on non-target species because they would increase the TAL and therefore potential interactions with other species.

Vessels that target skates in lieu of other fish while on a DAS are likely to catch and possibly discard low amounts of other species. Because these discards are controlled by measures in other fisheries, the impacts to non-skate species from the uncertainty buffer alternatives are negligible above those already analyzed for actions in the other FMPs. The increase in the TAL may allow the skate fisheries to be prosecuted throughout the entire fishing year and therefore would minimize the likelihood of effort shifting from skates to another target species if the incidental possession limit was put into effect, making a trip unprofitable.

7.2.2 Skate Wing Possession Limit Alternatives

7.3 Essential Fish Habitat (EFH) Impacts

7.3.1 Modification to the Uncertainty Buffer

7.3.1.1 Option 1: No Action

The No Action alternative would maintain the 25% uncertainty buffer, and therefore the TALs, as established in Framework 5 (NEFMC, 2018). This would not affect the ability of the bait and wing fisheries to fully achieve their existing TALs. Therefore, fishing effort would not be expected to be lower than the levels analyzed in Framework 5 (NEFMC, 2018), which increased the TALs and had minor negative EFH impacts.

EFH impacts are related to the amount and location of fishing effort, and the gear type used. Skates are caught using both gillnets and bottom trawls. Gillnets have a much smaller footprint overall than otter trawls because they are a fixed gear, and the quality of the per unit area impact is also lower (Stevenson *et al*. 2004, NEFMC 2011[16]). In addition, EFH for northeast skate species was determined to have a low vulnerability to sink gillnet gear (Stevenson *et al*. 2004). Combining these two findings, the gillnet component of the skate fishery is not causing adverse effects to EFH. Bottom otter trawls, on the other hand, have a relatively large area swept footprint and also a larger per unit area impact (Stevenson et al. 2004, NEFMC 2011). Bottom trawl per unit area impact aggregated over this larger footprint causes adverse effects to EFH. Because the skate fishery is largely an incidental fishery, measures that affect fishing effort in fisheries such as NE multispecies and monkfish may influence EFH impacts attributed to the skate fishery.

Option 1 would produce minor negative impacts to the EFH resource because no significant change in fishing effort or interactions with EFH would be expected. Option 1 may have similar low negative impacts on EFH compared to Options 2, 3, and 4.

7.3.1.2 Option 2: Reduction in Uncertainty Buffer to 20%

Option 2 would reduce the uncertainty buffer from 25% to 20%. The TAL would increase compared to the TAL established in Framework 5 (NEFMC, 2018). This would not improve the ability of the bait and wing fisheries to fully achieve their TALs, but would increase the amount they could land and slightly prolong the fishing year. Fishing effort would be expected to be slightly higher than Option 1and would be expected to have minor negative EFH impacts.

EFH impacts are related to the amount and location of fishing effort, and the gear type used. Skates are caught using both gillnets and bottom trawls. Gillnets have a much smaller footprint overall than otter trawls because they are a fixed gear, and the quality of the per unit area impact is also lower (Stevenson *et al*. 2004, NEFMC 2011[17]). In addition, EFH for northeast skate species was determined to have a low vulnerability to sink gillnet gear (Stevenson *et al*. 2004). Combining these two findings, the gillnet component of the skate fishery is not causing adverse effects to EFH. Bottom otter trawls, on the other hand, have a relatively large area swept footprint and also a larger per unit area impact (Stevenson et al. 2004, NEFMC 2011). Bottom trawl per unit area impact aggregated over this larger footprint causes

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[16] New England Fishery Management Council (2011). The Swept Area Seabed Impact (SASI) approach: a tool for analyzing the effects of fishing on Essential Fish Habitat. 257pp. Available online at www.nefmc.org/library/omnibus-habitat-amendment-2.

[17] New England Fishery Management Council (2011). The Swept Area Seabed Impact (SASI) approach: a tool for analyzing the effects of fishing on Essential Fish Habitat. 257pp. Available online at www.nefmc.org/library/omnibus-habitat-amendment-2.

adverse effects to EFH. Because the skate fishery is largely an incidental fishery, measures that affect fishing effort in fisheries such as NE multispecies and monkfish may influence EFH impacts attributed to the skate fishery.

Option 2 would produce minor negative impacts to the EFH resource because no significant change in fishing effort or interactions with EFH would be expected. Option 2 may have similar low negative impacts on EFH compared to Options 1, 3, and 4.

7.3.1.3 Option 3: Reduction in Uncertainty Buffer to 15%

Option 3 would reduce the uncertainty buffer from 25% to 15%. The TAL would increase compared to the TAL established in Framework 5 (NEFMC, 2018). This would not improve the ability of the bait and wing fisheries to fully achieve their TALs, but would increase the amount they could land and slightly prolong the fishing year. Fishing effort would be expected to be slightly higher than Option 1and would be expected to have minor negative EFH impacts.

EFH impacts are related to the amount and location of fishing effort, and the gear type used. Skates are caught using both gillnets and bottom trawls. Gillnets have a much smaller footprint overall than otter trawls because they are a fixed gear, and the quality of the per unit area impact is also lower (Stevenson *et al*. 2004, NEFMC 2011[18]). In addition, EFH for northeast skate species was determined to have a low vulnerability to sink gillnet gear (Stevenson *et al*. 2004). Combining these two findings, the gillnet component of the skate fishery is not causing adverse effects to EFH. Bottom otter trawls, on the other hand, have a relatively large area swept footprint and also a larger per unit area impact (Stevenson et al. 2004, NEFMC 2011). Bottom trawl per unit area impact aggregated over this larger footprint causes adverse effects to EFH. Because the skate fishery is largely an incidental fishery, measures that affect fishing effort in fisheries such as NE multispecies and monkfish may influence EFH impacts attributed to the skate fishery.

Option 3 would produce minor negative impacts to the EFH resource because no significant change in fishing effort or interactions with EFH would be expected. Option 3 may have similar low negative impacts on EFH compared to Options 1,2, and 4.

7.3.1.4 Option 4: Reduction in the Uncertainty Buffer to 10%

Option 4 would reduce the uncertainty buffer from 25% to 10%. The TAL would increase compared to the TAL established in Framework 5 (NEFMC, 2018). This would not improve the ability of the bait and wing fisheries to fully achieve their TALs, but would increase the amount they could land and slightly prolong the fishing year. Fishing effort would be expected to be slightly higher than Option 1and would be expected to have minor negative EFH impacts.

EFH impacts are related to the amount and location of fishing effort, and the gear type used. Skates are caught using both gillnets and bottom trawls. Gillnets have a much smaller footprint overall than otter trawls because they are a fixed gear, and the quality of the per unit area impact is also lower (Stevenson *et al*. 2004, NEFMC 2011[19]). In addition, EFH for northeast skate species was determined to have a low

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[18] New England Fishery Management Council (2011). The Swept Area Seabed Impact (SASI) approach: a tool for analyzing the effects of fishing on Essential Fish Habitat. 257pp. Available online at www.nefmc.org/library/omnibus-habitat-amendment-2.

[19] New England Fishery Management Council (2011). The Swept Area Seabed Impact (SASI) approach: a tool for analyzing the effects of fishing on Essential Fish Habitat. 257pp. Available online at www.nefmc.org/library/omnibus-habitat-amendment-2.

vulnerability to sink gillnet gear (Stevenson *et al*. 2004). Combining these two findings, the gillnet component of the skate fishery is not causing adverse effects to EFH. Bottom otter trawls, on the other hand, have a relatively large area swept footprint and also a larger per unit area impact (Stevenson et al. 2004, NEFMC 2011). Bottom trawl per unit area impact aggregated over this larger footprint causes adverse effects to EFH. Because the skate fishery is largely an incidental fishery, measures that affect fishing effort in fisheries such as NE multispecies and monkfish may influence EFH impacts attributed to the skate fishery.

Option 4 would produce minor negative impacts to the EFH resource because no significant change in fishing effort or interactions with EFH would be expected. Option 4 may have similar low negative impacts on EFH compared to Options 1, 2, and 3.

7.3.2 Skate Wing Possession Limit Alternatives

7.3.2.1 Option 1: No Action

7.3.2.2 Option 2: Intermediate Skate Wing Possession Limit

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.

7.4.1 Modification to the Uncertainty Buffer

7.4.1.1 Option 1: No Action

The No Action alternative would maintain the 25% uncertainty buffer and the TALs as those established in Framework 5 (NEFMC, 2018). As a result, fishing 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 skate fisheries are allowed to fish year-round for skate wings and bait, restrictions on fishing throughout the fishing year result from either fishery being projected to exceed its seasonal or annual TAL resulting in the incidental possession limit being implemented. It is difficult to predict when an incidental possession limit will be implemented and its effect on fishing behavior but previous implementation periods have been for relatively short time periods, e.g. 6 weeks in FY2016. Once the incidental possession limit was removed, 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 both TALs. However, the incidental possession limit was implemented approximately 4.5 months before the end of the 2017 fishing year and is not expected to be lifted until the next fishing year. Once 100% of the bait annual TAL is achieved, the bait fishery is closed.

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), but occasional fishery interactions still occur, the No Action is expected to have low negative to neutral impacts on non-ESA listed species of marine mammal. Relative to Options 2 and 3, Option 1, which has a lower total allowable landing, may result in slightly less negative impacts to non-ESA listed species of marine mammals as lower allocations may result in increases in fishing effort, which may equate to increased interactions with these marine mammal species.

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 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 alternative, as well as 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 specifications including the total allowable landings for both fisheries. 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 incidental possession limits be implemented for either 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 implementation in the fishery will result in reduced fishing in the wing 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. Once 100% of the bait annual TAL is achieved, the bait fishery is closed. 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 implementation of the incidental possession 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 incidental possession limit is in place.

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 be low negative. Relative to Options 2, 3, and 4, Option 1 may result in neutral to low positive impacts to protected species because lower allocations may result in decreased fishing effort, which may equate to decreased interactions with protected species.

7.4.1.2 Option 2: Reduction in Uncertainty buffer to 20%

Option 2 would revise the uncertainty buffer and increase the TAL for the skate complex for the 2018-2019 fishing years. The increase in the TALs may result in more directed fishing effort. However, a small component of the skate fishery targets skates. A large number of trips only land incidental amounts of wings and are likely targeting non-skate species (**Error! Reference source not found.**). Since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish DAS, fishing effort on skates are also largely constrained by regulations set by other FMPs. Catch of non-skate species on trips landing skates are controlled by the DAS limits, sector rules, or other discard limiting measures in other FMPs. Fishing effort would be restricted by the revised specifications, but also by regulations restricting fishing for non-skate species, and the associated AMs that account for any overage of ACLs. Based on the above, and the fact that the increase in TAL is moderately small, Option 2 is expected to result in little to no incentive to increase fishing effort on skate, especially as it may allow additional discards to be converted to landings.

Based on this information, impacts to protected species are not expected to be much greater than those under Option 1 (see Section 7.1.1.1). The small increase in total allowable landings may allow for discards to be converted to landings, while potentially not increasing overall effort. However, should the small increase in TAL result in some slight increase in fishing effort, this potentially equates to slightly more fishing time, and therefore, gear being present in the water for a longer 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 increase in either of these factors will increase the potential for protected species interactions with gear and therefore, increase the potential for serious injury or mortality to these species. As a result, Option 2 may have some negative impacts on protected species. Taking this into consideration, Option 2 is likely to have low negative to negative impacts on protected species relative.

Relative to Option 1, Option 2 is likely to have neutral to negative impacts on protected species as there is the potential, albeit small, that fishing effort could increase under Option 2, resulting in the potential for protected species interactions to increase. Relative to Options 3 and 4, Option 2 could have neutral impacts on protected species as the potential changes in effort, and thus interaction risks to protected species, are expected to be similar across all Options.

7.4.1.3 Option 3: Reduction in Uncertainty buffer to 15%

Option 3 would revise the uncertainty buffer and increase the TAL for the skate complex for the 2018-2019 fishing years. The increase in the TALs may result in more directed fishing effort. However, a small component of the skate fishery targets skates. A large number of trips only land incidental amounts of wings and are likely targeting non-skate species (**Error! Reference source not found.**). Since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish DAS, fishing effort on skates are also largely constrained by regulations set by other FMPs. Catch of non-skate species on trips landing skates are controlled by the DAS limits, sector rules, or other discard limiting measures in other FMPs. Fishing effort would be restricted by the revised specifications, but also by regulations restricting fishing for non-skate species, and the associated AMs that account for any overage of ACLs. Based on the above, and the fact that the increase in TAL is moderately small, Option 3 is expected to result in little to no incentive to increase fishing effort on skate, especially as it may allow additional discards to be converted to landings.

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Relative to Option 1, Option 3 is likely to have neutral to negative impacts on protected species as there is the potential, albeit small, that fishing effort could increase under Option 3, resulting in the potential for protected species interactions to increase. Relative to Options 2 and 4, Option 3 could have neutral impacts on protected species as the potential changes in effort, and thus interaction risks to protected species, are expected to be similar across all Options.

7.4.1.4 Option 4: Reduction in Uncertainty buffer to 10%

Option 4 would revise the uncertainty buffer and increase the TAL for the skate complex for the 2018-2019 fishing years. The increase in the TALs may result in more directed fishing effort. However, a small component of the skate fishery targets skates. A large number of trips only land incidental amounts of wings and are likely targeting non-skate species (**Error! Reference source not found.**). Since the possession of skates mostly requires vessels to be fishing on a NE Multispecies, Scallop, or Monkfish DAS, fishing effort on skates are also largely constrained by regulations set by other FMPs. Catch of non-skate species on trips landing skates are controlled by the DAS limits, sector rules, or other discard limiting measures in other FMPs. Fishing effort would be restricted by the revised specifications, but also by regulations restricting fishing for non-skate species, and the associated AMs that account for any overage of ACLs. Based on the above, and the fact that the increase in TAL is moderately small, Option 4 is expected to result in little to no incentive to increase fishing effort on skate, especially as it may allow additional discards to be converted to landings.

Based on this information, impacts to protected species are not expected to be much greater than those under Option 1 (see Section 7.1.1.1). The small increase in total allowable landings may allow for discards to be converted to landings, while potentially not increasing overall effort. However, should the small increase in TAL result in some slight increase in fishing effort, this potentially equates to slightly more fishing time, and therefore, gear being present in the water for a longer 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 increase in either of these factors will increase the potential for protected species interactions with gear and therefore, increase the potential for serious injury or mortality to these species. As a result, Option 4 may have some negative impacts on protected species. Taking this into consideration, Option 4 is likely to have low negative to negative impacts on protected species relative.

Relative to Option 1, Option 4 is likely to have neutral to negative impacts on protected species as there is the potential, albeit small, that fishing effort could increase under Option 4, resulting in the potential for protected species interactions to increase. Relative to Options 2 and 3, Option 4 could have neutral impacts on protected species as the potential changes in effort, and thus interaction risks to protected species, are expected to be similar across all Options.

7.5 Socio-Economic Impacts

7.5.1 Modification to the Uncertainty Buffer

Alternatives for updating the ACL are described in Section 4.1. These Alternatives (Option 2, 3, and 4) would decrease the buffer between the ACL and TAL, thus increasing the TAL for both the skate wing and bait fisheries.

7.5.1.1 Option 1: No Action (ACL= ABC of 31,327 mt, ACT of 23,495 mt, TAL of 13,157 mt, Wing TAL =8,749 mt, Bait TAL 4,408 mt)

Under the No Action Alternative, the buffer between ACL and TAL would remain at twenty-five percent (25%). Amendment 3 established an uncertainty buffer, considering both management and scientific uncertainty, between the ACL and TAL (NEFMC, 2010). Improvements in the sources of uncertainty made since Amendment 3 was implemented are itemized in Table 5.

Since FY 2013, landings have been above the TAL. This alternative has a higher possibility of allowing landings to exceed the TAL compared with the other Options. Based on dealer data, total skate revenue in FY 2015 and 2016 was $6,269,341 and $5,443,469 respectively. The total revenue from skate wings would not be expected to significantly decrease. Long-term, Option 1 would be expected to result in future increases in biomass and potential catch, less restrictive regulations to reach optimum yield, which would result in a positive economic impact to the fishery if the potential catch is realized. Option 1 would be expected to have overall negative economic impacts because the TAL would be set too low, forgoing potential economic gains within a sustainable TAL. Compared to Option 2, 3, and 4, Option 1 would have more negative short-term and long-term economic impacts.

The result of the specifications set in Framework Adjustment 3 was negative economic and social benefits, more than expected, mainly from triggering the AM and exceeding the TAL. The bait fishery was impacted by a de facto closure in Season 3 of FY2016, and a subsequent ad hoc increase in the incidental possession limit to restart that fishery. But FW4 modified both the bait fishery triggers and increased the incidental possession limits, beginning in March 2018. The FW3 specifications for TAL were below FY2016 total catch, wing catch, and bait catch.

Compared to Options 2, 3, and 4, Option 1 would have more negative short-term and long-term economic impacts. Option 1 would have more negative social impacts by keeping lower TALs and would not achieve optimum yield by forgoing economic benefits.

Table 27 - Total Skate Landings and Revenue by Fishing Year (Source: NMFS Dealer data)

	Total Landings (in live lbs)	Total Revenue
2010	32,698,753	$ 6,298,968
2011	41,302,586	$ 9,338,329
2012	33,193,745	$ 7,554,998
2013	30,896,762	$ 7,593,669
2014	34,090,696	$ 8,991,842
2015	33,825,878	$ 6,269,341
2016	30,354,217	$ 5,443,469

7.5.1.2 Option 2: Reduce buffer to 20% (ACL= ABC of 31,327 mt, ACT of 25,061 mt, TAL of 14,034 mt, Wing TAL =9,333 mt, Bait TAL 4,701 mt)

Under this alternative, the TAL would be increased from 13,157 metric tons to 14,034 metric tons. Under Option 2, the TAL (14,034 mt) is still below the total catch by federally reporting vessels in FY 2015 (15,343 mt), the last fishing year that the incidental possession limit was not imposed. FY 2015 is instructive, not to predict what expected landings and revenues will be, but to compare the differences between the proposed options. This is not possible using FY 2016 or 2017, because many skate trips where restricted to 500 pounds.

The wing and bait fisheries are affected differently because of the intervening effects of Framework 4 on the bait fishery. Tables 28 and 29 compare the four options using FY 2015 conditions. Option 1, No Action, shows a 13.8% revenue loss in the wing fishery and 23.98% loss in the bait fishery, compared to actual revenues during FY 2015 of $4,376,170 and $1,318,160 respectively. Options 2, 3, and 4 show positive benefits relative to this base case.

Table 28 compares landings and revenues in the wing fishery, across the four options. Relative to Option 1: No Action, this alternative would trigger AMs later (10 days in Season 1, 3 weeks in Season 2; Table 28, Options 1 and 2, compare incidental dates), if fishing behavior does not change from that during 2015. The overall impact of Option 2 would depend largely on future fishing behavior, which is difficult to predict. If fishing effort does not increase, Option 2 would be expected to have low positive long-term economic impacts because landings increase. The earlier the incidental possession limit is triggered, the higher are negative short-term impacts because this reduces revenue per trip and affects fishing for other more economically valuable species. Compared to Option 1, Option 2 has 4.9% more skate revenues ($ 3,957,664 / $ 3,771,367) in the short-term. Option 2 results in 90.1% of the wing TAL being landed (Table 28).

Bait fishery landings and revenues are compared in Table 29, over four options. Possession limits for bait (live pounds) are higher than for wings (landed pounds). None of the options, including No Action (Option 1), require the incidental limit for Season 1, based on FY 2015 conditions. Options 1, 2, and 3 impose the incidental limit in the last month of Season 2, October. In Season 3, Option 2 would impose the 8000-pound incidental limit almost a month later than No Action, or January 2, and allow an increase in revenues of 4.9% (1,054,308/1,004,634). The bait fishery lands 98.2% of its TAL under this option.

While the long-term economic benefits of the skate fishery depend on meeting, but not exceeding, the TAL, low short-term and long-term positive economic impacts may accrue to the targeted skate fishery with this alternative.

Conditions may be different from 2015; cumulative landings are trending higher in FY 2016 and 2017, as are recent wing prices. Nevertheless, Option 2 would have more positive social impacts compared to Option 1, with incidental possession limits imposed later and a higher TAL, in both the wing and bait fisheries.

7.5.1.3 Option 3: Reduce buffer to 15% (ACL= ABC of 31,327 mt, ACT of 26,628 mt, TAL of 14,911 mt, Wing TAL =9,916 mt, Bait TAL 4,995 mt)

Under this alternative, the TAL would be increased from 13,157 metric tons to 14,911 metric tons. Under Option 3, the TAL (14,911 mt) is also below the total catch by federally reporting vessels in FY 2015 (15,343 mt), the last fishing year that the incidental possession limit was not imposed.

Table 28 compares landings and revenues in the wing fishery, for Option 3, a 15% ACL buffer. Relative to Options 1 and 2, this alternative would trigger AMs later (none in Season 1, March 18 in Season 2; Table 28, Options 1, 2, and 3, compare incidental dates), if fishing behavior does not change from that during 2015. If fishing effort does not increase, Option 3 would be expected to have medium-low positive long-term economic impacts because landings are greater than Options 1 or 2. Compared to Option 1, Option 3 has 10% more skate revenues ($ 4,147,715 / $ 3,771,367) in the short-term; compared to Option 2, 4.8%.–Option 3 results in 88.3% of the TAL being landed (Table 28).

Bait fishery landings and revenues are shown in Table 29. None of the options, including No Action (Option 1), require the incidental limit for Season 1, based on FY 2015 conditions. Option 3 imposes the incidental limit on October 30. In Season 3, Option 3 would impose the 8000-pound incidental limit on January 28, allowing an increase in revenues of 6.8% (1,072,628/1,004,634) over No Action. The bait fishery lands 94.0% of its TAL under this option.

Option 3 would have more positive social impacts compared to either Options 1 or 2, with incidental possession limits imposed later and a higher TAL.

7.5.1.4 Option 4: Reduce buffer to 10% (ACL= ABC of 31,327 mt, ACT of 28,194 mt, TAL of 15,788 mt, Wing TAL =10,499 mt, Bait TAL 5,289 mt)

Under this alternative, the TAL would be increased from 13,157 metric tons to 15,788 metric tons. Under Option 4, the TAL (15,788 mt) is above the total catch by federally reporting vessels in FY 2015 (15,343 mt), the last fishing year that the incidental possession limit was not imposed.

Table 28 compares landings and revenues in the wing fishery, for Option 4, a 10% ACL buffer. Relative to Options 1, 2, and 3, this alternative would trigger AMs later (none in Season 1, April 21 in Season 2; Table 28, all options, compare incidental dates), if fishing behavior does not change from that during 2015. If fishing effort does not increase, Option 4 would be expected to have medium positive long-term economic impacts because landings would likely resemble the 2015 fishing year. Compared to Option 1, Option 3 has 14.1% more skate revenues ($ 4,302,796 / $ 3,771,367) in the short-term; compared to Option 2, 8.7%; compared to Option 3, 3.7%. Option 3 results in 86% of the wing TAL being landed (Table 28).

Bait fishery landings and revenues are shown in Table 29. None of the options require the incidental limit during Season 1, based on FY 2015 conditions, but Option 4 does not in Season 2 as well. In Season 3, Option 4 would impose the 8000-pound incidental limit on March 1and allow an increase in revenues of 8.3% (1,088,324/1,004,634) over No Action. The bait fishery lands 90.0% of its TAL under this option.

Option 4 would have more positive social impacts than all other options, with incidental possession limits imposed later and a higher TAL.

Table 28 – Wing Landings and Revenues with Revised Buffers and TAL (FY2015 conditions)

FY 2015	**FW 6 Wing Buffer Targets**											
	Option 1: 25%				Option 2: 20%			Option 3: 15%			Option 4: 10%	
	MT	*landed wt.*		*MT*	*landed wt.*		*MT*	*landed wt.*		*MT*	*landed wt.*	
Wing TAL (from FW5)	8749	8,497,106		9333	9,064,292		9916	9,630,507		10499	10,196,721	
	Actual											
S1 57% TAL		4,843,350			5,166,646			5,489,389			5,812,131	
S1actual landings	4,558,661											
S1 possession limit		2,600			2,600			2,600			2,600	
S1 trigger		4,116,848			4,391,649			4,665,980			4,940,311	
S1 incidental limit		500			500			500			500	
S1 incidental date		17-Aug			27-Aug			none			none	
S1 adjusted landings		4,215,563			4,424,154			4,533,506			4,533,506	
S2 actual landings	4,330,052											
S2 possession Limit		4,100			4,100			4,100			4,100	
S2 trigger		7,222,540			7,704,648			8,185,931			8,667,213	
S2 incidental limit		500			500			500			500	
S2 incidental date		2-Feb			23-Feb			18-Mar			21-Apr	
S12 adjusted landings		3,572,095			3,742,370			3,970,374			4,230,919	
Total actual landings	8,888,713											
Total adj. landings(%TAL)		7,787,658	91.7%		8,166,524	90.1%		8,503,880	88.3%		8,764,425	86.0%
Total adjusted $$		3,771,367			3,957,664			4,147,715			4,302,796	
Lost landings		1,101,055	12.4%		722,189	8.1%		384,833	4.3%		124,128	1.4%
Lost $$		604,803	13.8%		418,506	9.6%		228,456	5.2%		73,374	1.7%

Table 29 – Bait Landings and Revenues with Revised Buffers and TAL (FY2015 conditions)

FY 2015	**FW 6 Bait Buffer Targets**											
	Option 1: 25%			Option 2: 20%			Option 3: 15%			Option 4: 10%		
	MT	*live wt.*		*MT*	*live wt.*		*MT*	*live wt.*		*MT*	*live wt.*	
Wing TAL (from FW5)	8749	9,718,070		9333	10,364,031		9916	11,012,197		10499	11,660,362	
	Actual											
S1 30.8% TAL		2,993,166			3,192,122			3,391,757			3,591,391	
S1actual landings	2,541,085											
S1 possession limit		25,000			25,000			25,000			25,000	
S1 trigger		2,693,849			2,872,909			3,052,581			3,232,252	
S1 incidental limit		8,000			8,000			8,000			8,000	
S1 incidental date		none			none			none			none	
S1 adjusted landings		2,541,085			2,541,085			2,541,085			2,541,085	
S2 37.1% TAL		3,605,404			3,845,056			4,085,525			4,325,994	
S2 actual landings	3,714,076											
S2 possession Limit		25,000			25,000			25,000			25,000	
S2 trigger		3,244,864			3,460,550			3,676,973			3,893,395	
S2 incidental limit		8,000			8,000			8,000			8,000	
S2 incidental date		19-Oct			24-Oct			30-Oct			none	
S2 adjusted landings		3,548,691			3,601,026			3,696,326			3,714,076	
S3 actual landings	6,428,942											
S3 possession Limit		12,000			12,000			12,000			12,000	
S3 trigger		7,774,456			8,291,225			8,809,758			9,328,290	
S3 incidental limit		8,000			8,000			8,000			8,000	
S3 incidental date		11-Dec			2-Jan			28-Jan			1-Mar	
S3 adjusted landings		3,626,844			4,038,392			4,118,892			4,242,022	
CLOSURE		22-Apr										
Total actual landings	12,684,103											
Total adj. landings(%TAL)		9,716,620	100.0%		10,180,503	98.2%		10,356,303	94.0%		10,497,183	90.0%
Total adjusted $$		1,004,634			1,054,308			1,072,628			1,088,324	
Lost landings		2,967,483	23.4%		2,503,600	19.7%		2,327,800	18.4%		2,186,920	17.2%
Lost $$		313,526	23.8%		263,852	20.0%		245,532	18.6%		229,836	17.4%