Small-Mesh Multispecies
Fishing Year 2018-2020 Specifications
Environmental Assessment
Regulatory Impact Review
and
Initial Regulatory Flexibility Analysis

DECEMBER 2017

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

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1.0 EXECUTIVE SUMMARY

Under the provision of the M-S Act, the Council submits proposed management actions to the Secretary of Commerce for review. The Secretary of Commerce can approve, disapprove, or partially approve the action proposed by the Council. In the following alternative descriptions, measures identified as Preferred Alternatives constitute the Council's proposed management action.

If the Preferred Alternatives identified in this document are adopted, this action would implement catch limits and associated TAL triggers that are designed to achieve mortality targets and net benefits from the fishery. Details of the proposed measures summarized below can be found in Section 4.0.

The proposed action would adjust the catch specifications during 2018-2020 for four target stocks in the small-mesh fishery: northern silver hake, northern red hake, southern whiting, and southern red hake. The proposed action would adjust the overfishing limit (OFL), the allowable biological catch (ABC), the annual catch limits (ACL), the TAL (total allowable landings) and the TAL trigger values. These adjustments are necessary to account for the changes in stock biomass since the last assessment update and changes in the discard rate since the last specifications were established.

These specification limits are intended to keep the risk of overfishing at acceptable levels defined by the Council and its Scientific and Statistical Committee (SSC). These catch limits are consistent with producing MSY from the resource, but are not intended to rebuild depleted or overfished stocks. According to the assessment update (summarized in NEFMC 2017), the biomass of southern red hake has fallen below the threshold that would determine that the stock is overfished. If the assessment is certified, the Council plans to initiate an amendment to address the overfished status and rebuild the resource. A benchmark assessment is also planned for 2019 which could re-assess the red hake biological reference points.

Section 3.1 summarizes the purpose and need for taking action, while Section 4.0 includes a description of and rational for the alternatives. Section 3.2 summarizes the management background, including a description of the ACL framework that was adopted in Amendment 19 to the Northeast Multispecies FMP to set specifications for red, silver, and offshore hake. Section 5.0 summarizes the Affected Environment and outlines the Valued Environmental Components (VECs) that are used to describe the impacts of the proposed alternatives in Section 4.0. These VECs include 1) red hake stocks, 2) stocks of northern silver hake and southern whiting, 3) non-target species and bycatch, 4) physical environment and essential fish habitat, 5) protected resources, and 6) fishery related businesses and communities. The impacts of the proposed alternatives are estimated and discussed in Sections 6.1 to 6.5. The cumulative effects of the preferred alternative and other regulations are discussed in Section 6.6. Section 7.0 discusses compliance of this action with applicable laws.

1.1 Decision Matrix

1.1.1 Specifications

There are two alternatives for setting specifications for small-mesh multispecies: an update based on the best available science that accounts for recent changes in stock biomass and catch, and No Action (SQ) which would retain the existing specifications.

The proposed change in specifications is listed in the table below.

Table 1. Proposed Specifications for 2018-2020 fishing years.

Stock	OFL (mt)	ABC (mt)	ACL (mt)	Change from SQ	TAL (mt)	Change from SQ
Northern silver hake	58,350	31,030	29,475	27%	26,604	33%
Northern red hake	840	721	685	45%	274	128%
Southern whiting	31,180	19,395	18,425	-35%	14,465	-39%
Southern red hake	1,150	1,060	1,007	-38%	305	-59%

OFL = Overfishing Limit
ABC = Acceptable Biological Catch
TAL = Total Allowable Landings

Impacts on the VECs are summarized in the table below and discussed in more detail in Section 5.0. In general, the ACL specifications are intended to prevent overfishing and hence have positive, insignificant effects compared to baseline environmental conditions. Except for northern red hake, catch is generally constrained by restrictive regulations to avoid unacceptable bycatch and market forces, so changes in the ACL specifications generally have positive effects. When the No Action alternative has higher catch limits than the preferred alternative for some stocks, it is expected to have a negative biological impact because the risk of overfishing would be higher with No Action. When this action is considered in conjunction with all the other pressures placed on fisheries by past, present, and reasonably foreseeable future actions, it is not expected to result in any significant impacts, positive or negative. Based on the information and analyses presented in these past FMP documents and this document, there are no significant cumulative effects associated with the preferred alternatives in this document (Table 53).

VEC impacts	Updated specifications Section 4.1.1	No Action Section 4.1.2
Target species		
Red hake stocks Section 6.1.1	North: Low negative South: High positive	North: Low positive South: High negative
Silver and offshore hake stocks Section 6.1.2	North: Low negative South: Low positive	North: Neutral South: Low negative to neutral
Non-target species and bycatch Section 6.2.1	Low negative	Neutral
Physical environment and essential fish habitat Section 6.3.1	Low negative	Neutral
Protected resources Section 6.4.1	Neutral	Neutral
Fishery-related businesses and communities Section 6.5.1	Low positive	Short term: Low positive Long term: Low negative

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ABC	Annual 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 or Commission
BiOp, BO	Biological Opinion, a result of a review of potential effects of a fishery on Protected Resource species
B_{MSY}	Biomass at Maximum Sustainable Yield
CAI	Closed Area I
CAII	Closed Area II
CEA	Cumulative Effects Assessment
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CPUE	Catch per unit of effort
CV	Coefficient of Variation
CZMA	Coastal Zone Management Act
DMF	Division of Marine Fisheries (Massachusetts)
DMR	Department of Marine Resources (Maine)
DPS	Distinct Population Segment
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EFP	Exempted Fishing Permit
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
F	Fishing Mortality Rate
FEIS	Final Environmental Impact Statement

F_{MSY}	Fishing Mortality Rate at Maximum Sustainable Yield
FR	Federal Register
FMP	Fishery Management Plan
FONSI	Finding of No Significant Impact
GARFO	Greater Atlantic Regional Fisheries Office (formerly Northeast Regional Office/NERO)
GB	Georges Bank
GIS	Geographical Information System
GOM	Gulf of Maine
HAPC	Habitat Area of Particular Concern
HPTRP	Harbor Porpoise Take Reduction Plan
IRFA	Initial Regulatory Flexibility Analysis
LNG	Liquefied Natural Gas
LOA	Letter of Authorization
LOF	List of Fisheries
MAFMC	Mid-Atlantic Fishery Management Council
MMPA	Marine Mammal Protection Act
MRFSS	Marine Recreational Fisheries Statistical Survey
MRIP	Marine Recreational Information Program
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
MT	Metric tons
NAO	National Oceanic and Atmospheric Administration Administrative Order
NEFSC	Northeast Fisheries Science Center
NEFMC	New England Fishery Management Council
NEFOP	Northeast Fisheries Observer Program
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OFL	Overfishing Limit
OY	Optimum Yield
PDT	Whiting Plan Development Team
PRA	Paperwork Reduction Act
RFA	Regulatory Flexibility Act
RMA	Regulated Mesh Area
RIR	Regulatory Impact Review
SA	Three-digit Statistical Area (used to report catch)
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SBA	Small Business Administration
SNE	Southern New England
SSC	Scientific and Statistical Committee
TAL	Total Allowable Landings
TED	Turtle Excluder Device
TMS	Ten-minute square
US	United States
USCG	US Coast Guard
VECs	Valued Ecosystem Components
VMS	Vessel Monitoring Sytem
VTR	Vessel Trip Report

3.0 INTRODUCTION AND BACKGROUND

3.1 Purpose and Need

The purpose of this action is to specify the overfishing limit (OFL) and acceptable biological catch (ABC)small-mesh multispecies fishery, and to set specifications for the 2016-2018 fishing years consistent with the requirements of the NE Multispecies FMP, while providing additional flexibility and promoting the full utilization of optimum yield (OY).The requirement to set multiyear specifications is also needed to prevent overfishing. Pursuant to the requirements of the MSA, the specifications are intended to continue to address and minimize the catch and discards of small-mesh multispecies to the extent practicable.discards of small-mesh multispecies to the extent practicable.

The Northeast Multispecies Fishery Management Plan (FMP) requires that the NMFS Regional Administrator, after consultation with the Council, determine the specifications for northern and southern stocks of red and silver hake at least every three years. Amendment 19 established a process and framework for setting catch specifications, as well as set the specifications for the 2012-2014 fishing years. The small-mesh multispecies specifications are intended to meet many of the goals and objectives for this fishery by establishing catch limits that promote sustainable yield and prevent overfishing.

Changes to specifications are needed to respond to changes in stock biomass, provide for sustainable yield, and prevent overfishing. Changes to the total allowable landings (TAL) are also needed to respond to changes in the discard rate of red and silver hake. This action proposes new specifications for the 2018-2020 fishing years, derived from a stock assessment update for northern and southern red and silver hake (4 stocks). This stock assessment (NEMFC 2017) was updated with survey data through spring 2017 for red hake and through fall 2016 for silver hake. Reported landings and estimated discards were updated through calendar year 2016. (Note, offshore hake is included in the fishery, but is not currently able to be assessed. The southern silver hake stock ABC is adjusted by the estimated proportion (4 percent) of offshore hake in the combined "whiting" landings.)

Table 2. Summary of Purpose and Need.

NEED	CORRESPONDING PURPOSE
For all small mesh multispecies, modify specifications in response to changes in stock biomass to provide for sustainable yield and prevent overfishing. For red and silver hake, modify the total allowable landings in response to changes in discard rate.	Set red and silver hake specifications for 2018 – 2020 fishing years.

3.2 Management Background

The small-mesh multispecies fishery consists of three species: Silver hake (*Merluccius bilinearis*), red hake (*Urophycis chuss*), and offshore hake (*Merluccius albidus*). There are two stocks of silver hake (northern and southern), two stocks of red hake (northern and southern), and one stock of offshore hake, which primarily co-occurs with the southern stock of silver hake. There is little to no separation of silver and offshore species in the market, and both are generally sold under the name "whiting." Throughout the document, "whiting" is used to refer to silver hake, and offshore and silver hake combined catches.

3.2.1 Goals and Objectives of FMP

The Council's objective is to manage fisheries catching red, silver, and offshore hake that maintain stock size at levels capable of sustaining Maximum Sustainable Yield (MSY) on a continuing basis. In addition to existing restrictions on fishing through exemption areas and seasons to minimize groundfish bycatch, other measures are intended to optimize size selectivity and keep landings from temporarily flooding limited market demand. These measures include red and silver hake possession limits. The silver hake possession limits are higher when a vessel uses large mesh, providing an incentive to avoid catching juvenile or small silver hake. Amendment 19 established and specified catch and landings limits which are deemed to be sustainable, including accountability measures which either reduce the risk that catches will exceed the ACL or to account for those overages in later seasons if they do occur.

3.2.2 Overfishing Definitions

The following overfishing definitions were chosen by the Council in Amendment 12 (https://www.nefmc.org/library/amendment-12-2) and re-evaluated in the 2010 benchmark assessment (NEFSC 2011) and subsequently approved by the Council's SSC for determining stock status.

3.2.2.1 Silver hake

Silver hake is overfished when the three-year moving average of the fall survey weight per tow (i.e. the biomass threshold) is less than one half the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1973-1982. The most recent estimates of the biomass thresholds are 3.21 kg/tow for the northern stock, and 0.83 kg/tow for the southern stock.

Overfishing occurs when the ratio between the catch and the arithmetic fall survey biomass index from the most recent three years exceeds the overfishing threshold. The most recent estimates of the overfishing threshold are 2.78 kt/kg for the northern stock and 34.19 kt/kg for the southern stock of silver hake.

Overfishing threshold estimates are based on annual exploitation ratios (catch divided by arithmetic fall survey biomass) averaged from 1973-1982.

Table 3. Silver hake overfishing definition reference points.

Stock	Threshold	Target
Northern Silver Hake	½ B_{MSY} Proxy (3.21 kg/tow) F_{MSY} Proxy (2.78 kt/kg)	B_{MSY} Proxy (6.42 kg/tow) F_{MSY} Proxy (n/a)
Southern Silver Hake	½ B_{MSY} Proxy (0.83 kg/tow) F_{MSY} Proxy (34.19 kt/kg)	B_{MSY} Proxy (1.65 kg/tow) F_{MSY} Proxy (n/a)

3.2.2.2 Red hake

Red hake is overfished when the three-year moving arithmetic average of the spring survey weight per tow (i.e., the biomass threshold) is less than one half of the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1980 – 2010. The current estimates of $B_{THRESHOLD}$ for the northern and southern stocks are 1.27 kg/tow and 0.51 kg/tow, respectively.

Overfishing occurs when the ratio between catch and spring survey biomass for the northern and the southern stocks exceeds 0.163 kt/kg and 3.038 kt/kg, respectively, derived from AIM analyses from 1980-2009.

Table 4. Red hake overfishing definition reference points.

Stock	Threshold	Target
Northern Red Hake	½ B_{MSY} Proxy (1.27kg/tow) F_{MSY} Proxy (0.163 kt/kg)	B_{MSY} Proxy (n/a) F_{MSY} Proxy (n/a)
Southern Red Hake	½ B_{MSY} Proxy (0.51 kg/tow) F_{MSY} Proxy (3.038 kt/kg)	B_{MSY} Proxy (n/a) F_{MSY} Proxy (n/a)

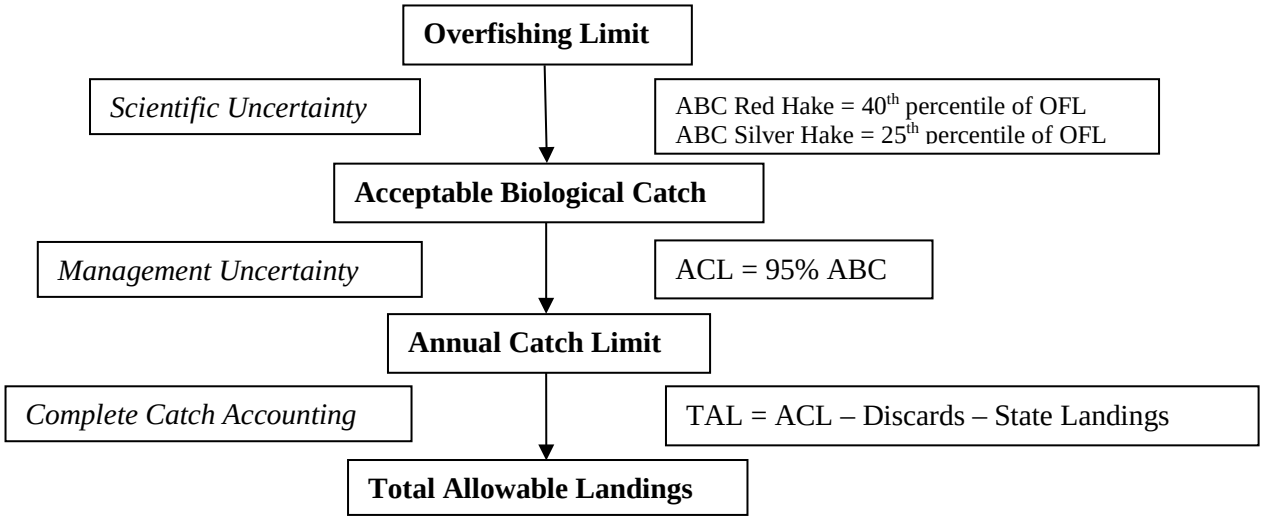
3.2.2.3 Offshore hake

The 2010 benchmark assessment concluded that information was not available to determine stock status for offshore hake because fishery data were insufficient, and the survey data are not considered to reflect stock trends. It was not possible to recommend a reference points for offshore hake and the overfished and overfishing status of offshore hake is therefore unknown.

3.2.3 Formulas for Specifications

The process and formulae for developing specifications for red, silver, and offshore hake (target species for the small-mesh multispecies fishery) are described in §648.90(b). The regulations provide for an annual review and three-year specification process where the Council sets specifications for at least a three-year period, using best available science. The specifications for each stock include an overfishing limit (OFL), which is associated with maximum sustainable yield (MSY); an Acceptable Biological Catch (ABC), which accounts for scientific uncertainty; an Annual Catch Limit (ACL), which accounts for management uncertainty; and a Total Allowable Landings (TAL) limit that accounts for discards and catch by state-only permitted vessels.

This ACL framework, including the OFLs and ABCs, is illustrated below:



The OFL is derived from the average exploitation rate during a period that is considered to represent conditions that generated MSY. Adopted in the last benchmark assessment (SAW 51, NEFSC 2011), these baseline reference periods were 1980-2009 for red hake and 1973-1982 for silver hake. These average exploitation rates derived from the assessments were applied to the most recent three-year moving average biomass estimates gives the OFL (in mt) that is consistent with current stock conditions.

Precision (or conversely, scientific uncertainty) is estimated and a level of precaution was selected in Amendment 19 to account for scientific uncertainty. For red hake, the 40th percentile of the distribution of scientific uncertainty estimates was chosen as an appropriate level of precaution. For silver hake, a more conservative 25th percentile was chosen. This buffer between the OFL and ABC will vary with the degree of scientific uncertainty (getting smaller with greater amounts of precision in the estimates). In Amendment 19, the Council also chose a 5% buffer to account for management uncertainty to set the ACL. A three-year average discard rate (discards/catch) is applied for each stock to set the TAL, after deducting an assumed 3% catch for state-only permitted vessels.

Details about the estimation procedures and values derived from the latest stock assessment are given in the SAFE Report for the 2013 fishing year (NEFMC 2014).

3.2.4 Stock Status, Biological Reference Points and Specifications

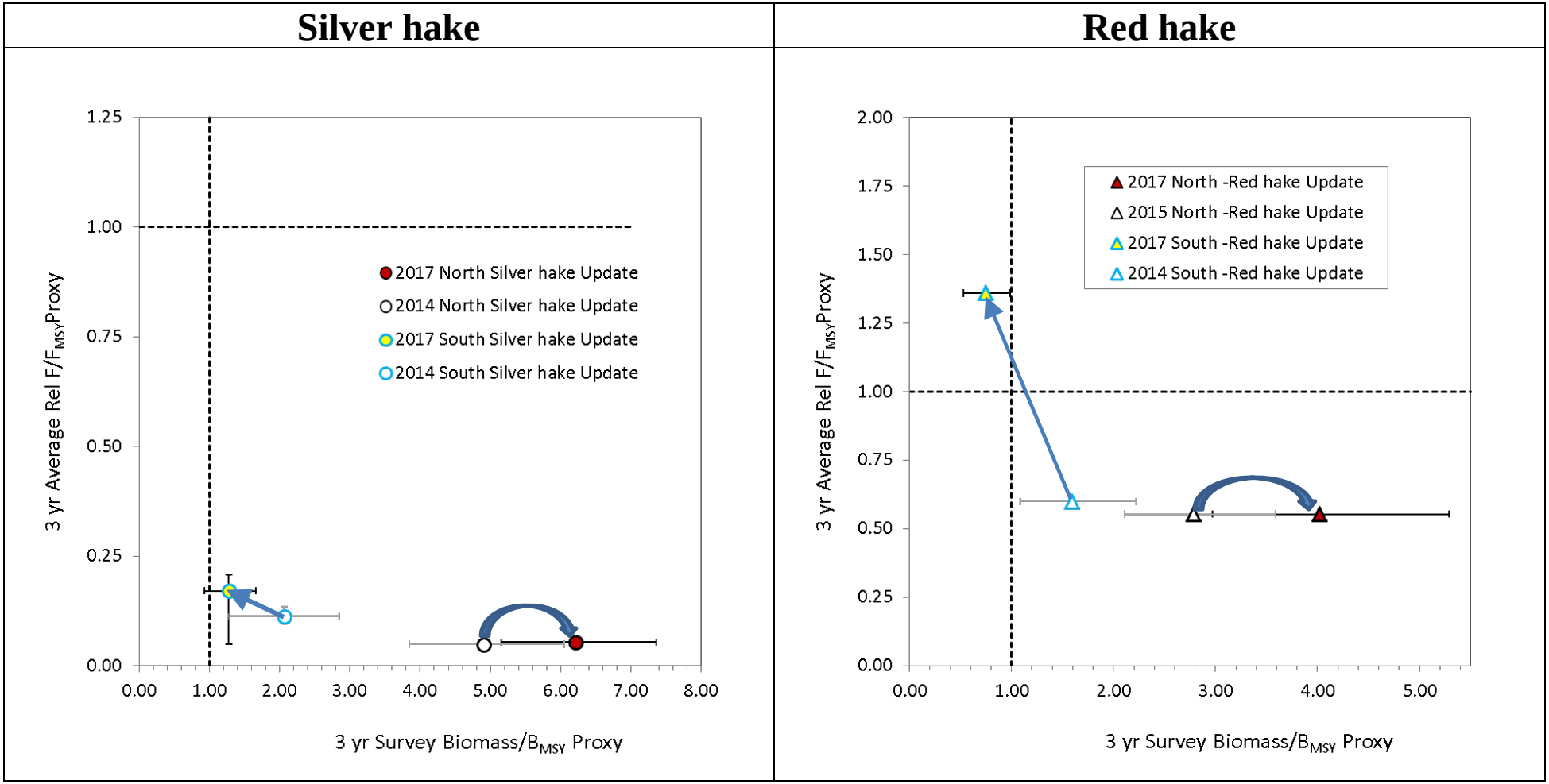
3.2.4.1 Stock Status

According to the 2016 assessment update conducted by the NEFSC and included in the Stock Assessment and Fishery Performance Report for Fishing Year 2016 (NEFMC 2017), southern red hake has become overfished and overfishing is occurring. For all other stocks in the fishery, overfishing is not occurring (see Figure 1).

The stock biomass index for northern silver hake is well above the 6.42 kg/tow target, the highest level since 1963, and exploitation remains low (below the 2.77 kt/kg target. Stock biomass for southern silver hake has declined from recent levels and is now below the MSY proxy value (1.65 kg/tow), although exploitation remains low (below the 34.17 kt/kg threshold). Biomass is above the 0.825 kg/tow threshold, thus the stock is not overfished.

The stock biomass index for northern red hake is well above the 2.53 kg/tow target, the highest level in the time series. Since being overfished in 2013, exploitation has declined below the 0.163 kt/kg threshold. Southern red hake biomass has declined from a peak in 2010 and is now below the minimum biomass threshold of 0.51 kg/tow. Recent catch has remained relatively stable despite a reduction in the specifications in 2016. Coupled with a reduction in stock biomass, the stable catches caused exploitation to increase above the 3.04 kt/kg threshold. Overfishing is therefore occurring.

Figure 1. Stock status relative to MSY proxy values for exploitation (y-axis) and biomass (x-axis). Dashed lines (value=1) indicate targets. Biomass and fishing stock status plots for specification years 2016-2018 in the north (labeled as 2015), 2015-2017 in the south (labeled as 2014) and 2018-2020 (labeled as 2017) and associated 95% confidence intervals. The triangle symbols are points estimates derived from the ratio of the most recent 3yr average index to proxy reference points while the 95% CI were calculated from the 5th and 95th percentile of the cumulative distribution of the recent 3-year index of biomass and Relative F.



3.2.4.2 Maximum Sustainable Yield (MSY)

National Standard 1 requires that FMPs achieve "on a continuing basis, the optimum yield from each fishery for the United States fishing industry." The term "optimum," with respect to yield from a fishery, is defined as the amount of fish which:

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

Optimum yield (OY) for silver hake, offshore hake, and red hake will therefore be the amount of fish that results from fishing under the set of rules designed to achieve the plan objectives. It is the amount of fish caught by the fishery when fishing at target fishing mortality rates (Ftarget) at current biomass levels (Bt), or when fishing in a manner intended to maintain or achieve biomass levels capable of producing maximum sustainable yield (MSY) on a continuing basis. Accounting for scientific uncertainty in the estimate of MSY, Ftarget is defined as the mortality that would produce the ACL at existing stock biomass and size selectivity. Expressed as an equation:

$$OY = Ftarget \times (Bt)$$

For a rebuilt stock, Bt is always greater than BMSY (stock biomass capable of sustaining MSY over time). Ftarget is the target level of fishing mortality and is set safely below FMSY (the fishing mortality rate capable of producing MSY over time) to prevent overfishing and ensure that OY can be achieved on a continuing basis. For an overfished stock, Bt is the current stock biomass level estimated or projected from the most recent assessment, and Ftarget is the fishing mortality rate objective that will achieve the desired rebuilding. If the current F, Ftarget, or Bt is unknown, proxy control rules are applied and the long-term potential yield may be a satisfactory proxy for OY.

The target fishing mortality rate (Ftarget) is the rate that will achieve the plan objectives with an acceptable degree of safety or precaution. Factors to be considered in setting Ftarget will be calculated through periodic stock assessments and include the stock size relative to BMSY, the current age structure of the population and recruitment, as well as projected growth and recruitment characteristics of the stock. The Council may also consider social and economic characteristics in setting Ftarget provided the stock rebuilding projections are within the Council's range of precaution.

For an overfished stock (no stock is currently overfished), for example, the Council would set a target rate to rebuild the stock within a maximum time, usually not to exceed ten years. On a rebuilt stock, the Council should set Ftarget safely below the threshold level that will produce MSY. In setting target fishing mortality rates, the Council must balance maximizing short-term economic yield and providing for sustained participation of communities in the fishery against the risk or cost of allowing the biomass to decline to levels below BMSY. Thus, the Council will consider social, economic, and ecological factors in setting the Ftarget in addition to considering the risk of not achieving stock recovery in an acceptable time period, or the risk of the rebuilt stock becoming overfished at any given time.

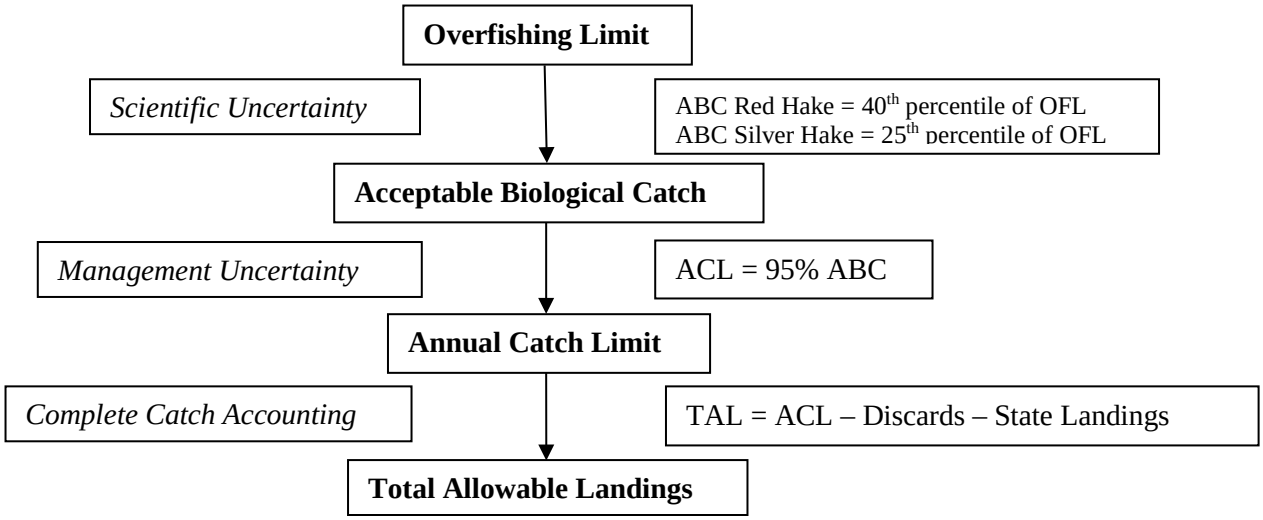
OY, therefore, is not a fixed amount but varies with the status of the stocks in the fishery, but it cannot be above a level that would exceed FMSY. It is a quantity that represents the yield resulting from fishing at

target levels on a rebuilt stock or stock complex, or the yield resulting from fishing at target levels designed to rebuild the stock in a specified time frame.

3.2.4.3 Acceptable Biological Catch (ABC)

The process and formulae for developing specifications for red, silver, and offshore hake (target species for the small-mesh multispecies fishery) are described in §648.90(b). The regulations provide for an annual review and three-year specification process where the Council sets specifications for at least a three-year period, using best available science. The specifications for each stock include an overfishing limit (OFL), which is associated with maximum sustainable yield (MSY); an Acceptable Biological Catch (ABC), which accounts for scientific uncertainty; an Annual Catch Limit (ACL), which accounts for management uncertainty; and a Total Allowable Landings (TAL) limit that accounts for discards and catch by state-only permitted vessels.

This ACL framework, including the OFLs and ABCs, is illustrated below:



The OFL is derived from the average exploitation rate during a period that is considered to represent conditions that generated MSY. Adopted in the last benchmark assessment (SAW 51, NEFSC 2011), these baseline reference periods were 1980-2009 for red hake and 1973-1982 for silver hake. These average exploitation rates derived from the assessments were applied to the most recent three-year moving average biomass estimates gives the OFL (in mt) that is consistent with current stock conditions.

Precision (or conversely, scientific uncertainty) is estimated and a level of precaution was selected in Amendment 19 to account for scientific uncertainty. For red hake, the 40th percentile of the distribution of scientific uncertainty estimates was chosen as an appropriate level of precaution. For silver hake, a more conservative 25th percentile was chosen. This buffer between the OFL and ABC will vary with the degree of scientific uncertainty (getting smaller with greater amounts of precision in the estimates). In Amendment 19, the Council also chose a 5% buffer to account for management uncertainty to set the ACL. A three-year average discard rate (discards/catch) is applied for each stock to set the TAL, after deducting an assumed 3% catch for state-only permitted vessels.

Details about the estimation procedures and values derived from the latest stock assessment are given in the SAFE Report for the 2013 fishing year (NEFMC 2014).

3.2.4.4 Specifications (Allowable Biological Catch and Annual Catch Limits)

New Specifications for 2018-2020 (2017) are being developed by the Council, based on an assessment update for 2016 prepared by the Northeast Fisheries Science Center (NEFSC). The new specifications are presented in Table 5, but have not yet been reviewed or approved by the Council's Scientific and Statistical Committee (SSC). The SSC meeting is tentatively scheduled for early October 2017 and the Council expects to approve a specification package in December 2017, so that new regulations become effective on May 1, 2018.

An update assessment was performed by the Northeast Fisheries Science Center (NEFSC) and presented to the Whiting PDT in July. This assessment followed the same procedures that were applied in the benchmark assessment using new survey data and catch estimates. Also, scientific uncertainty in these estimates were estimated and the full range of potential ABC values as well as probability of overfishing (ABC>OFL) will be presented to the Scientific and Statistical Committee (SSC). These estimates included the ABC at the 25th percentile for silver hake and the 40th percentile for red hake, separately for the northern and southern management areas.

During the last update assessment and development of three-year specifications, two advisors raised concerns about red hake stock structure and survey availability due to interference with fixed gear. More data and analyses were presented to the SSC, who felt that the concerns were valid but also deemed the assessment was consistent with currently available information. The SSC did however recommend that these issues should be more thoroughly examined at the next benchmark assessment. In addition, it has been six years since the last benchmark assessment and will be nine years old by the next specification cycle. Changes in distribution and an apparent shift in relative productivity of northern and southern stocks may make the existing reference point benchmarks (1973-1982 for silver hake and 1980-2009 for red hake) less suitable for future management targets and thresholds. Further advancements could be made if red hake aging data can be used in the assessment. An alternative assessment could also be performed using survey data ONLY from the RV Bigelow time series, coupled with compatible state survey data (including the ME/NH and NEMAP trawl surveys). The 2011 benchmark assessment adjusted the RV Albatross survey series to RV Bigelow units based on calibration data (which has some level of uncertainty) that the NEFSC collected during the transition.

After reviewing the PDT advice, the SSC felt that the buffers the Council chose for scientific uncertainty were appropriate and had worked as intended during the 2012-2014 specification period. The SSC therefore approved using the 25th percentile for silver hake and a less conservative 40th percentile for red hake. The proposed 2018-2020 specifications are shown in the table below.

Table 5. Proposed 2018-2020 specifications.

Stock	OFL (mt)	ABC (mt)	ACL (mt)	Change from 2016-2017	TAL (mt)
Northern silver hake	58,350	31,030	29,475	+27%	26,604
Northern red hake	840	721	685	+45%	274
Southern whiting	31,180	19,395	18,425	-35%	14,465
Southern red hake	1,150	1,060	1,007	-38%	305

3.2.5 Management History

The small-mesh multispecies fishery consists of three species: Silver hake (*Merluccius bilinearis*), red hake (*Urophycis chuss*), and offshore hake (*Merluccius albidus*). There are two stocks of silver hake (northern and southern), two stocks of red hake (northern and southern), and one stock of offshore hake, which primarily co-occurs with the southern stock of silver hake. There is little to no separation of silver and offshore species in the market, and both are generally sold under the name "whiting." Throughout the document, "whiting" is used to refer to silver hake and offshore and silver hake combined catches.

Collectively, the small-mesh multispecies fishery is managed under a series of exemptions from the Northeast Multispecies Fishery Management Plan. The Northeast Multispecies FMP requires that a fishery can routinely catch less than 5% of regulated multispecies to be exempted from the minimum mesh size. In the Gulf of Maine and Georges Bank Regulated Mesh Areas (Map 1), there are six exemption areas, which are open seasonally (Table 6).

Table 6. Northern area exemption program seasons

	May	Jun	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Cultivator			June 15 – October 31									
GOM* Grate			July 1 – November 30									
Small I			July 15 – November 30									
Small II	– June 30								January 1 –			
Cape Cod RFT†					Sept 1 – Nov 20							
					September 1 – December 31							

* GOM = Gulf of Maine
† RFT = Raised Footrope Trawl

The Gulf of Maine Grate Raised Footrope area is open from July 1 through November 30 of each year and requires the use of an excluder grate on a raised footrope trawl with a minimum mesh size of 2.5 inches. Small Mesh Areas I and II are open from July 15 through November 15, and January 1 through June 30, respectively. A raised footrope trawl is required in Small Mesh Areas I and II, and the trip limits are mesh size dependent. Cultivator Shoal Exemption Area is open from June 15 – October 31, and requires a minimum mesh size of 3 inches. The Raised Footrope Trawl Exemption Areas are open from September 1 through November 20, with the eastern portion remaining open until December 31. A raised footrope trawl, with a minimum mesh size of 2.5-inch square or diamond mesh, is required. The Southern New England and Mid-Atlantic Regulated Mesh Areas are open year-round and have mesh size dependent possession limits for the small-mesh multispecies.

The mesh size dependent possession limits for all the areas with that requirement are shown below.

Table 7. Mesh size dependent possession limits

Codend Mesh Size	Silver and offshore hake, combined, possession limit	Red Hake South	Red Hake North
Smaller than 2.5”	3,500 lbs.	5,000 lbs.	3,000 lbs.
Larger than 2.5”, but smaller than 3.0”	7,500 lbs.	5,000 lbs.	3,000 lbs.
Equal to or greater than 3.0”	30,000 lbs. (40,000 lbs. in Southern Area)	5,000 lbs.	3,000 lbs.
Accountability measure, in-season trigger	2,000 lbs. 90% of TAL	400 lbs. 90% of TAL	400 lbs. 37.9% of TAL

The exemption areas (Map 1) were implemented as part of several different amendments and framework adjustments to the Northeast Multispecies FMP. In 1991, Amendment 4 incorporated silver and red hake and established an experimental fishery on Cultivator Shoal. Framework Adjustment 6 (1994) was intended to reduce the catch of juvenile whiting by changing the minimum mesh size from 2.5 inches to 3 inches. Small Mesh Areas I and II, off the coast of New Hampshire, were established in Framework Adjustment 9 (1995). The New England Fishery Management Council (Council) established essential fish habitat (EFH) designations and added offshore hake to the plan in Amendment 12 (2000). Also in Amendment 12, the Council proposed to establish limited entry into the small-mesh fishery. However, that measure was disapproved by the Secretary of Commerce because it did not comply with National Standard 4[1] as a result of measures that benefited participants in the Cultivator Shoal experimental fishery and because of the “sunset” provision that would have ended the limited entry program at some date. The Raised Footrope Trawl Area off of Cape Cod was established in Framework Adjustment 35 (2000). A modification to Framework Adjustment 35 in 2002 adjusted the boundary along the eastern side of Cape Cod and extended the season to December 31 in the new area. Framework Adjustment 37 modified and streamlined some of the varying management measures to increase consistency across the exemption areas. In 2003, Framework Adjustment 38 established the Grate Raised Footrope Exemption Area in the inshore Gulf of Maine area.

The Northeast Multispecies FMP was implemented primarily to manage the commercial cod and haddock fisheries in the Gulf of Maine and Georges Bank[2]. The FMP is complicated and has been changed numerous times since 1985 (almost 20 Council amendments and over 50 framework adjustments; not including dozens of emergencies, interim, and Secretarial amendments implemented outside of the Council process.) A few of those amendments and several framework adjustments have addressed the small-mesh fishery specifically and are described below.

Amendment 1 (1987) reduced the spatial footprint of the winter inshore whiting fishery in order to protect struggling large mesh species like redfish, gray sole, and dabs; focused the small-mesh target species to

[1] National Standard 4 states that measures “shall not discriminate between residents of different States,” and that fishing privileges must be “fair and equitable to all such fishermen.”

[2] The large-mesh species (cod, haddock, pollock, flounders, etc.) were commonly referred to as the “regulated” species because they were the focus of management originally. That term is confusing as almost all of the commercially viable stocks are now “regulated.” This document refers to the management of those species as the “groundfish fishery” or the “large-mesh multispecies fishery.”

large-mesh species ratio on a selected set of species; and reduced the size of the Georges Bank whiting fishery area to protect yellowtail flounder.

Amendment 2 (1989) made some additional, minor changes to the exempted fishery program for whiting and other small-mesh stocks.

Amendment 4 (1991) established the Cultivator Shoals Exemption Area and formally incorporated silver hake and red hake into the FMP. This amendment also established a minimum mesh size for the directed small-mesh fishery as well. This was intended to control mortality of whiting and red hake in this fishery.

Amendment 5 (1994) established an overfishing definition for red hake, and implemented some other minor modifications to small-mesh management, including a standardized bycatch amount of 500 lb of large-mesh groundfish.

Framework Adjustment 3 (1994) modified the 500-lb bycatch limit to reduce the incentive for vessels to target groundfish with small mesh. This action changed the limit to "10-percent of the total weight of fish on board, or 500 lb, whichever is less." This preserved the Council's original intent of minimizing mortality on juvenile groundfish, while allowing the legitimate small-mesh fishery to continue.

Framework Adjustment 6 (1994) was intended, in part, to reduce juvenile whiting mortality in the Cultivator Shoals whiting fishery and modified the requirements of that program.

Framework Adjustment 9 (1995) established Small Mesh Areas I and II in the Gulf of Maine and implemented the requirements for fishing in those areas.

An Adjustment to Amendment 7 (1996) made some minor modifications to non-groundfish bycatch limits in the Cultivator Shoals fishery.

Amendment 12 (1999/2000) addressed many small-mesh issues. This amendment officially incorporated offshore hake into the FMP; established essential fish habitat designations for all three small-mesh species; standardized the mesh-size based possession limits (see below); required a Letter of Authorization for several small-mesh exemption areas; and established a provision to allow the transfer of up to 500 lb of small-mesh multispecies at sea. Amendment 12 also proposed a limited access permit program for this fishery. However, that program was not implemented because NMFS determined that it did not comply with the requirement to treat residents of different states equally (National Standard 4.)

Framework Adjustment 35 (2000) established the Raised Footrope Trawl Exemption Area off Cape Cod. A Modification to Framework 35 (2002) modified the boundaries and seasons of the Cape Cod exemption areas.

Framework Adjustment 37 (2003) eliminated some of the now unnecessary provisions from Amendment 12, clarified the transfer-at-sea provisions, and reinstated the full season (back to an October 31 end date) for the Cultivator Shoal Exempted Fishery. This framework also standardized the types and amounts of incidental species that could be retained in the small-mesh exemption areas between Small Mesh Areas I and II and the Cape Cod Exemption Area.

A new Control Date (2003) was formally established with the intentions of developing a limited access permit program.

Framework Adjustment 38 (2003) established the Inshore Gulf of Maine Grate Raised Footrope Trawl Exemption Area along the coast of Maine.

A Secretarial Amendment (2012) brought this portion of the FMP into compliance with the Magnuson-Stevens Act requirements to have (1) annual catch limits and (2) measures to ensure accountability for each Council managed fishery. A Secretarial Amendment was necessary because the development of Amendment 19, the mechanism through which the Council was intending to adopt the new requirements, was delayed.

The Control Date for the small-mesh multispecies was modified to November 28, 2012.

Amendment 19 (2013) allowed the Council to incorporate updated stock assessment information and adopt the annual catch limit structure implemented in the 2012 Secretarial Amendment. Amendment 19 modified the accountability measures, adopted new biological reference points, and established a trip limit for red hake.

Framework Adjustment 50 (2013) established a separate, sub-annual catch limit of Georges Bank yellowtail flounder for the small-mesh fishery (whiting and squid fisheries.)

Framework Adjustment 51 (2014) implemented accountability measures for that sub-annual catch limit.

Post-season Accountability Measure (2015) reduced the TAL trigger for northern red hake from 90% of the TAL to 62.5% of the TAL.

Specifications for 2015-2017 (2016) adjusted the OFL, ABC. ACL, and TALs to account for changes in stock biomass. The specification document also changed the northern red hake possession limit to 3,000 lbs. at the beginning of the fishing year, which would automatically drop to 1,500 lbs. when landings reach 62.5% of the TAL. Due to prior overages, the TAL trigger was reduced to 45% of the TAL.

Post-season Accountability Measure (2016) reduced the northern red hake TAL trigger from 45% of the TAL to 37.9%.

New Specifications for 2018-2020 (2017) are being developed by the Council, based on an assessment update for 2016 prepared by the Northeast Fisheries Science Center (NEFSC). The new specifications are presented in Section 3.2.4.4, but have not yet been reviewed or approved by the Council's Scientific and Statistical Committee (SSC). The SSC meeting is tentatively scheduled for early October 2017 and the Council expects to approve a specification package in December 2017, so that new regulations become effective on May 1, 2018.

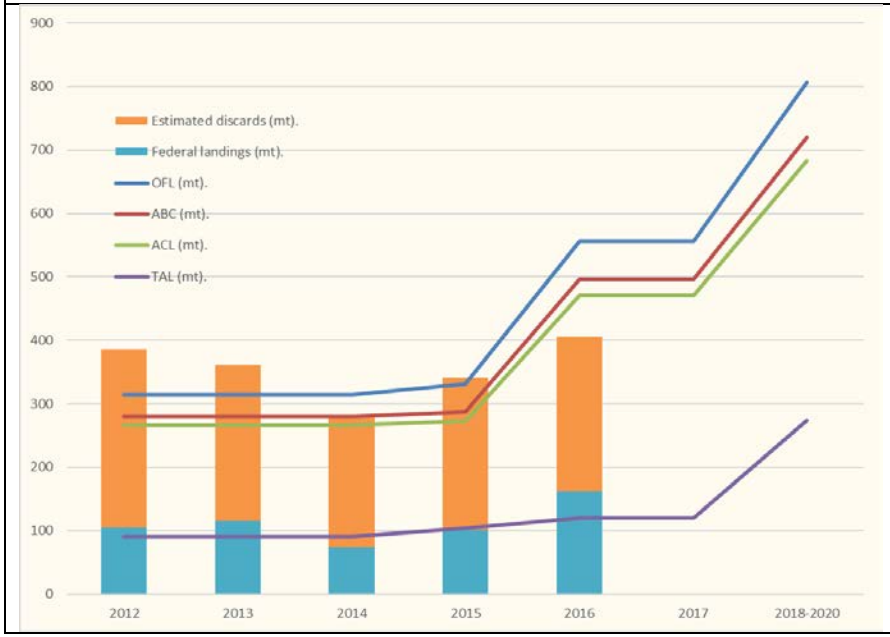
The following figure summarizes the past, current, and proposed specifications by stock.

Figure 2. Annual specifications and catch estimates for small-mesh multispecies by stock

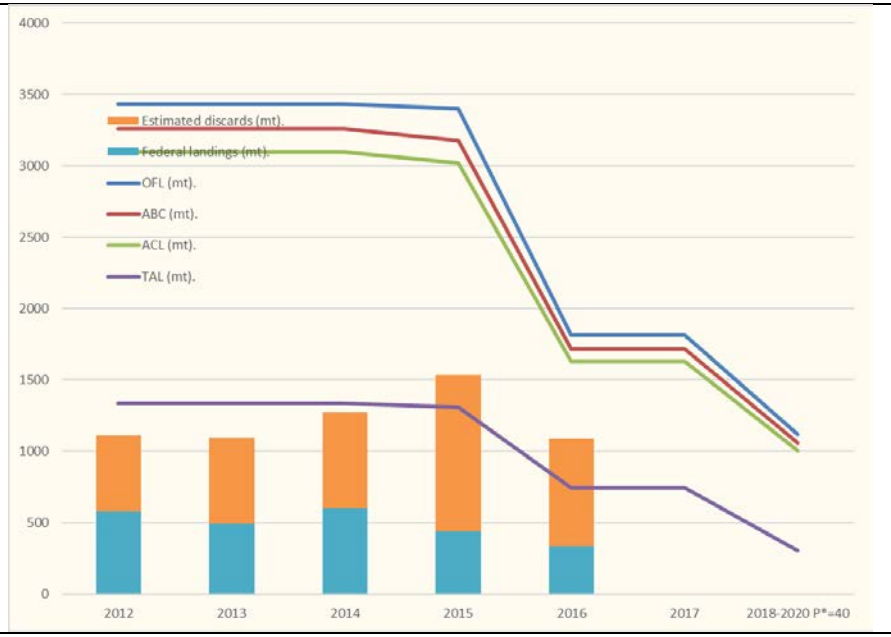
Northern silver hake

Southern whiting

Northern red hake



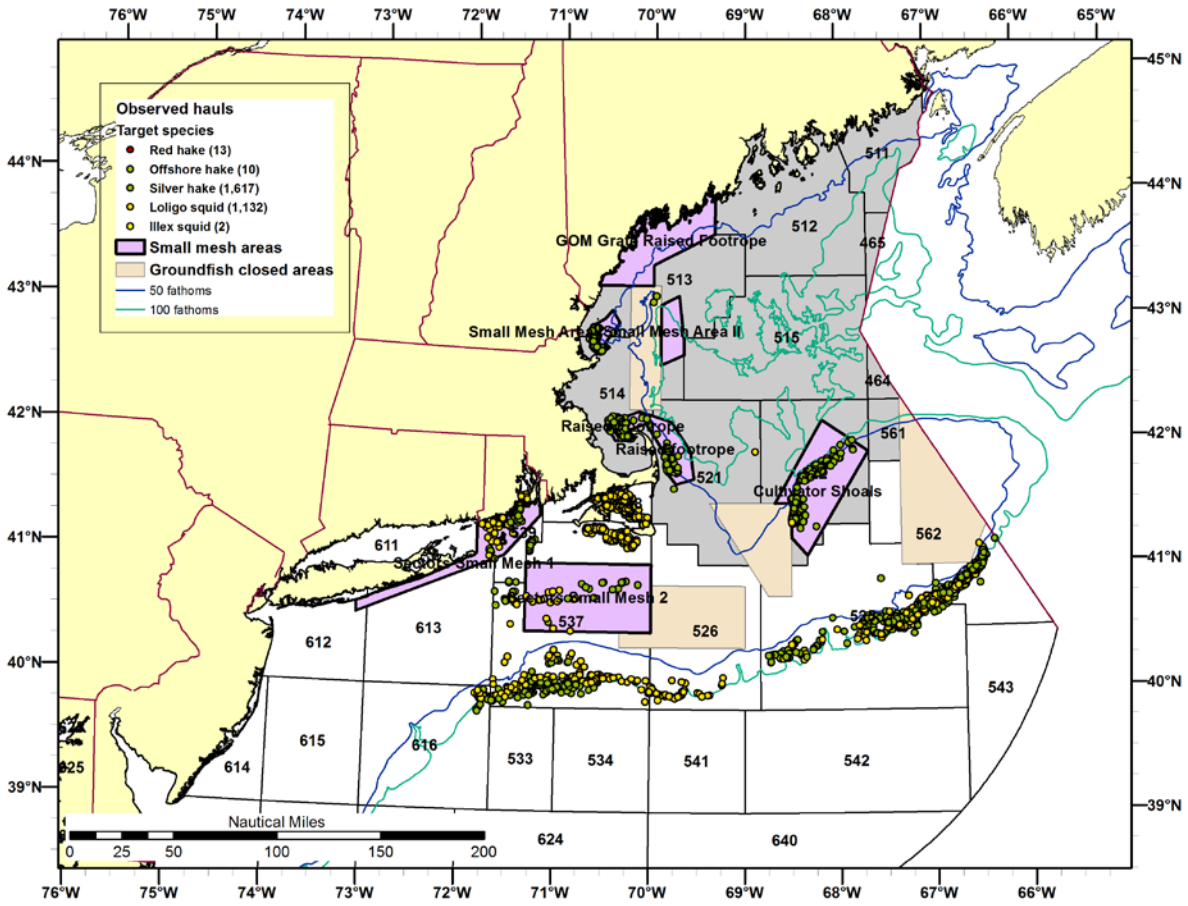
Southern red hake



Vessels participating in any of the exemption areas must have a Northeast Multispecies limited access or open access category K permit and must have a letter of authorization from the Regional Administrator to fish in Cultivator Shoal and the Cape Cod Raised Footrope areas. Most of the areas (Small Mesh Areas I and II, the Cape Cod Raised Footrope areas, Southern New England Exemption Area, and the Mid-Atlantic Exemption Area) have mesh size dependent possession limits for silver and offshore hake, combined (Table 7). The Gulf of Maine Grate Raised Footrope Area has a possession limit of 7,500 lb, with a 2.5-inch minimum mesh size, and Cultivator Shoal has a possession limit of 30,000 lb, with a 3-inch minimum mesh size.

The red hake possession limit is 5,000 lb, regardless of area fished. Amendment 19 also implemented a 40,000 lb possession limit for vessels fishing in the southern stock area.

Map 1. Location of small-mesh fishing during 2002-2013 and exemption areas. Vessels that belong to a groundfish sector may fish for small-mesh multispecies in the two shaded exemption areas off NY, CT, and southern MA. The northern stock area is shaded grey, while the southern stock area is not shaded. The locations of groundfish closed areas shaded beige are shown for reference.



3.2.5.1 Magnuson-Stevens Fishery Conservation and Management Act

In 2006, the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) was passed, which updated the original Magnuson-Stevens Act (MSA) and the Sustainable Fisheries Act of 1996. The MSFCMA introduced requirements for fishery management, including:

- A firm deadline to end overfishing in America by 2011. For stocks that are currently experiencing overfishing, the deadline for ending that overfishing is 2010
- Use of Annual Catch Levels (ACLs) to prevent overfishing, set at a level to ensure that overfishing does not occur in the particular fishery. The ACL is required to be set at or below the Acceptable Biological Catch (ABC) of the fishery. Councils were directed to follow the recommendations of their Scientific and Statistical Committee (SSC); the ACL cannot exceed the SSC's ABC recommendation.
- Use of Accountability Measures (AMs), actions to be taken in the event of an ACL overage.

4.0 ALTERNATIVES UNDER CONSIDERATION

4.1 ACL Specifications

4.1.1 Updated Specifications (preferred)

Limits on fishing year catches for northern and southern stocks of red and silver hakes would be revised to be consistent with changes in stock biomass (indexed by a 3-year moving average of the stratified mean survey biomass), changes in the assessment of scientific uncertainty (i.e., precision of the survey biomass), and changes in the estimated discard rate.

The overfishing level (OFL) is a catch level (commercial landings and discards) that has a 50% probability of causing overfishing (i.e., mortality above the approved MSY proxy). Accounting for scientific uncertainty, the ABC is a catch level that has a low probability of causing overfishing. The Council's Scientific and Statistical Committee (SSC) set the silver hake ABC at the 25th percentile and the red hake ABC at the 40th percentile of the estimate of scientific uncertainty[3]. The specifications for southern silver hake were increased by 4% to account for traditional mixed catches of silver and offshore hake, according to the 2012 benchmark assessment estimates and procedures approved by the SSC. Offshore hake is a managed small-mesh multispecies, but, lacking a viable analytical assessment and MSY estimate, is managed as a component of the targeted southern whiting fishery. In Amendment 19 (NEFMC 2013), the annual catch limit (ACL) is 95% of the ABC to account for management uncertainty (e.g. inaccuracies in monitoring catch). The parameters for these specifications remain unchanged from what was analyzed and approved in Amendment 19. Only the values changed in response to updating the stock assessment through 2017.

The Total Allowable Landings (TAL) is reduced from the ACL to account for discards by federally-permitted vessels and catches by state-permitted vessels fishing in state waters. Following the framework established in Amendment 19 (Section 3.2.3), the discard rate (shown in the table below) was re-estimated for the most recent three-year period (for fishing years 2014-2016). Using the estimates for Amendment 19, catches by state waters fishing was assumed not to exceed three percent. The TAL is used to determine when possession limits are reduced to discourage targeting a species whose catches are approaching the ABC. For northern red hake, possession limits are reduced from 3,000 to 400 lbs. when landings reach 37.9% of the TAL[4]. For the other three stocks (southern red hake, southern whiting, and northern silver hake), possession limits are reduced to an incidental catch level (400 lbs. for red hake; 2,000 lbs. for silver hake/whiting) when landings reach 90% of the TAL.

Table 8. Proposed ABC and ACL specifications for 2018-2020 fishing years.

Stock	OFL (mt)	ABC (mt)	ACL (mt)	Change from SQ	TAL (mt)	Change from SQ
Northern silver hake	58,350	31,030	29,475	27%	26,604	33%
Northern red hake	840	721	685	45%	274	128%
Southern whiting	31,180	19,395	18,425	-35%	14,465	-39%
Southern red hake	1,150	1,060	1,007	-38%	305	-59%

[3] The 50th percentile on scientific uncertainty is approximately the level that is associated with a 50%
[4] The in-season AM for northern red hake was reduced in 2016 to 37.9% to account for an ABC overage in 2015.

Rationale: The proposed limits use best available science to prevent overfishing and are consistent with Magnuson-Stevens Act guidelines and requirements. The catch and survey data used to establish these limits were updated and revised through 2014-2016 in an assessment update (NEFMC 2017). These estimates and their basis were reviewed by the Council's SSC and approved for the 2018-2020 fishing years.

Although scientific uncertainty was recalculated in the update assessment, the Council maintained the basis (otherwise known as 'P*') for selecting the level of precaution previously approved in Amendment 19. Due to the economic and ecological importance of silver hake stocks, plus uncertainty regarding the assessment model, the Council chose a P* equivalent to the 25th percentile on the distribution of scientific uncertainty estimates. This is estimated to have a very low probability that the fishing at the ABC would cause overfishing to occur. Red hake ABCs are set at a less-conservative 40th percentile on the distribution of scientific uncertainty due to lower economic value and the potential for this to become a choke stock for fisheries targeting other species (particularly silver hake). Updated estimates for the potential for overfishing at various P* levels are given in NEFMC 2017. These risk estimates are always less than 50% and are generally less than 10%.

4.1.2 No Action (Status quo)

No action would retain the current specifications as shown below and the current accountability measures (including reducing the northern red hake possession limit to 400 lbs. when landings reach 37.9% of the TAL).

Table 9. Existing ABC and ACL specifications for 2016-2017 fishing years

				2016 Catch		2016 Landings
Stock	OFL (mt)	ABC (mt)	ACL (mt)	% ACL	TAL (mt)	% TAL
Northern silver hake	43,608	24,383	23,161	15%	19,949	15%
Northern red hake	556	496	471	86%	120	135%
Southern whiting	60,148	31,180	29,261	16%	23,833	16%
Southern red hake	1,816	1,717	1,631	67%	746	45%

Rationale: This alternative would be chosen (or would continue in force according to existing regulations) if the agency decides that updates to the biological information on stock status and catches are not warranted.

5.0 AFFECTED ENVIRONMENT (EIS)

5.1 Biological Environment

5.1.1 Summary of life history characteristics

5.1.1.1 Silver hake

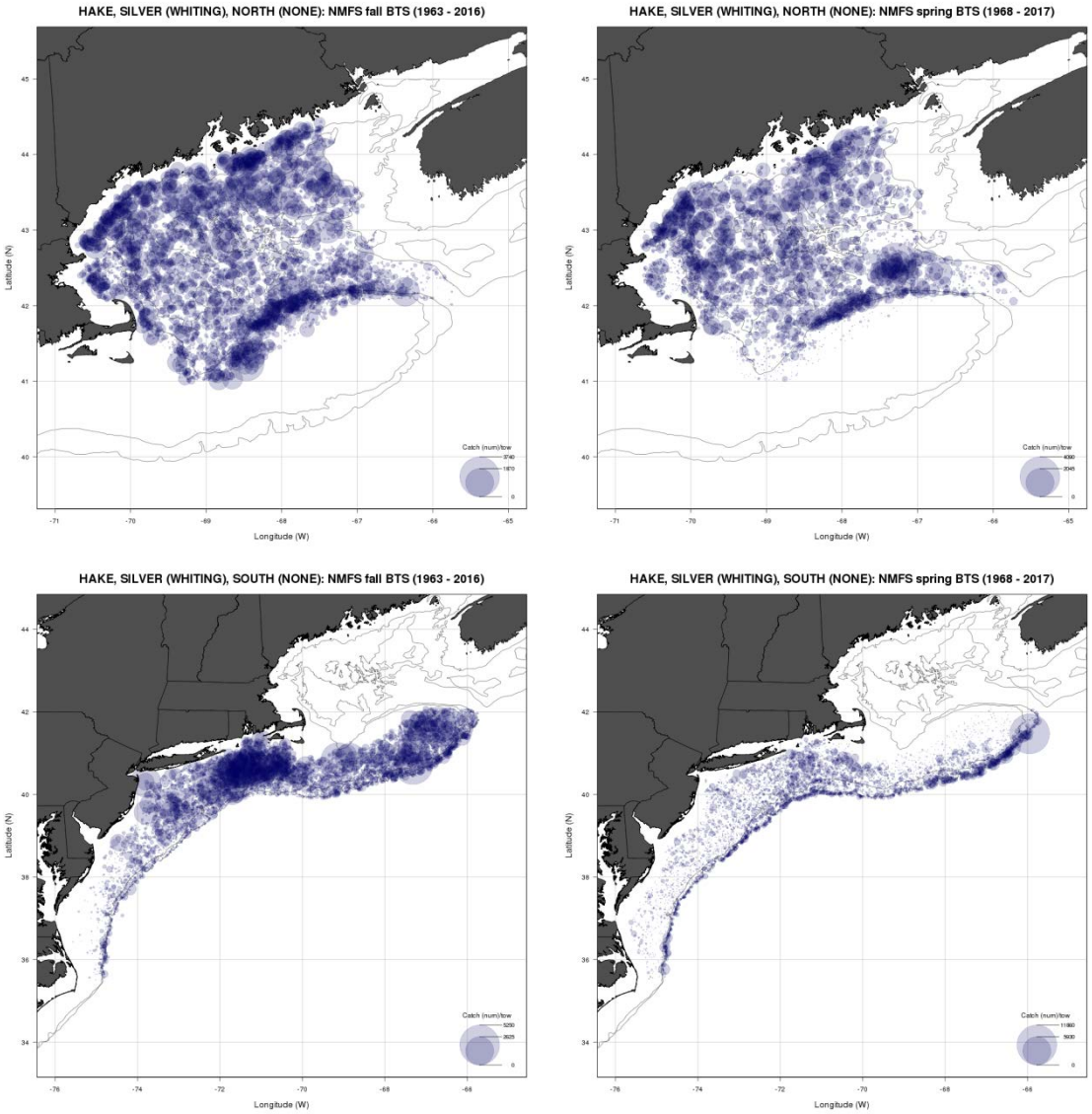
Silver hake, *Merluccius bilinearis*, also known as whiting, range from the Grand Banks of Southern Newfoundland to South Carolina (Brodziak, 2001, Lock and Packer 2004). In U.S. waters, two subpopulations of silver hake are assumed to exist within the EEZ based on numerous methods, primarily morphometric differences and otolith micro-constituent differences (Conover et al. 1967, Almeida 1987, Bolles and Begg 2000). The northern silver hake stock inhabits the Gulf of Maine to Northern Georges Bank waters, while the southern silver hake stock inhabits Southern Georges Bank to the Mid Atlantic Bight waters (Figure 3). However, Bolles and Begg (2000) reported some mixing of silver hake due to their wide migratory patterns, but the degree of mixing among the management areas is unknown. A re-evaluation of stock structure in the last silver hake assessment, based on trends in adult biomass, icthyolplankton survey, growth and maturity analyses, also suggests that reproductive isolation between the two stocks is unlikely (NEFSC, 2010). Based on the mixed evidence on silver hake stock structure (morphometrics, tagging, discontinuous larva distribution, homogeneous growth and maturity), it was concluded that there was no strong biological evidence to support either a separate or a single stock structure for silver hake. Thus, the two-stock structure definition remained as the basis for science and management (NEFSC, 2010).

Survey distribution suggests that most of the silver hake are in the Gulf of Maine and on Georges Bank in the fall and along the shelf edge in the spring (Figure 3). Silver hake migrate in response to seasonal changes in water temperatures, moving toward shallow, warmer waters in the spring. Silver hake spawn in shallow waters during late spring and early summer and then return to deeper waters in the autumn (Brodziak et al. 2001). The older, larger silver hake especially prefer deeper waters. During the summer, portions of both stocks can be found on Georges Bank. In winter, fish in the northern stock move to deep basins in the Gulf of Maine, while fish in the southern stock move to outer continental shelf and slope waters. Silver hake are widely distributed, and have been observed at temperature ranges of 2-17° C (36-63° F) and depth ranges of 11-500 m (36-1,640 ft). However, they are most commonly found between 7-10º C (45-50º F) (Lock and Packer 2004).

Female silver hake are serial spawners, producing and releasing up to three batches of eggs in a single spawning season (Collette and Klein-MacPhee eds. 2002). Major spawning areas include the coastal region of the Gulf of Maine from Cape Cod to Grand Manan Island, southern and southeastern Georges Bank, and the southern New England area south of Martha's Vineyard. Peak spawning occurs earlier in the south (May to June) than in the north (July to August). Over 50 percent of age-2 fish (20 to 30 cm, 8 to 12 in) and virtually all age-3 fish (25 to 35 cm, 10 to 14 in) are sexually mature (O'Brien et al. 1993). Silver hake grow to a maximum length of over 70 cm (28 in) and ages up to 14 years have been observed in U.S. waters, although few fish older than age 6 have been observed in recent years (Brodziak et al. 2001, NEFSC 2010). Silver hake are nocturnal, semi-pelagic predators, moving up in the water column to feed at night, primarily between dusk and midnight and returning to rest on the bottom during the day, preferring sandy, muddy or pebble substrate (Collette and Klein-MacPhee eds. 2002). Silver hake population constitutes an important link in the food web dynamics due to their high prey consumption capacity and as food source for major predators in the northwest Atlantic ecosystem. Consumptive estimates of silver hake indicate that predatory consumption represents a major source of silver hake removals from the system and primarily includes goosefish, bluefish, windowpane, four spot flounder, red

hake, cod, silver hake, thorny skate, winter skate, little skate, Pollock and spiny dogfish (Garrison and Link 2000, NEFSC, 2010). Silver hake are generally cannibalistic but their diet varies by region, size, sex, season, migration, spawning and age (Garrison and Link 2000, Lock and Packer 2004, Link et al. 2011).

Figure 3 Fall (left) and spring (right) survey distribution of silver hake in the northern stock (Top) and southern stock (Bottom) from the NEFSC bottom trawl surveys, 1963-2017.



5.1.1.2 Red hake

Red hake, *Urophycis chuss*, is a demersal gadoid species distributed from the Gulf of St. Lawrence to North Carolina, and are most abundant from the western Gulf of Maine through Southern New England

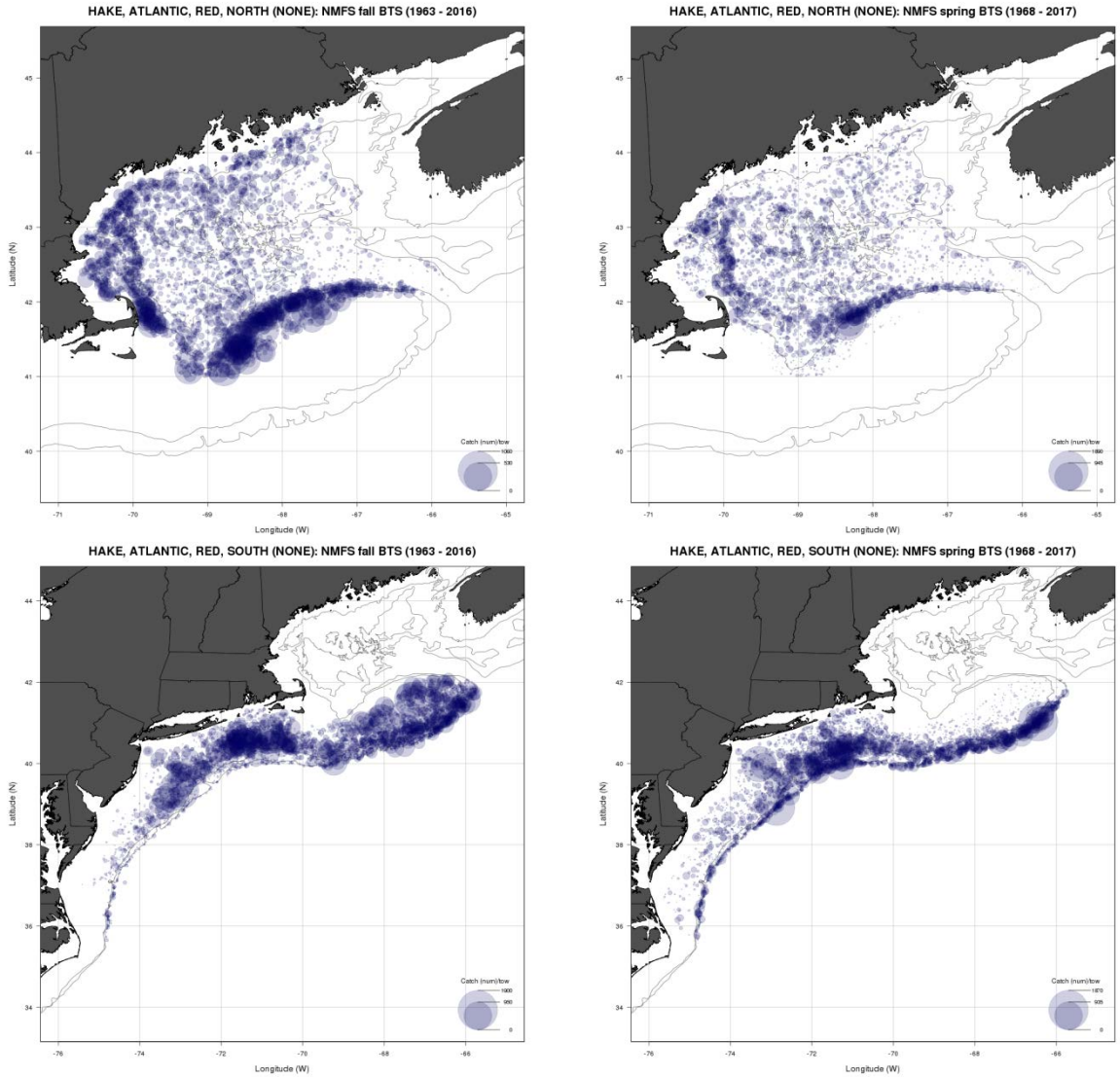
waters. Red hake are separated into northern and southern stocks for management purposes. The northern stock is defined as the Gulf of Maine to Northern Georges Bank region, while the southern stock is defined as the Southern Georges Bank to Mid-Atlantic Bight region (Figure 4). Survey distributions indicate that there are higher concentrations of red hake by catch weight (kg) during the NEFSC spring surveys than the NEFSC fall surveys. Less red hake are caught in the middle of Georges Bank in the spring than the fall. They tended to be more in the Gulf of Maine and along the shelf, than in the middle of the bank (Figure 4).

Red hake migrate seasonally, preferring temperatures between 5 and 12° C (41-54° F) (Grosslein and Azarovitz 1982). During the spring and summer months, red hake move into shallower waters to spawn, then move offshore to deep waters in the Gulf of Maine and the edge of the continental shelf along Southern New England and Georges Bank in the winter. Spawning occurs from May through November, with primary spawning grounds on the southwest part of Georges Bank and in the Southern New England area off Montauk Point, Long Island (Colton and Temple 1961).

Red hake do not grow as large as white hake, and normally reach a maximum size of 50 cm (20 in) and 2 kg (4.4 lb.) (Musick 1967). Females are generally larger than males of the same age, and reach a maximum length of 63 cm (25 in) and a weight of 3.6 kg (7.9 lb.) (Collette and Klein-MacPhee eds. 2002). Although they generally do not live longer than 8 years, red hake have been recorded up to 14 years old. In the northern stock, the age at 50 percent maturity is 1.4 years for males and 1.8 years for females, and the size at 50 percent maturity is 22 cm (8.7 in) for males and 27 cm (10.6 in) for females (O'Brien et al. 1993). In the southern red hake stock, the age at 50 percent maturity is 1.8 years for males and 1.7 years for females, and the size at 50 percent maturity is 24 cm (9.5 in) for males and 25 cm (9.8 in) for females (O'Brien et al. 1993).

Red hake prefer soft sand or muddy bottom, and feed primarily on crustaceans such as euphausiids, decapods, and rock crabs as well as fish such as haddock, silver hake, sea robins, sand lance, mackerel and small red hake (Bowman et al. 2000). Primary predators of red hake include spiny dogfish, cod, goosefish, and silver hake (Rountree 1999). As juveniles, red hake seek shelter from predators in scallop beds, and are commonly found in the mantle cavities of (or underneath) sea scallops. In the fall, red hake likely leave the safety of the scallop beds due to their increasing size and to seek warmer temperatures in offshore waters (Steiner et al. 1982).

Figure 4 Fall (left) and spring (right) survey distribution of red hake in the northern stock (Top) and southern stock (Bottom) from the NEFSC bottom trawl surveys, 1963-2017



5.1.1.3 Offshore hake

Offshore hake (*Merluccius albidus*) is a data-poor stock and very little is known about its biology and life history. They are commonly distributed from southern Georges Bank through the Mid-Atlantic Bight, at depths of 160-550 meters and temperatures ranging between 11-13ºC. They are known to co-occur with silver hake in the outer continental slopes of the Atlantic Ocean and are easily confused with silver hake because of their strong morphological resemblances. There appears to be seasonal differences in the patterns of distribution with concentrations shifting south of Georges Bank in the winter months and extending to the southern flank of Georges Bank and further south in the spring (Figure 5).

The primary source of biological information for offshore hake is the annual fishery independent surveys conducted by the Northeast Fisheries Science Center (NEFSC). Offshore hake Survey catches are generally low and variable relative to other hake species.

Offshore hake are located primarily on the continental shelf and presumably beyond the NEFSC survey area. Offshore hake tend to be concentrated in the southern Georges Bank region in the fall, whereas in the spring, they are found further south in the Mid-Atlantic Bight. However, offshore hake appear to be more abundant during the winter months.

Offshore hake appear to be sexually dimorphic with females slightly larger than males. Females mature at a larger length than males, like other gadoid species (O'Brien et al 1993). Maximum size observed in the survey was approximately 56 cm. Length at 50 percent maturity also differed significantly between sexes with females maturing at larger sizes (28 cm) relative to males (23 cm). Spawning generally occurs between April and July. Maximum observed size was approximately 43 cm for males and 56 cm for female (Traver et al. 2011).

Figure 5 Fall (left) and Spring (right) survey distribution of offshore hake from the NEFSC bottom trawl surveys, 1967-2017.

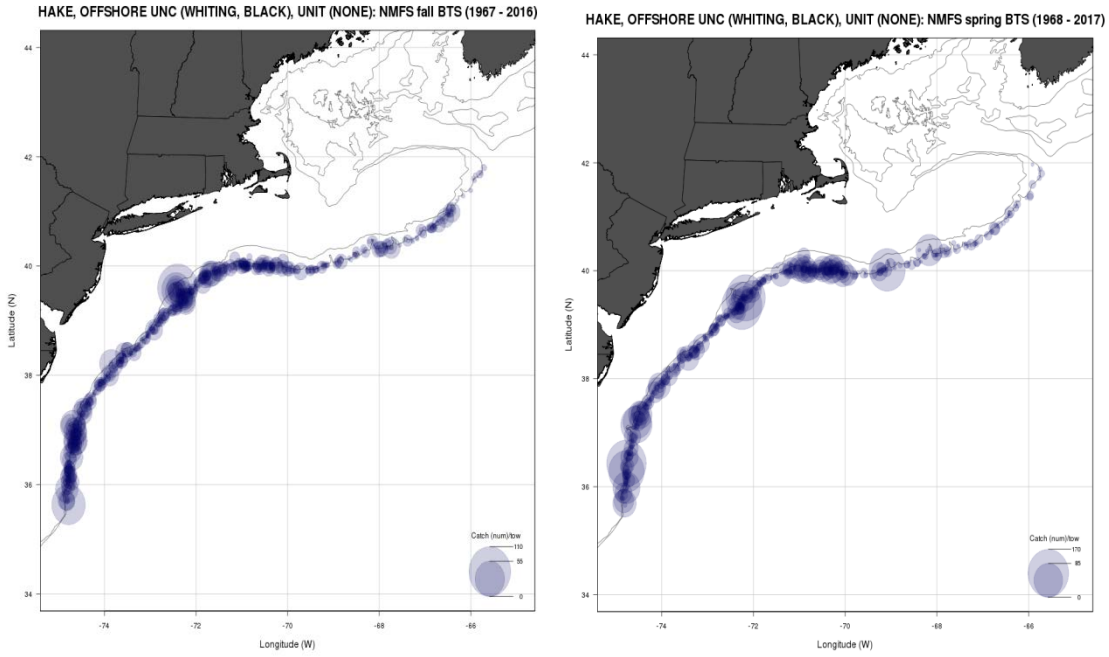
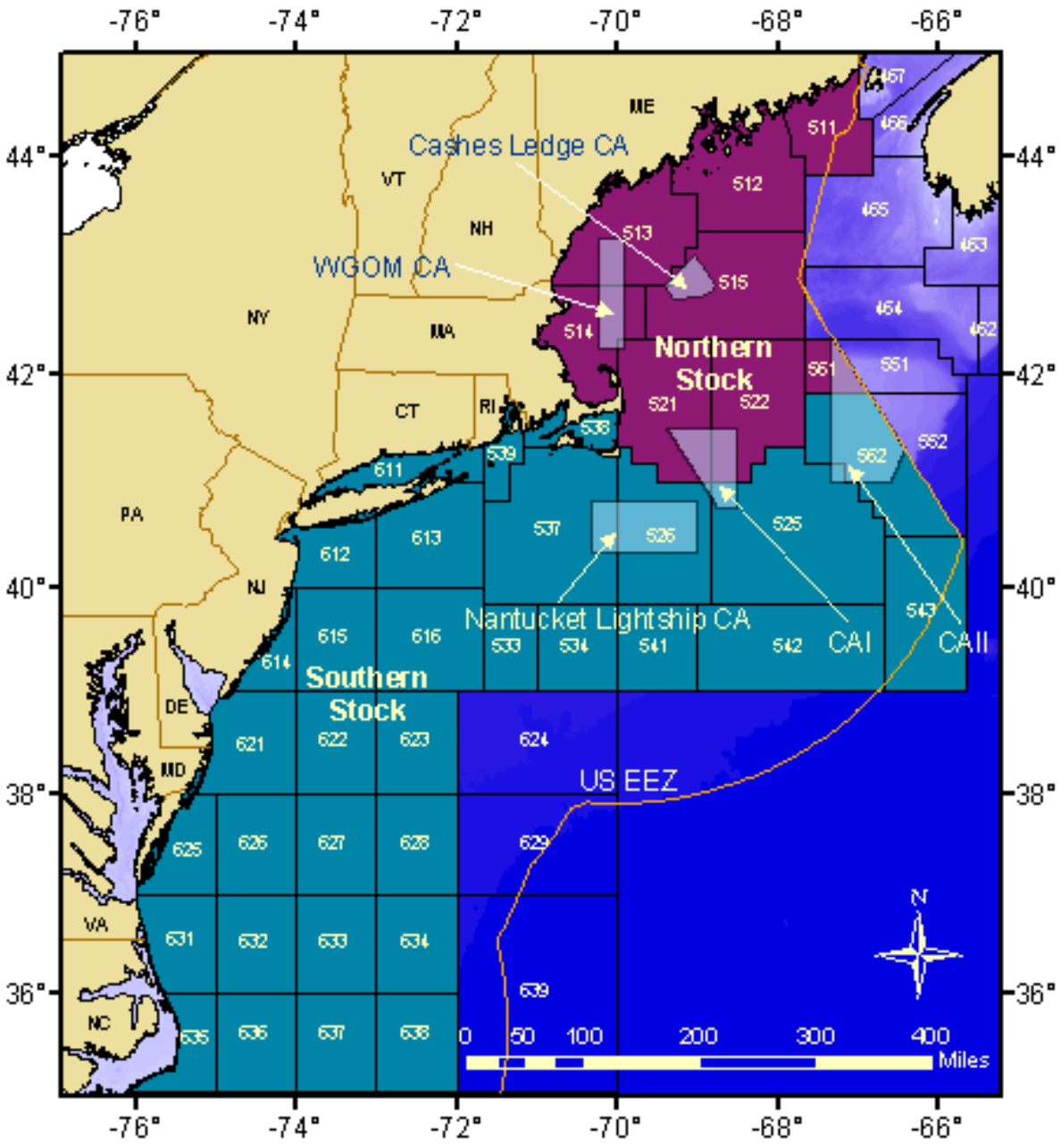


Figure 6. Statistical area used to define red and silver hake in the northern and southern management areas. Offshore hake statistical areas are restricted to the southern management region only.



5.1.2 Stock status

An update assessment was performed by the Northeast Fisheries Science Center (NEFSC) and presented to the Whiting PDT. This assessment followed the same procedures that were applied in the benchmark assessment using new survey data and catch estimates. Also, scientific uncertainty in these estimates

were estimated and the full range of potential ABC values as well as probability of overfishing (ABC>OFL) which will be presented to the Scientific and Statistical Committee (SSC) on October 12, 2017 (https://www.nefmc.org/calendar/oct-12-2017-ssc-meeting). These estimates included the ABC at the 25th percentile for silver hake and the 40th percentile for red hake, separately for the northern and southern management areas. For offshore hake, there was no reliable information about catch or trends in abundance and biomass to guide management of offshore hake.

5.1.2.1 Silver hake

The 2017 silver hake assessment update for both the northern and southern management areas included survey data from the NEFSC fall bottom trawl survey, commercial fishing data from vessel trip reports, dealer landings, and on-board fishery observer data through 2016 and will be the basis for this report.

In the absence of an analytical assessment for silver hake, the biological reference points for both the northern and southern silver hake stocks are as follows:

Silver hake is overfished when the three-year moving average of the fall survey weight per tow (i.e. the biomass threshold) is less than one half the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1973-1982. The most recent estimates of the biomass thresholds are 3.21 kg/tow for the northern stock, and 0.83 kg/tow for the southern stock.

Overfishing occurs when the ratio between the catch and the arithmetic fall survey biomass index from the most recent three years exceeds the overfishing threshold. The most recent estimates of the overfishing threshold are 2.78 kt/kg for the northern stock and 34.19 kt/kg for the southern stock of silver hake.

Overfishing thresholds are based on annual exploitation ratios (catch divided by arithmetic fall survey biomass) averaged from 1973-1982 (Table 10). Catch per tow is in "Albatross" units.

Table 10. Silver hake overfishing definition reference points.

Stock	Threshold	Target
Northern Silver Hake	½ B_{MSY} Proxy (3.21 kg/tow) F_{MSY} Proxy (2.78 kt/kg)	B_{MSY} Proxy (6.42 kg/tow) F_{MSY} Proxy (n/a)
Southern Silver Hake	½ B_{MSY} Proxy (0.83 kg/tow) F_{MSY} Proxy (34.19 kt/kg)	B_{MSY} Proxy (1.65 kg/tow) F_{MSY} Proxy (n/a)

In the northern management area (Table 11; Figure 7), the three-year average arithmetic mean biomass based on the NEFSC fall bottom trawl survey for data 2014-2016 (19.92 kg/tow) was above the management threshold (3.21 kg/tow) and above the target (6.42 kg/tow). The three-year average exploitation index (total catch divided by biomass index) for 2014-2016 (0.15kt/kg) was below the overfishing threshold (2.78 kt/kg).

In the southern management area (Table 12; Figure 8), the three-year arithmetic also based on the NEFSC fall bottom trawl survey data for 2014-2016 (1.05 kg/tow) was above the biomass threshold (0.83 kg/tow) but below the target (1.65 kg/tow). The three-year average exploitation index (total catch divided by biomass index) for 2014-2016 (2.95 kt/kg) was below the overfishing threshold (34.19 kt/kg). Therefore, based on the 2017 silver hake updated assessment, it is recommended that both stocks so silver hake are NOT overfished and overfishing is NOT occurring.

Table 11. Northern silver hake stock - summary of catch and survey indices in albatross units for northern silver hake, 1955-2016.

Year	Northern Fall Survey Arithmetic kg/tow	Northern Fall Survey 3-year Average	Northern Total Landings (000's mt)	Northern Discards (000's mt)	Northern Total Catch (000's mt)	Northern Exploitation Index (kg/000's mt)	Northern Exploitation Index 3-year Average
1955			53.36		53.36		
1956			42.15		42.15		
1957			62.75		62.75		
1958			49.90		49.90		
1959			50.61		50.61		
1960			45.54		45.54		
1961			39.69		39.69		
1962			79.00		79.00		
1963	23.10		73.92		73.92	3.20	
1964	4.34		94.46		94.46	21.77	
1965	7.06	11.50	45.28		45.28	6.41	10.46
1966	4.19	5.20	47.81		47.81	11.41	13.20
1967	2.27	4.51	33.37		33.37	14.70	10.84
1968	2.28	2.91	41.38		41.38	18.15	14.75
1969	2.41	2.32	24.06		24.06	9.98	14.28
1970	3.03	2.57	27.53		27.53	9.09	12.41
1971	2.67	2.70	36.40		36.40	13.63	10.90
1972	5.78	3.83	25.22		25.22	4.36	9.03
1973	4.12	4.19	32.09		32.09	7.79	8.60
1974	3.45	4.45	20.68		20.68	5.99	6.05
1975	8.09	5.22	39.87		39.87	4.93	6.24
1976	11.25	7.60	13.63		13.63	1.21	4.05
1977	6.72	8.69	12.46		12.46	1.85	2.66
1978	6.32	8.10	12.61		12.61	2.00	1.69
1979	6.18	6.41	3.42		3.42	0.55	1.47
1980	7.23	6.58	4.73		4.73	0.65	1.07
1981	4.52	5.98	4.42	2.64	7.05	1.56	0.92
1982	6.28	6.01	4.66	2.91	7.57	1.21	1.14
1983	8.76	6.52	5.31	2.64	7.95	0.91	1.22
1984	3.36	6.13	8.29	2.59	10.88	3.24	1.78
1985	8.28	6.80	8.30	2.56	10.86	1.31	1.82
1986	13.04	8.23	8.50	2.35	10.86	0.83	1.79
1987	9.79	10.37	5.66	2.11	7.77	0.79	0.98
1988	6.05	9.63	6.79	1.79	8.57	1.42	1.01
1989	10.53	8.79	4.65	2.32	6.96	0.66	0.96
1990	15.61	10.73	6.38	1.96	8.34	0.53	0.87
1991	10.52	12.22	6.06	1.26	7.31	0.69	0.63
1992	10.25	12.13	5.31	1.42	6.73	0.66	0.63
1993	7.50	9.42	4.36	0.69	5.05	0.67	0.67
1994	6.84	8.20	3.90	0.24	4.14	0.61	0.65
1995	12.89	9.08	2.59	0.63	3.22	0.25	0.51
1996	7.57	9.10	3.62	0.82	4.44	0.59	0.48
1997	5.66	8.71	2.80	0.24	3.05	0.54	0.46
1998	18.91	10.71	2.05	0.69	2.74	0.14	0.42
1999	11.15	11.91	3.45	0.74	4.19	0.38	0.35

Year	Northern Fall Survey Arithmetic kg/tow	Northern Fall Survey 3-year Average	Northern Total Landings (000's mt)	Northern Discards (000's mt)	Northern Total Catch (000's mt)	Northern Exploitation Index (kg/000's mt)	Northern Exploitation Index 3-year Average
2000	13.51	14.52	2.59	0.36	2.95	0.22	0.25
2001	8.33	11.00	3.39	0.48	3.87	0.46	0.35
2002	7.99	9.94	2.59	0.51	3.11	0.39	0.36
2003	8.29	8.20	1.81	0.20	2.01	0.24	0.37
2004	3.28	6.52	1.05	0.12	1.16	0.35	0.33
2005	1.72	4.43	0.83	0.06	0.89	0.52	0.37
2006	3.69	2.90	0.90	0.04	0.94	0.26	0.38
2007	6.44	3.95	1.01	0.75	1.76	0.27	0.35
2008	5.27	5.13	0.62	0.17	0.79	0.15	0.23
2009	6.89	6.20	1.04	0.19	1.23	0.18	0.20
2010	13.35	8.50	1.69	0.79	2.48	0.19	0.17
2011	9.97	10.07	1.93	0.12	2.04	0.20	0.19
2012	20.43	14.58	1.95	0.29	2.24	0.11	0.17
2013	16.75	15.72	1.37	0.25	1.62	0.10	0.14
2014	18.77	18.65	2.55	0.47	3.02	0.16	0.12
2015	19.49	18.34	2.19	0.31	2.50	0.13	0.13
2016	21.51	19.92	3.07	0.31	3.37	0.16	0.15

Table 12. Southern silver hake stock– summary of catch and survey indices in albatross units for northern silver hake, 1955- 2016.

Year	Southern Fall Survey Arithmetic kg/tow	Southern Fall Survey 3-year Average	Southern Total Landings (000's mt)	Southern Discards (000's mt)	Southern Total Catch (000's mt)	Southern Exploitation Index (kg/000's mt)	Southern Exploitation Index 3-year Average
1955			13.26		13.26		
1956			14.24		14.24		
1957			16.43		16.43		
1958			12.90		12.90		
1959			16.39		16.39		
1960			8.82		8.82		
1961			12.65		12.65		
1962			17.94		17.94		
1963	4.66		89.43		89.43	19.19	
1964	4.06		147.05		147.05	36.22	
1965	5.28	4.67	294.12		294.12	55.70	37.04
1966	2.64	3.99	202.32		202.32	76.64	56.19
1967	2.44	3.45	87.38		87.38	35.81	56.05
1968	2.73	2.60	58.16		58.16	21.30	44.58
1969	1.26	2.14	74.89		74.89	59.44	38.85
1970	1.35	1.78	26.83		26.83	19.87	33.54
1971	2.21	1.61	70.51		70.51	31.90	37.07
1972	2.13	1.90	88.18		88.18	41.40	31.06
1973	1.70	2.01	102.08		102.08	60.05	44.45
1974	0.85	1.56	102.40		102.40	120.47	73.97
1975	1.79	1.45	72.16		72.16	40.31	73.61
1976	1.99	1.54	64.61		64.61	32.47	64.42
1977	1.68	1.82	57.16		57.16	34.02	35.60
1978	2.50	2.06	25.83		25.83	10.33	25.61
1979	1.68	1.95	16.40		16.40	9.76	18.04
1980	1.63	1.94	11.68		11.68	7.17	9.09
1981	1.12	1.48	13.43	3.50	16.93	15.12	10.68
1982	1.56	1.44	14.15	4.65	18.80	12.05	11.44
1983	2.57	1.75	11.86	4.81	16.67	6.49	11.22
1984	1.40	1.84	12.96	4.88	17.84	12.74	10.43
1985	3.55	2.51	12.82	3.87	16.69	4.70	7.98
1986	1.45	2.13	9.70	4.33	14.03	9.68	9.04
1987	1.95	2.32	9.55	4.25	13.80	7.08	7.15
1988	1.78	1.73	8.95	4.50	13.45	7.56	8.10
1989	1.87	1.87	13.00	6.57	19.57	10.47	8.37
1990	1.52	1.72	13.02	5.97	18.99	12.49	10.17
1991	0.85	1.41	9.74	3.08	12.82	15.08	12.68
1992	0.99	1.12	10.53	3.45	13.98	14.12	13.90
1993	1.28	1.04	12.49	5.17	17.66	13.80	14.33
1994	0.79	1.02	12.18	5.94	18.12	22.94	16.95
1995	1.59	1.22	11.99	1.40	13.39	8.42	15.05
1996	0.45	0.94	12.13	0.48	12.61	28.02	19.79
1997	0.83	0.96	12.55	0.62	13.17	15.87	17.44
1998	0.57	0.62	12.56	0.53	13.09	22.96	22.28
1999	0.82	0.74	10.42	3.55	13.97	17.04	18.62

Year	Southern Fall Survey Arithmetic kg/tow	Southern Fall Survey 3-year Average	Southern Total Landings (000's mt)	Southern Discards (000's mt)	Southern Total Catch (000's mt)	Southern Exploitation Index (kg/000's mt)	Southern Exploitation Index 3-year Average
2000	0.72	0.70	9.47	0.33	9.80	13.61	17.87
2001	2.04	1.19	8.88	0.19	9.07	4.45	11.70
2002	1.18	1.31	4.89	0.41	5.30	4.49	7.52
2003	1.42	1.55	6.28	0.60	6.88	4.85	4.59
2004	1.24	1.28	6.97	1.20	8.17	6.59	5.31
2005	0.94	1.20	6.40	1.58	7.98	8.49	6.64
2006	1.42	1.20	4.58	0.16	4.74	3.34	6.14
2007	0.87	1.08	5.07	0.15	5.22	6.00	5.94
2008	1.36	1.22	5.58	1.03	6.61	4.86	4.73
2009	1.10	1.11	6.75	0.84	7.59	6.90	5.92
2010	2.82	1.76	6.39	0.78	7.17	2.54	4.77
2011	1.77	1.90	5.75	1.81	7.56	4.27	4.57
2012	1.98	2.19	5.43	1.02	6.45	3.25	3.35
2013	1.33	1.70	4.79	0.64	5.42	4.07	3.86
2014	1.44	1.58	4.71	0.66	5.37	3.74	3.69
2015	0.42	1.06	4.26	0.29	4.56	10.87	6.22
2016	1.30	1.05	3.29	0.54	3.83	2.95	5.85

Figure 7. ***Northern Silver hake*** fall survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the fall survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the solid line is the biomass target. The BOTTOM panels reflect the most recent 23 years of the entire time series.

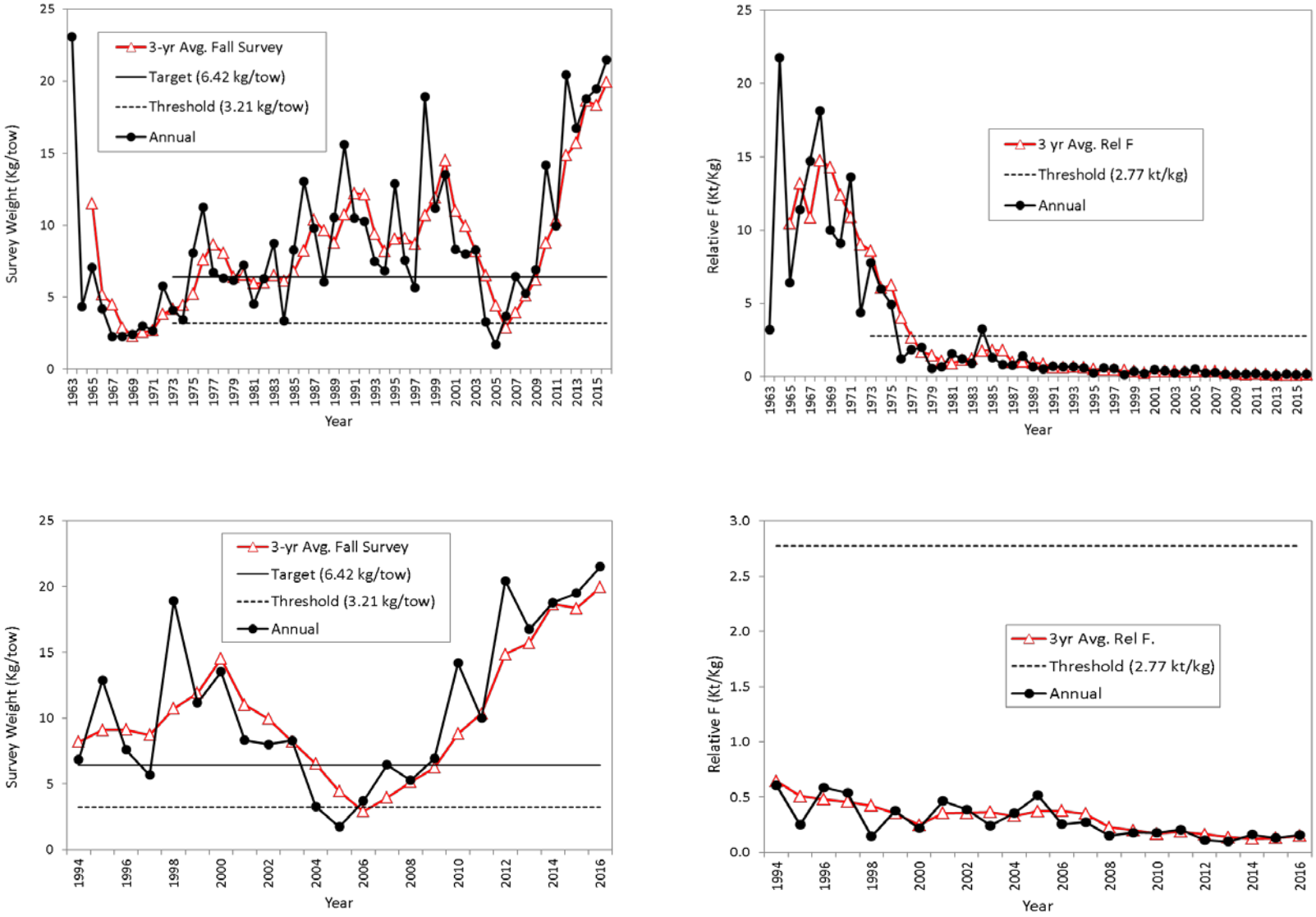
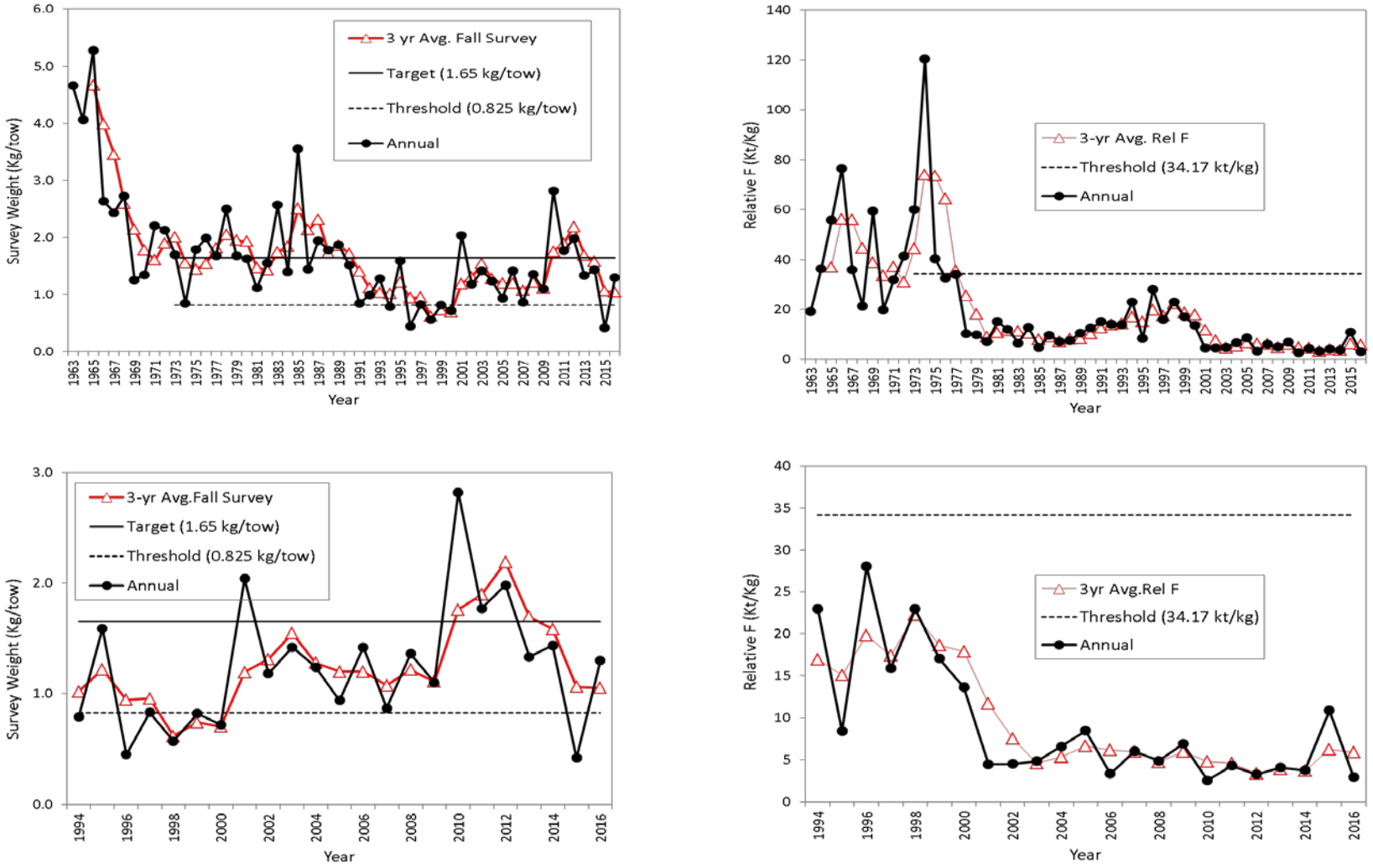


Figure 8. ***Southern silver hake*** fall survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the fall survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the solid line is the biomass target. The BOTTOM panels reflect the most recent 23 years of the entire time series



The range of years (1973-1982) adopted during the benchmark assessments for deriving the overfishing definition reference points are considered to be uncertain. The transition from the 1970's to the 1980's highlight a period of high and low productivity with respect to the stock dynamics. This time period also does not include more recent years as basis for defining the F_{MSY} proxy. Recognizing the potential for non-stationary productivity in the stock dynamics and the implications on estimates of the OFL, the Council chose to set silver hake ABC using the 25th percentile on the OFL distribution of scientific uncertainty estimates, corresponding to a low probability of overfishing. This choice was made in part due to the economic and ecological importance of silver hake.

5.1.2.2 Red hake

The 2017 red hake assessment update for both the northern and southern management areas included survey data from the NEFSC spring bottom trawl survey through 2017, commercial fishing data from vessel trip reports, dealer landings, and on-board fishery observer data through 2016. (Table 14 and Table 15). In the absence of an analytical assessment for red hake, the biological reference points for both the northern and southern silver stocks are as follows:

Red hake is overfished when the three-year moving arithmetic average of the spring survey weight per tow (i.e., the biomass threshold) is less than one half of the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1980 – 2010. The current estimates of $B_{THRESHOLD}$ for the northern and southern stocks are 1.27 kg/tow and 0.51 kg/tow, respectively.

Overfishing occurs when the ratio between catch and spring survey biomass for the northern and the southern stocks exceeds 0.163 kt/kg and 3.038 kt/kg, respectively, derived from AIM analyses from 1980-2009.

Table 13. Red hake overfishing definition reference points.

Stock	Threshold	Target
Northern Red Hake	½ B_{MSY} Proxy (1.27kg/tow) F_{MSY} Proxy (0.163 kt/kg)	B_{MSY} Proxy (n/a) F_{MSY} Proxy (n/a)
Southern Red Hake	½ B_{MSY} Proxy (0.51 kg/tow) F_{MSY} Proxy (3.038 kt/kg)	B_{MSY} Proxy (n/a) F_{MSY} Proxy (n/a)

Table 14. Northern red hake stock - summary of catch and survey indices in albatross units for northern silver hake, 1962-2017.

Year	Northern Spring Survey arithmetic (kg/tow)	Northern Spring Survey 3-year Average (kg/tow)	Total Northern Commercial Landings (000's mt)	Northern Commercial Discards (000's mt)	Northern Recreational Catch (000's mt)	Northern total Catch (000's mt)	Northern Exploitation Index (kg/000's mt)	Northern Exploitation Index 3-year Average (kg/000's mt)
1955								
1956								
1957								
1958								
1959								
1960								
1961								
1962			1.91	1.60	0.007	3.52		
1963			3.28	1.60	0.004	4.89		
1964			1.41	1.70	0.001	3.11		
1965			2.77	1.62	0.001	4.40		
1966			5.58	1.60	0.003	7.18		
1967			1.86	1.40	0.002	3.27		
1968	1.14		2.63	1.30	0.002	3.93	3.45	
1969	0.64		2.02	1.12	0.001	3.14	4.91	
1970	0.54	0.77	1.03	1.10	0.001	2.13	3.94	4.10
1971	0.65	0.61	4.81	1.16	0.001	5.97	9.21	6.02
1972	1.56	0.92	15.03	0.96	0.002	15.99	10.25	7.80
1973	4.31	2.17	15.29	0.91	0.001	16.20	3.76	7.74
1974	2.43	2.77	7.22	0.82	0.003	8.04	3.31	5.77
1975	4.25	3.67	8.70	1.20	0.002	9.90	2.33	3.13
1976	3.37	3.35	6.34	0.93	0.002	7.26	2.15	2.60
1977	2.66	3.43	0.89	1.08	0.003	1.98	0.74	1.74
1978	2.57	2.87	1.22	1.12	0.004	2.34	0.91	1.27
1979	2.04	2.42	1.52	1.22	0.006	2.75	1.35	1.00
1980	3.88	2.83	1.03	1.37	0.004	2.40	0.62	0.96
1981	6.35	4.09	1.25	1.32	0.031	2.60	0.41	0.79
1982	2.13	4.12	1.21	1.46	0.003	2.67	1.26	0.76
1983	3.70	4.06	0.90	1.35	0.000	2.25	0.61	0.76
1984	2.98	2.94	1.06	1.33	0.001	2.39	0.80	0.89
1985	3.91	3.53	0.99	1.27	0.000	2.26	0.58	0.66
1986	3.26	3.39	1.46	1.19	0.000	2.65	0.81	0.73
1987	2.94	3.37	1.01	1.05	0.000	2.07	0.70	0.70
1988	2.00	2.73	0.86	0.90	0.004	1.76	0.88	0.80
1989	1.65	2.20	0.78	1.45	0.000	2.22	1.35	0.98
1990	1.33	1.66	0.83	0.60	0.004	1.43	1.07	1.10
1991	1.62	1.53	0.74	0.82	0.002	1.56	0.96	1.13
1992	2.50	1.82	0.92	0.73	0.001	1.65	0.66	0.90
1993	2.82	2.32	0.77	0.08	0.001	0.85	0.30	0.64
1994	1.59	2.31	0.73	0.08	0.002	0.81	0.51	0.49
1995	1.97	2.13	0.19	0.06	0.001	0.25	0.13	0.31
1996	1.79	1.79	0.41	0.66	0.005	1.07	0.60	0.41
1997	1.81	1.86	0.34	0.13	0.001	0.46	0.26	0.33
1998	2.52	2.04	0.19	0.13	0.000	0.32	0.13	0.33
1999	2.32	2.22	0.22	0.47	0.000	0.69	0.30	0.23
2000	3.19	2.68	0.20	0.06	0.000	0.25	0.08	0.17

Year	Northern Spring Survey arithmetic (kg/tow)	Northern Spring Survey 3-year Average (kg/tow)	Total Northern Commercial Landings (000's mt)	Northern Commercial Discards (000's mt)	Northern Recreational Catch (000's mt)	Northern total Catch (000's mt)	Northern Exploitation Index (kg/000's mt)	Northern Exploitation Index 3-year Average (kg/000's mt)
2001	3.58	3.03	0.22	0.14	0.000	0.36	0.10	0.16
2002	4.46	3.74	0.28	0.10	0.000	0.38	0.08	0.09
2003	1.00	3.01	0.21	0.09	0.000	0.30	0.30	0.16
2004	1.77	2.41	0.10	0.06	0.000	0.16	0.09	0.16
2005	1.10	1.29	0.10	0.06	0.000	0.15	0.14	0.18
2006	0.91	1.26	0.10	0.18	0.001	0.28	0.30	0.18
2007	2.06	1.36	0.07	0.13	0.000	0.20	0.10	0.18
2008	3.49	2.15	0.05	0.06	0.000	0.11	0.03	0.14
2009	1.78	2.44	0.09	0.10	0.002	0.18	0.10	0.08
2010	2.79	2.69	0.07	0.24	0.001	0.31	0.11	0.08
2011	2.18	2.25	0.14	0.10	0.001	0.24	0.11	0.11
2012	1.73	2.23	0.10	0.19	0.001	0.29	0.17	0.13
2013	1.35	1.75	0.10	0.22	0.003	0.31	0.23	0.17
2014	3.02	2.03	0.07	0.19	0.012	0.27	0.09	0.16
2015	6.27	3.55	0.10	0.27	0.002	0.37	0.06	0.13
2016	4.46	4.58	0.14	0.26	0.003	0.41	0.09	0.08
2017	4.66	5.13						

Table 15. Southern red hake stock - summary of catch and survey indices in albatross units for northern silver hake, 1962-2010.

Year	Southern Spring Survey arithmetic kg/tow	Southern Spring Survey 3-year Average kg/tow	Total Southern Commercial Landings (000's mt)	Southern Commercial Discards (000's mt)	Southern Recreational Catch (000's mt)	Southern total Catch (000's mt)	Southern Exploitation Index (kg/000's mt)	Southern Exploitation Index 3-year Average (kg/000's mt)
1955								
1956								
1957								
1958								
1959								
1960								
1961								
1962			11.87	4.00	0.892	16.76		
1963			31.90	4.00	0.770	36.67		
1964			43.37	3.76	0.848	47.98		
1965			92.99	4.29	0.634	97.92		
1966			107.92	3.77	0.094	111.79		
1967			58.78	3.66	0.165	62.61		
1968	1.29		18.14	3.72	0.575	22.43	17.45	
1969	1.08		52.93	3.62	0.489	57.04	52.72	
1970	1.72	1.36	11.45	3.14	0.410	15.01	8.71	26.29
1971	3.49	2.10	35.13	2.31	0.287	37.73	10.82	24.08
1972	3.59	2.93	61.19	2.10	0.177	63.47	17.68	12.40
1973	3.99	3.69	51.36	2.24	0.317	53.92	13.51	14.00
1974	2.84	3.47	26.64	2.16	0.191	28.99	10.22	13.80
1975	3.18	3.34	19.98	1.76	0.052	21.79	6.85	10.19
1976	5.31	3.78	22.47	1.83	0.645	24.94	4.69	7.25
1977	2.30	3.60	7.06	1.82	0.750	9.63	4.19	5.24
1978	7.65	5.09	5.46	2.44	0.971	8.87	1.16	3.35
1979	1.51	3.82	7.59	2.67	0.245	10.50	6.94	4.09
1980	2.38	3.85	4.08	2.70	0.144	6.93	2.91	3.67
1981	4.61	2.84	2.32	2.72	0.176	5.21	1.13	3.66
1982	3.34	3.45	3.17	3.78	0.029	6.98	2.09	2.04
1983	2.21	3.39	1.44	3.89	0.135	5.47	2.48	1.90
1984	1.33	2.29	1.27	3.91	0.548	5.73	4.30	2.96
1985	1.39	1.64	0.90	2.97	0.029	3.90	2.80	3.19
1986	1.73	1.49	0.69	3.39	0.205	4.29	2.47	3.19
1987	0.88	1.33	0.94	3.31	0.472	4.73	5.38	3.55
1988	1.01	1.21	0.87	3.46	0.251	4.58	4.56	4.14
1989	0.49	0.79	0.93	5.01	0.436	6.37	13.09	7.68
1990	0.71	0.73	0.80	4.75	0.514	6.06	8.57	8.74
1991	0.61	0.60	0.93	2.61	0.285	3.82	6.26	9.30
1992	0.47	0.59	1.25	6.34	0.194	7.78	16.74	10.52
1993	0.42	0.50	0.92	5.31	0.089	6.32	14.91	12.63
1994	0.68	0.52	0.98	1.72	0.069	2.77	4.11	11.92
1995	0.52	0.54	1.43	1.33	0.045	2.80	5.43	8.15
1996	0.45	0.55	0.70	0.38	0.019	1.10	2.43	3.99
1997	1.16	0.71	1.00	2.42	0.173	3.59	3.10	3.65
1998	0.21	0.61	1.15	0.74	0.053	1.95	9.10	4.87
1999	0.46	0.61	1.35	1.06	0.053	2.46	5.42	5.87
2000	0.42	0.36	1.42	0.25	0.044	1.71	4.04	6.19

Year	Southern Spring Survey arithmetic kg/tow	Southern Spring Survey 3-year Average kg/tow	Total Southern Commercial Landings (000's mt)	Southern Commercial Discards (000's mt)	Southern Recreational Catch (000's mt)	Southern total Catch (000's mt)	Southern Exploitation Index (kg/000's mt)	Southern Exploitation Index 3-year Average (kg/000's mt)
2001	0.64	0.51	1.47	0.14	0.024	1.63	2.54	4.00
2002	0.54	0.54	0.66	0.33	0.010	1.00	1.85	2.81
2003	0.21	0.46	0.62	0.35	0.018	0.99	4.79	3.06
2004	0.15	0.30	0.59	0.62	0.015	1.22	7.92	4.85
2005	0.38	0.25	0.36	1.01	0.118	1.48	3.94	5.55
2006	0.38	0.30	0.38	0.67	0.077	1.13	2.96	4.94
2007	0.86	0.54	0.47	1.55	0.151	2.17	2.53	3.14
2008	0.47	0.57	0.58	0.81	0.117	1.51	3.19	2.90
2009	1.44	0.92	0.58	0.87	0.133	1.58	1.10	2.27
2010	0.94	0.95	0.58	0.74	0.153	1.47	1.56	1.95
2011	1.79	1.39	0.50	1.01	0.094	1.60	0.89	1.18
2012	1.06	1.26	0.75	0.65	0.085	1.49	1.40	1.29
2013	0.64	1.16	0.44	0.58	0.143	1.16	1.82	1.37
2014	0.63	0.78	0.56	0.52	0.089	1.16	1.85	1.69
2015	0.58	0.62	0.39	0.85	0.027	1.26	2.17	1.95
2016	0.31	0.51	0.39	0.76	0.130	1.28	4.13	2.72
2017	0.25	0.38						

In the north, the three-year arithmetic mean biomass index (Figure 9), based on the NEFSC spring bottom trawl survey for 2015-2017 (5.13 kg/tow) was above the management threshold (1.27 kg/tow) and above the target (2.54 kg/tow). The exploitation index (catch divided by biomass index for 2016 (0.09 kt/kg) was below the threshold (0.16 kt/kg; Figure 9).

In the south, the three year arithmetic mean biomass index (Figure 10), based on the NEFSC spring bottom trawl survey for 2015-2017 (0.38 kg/tow) was below both the management threshold (0.51 kg/tow) and the target (1.02 kg/tow). The exploitation index (catch divided by biomass index for 2016 (4.03 kt/kg) was above the threshold (3.04 kt/kg). Therefore, based on the 2017 assessment update, the northern is not overfished and overfishing is not occurring while in the south, the stock is overfished and overfishing is occurring.

Figure 9. ***Northern red hake*** spring survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the spring survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the solid line is the biomass target. The BOTTOM panels reflect the most recent 24 years of the entire time series.

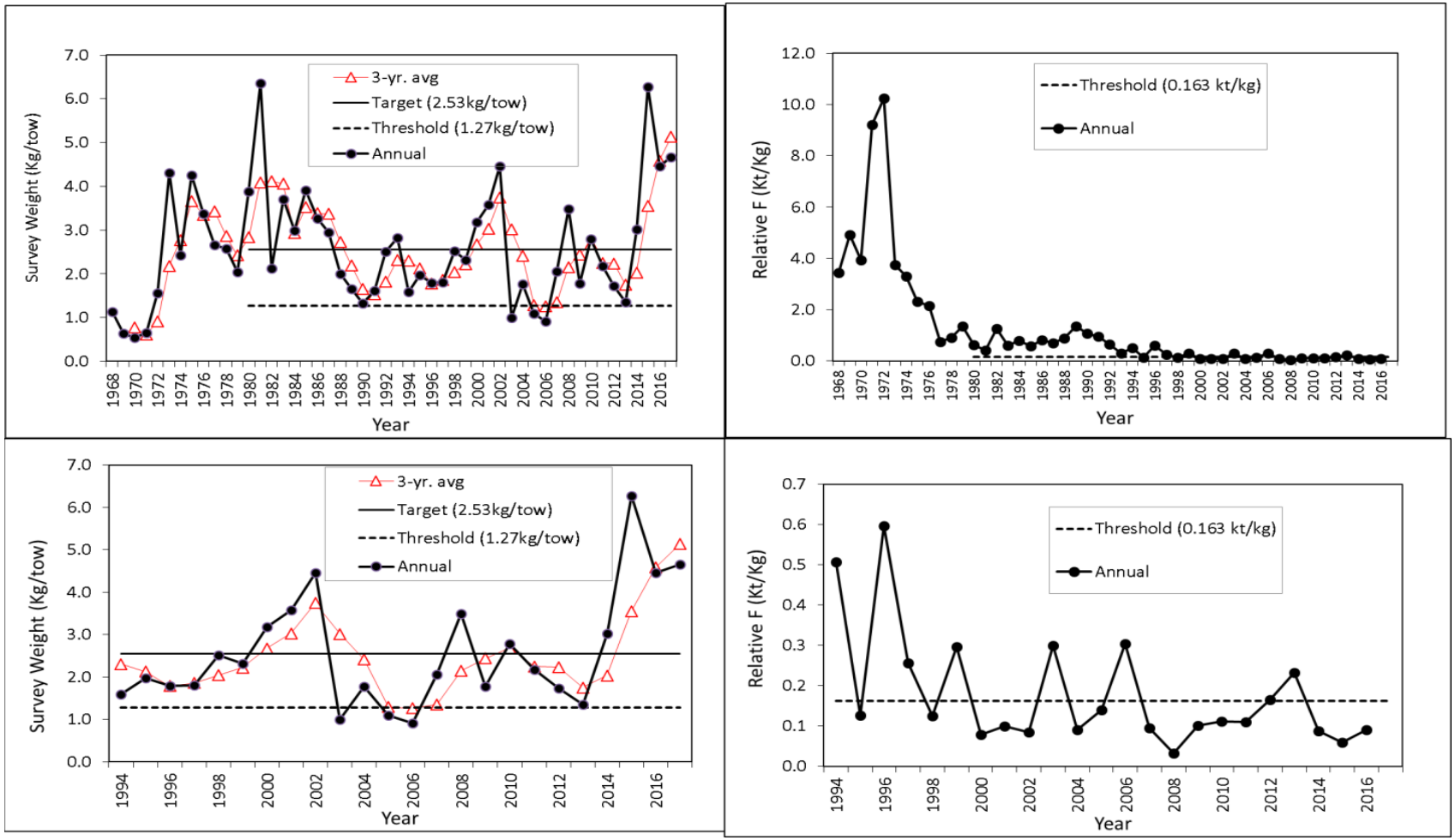
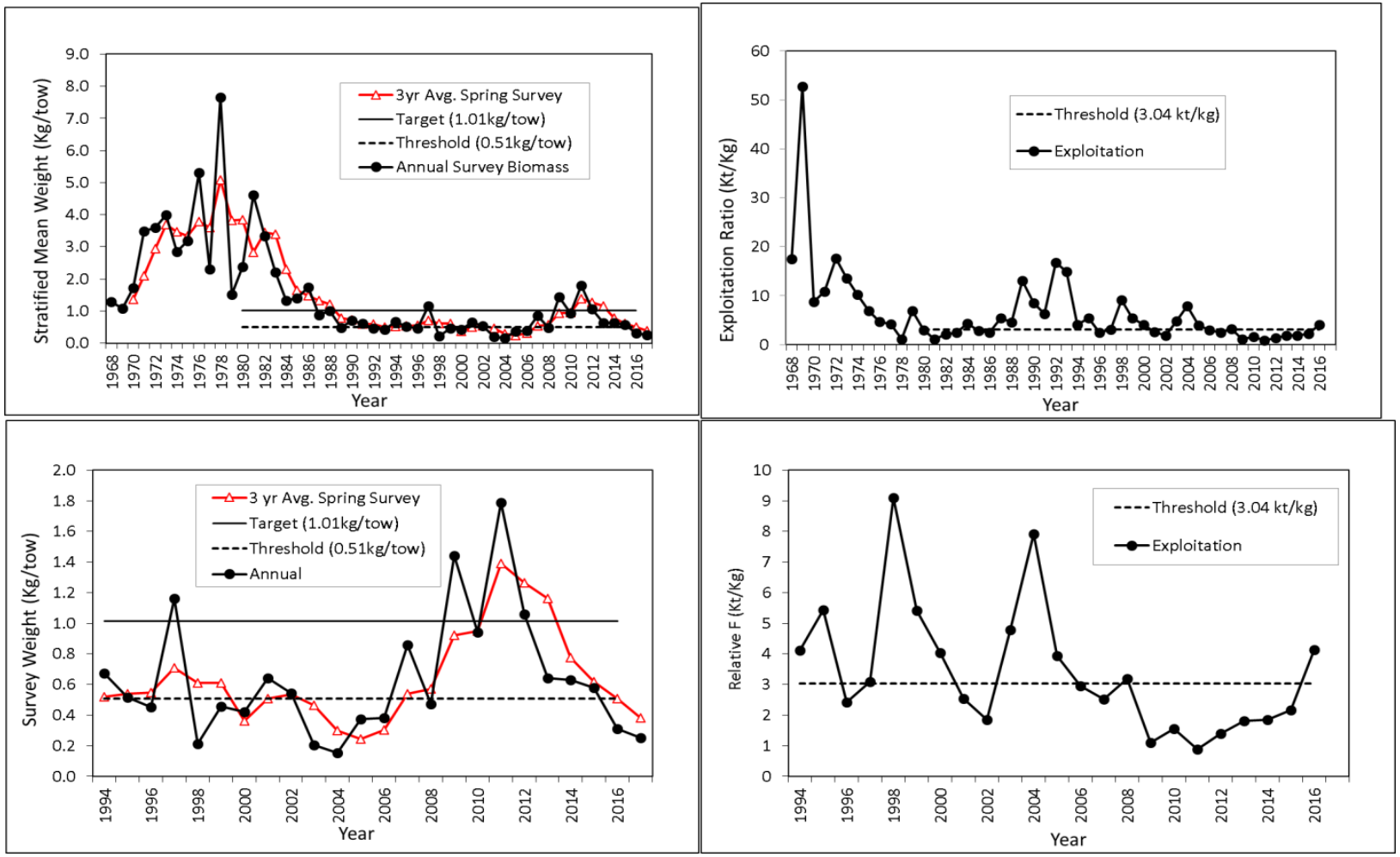


Figure 10. ***Southern red hake*** spring survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the spring survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the solid line is the biomass target. The BOTTOM panels reflect the most recent 24 years of the entire time series.



5.1.2.3 Offshore hake

The new 2010 benchmark assessment concluded that information was not available to determine stock status for offshore hake because fishery data were insufficient and the survey data are not considered to reflect stock trends. It was not possible to recommend a reference points for offshore hake and the overfished and overfishing status of offshore hake is therefore unknown.

5.1.3 Landings and discards of target species

Using data from the 2017 assessment update (NEFMC 2017), the Whiting PDT calculated discards as a percent of total catch, including 'landings' reported by fishermen on VTRs as being transferred at sea for sale as bait. These data were used to estimate and set the TALs by stock area (see Sections 3.2.4.4 and 4.1.1).

Red and silver hake discards were estimated by applying the observed discard to total landings ratio (D/K_all) to total landings of all trips from a strata. Strata used for this analysis included gear type, three-digit statistical area, and half-year. Landings data with no matching observed trips in a stratum were filled as appropriate. More details are provided in NEFSC 2011b.

Silver hake

The discard rate for silver hake is typically lower than it is for red hake, presumably because of more market demand and better tolerance of shipping and handling. Nominal discards in the northern stock area were variable, peaking at 750 mt in 2007, and has been steadily declining but variable and currently estimated at 310 mt in 2016 (Figure 12). Much of this variability in discards appears to be related to market demand. These peaks in discards resulted in the discard rate spiking to 43% in 2008 and 32% in 2010 (Section 5.1.3). The thee year moving average is of course is more stable, fluctuating from 27% in 2008 to 30% in 2009 and to 12% in 2016.

The silver hake discard rate in the southern stock area is typically even lower, under 20% throughout the time series (Section 5.1.3). The proportion discard in the southern area appears to be varying without trend. Discards were estimated to be only 150 mt in 2007, but increased to 1800 mt in 2011, before declining to 290 mt in 2015 and estimated at 540mt in 2016 (Figure 12). The three-year moving average was approximately 11% of the total catch in 2016.

Figure 11. Northern and southern silver hake discard rate (percent of total catch).

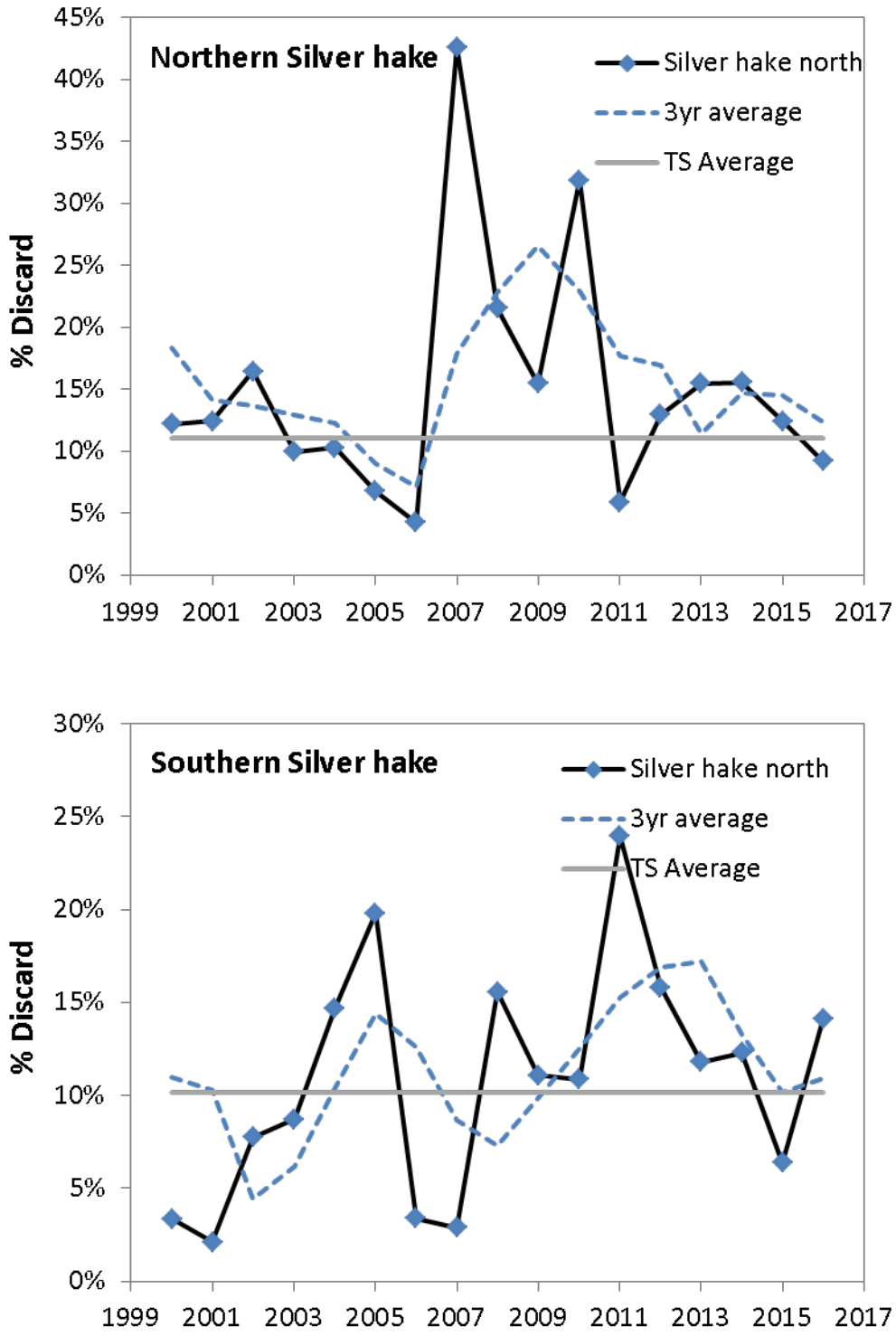
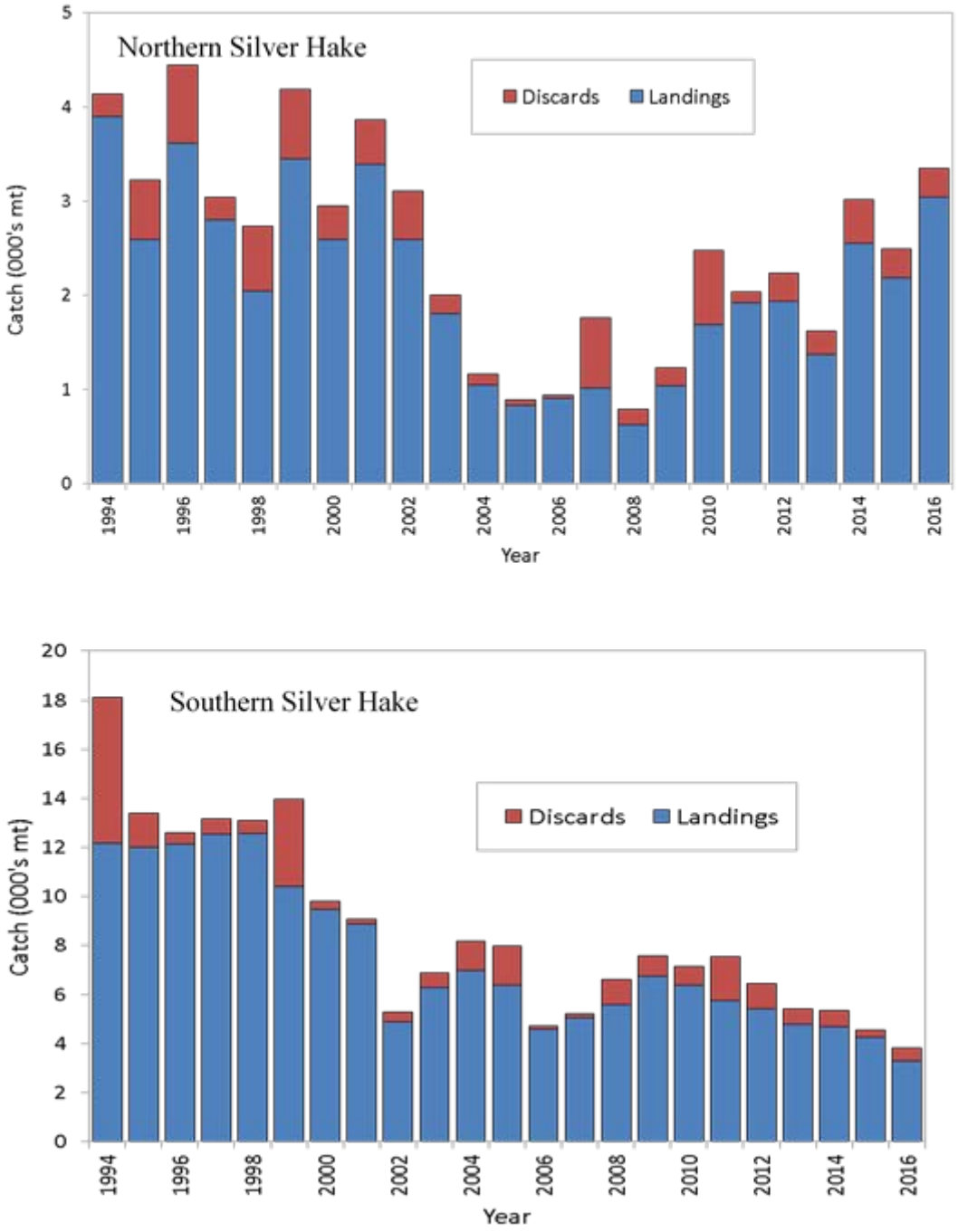


Figure 12. Landings and estimated nominal discards (mt) for northern and southern stocks of silver hake, 2000-2010. Source: NEFSC 2011a, updated by Whiting PDT analysis.



Red hake

Red hake discards were comparatively high, ranging from 10-40% from 2000-2003, increasing to 50-80% from 2005 to present (Figure 13), in both the northern and southern stock areas. The main cause of the

increasing discard rate appears to be related to limited markets and decreasing landings, rather than increases in discarding from higher red hake catches.

Nominal discard estimates in the northern region however increased from 59 mt in 2008 and 95 mt in 2009 to 244 mt in 2010 (Figure 14). This discard increase drove the 2010 discards to 78%, from 52% in 2008 and 51% in 2009 (Figure 13). Since, proportion of discards in the total catch has fluctuated around approximately 64% per year. The three-year moving average proportion discard (used to set the TAL), also increased from 61% in 2008 and 57% in 2009 to 70% in 2016.

Nominal discard rates in the southern region also increased through the time series in Figure 13, through 2005 but since then has been more stable. The proportion discards on average since 2010 is approximately 14% per year. In 2016, discard was 66% of the total catch. The three-year moving average has been declining but variable since and was estimated at 61% in 2016.

Figure 13. Northern and southern red hake discard rate (percent of total catch).

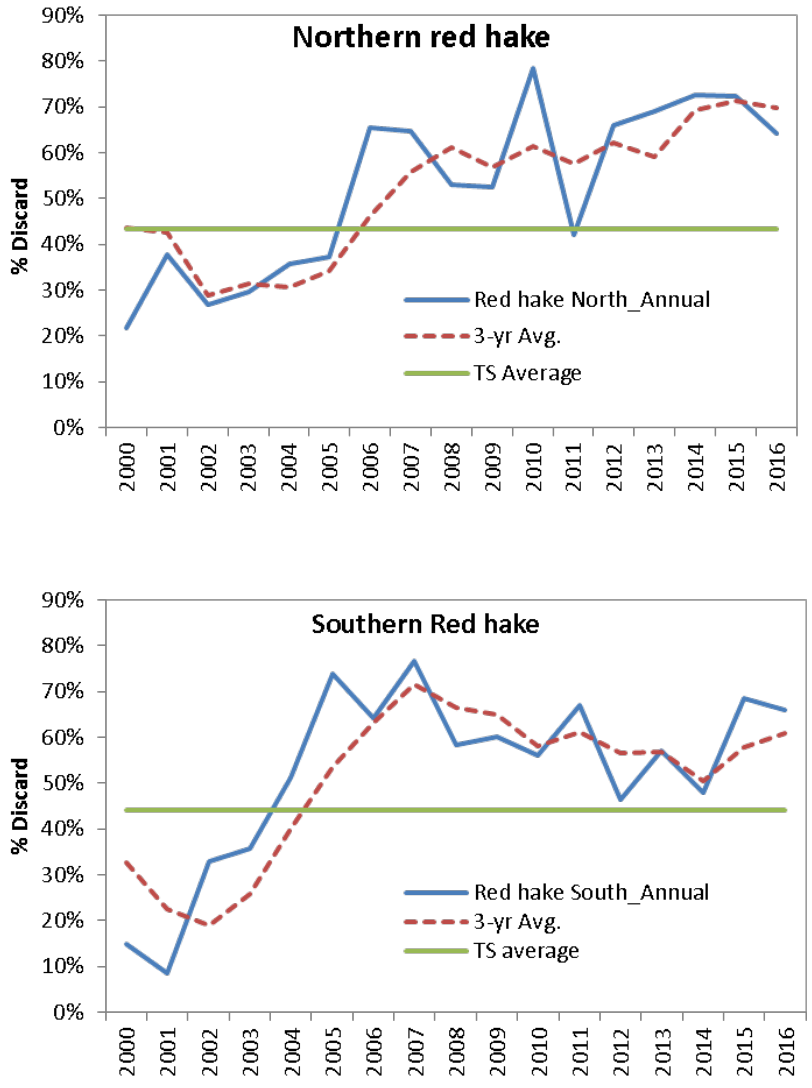
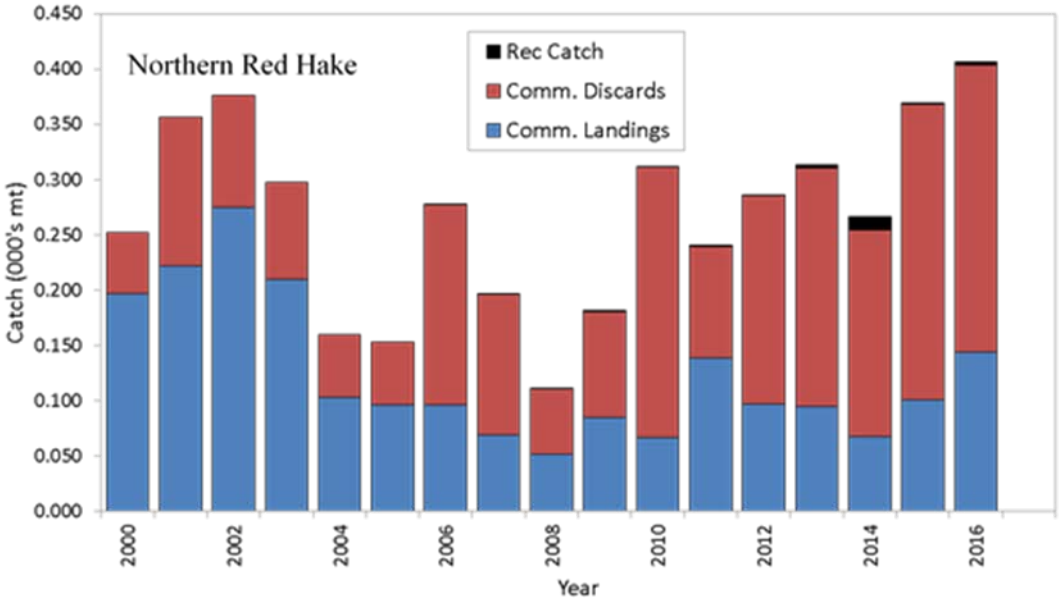
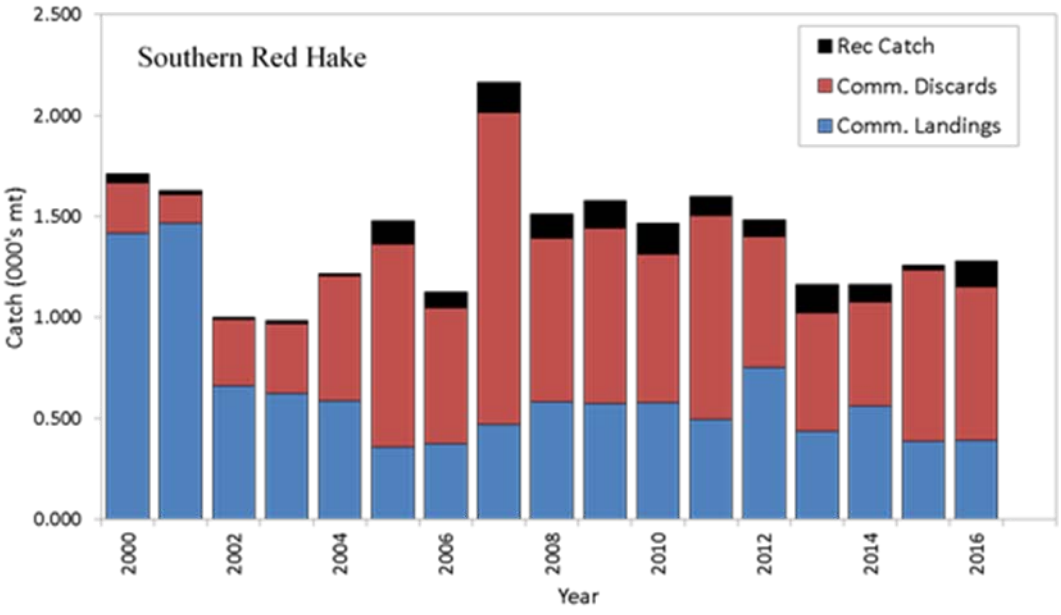


Figure 14. Landings and estimated nominal discards (mt) for northern and southern stocks of red hake, 2000-2010. Source: NEFSC 2011a, updated by Whiting PDT analysis.





5.1.4 Landings and discards of non-target species

Bycatch in the small-mesh multispecies fishery was estimated by applying the D/Kall ratios from all observed tows (NEFOP and ASM) to landings off all species on trips using small-mesh trawls and landing 2,000 lbs. of whiting or 400 lbs. of red hake, stratified by year, quarter, and management area[5]. All observed tows on NEFOP and ASM were used to calculate the discard ratios (Table 17 and Table 18).

In the northern area (Table 16, left panel), haddock, spiny dogfish, red hake, silver hake, winter skate, and Atlantic herring were the top six species over 2014-2016. Haddock discards have been high as a result of an historically strong 2013 year class. It was also the top discard species in an experimental small-mesh trawl fishery conducted in June 2016 and observed by MA Division of Marine Fisheries (M. Griffin pers comm.). Red hake discards increased in response to a strong 2014 year class, which became vulnerable to capture in 2015 and is now contributing to the increase in specifications for 2018-2020. Winter skate and silver hake discards increased during 2016 for unknown reasons, but it is consistent with the higher silver hake landings (Table 28).

In the southern area, the top discards were comprised of red hake, spiny dogfish, butterfish, silver hake, little skate, and haddock (Table 16, right panel) during 2014-2016. Haddock discards in 2016 declined possibly because haddock may have become separated from the traditional whiting fishing grounds as they aged and grew.

[5] Note that the small-mesh multispecies management areas do not coincide with groundfish stock areas. For example, the Cultivator Shoals Area is a northern management area for small-mesh multispecies, but the catch of haddock is considered to be from the Georges Bank stock area for groundfish monitoring.

Table 16. Total discard estimates (mt) for vessels using small mesh trawls on trips landing more than 2,000 lbs. of whiting or 400 lbs. of red hake. Source: D/Kall ratios on NEFOP and ASM small-mesh multispecies trips applied to landings of all species by year, quarter, and management area.

Northern

Species	Calendar year 2014	2015	2016
Haddock	476.8	241.0	353.0
Spiny dogfish	98.3	90.7	399.2
Red hake	91.4	224.1	209.6
Silver hake	175.2	34.5	133.5
Winter skate	6.8	114.9	98.4
Atlantic herring	20.2	77.3	4.6
Little skate	12.3	29.1	44.6
Yellowtail flounder	3.0	13.7	7.9
Witch flounder	1.5	4.9	14.0
American plaice	4.0	3.2	10.5
Barndoor skate	2.9	4.0	7.5
Butterfish	4.0	4.2	1.5
Winter flounder	5.6	2.3	1.5
Monkfish	0.9	2.6	5.7
Summer flounder	4.8	1.5	1.5
Windowpane	1.1	0.2	5.6
White hake	1.3	2.6	1.4
Cod	0.7	0.8	1.4
Ocean pout	0.1	0.7	0.6
Thorny skate	0.4	0.0	0.4
Smooth skate	0.0	0.0	0.0
Total	911.4	852.3	1,302.3

Southern

Species	Calendar year 2014	2015	2016
Red hake	596.8	1,058.6	1,143.6
Spiny dogfish	464.5	630.6	248.6
Butterfish	464.7	312.2	264.3
Silver hake	562.9	101.0	266.0
Little skate	189.5	81.2	218.7
Haddock	122.0	214.8	56.6
Summer flounder	37.9	166.0	126.1
Winter skate	38.0	72.3	211.6
Barndoor skate	41.6	56.4	132.6
Monkfish	10.5	39.9	120.1
Witch flounder	26.9	45.7	9.0
Ocean pout	55.4	4.5	11.1
Winter flounder	14.4	0.9	19.4
Yellowtail flounder	17.4	0.5	3.9
Atlantic herring	6.4	13.2	0.0
Windowpane	2.8	1.2	4.2
Cod	0.2	0.0	4.1
White hake	0.0	1.7	1.3
American plaice	0.1	0.0	0.0
Smooth skate	0.0	0.0	0.0
Thorny skate	0.0	0.0	0.0
Total	2,652.0	2,800.6	2,841.4

Table 17. D/Kall statistics from NEFOP and ASM observed tows on small-mesh multispecies trips in the northern management area.

		QUARTER	Statistic				
		1	1	3	3	4	4
YEAR	Values	Arithmetic Mean	Coefficient of Variation	Arithmetic Mean	Coefficient of Variation	Arithmetic Mean	Coefficient of Variation
2014	American plaice	0.002	0.654	0.024	4.222	0.002	2.863
2014	Atlantic herring	-		0.020	11.826	0.166	4.825
2014	Barndoor skate	0.001	2.646	0.002	6.931	0.003	1.986
2014	Butterfish	-		0.004	11.877	0.000	3.338
2014	Cod	-		0.001	6.804	0.001	3.127
2014	Haddock	0.002	0.654	0.402	3.501	0.095	0.827
2014	Little skate	-		0.008	7.210	0.007	2.724
2014	Monkfish	0.006	0.847	0.001	8.283	0.001	3.519
2014	Ocean pout	-		0.000	12.481	-	
2014	Red hake	0.002	2.236	0.286	4.573	0.017	1.843
2014	Silver hake	0.068	2.440	0.091	4.323	0.021	1.432
2014	Smooth skate	0.000	2.646	-		0.000	8.307
2014	Spiny dogfish	0.092	0.707	0.056	4.310	0.115	2.293
2014	Summer flounder	-		0.013	5.974	0.000	3.509
2014	Thorny skate	-		0.000	3.000	0.002	4.028
2014	White hake	0.004	1.083	0.001	4.532	0.002	3.503
2014	Windowpane flounder	-		0.001	9.428	0.003	2.718
2014	Winter flounder	-		0.006	6.350	0.001	2.996
2014	Winter skate	-		0.002	5.397	0.014	2.249
2014	Witch flounder	0.000	1.708	0.014	5.326	0.002	3.598
2014	Yellowtail flounder	-		0.007	5.689	0.005	1.712
2015	American plaice			0.010	5.708	0.012	1.406
2015	Atlantic herring			0.120	13.427	1.280	1.768
2015	Barndoor skate			0.023	9.692	0.014	2.236
2015	Butterfish			0.005	13.347	-	
2015	Cod			0.002	12.102	-	
2015	Haddock			0.712	6.566	0.333	1.758
2015	Little skate			0.174	11.003	0.007	1.491
2015	Monkfish			0.010	10.589	-	
2015	Ocean pout			0.004	11.147	-	
2015	Red hake			0.271	5.643	1.383	1.783
2015	Silver hake			0.020	9.684	0.064	1.953
2015	Smooth skate			-		-	
2015	Spiny dogfish			1.250	7.739	0.028	3.882
2015	Summer flounder			0.001	11.172	0.008	2.236
2015	Thorny skate			0.000	6.856	-	
2015	White hake			-		0.059	1.571
2015	Windowpane flounder			0.011	10.076	-	
2015	Winter flounder			0.010	10.189	-	
2015	Winter skate			0.190	6.039	0.010	1.482
2015	Witch flounder			0.011	6.328	0.056	1.251
2015	Yellowtail flounder			0.022	5.966	0.010	0.682
2016	American plaice			0.042	5.782	0.006	1.423
2016	Atlantic herring			0.007	6.668	0.018	1.895
2016	Barndoor skate			0.016	7.715	0.003	3.742
2016	Butterfish			0.004	14.171	-	
2016	Cod			0.002	11.579	-	
2016	Haddock			1.392	10.337	0.242	3.383
2016	Little skate			0.125	8.731	0.157	5.183
2016	Monkfish			0.006	9.111	0.006	4.800
2016	Ocean pout			0.000	16.149	0.001	2.098
2016	Red hake			0.475	9.247	0.078	3.585
2016	Silver hake			0.227	8.921	0.302	2.719
2016	Smooth skate			-		-	
2016	Spiny dogfish			0.047	5.407	0.748	3.536
2016	Summer flounder			0.001	4.413	-	
2016	Thorny skate			0.000	11.455	0.000	3.742
2016	White hake			0.009	5.527	0.003	2.604
2016	Windowpane flounder			0.002	3.767	-	
2016	Winter flounder			0.001	8.310	0.001	3.742
2016	Winter skate			0.531	10.768	0.172	4.493
2016	Witch flounder			0.015	5.717	0.048	3.400
2016	Yellowtail flounder			0.018	6.773	0.001	3.742

Table 18. D/Kall statistics from NEFOP and ASM observed tows on small-mesh multispecies trips in the southern management area.

		QUARTER	Statistic						
		1	1	2	2	3	3	4	4
YEAR	Values	Arithmetic Mean	Coefficient of Variation	Arithmetic Mean	Coefficient of Variation	Arithmetic Mean	Coefficient of Variation	Arithmetic Mean	Coefficient of Variation
2014	American plaice	-		-		0.000	6.083	-	
2014	Atlantic herring	0.001	8.367	0.038	5.129	-		0.001	2.828
2014	Barndoor skate	0.048	6.371	0.101	9.924	0.014	5.214	0.082	6.592
2014	Butterfish	0.152	2.198	0.157	5.630	0.362	4.898	0.480	3.966
2014	Cod	-		0.001	3.051	-		-	
2014	Haddock	0.003	5.993	0.039	13.351	0.096	2.864	0.042	1.981
2014	Little skate	0.001	4.034	0.209	7.246	0.626	5.054	0.277	3.572
2014	Monkfish	0.004	2.565	0.014	7.747	0.000	6.083	0.012	5.689
2014	Ocean pout	-		0.156	3.541	-		-	
2014	Red hake	0.093	2.393	0.731	8.698	0.795	2.855	0.140	5.277
2014	Silver hake	0.027	5.512	0.366	4.625	0.887	3.204	0.105	6.015
2014	Smooth skate	-		-		-		-	
2014	Spiny dogfish	0.307	3.301	0.588	7.337	0.063	4.560	0.170	3.716
2014	Summer flounder	0.034	2.360	0.056	8.782	0.002	6.083	0.030	4.776
2014	Thorny skate	-		-		-		-	
2014	White hake	-		-		-		-	
2014	Windowpane flounder	0.007	8.190	0.008	4.790	0.012	3.113	0.000	2.236
2014	Winter flounder	-		0.021	4.884	0.032	4.969	0.010	2.178
2014	Winter skate	0.032	5.791	0.001	6.403	0.304	3.584	0.001	7.032
2014	Witch flounder	0.009	4.378	0.016	7.622	0.000	8.911	0.001	7.032
2014	Yellowtail flounder	0.010	8.205	0.000	2.823	0.122	6.197	0.018	3.399
2015	American plaice	-		-		0.000	6.708	0.000	9.381
2015	Atlantic herring	0.003	7.141	0.199	7.966	0.003	4.708	0.008	8.626
2015	Barndoor skate	0.046	4.150	0.076	5.832	0.020	4.820	0.041	6.241
2015	Butterfish	0.238	5.590	0.040	5.481	0.106	1.609	0.106	9.339
2015	Cod	-		0.000	9.592	-		0.000	9.381
2015	Haddock	0.001	5.256	0.127	3.180	0.047	1.936	0.129	8.966
2015	Little skate	0.039	5.925	0.773	6.996	0.193	3.234	0.093	6.004
2015	Monkfish	0.044	3.822	0.051	8.262	0.003	2.929	0.020	4.998
2015	Ocean pout	0.002	6.469	0.008	8.163	0.000	6.059	0.000	12.059
2015	Red hake	0.520	4.179	0.358	7.193	0.229	3.329	0.651	2.779
2015	Silver hake	0.021	2.423	0.024	3.222	0.140	3.735	0.209	6.161
2015	Smooth skate	-		-		-		-	
2015	Spiny dogfish	0.700	3.360	1.306	7.167	0.006	3.625	0.535	8.910
2015	Summer flounder	0.296	4.900	0.073	7.005	0.020	2.652	-	
2015	Thorny skate	-		-		-		-	
2015	White hake	0.003	4.583	-		0.000	3.847	0.000	7.611
2015	Windowpane flounder	-		0.001	7.781	0.009	4.482	-	
2015	Winter flounder	-		0.001	6.810	0.006	4.404	-	
2015	Winter skate	0.068	7.792	0.107	6.934	0.010	5.569	-	
2015	Witch flounder	0.040	3.481	0.016	9.236	0.001	4.559	-	
2015	Yellowtail flounder	-		-		0.003	3.564	-	
2016	American plaice	0.000	7.141	-		-		-	
2016	Atlantic herring	-		-		-		-	
2016	Barndoor skate	0.240	5.200	0.017	4.330	0.004	4.800	0.001	4.506
2016	Butterfish	0.436	6.189	0.091	3.504	0.077	5.074	0.046	2.583
2016	Cod	0.004	5.541	-		-		-	
2016	Haddock	0.066	2.053	0.005	7.728	0.002	3.437	0.001	3.139
2016	Little skate	0.046	5.643	0.028	3.362	0.141	1.263	0.226	3.702
2016	Monkfish	0.151	5.776	0.019	6.617	0.008	1.741	0.062	2.953
2016	Ocean pout	0.006	2.260	0.017	2.395	0.000	4.963	-	
2016	Red hake	0.844	4.226	0.508	5.705	0.025	1.328	0.098	2.367
2016	Silver hake	0.021	3.547	0.506	7.249	0.054	2.630	0.234	1.320
2016	Smooth skate	-		-		-		-	
2016	Spiny dogfish	2.132	7.761	0.040	5.247	0.029	3.119	0.014	3.667
2016	Summer flounder	0.715	5.349	0.002	3.124	0.007	2.042	0.029	2.810
2016	Thorny skate	-		-		-		-	
2016	White hake	0.000	7.141	-		0.002	5.616	-	
2016	Windowpane flounder	0.001	3.162	0.001	4.003	0.005	1.938	-	
2016	Winter flounder	-		0.008	3.148	0.022	2.518	0.003	6.691
2016	Winter skate	0.234	2.154	0.003	5.353	0.010	3.563	-	
2016	Witch flounder	0.017	7.669	0.006	2.268	0.000	5.320	0.000	4.840
2016	Yellowtail flounder	-		-		0.004	2.128	0.001	5.096

5.2 Protected Species (including Fish, Sea Turtles, and Marine Mammals)

5.2.1 Species Present in the Area

Protected species are those afforded protections under the Endangered Species Act (ESA; species listed as threatened or endangered under the ESA) and/or the Marine Mammal Protection Act (MMPA). Table 19 provides a list of protected species that occur in the affected environment of the small-mesh multispecies fishery and the potential for the fishery to impact the species, specifically via interactions with fishing gear.

Table 19. Species protected under the ESA and/or MMPA that may occur in the affected environment of the small-mesh multispecies fishery. Marine mammal species (cetaceans and pinnipeds) italicized and in bold are considered MMPA strategic stocks[1]. Shaded rows indicate species who prefer continental shelf edge/slope waters (i.e., >200 meters).

Species	**Status[2]**	***Potential to interact with small-mesh multispecies fishing gear?***
Cetaceans		
North Atlantic right whale (Eubalaena glacialis)	***Endangered***	***No***
Humpback whale, West Indies DPS, (*Megaptera novaeangliae*)	Protected (MMPA)	No
Fin whale (Balaenoptera physalus)	***Endangered***	***No***
Sei whale (Balaenoptera borealis)	***Endangered***	***No***
Blue whale (Balaenoptera musculus)	***Endangered***	***No***
Sperm whale (Physeter macrocephalus	***Endangered***	***No***
Minke whale (*Balaenoptera acutorostrata*)	Protected (MMPA)	Yes
Pilot whale (Globicephala spp.)[3]	***Protected (MMPA)***	***Yes***
Pygmy sperm whale (*Kogia breviceps*)	Protected (MMPA)	No
Dwarf sperm whale (*Kogia sima*)	Protected (MMPA)	No
Risso's dolphin (*Grampus griseus*)	Protected (MMPA)	Yes
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected (MMPA)	Yes
Short Beaked Common dolphin (*Delphinus delphis*)	Protected (MMPA)	Yes
Atlantic Spotted dolphin (*Stenella frontalis*)	Protected (MMPA)	No
Striped dolphin (*Stenella coeruleoalba*)	Protected (MMPA)	No
Beaked whales (*Ziphius and Mesoplodon spp*)[4]	Protected (MMPA)	No
Bottlenose dolphin (Tursiops truncatus)[5]	***Protected (MMPA)***	***Yes***
Harbor porpoise (*Phocoena phocoena*)	Protected (MMPA)	Yes
Pinnipeds		
Harbor seal (*Phoca vitulina*)	Protected (MMPA)	Yes
Gray seal (*Halichoerus grypus*)	Protected (MMPA)	Yes
Harp seal (*Phoca groenlandicus*)	Protected (MMPA)	Yes

Species	Status[2]	*Potential to interact with small-mesh multispecies fishing gear?*
Hooded seal (*Cystophora cristata*)	Protected (MMPA)	No
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*)	Threatened	Yes
Loggerhead sea turtle (*Caretta caretta*), Northwest Atlantic Ocean DPS	Threatened	Yes
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered	No
Fish		
Atlantic salmon	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
Alewife (Alosa pseudoharengus)	Candidate	Yes
Blueback herring (Alosa aestivalis)	Candidate	Yes
Critical Habitat		
Northwest Atlantic DPS of Loggerhead Sea Turtle	ESA (Protected)	No
North Atlantic Right Whale Critical Habitat	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] Status is defined by whether the species is listed under the ESA as endangered (i.e. at risk of extinction) or threatened (i.e. at risk of endangerment), or protected under the MMPA. Marine mammals listed under the ESA are also protected under the MMPA. Candidate species are those species for which ESA listing may be warranted.

[3] There are 2 species of pilot whales: short finned (*G. melas melas*) and long finned (*G. macrorhynchus*). Due to the difficulties in identifying the species at sea, they are often referred to as *Globicephala spp*.

[4] There are multiple species of beaked whales in the Northwest Atlantic. They include the cuvier's (*Ziphius cavirostris*), blainville's (*Mesoplodon densirostris*), gervais' (*Mesoplodon europaeus*), sowerbys' (*Mesoplodon bidens*), and trues' (*Mesoplodon mirus*) beaked whales. Species of *Mesoplodon* are difficult to identify at sea, therefore, much of the available characterization for beaked whales is to the genus level only.

[5] This includes the Western North Atlantic Offshore, Northern Migratory Coastal, and Southern Migratory Coastal Stocks of Bottlenose Dolphins.

Cusk, 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, these 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.

5.2.2 Protected Species and Critical Habitat Not Likely Affected (via interactions with gear or destruction of essential features of critical habitat) by the small-mesh multispecies fishery

Based on available information, it has been determined that this action is not likely to affect (via interactions with gear or destruction of essential features of critical habitat) multiple ESA listed and/or marine mammal protected species or any designated critical habitat (Table 19). 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 used to prosecute the small-mesh multispecies fishery (i.e., bottom otter trawl (small mesh); Waring et al. 2014a, 2015, 2016; Hayes et al. 2017; NMFS NEFSC FSB 2015, 2016, 2017; http://www.nefsc.noaa.gov/fsb/take_reports/nefop.html). In the case of critical habitat, this determination has been made because operation of the small-mesh multispecies fishery 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 2014; NMFS 2015a,b).

5.2.3 Species Potentially Affected by the Proposed Action

Kemp's ridley, leatherback, the North Atlantic DPS of green and the Northwest Atlantic DPS of loggerhead sea turtle are the four ESA-listed species of sea turtles that occur in the affected environment of the small-mesh multispecies fishery. Three of the four species are hard-shelled turtles (i.e., green, loggerhead, and Kemp's ridley). Additional background information on the range-wide status, descriptions, and life histories of these four species can be found in a number of published documents, including sea turtle status reviews and biological reports (NMFS and USFWS 1995; Hirth 1997; Turtle Expert Working Group [TEWG] 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b; 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, 1998a), Kemp's ridley sea turtle (NMFS et al. 2011), and green sea turtle (NMFS and USFWS 1991, 1998b).

A general overview of sea turtle occurrence and distribution in waters of the Northwest Atlantic Ocean is provided below to assist in understanding how the small-mesh multispecies fishery overlaps in time and space with sea turtles. Maps depicting the range wide distribution and occurrence of sea turtles in the Greater Atlantic Region can be found at the following websites: https://www.greateratlantic.fisheries.noaa.gov/protected/section7/listing/index.html; http://marinecadastre.gov/; and, http://seamap.env.duke.edu/.

Hard-Shelled Sea Turtles

In U.S. Northwest Atlantic waters, hard-shelled turtles commonly occur throughout the continental shelf from Florida to Cape Cod, Massachusetts, 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. Loggerheads, the most common hard-shelled sea turtle in the Greater Atlantic Region, 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).

Hard-shelled sea turtles occur year-round in waters off Cape Hatteras, North Carolina 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 foraging areas as early as late April and on the most northern foraging grounds in the Gulf of Maine in June (Shoop and Kenney 1992). The trend is reversed in the fall as water temperatures cool. The large majority leave the Gulf of Maine by September, but some remain in Mid-Atlantic and Northeast areas until 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

Leatherbacks, a pelagic species, are known to use coastal waters of the U.S. continental shelf and to have a greater tolerance for colder water than hard-shelled sea turtles (James *et al.* 2005; Eckert *et al.* 2006; Murphy *et al.* 2006; NMFS and USFWS 2013; Dodge *et al.* 2014). Leatherback sea turtles 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). They are found in more northern waters (i.e., Gulf of Maine) later in the year (i.e., similar time frame as hard-shelled sea turtles), with most leaving the Northwest Atlantic shelves by mid-November (James *et al.* 2005; James *et al*. 2006; Dodge *et al.* 2014).

Marine Mammals

Large Cetaceans

Multiple species of whales occur in the Northwest Atlantic, with the minke whale being the only whale species potentially affected by the proposed action (Table 19). In general, large whales, such as minke whales, 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. 2014, 2015, 2016; Hayes et al. 2017; NMFS 1991, 2005, 2010b, 2011a, 2012b). 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. 2014, 2015, 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 whale species, such as the minke whale, please refer to marine mammal stock assessment reports provided at: http://www.nmfs.noaa.gov/pr/sars/region.htm.

To further assist in understanding how the small-mesh multispecies fishery may overlap in time and space with the occurrence of minke whales, a general overview on species occurrence and distribution in the area of operation for the small-mesh multispecies fishery is provided in the following table.

Table 20. Minke occurrence in the affected environment of the small-mesh multispecies fishery.

Species	Prevalence and Approximate Months of Occurrence
Minke	• Widely distributed throughout continental shelf waters (<100m deep) of the Mid-Atlantic (Southern New England included), Gulf of Maine, and Georges Bank. • Most common in the EEZ from spring through fall, with greatest abundance found in New England waters; fall through spring widespread and common in deep-ocean waters.
***Sources*:** Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017.	

Small Cetaceans

Small cetaceans can be found throughout the year in waters of the Northwest Atlantic Ocean (Waring *et al*. 2014a; Waring et al. 2015; Waring *et al*. 2016; Hayes *et al*. 2017). Within this range, however, there are seasonal shifts in species distribution and abundance. In regards to pinnipeds, species 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; Hayes *et al*. 2017).

To further assist in understanding how small-mesh multispecies fishery may overlap in time and space with the occurrence of small cetaceans and pinnipeds, a general overview of species occurrence and distribution in the affected environment of this fishery is provided in the table below

Table 21. Small cetacean and pinniped occurrence in the affected environment of the small-mesh multispecies 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), Southern New England, Georges Bank, and Gulf of Maine; however, most common in continental shelf waters from Hudson Canyon (~ 39ºN) to Georges Bank, and into the Gulf of Maine. • **January-May**: low densities found from Georges Bank to Jeffreys Ledge. • **June-September**: large densities found from Georges Bank through the Gulf of Maine. • **October-December**: intermediate densities found from southern Georges Bank to southern Gulf of Maine. • South of Georges Bank (Southern New England and Mid-Atlantic), low densities found year round, with waters off Virginia and 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, Southern New England, and Georges Bank (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 /South Carolina border. • **January-May**: occur from waters off Cape Hatteras, NC, to Georges Bank (35º to 42ºN). • **Mid-summer-fall**: occur primarily on Georges Bank with small numbers present in the Gulf of Maine; Peak abundance found on Georges Bank in the autumn.
Risso's Dolphin	• **Spring through fall**: Distributed along the continental shelf edge from Cape Hatteras, NC, to Georges Bank. • **Winter**: distributed in the Mid-Atlantic Bight, extending into oceanic waters. • Rarely seen in the Gulf of Maine; primarily a Mid-Atlantic continental shelf edge species (can be found year round).

Species	Prevalence and Approximate Months of Occurrence
Harbor Porpoise	• Distributed throughout the continental shelf waters of the Mid-Atlantic (north of 35ºN), Southern New England, Georges Bank, and Gulf of Maine. • **July-September**: concentrated in the northern Gulf of Maine (waters < 150 meters); low numbers can be found on Georges Bank. • **October-December**: widely dispersed in waters from NJ to Maine; 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 NY to Gulf of Maine. • **April-June**: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters).
Bottlenose Dolphin	**<u>Western North Atlantic Offshore Stock</u>** • Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from Georges Bank to FL. • Depths of occurrence: ≥40 meters **<u>Western North Atlantic Northern Migratory Coastal Stock</u>** • 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. **<u>Western North Atlantic Southern Migratory Coastal Stock</u>** • **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.

Species	Prevalence and Approximate Months of Occurrence
Pilot Whales: *Short- and Long-Finned*	**Short-Finned Pilot Whales** • Except for area of overlap (see below), primarily occur south of 40°N • May through December (approximately): distributed primarily near the continental shelf break of the Mid-Atlantic and Southern New England; beginning in the fall, individuals appear to shift to southern waters (i.e., 35°N and south) . **Long-Finned Pilot Whales** • Except for area of overlap (see below), primarily occur north of 42°N. • Winter to early spring : primarily distributed along the continental shelf edge-slope. • Late spring through fall (: movements and distribution shift onto/within Georges Bank, the Great South Channel, and Gulf of Maine. **Area of Species Overlap:** between approximately 38°N and 41°N.
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 (35°N). • **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.

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.

Atlantic Sturgeon

The marine range of U.S. Atlantic sturgeon extends from Labrador, Canada, to Cape Canaveral, Florida. Atlantic sturgeon from all five DPSs have the potential to be located anywhere in this marine range (ASSRT 2007; Dovel and Berggren 1983; Dadswell et al. 1984; Kynard et al. 2000; Stein et al. 2004a; Dadswell 2006; Laney et al. 2007; Dunton et al. 2010; Dunton et al. 2012; Dunton et al. 2015; Erickson et

al. 2011; Wirgin et al. 2012, 2015 a, b; O'Leary et al. 2014; Waldman et al. 2013). 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; Wipplehauser 2012; Whipplehauser and Squiers 201). 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).

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 Gulf of Maine DPS extends from the Gulf of Maine (primarily northern portion of the Gulf of Maine) to the coast of Greenland (NMFS and USFWS 2005, 2016; Fay *et al*. 2006). In general, smolts, post-smolts, and adult Atlantic salmon may be present in the Gulf of Maine 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; USASAC 2004; Hyvarinen *et al.* 2006; Lacroix and McCurdy 1996; Lacroix *et al.* 2004, 2005; Reddin 1985; Reddin and Short 1991; Reddin and Friedland 1993, Sheehan *et al.* 2012; NMFS and USFWS 2005, 2016; Fay *et al*. 2006). For additional information on the on the biology, status, and range-wide distribution of the Gulf of Maine DPS of Atlantic salmon please refer to NMFS and USFWS 2005, 2016; Fay *et al*. 2006.

5.2.4 Interactions Between Gear and Protected Species

The small-mesh multispecies fishery is prosecuted with small-mesh bottom trawl gear. Protected species described in Section 1.1.2 are all vulnerable to interactions with bottom trawl gear, including small-mesh bottom trawl gear. Available information provided below on protected species serious injury or mortality, or estimated annual interactions is not specific to small-mesh bottom trawl gear, per say, but instead considers bottom trawl effort as a whole to provide an overall risk to a given protected species (or species

group) from this gear type, in general.6 However, to provide an idea of the relative interaction risk associated with the small-mesh multispecies fishery, a section is provided that provides information on NEFOP observed interactions with the whiting fishery.

Gear Interactions with Sea Turtles

Bottom Otter Trawl

Sea turtle interactions with bottom trawl gear have been observed on Georges Bank, and in the Mid-Atlantic; however, most of the observed interactions have occurred in the Mid-Atlantic (Warden 2011a,b; Murray 2015). As no sea turtle interactions with bottom trawl gear have been observed in the Gulf of Maine, and few sea turtle interactions have been observed on Georges Bank, there is insufficient data available to conduct a robust model-based analysis on sea turtle interactions with bottom trawl gear in these regions or produce a bycatch estimate for these regions. As a result, the bycatch estimates and discussion below are for bottom trawl gear in the Mid-Atlantic.

Bottom trawl gear poses an injury and mortality risk to sea turtles, specifically due to forced submergence (Sasso and Epperly 2006). Green, Kemp's ridley, leatherback, loggerhead, and unidentified sea turtles have been documented interacting (e.g., bycaught) 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[7] 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).8 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[9] 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 (2015) 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).

Gear Interactions with Atlantic Sturgeon

Bottom Otter Trawl

Atlantic sturgeon interactions (i.e., bycatch) with 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 bottom trawl gear: Stein et al. (2004b) for 1989-2000; ASMFC (2007) for 2001-2006; and Miller and Shepard (2011) for 2006-

6 Overall bottom trawl effort in relation to protected species interactions does take into consideration bottom trawl effort with small mesh gear used in the whiting fishery; see literature cited in sections discussing gear interactions with sea turtles, marine mammals, Atlantic salmon, and Atlantic sturgeon.

7 Warden (2011a) defined the Mid-Atlantic as south of Cape Cod, Massachusetts, to approximately the North Carolina/South Carolina border.

8 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).

9 Murray 2015b defined the Mid-Atlantic as the boundaries of the Mid-Atlantic Ecological Production; roughly waters west of 71°W to the North Carolina/South Carolina border)

2010; none of these documents provide estimates of Atlantic sturgeon bycatch by Distinct Population Segment. Miller and Shepard (2011), the most recent of the three documents, analyzed fishery observer data and VTR data in order to estimate the average annual number of Atlantic sturgeon interactions in 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 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 bottom trawl gear to be 1,342 sturgeon. Miller and Shepard (2011) reported observed Atlantic sturgeon interactions in trawl gear with small (< 5.5 inches) and large (≥ 5.5 inches) mesh sizes and concluded that, based on NEFOP observed sturgeon mortalities, relative to gillnet gear, bottom trawl gear posed less risk of mortality to Atlantic sturgeon. 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.

Gear Interaction with Atlantic Salmon

Bottom Otter Trawl

Atlantic salmon interactions (i.e., bycatch) with bottom trawl have been observed since 1989; in many instances, these interactions have resulted in the injury and mortality of Atlantic salmon (NMFS NEFSC FSB 2015, 2016, 2017). According to the Biological Opinion issued by NMFS Greater Atlantic 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); of those 15 salmon, four were observed caught in bottom trawl gear (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 bottom trawl gear (NMFS NEFSC FSB 2015, 2016, 2017). Based on the above information, bottom trawl interactions with Atlantic salmon are likely rare (NMFS 2013; Kocik *et al*. 2014).

Gear Interactions with Marine Mammals

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

Large Whales

Bottom Otter
With the exception of one species, there have been no observed interactions with large whales and bottom trawl gear. The one exception is minke whales, which have been observed seriously injured or killed in trawl gear.

To date, bottom trawl 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 above information, bottom trawl gear is likely to pose a low interaction risk to any large whale species. Should an interaction occur, serious injury or mortality to any large whale is possible; however, relative to other gear types, such as fixed gear, trawl gear represents a low source serious injury or mortality to any large whale (Henry *et al*. 2016; Hayes *et al*. 2017).

Small Cetaceans and Pinnipeds

Bottom Trawl Gear
Small cetaceans and pinnipeds are vulnerable to interactions with bottom trawl gear (Read *et al*. 2006; Waring *et al*. 2014a; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)).10 Based on the most recent five years of observer data (2010-2014), The table below provides a list of species that have been observed (incidentally) seriously injured and/or killed by List of Fisheries Category II bottom trawl fisheries that operate in the affected environment of the small-mesh multispecies fishery(Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)). Lyssikatos (2015) provided total annual bycatch mortality in Northeast and Mid-Atlantic commercial bottom trawl trips (considers all FMPs) from 2008-2013. The highest annual bycatch mortality in bottom trawl gear (Northeast and Mid-Atlantic combined) was observed for short beaked common dolphins, followed by Atlantic white-sided dolphins, gray seals, risso's dolphins, long-finned pilot whales, bottlenose dolphins, harbor seals, harbor porpoise, and harp seals (Lyssikatos 2015).

10 For additional information on small cetacean and pinniped interactions prior to those provided in Waring et al. 2014a, see: http://www.nmfs.noaa.gov/pr/sars/region.htm

Table 22. Small cetacean and pinniped species observed seriously injured and/or killed by Category trawl fisheries in the affected environment of the small-mesh multispecies fishery.

Fishery	Category	Species Observed or reported Injured/Killed
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
		Short-beaked common dolphin
		Risso's dolphin
		Bottlenose dolphin (offshore)
		Gray seal
		Harbor seal
Sources: Hayes *et al*. 2017; MMPA LOF 82 FR 3655 (January 12, 2017).		

In 2006, based on observed mid-water trawl interactions with long-finned pilot whales, short -finned pilot whales, common dolphins, and white sided dolphins, the Atlantic Trawl Gear Take Reduction Team (ATGTRT) was convened to address the incidental mortality and serious injury of these species incidental to bottom and mid-water trawl fisheries operating in both the New England and Mid-Atlantic regions. Because none of the marine mammal stocks of concern to the ATGTRT are classified as a "strategic stock", nor do they currently interact with a Category I fishery,11 it was determined that development of a take reduction plan was not necessary. In lieu of a take reduction plan, the ATGTRT agreed to develop an Atlantic Trawl Gear Take Reduction Strategy (ATGTRS). The ATGTRS identifies informational and research tasks, as well as education and outreach needs the ATGTRT believes are necessary to provide the basis for decreasing mortalities and serious injuries of marine mammals to insignificant levels approaching zero. The ATGTRS also identifies several voluntary measures that can be adopted by certain trawl fishing sectors to potentially reduce the incidental capture of marine mammals.12

11 Category I fisheries have frequent incidental mortality and serious injury of marine mammals.

12 For additional details on the ATGTRS, visit: http://www.greateratlantic.fisheries.noaa.gov/Protected/mmp/atgtrp/

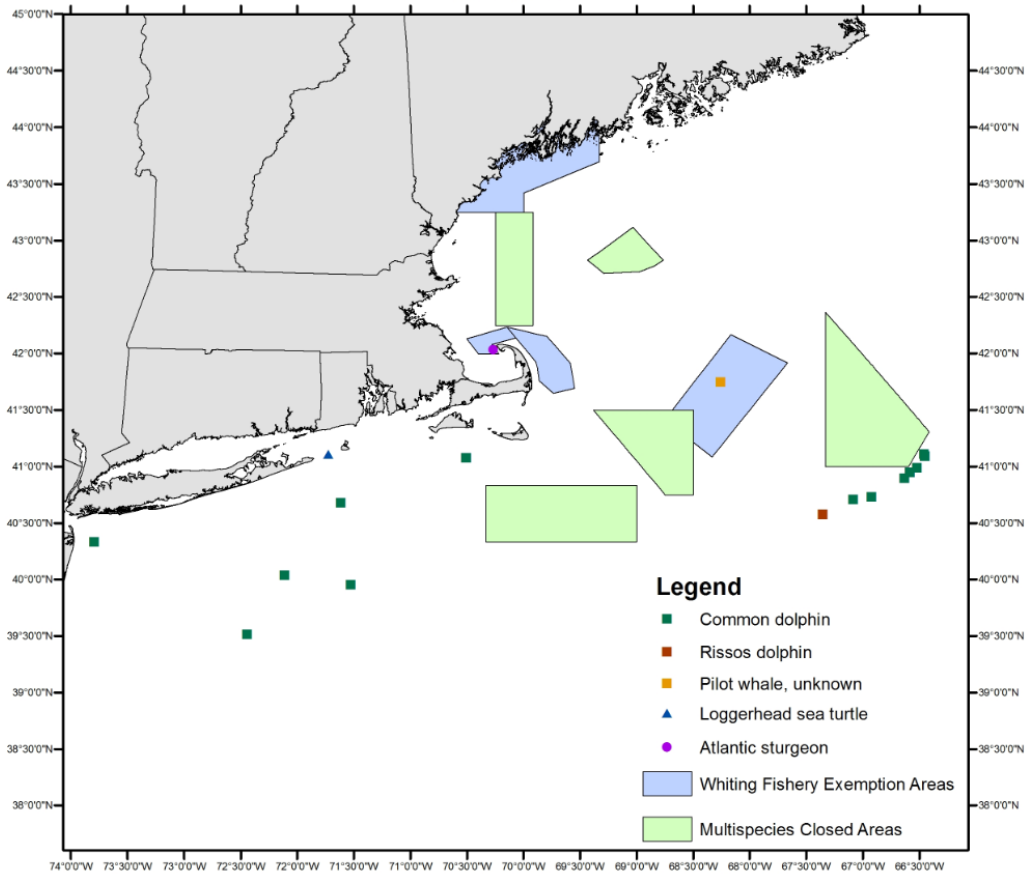
5.2.4.1 Observed Protected Species Interactions with the Whiting Fishery

The information provided in Table 23 and Map 2 are based on NEFOP observed protected species interactions with trips targeting or landing whiting, with small-mesh bottom trawl gear, over the last 10 years (i.e., 2007-2016). From 2007-2016, a total of 24 protected species interactions were observed in the whiting fishery, with interactions occurring primarily with common dolphins (i.e., 20/24 observed interactions). In addition, over the 10 years of observed interactions with protected species, there was no significant trend in time of year in which interactions were observed (i.e., interactions were observed year-round).

Table 23. Observed Protected Species Interactions with the Whiting Fishery from 2007-2016

Species	Number of Interactions Observed
Common Dolphin	20
Pilot Whale (spp)	1
Risso's Dolphin	1
Atlantic Sturgeon	1
Loggerhead Sea Turtle	1
Total	24

Map 2. Observed takes of protected species in the small-mesh multispecies fishery.



5.3 Physical Environment and EFH

5.3.1 Physical environment of the small-mesh multispecies fishery

The Northeast U.S. Shelf Ecosystem includes 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 to a depth of 2,000 m (Sherman et al. 1996). Four distinct sub-regions are identified: the Gulf of Maine, Georges Bank, the Mid-Atlantic Bight, and the continental slope. The physical oceanography and biota of these regions were described in Northeast Multispecies Amendment 16, Section 6.1. Much of this information was extracted from Stevenson et al. (2004), and the reader is referred to this document and sources referenced therein for additional information. A complete description of the physical environment in the Gulf of Maine, Georges Bank, and portions of the Continental Shelf south of New England is contained in Section E.6.2.1 the FSEIS for Amendment 5 to the Northeast Multispecies FMP.

The small-mesh multispecies fishery occurs throughout the Mid-Atlantic Bight, the Gulf of Maine, and Georges Bank (Map 3). The following paragraphs contains additional information about the Mid-Atlantic region to Cape Hatteras because whiting and red hake generally tend to be distributed further south than other groundfish species.

The coastal zone of the Mid-Atlantic states varies from a glaciated and rugged coastline from Cape Cod south to the New York Bight; further south the coast is bordered by a 160 km wide plain. Along the coastal plain, the beaches of the outer banks and barrier islands are wide, gently sloped and sandy, with gradually deepening offshore waters. The area is characterized by a series of sounds, broad estuaries, large river basins (e.g. Connecticut, Hudson, Delaware and Susquehanna), and barrier islands. Conspicuous estuarine features are Narragansett Bay, Long Island Sound, the Hudson River, Delaware Bay, Chesapeake Bay, and the nearly continuous band of estuaries behind outer banks and barrier islands along southern Long Island, New Jersey, Delaware, Maryland, Virginia and North Carolina. The complex estuary of Currituck, Albemarle, and Pamlico Sounds behind the Outer Banks on Cape Hatteras (covering an area of 6,500 km2 or 2,500 square miles, with 150,000 acres of salt marsh) is an important feature of the region. Chesapeake Bay is the largest estuary in the U.S., draining 64,000 square miles of land from five states, and includes almost 300,000 acres of salt marsh and 100,000 acres of tidal flats. Coastal marshes border small estuaries in Narragansett Bay and all along the glaciated coast from Cape Cod around Long Island Sound. Nearly continuous marshes occur along the shores of the estuaries behind the outer banks and around Delaware Bay. As a whole, this region contains more than 3,500 square miles of wetlands, one-third of which are in Chesapeake Bay. Atlantic coastal plain estuaries are characteristically shallow and subject to strong tidal circulation, thus creating ideal conditions for biological productivity.

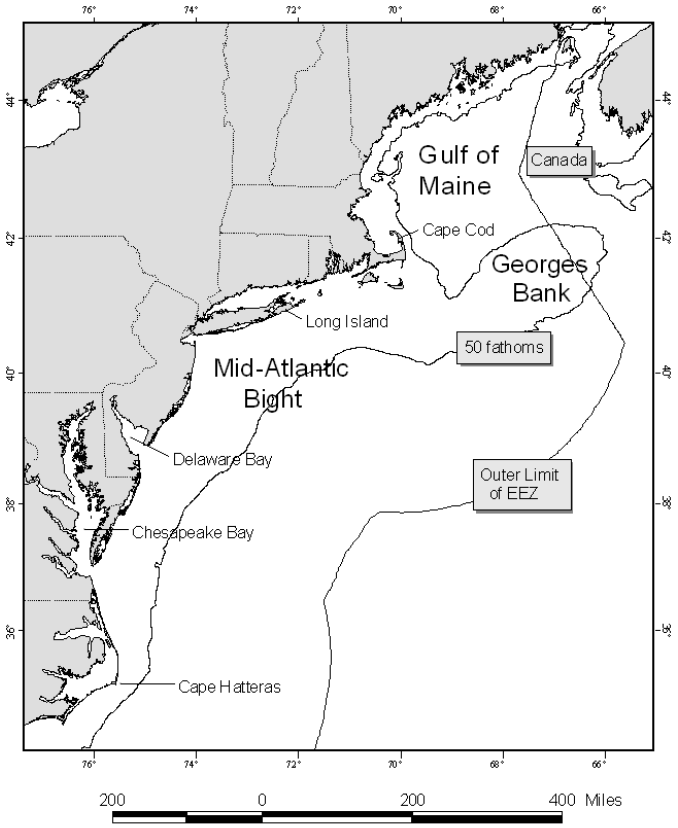
At Cape Hatteras, the shelf extends seaward approximately 33 km, then widens gradually to 113 km off New Jersey and Rhode Island. It is intersected by numerous underwater canyons. Surface circulation north of Cape Hatteras is generally southwesterly during all seasons, although this may be interrupted by coastal in-drafting and some reversal of flow at the northern and southern extremities of the area. Speeds of the drift are on the order of 9 km per day. There may be a shoreward component to this drift during the warm half of the year and an offshore component during the cold half. The Gulf Stream is located about 160 km offshore of Cape Hatteras, but becomes less discrete and veers to the northeast north of the cape. Surface currents, as high as 200 cm per second (4 knots), have been measured in the Gulf Stream off Cape Hatteras.

Hydrographic conditions in the mid-Atlantic region vary seasonally due to river runoff and warming in spring and cooling in winter; the water column becomes increasingly stratified in the summer and homogenous in the winter due to fall-winter cooling of surface waters. In winter, mean minimum and maximum sea surface temperatures are 0°C and 7°C off Cape Cod and 1°C and 14°C off Cape Charles (at the end of the Delmarva Peninsula); in summer, the mean minimums and maximums are 15°C and 21°C off Cape Cod, and 20°C and 27°C off Cape Charles. The tidal range averages slightly over one meter on Cape Cod, decreasing to a meter at the tip of Long Island and on the Connecticut shore. Westward within Long Island tide ranges gradually increase, reaching two meters at the head of the Sound and in the New York Bight. South of the bight, tidal ranges decrease gradually to slightly over a meter at Cape Hatteras.

The waters of the coastal mid-Atlantic region have a complex and seasonally dependent circulation pattern. Seasonally varying winds and irregularities in the coastline result in the formation of a complex system of local eddies and gyres. Surface currents tend to be strongest during the peak river discharge period in late spring and during periods of highest winds in the winter. In late summer, when winds are light and estuarine discharge is minimal, currents tend to be sluggish, and the water column is generally stratified.

One of the most frequently mentioned physical environmental parameters affecting fishing is the weather. High winds, waves, and extremely low temperatures can create extremely hazardous conditions, ranking commercial fishing among the most dangerous occupations in the world. Section E.6.2.2 of the FSEIS for Amendment 5 to the Northeast Multispecies FMP contains a complete description of weather patterns affecting the fisheries in question as well as southern New England and the Northeast region.

Map 3. Northeast U.S. Shelf Ecosystem



5.3.2 Essential fish habitat

The 1998 Omnibus Essential Fish Habitat Amendment 1 (Amendment 11 to the Northeast Multispecies FMP) described and identified the essential fish habitat (EFH) for silver and red hake. EFH includes those waters and substrate necessary for spawning, breeding, feeding, and growth to maturity. EFH Amendment 1 addressed all elements required by the EFH provisions of the 1996 Sustainable Fisheries Act. These include the description and identification EFH, the identification of threats to EFH from fishing and non-fishing activities, and the development of conservation and enhancement measures to protect EFH. EFH for offshore hake was described and identified in Amendment 12 to the Northeast Multispecies FMP in 2000. Amendment 13 to the Northeast Multispecies FMP (2004) updated the EFH conservation measures in the plan, but not the designations themselves.

In 2004, the Council initiated an update to the EFH Amendment, Omnibus EFH Amendment 2 (OHA2). This amendment was approved by the Council in June 2015 and is undergoing NMFS review. It includes revised EFH designations, an assessment of fishing and non-fishing impacts, and updated management measures to conserve EFH. The proposed EFH designation maps for silver and red hake are generally based on NEFSC trawl survey data through 2005, with juvenile distributions used as a proxy for the egg and larval lifestages. Offshore hake EFH for eggs and larvae are based on MARMAP survey data, and the combined juvenile and adult designation map includes areas with high catch rates in the trawl survey. Hake EFH designations also include the continental slope to a depth of 400 m (juvenile and adult silver hake) or 750 m (adult red hake, juvenile and adult offshore hake), beyond the depth fished by the survey. Hake EFH includes both inshore and offshore areas, typically with soft sediments and some sort of structure such as biogenic depressions or sand waves. Depending on the lifestage, hakes may occur on the seabed, or in the water column. Interactive maps of EFH for each species and life stage are available on NOAA EFH Mapper http://www.habitat.noaa.gov/protection/efh/efhmapper/index.html. The mapper will be updated to reflect changes proposed in OHA2 once the amendment is published. Additional details are provided in Volume 2 (designations), Appendix A (designation methods), and Appendix B (supplementary information) of Omnibus Habitat Amendment 2 (http://www.nefmc.org/library/omnibus-habitat-amendment-2).

The area that may potentially be affected by the proposed action has been identified as EFH for various species that are managed under the Northeast Multispecies; Atlantic Sea Scallop; Monkfish; Deep-Sea Red Crab[13]; Northeast Skate Complex; Atlantic Herring; Summer Flounder, Scup, and Black Sea Bass; Tilefish; Atlantic Mackerel, Squid, and Butterfish; and Atlantic Surfclam and Ocean Quahog Fishery Management Plans. EFH for the species managed under these FMPs includes a wide variety of benthic habitats in state and federal waters throughout the Northeast U.S. Shelf Ecosystem. For more information on the geographic area, depth, and EFH description for each applicable life stage of these species, the reader is referred to OHA2 for New England-managed species, and various Mid-Atlantic FMPs for summer flounder/scup/black sea bass, tilefish, mackerel/squid/butterfish, and clams.[14]

5.3.3 Gear impacts from the small-mesh multispecies fishery

The small-mesh multispecies fishery is primarily a trawl fishery (Table 24). Omnibus EFH Amendment 2 and previous Council actions have found that bottom trawls can cause adverse, i.e. more than minimal

[13] The OHA2 designations for red crab have a minimum depth of 320 m, such that red crab EFH is outside the depths typically targeted by the whiting fishery.

[14] Summer Flounder, Scup, and Black Seabass Amendment 12 (1999), Golden Tilefish Amendment 1 (2008), Atlantic Mackerel, Squid and Butterfish Amendment 11 (2011), Atlantic Surfclam and Ocean Quahog Amendment 12 (1998).

and not temporary, impacts to EFH. Specifically, Omnibus EFH Amendment 1 (NEFMC 1999) found that "bottom-tending mobile gears (otter trawls, scallop dredges, beam trawls, and hydraulic clam dredges) are most likely to be associated with adverse impacts to habitat". These findings were confirmed by the adverse effects assessment for OHA2.

Table 24 Landings of small-mesh multispecies by gear (2008-2010)

Gear Type	% of Total Small-Mesh Multispecies Landings
Otter Trawl, including Raised Footrope Trawl	97.76%
Sink Gillnets	1.09%
All Other Gear‡	1.15%

‡Includes: Handgear, Pots and Traps, Shrimp Trawl, Dredges, Longline, and all other reported gear

Jones (1992) suggests that beam trawls, otter trawls, and dredges are all essentially similar in impact, and the severity of the impact can be correlated to the weight of the gear that is in contact with the bottom. The heavier the gear that contacts the bottom, the greater the impact the gear has. This may be an oversimplification, but it illustrates an important point – the lighter the gear, the less impact it is likely to have."

5.4 Human Environment

Amendment 22 considers and evaluates the effect management alternatives may have on people's economy, way of life, traditions, and community. These social and economic impacts may be driven by changes in fishery flexibility, opportunity, stability, certainty, safety, and/or other factors. While it is possible that social and economic impacts could be solely experienced by individuals, it is more likely that impacts would be experienced across communities, gear types, and/or vessel size classes.

Summarized here are the fisheries and human communities most likely to be impacted by the Alternatives under Consideration. Social, economic and fishery information presented herein is useful in describing the response of the fishery to past management actions and predicting how the Amendment 8 alternatives may affect human communities. Additionally, this section establishes a descriptive baseline for the fishery with which to compare actual and predicted future changes that result from management actions.

5.4.1 Permits

5.4.1.1 Permit holdings

Vessels fishing for small-mesh multispecies in an exemption program must possess either an open access (Category K) or limited access (Categories A-F) NE multispecies permit. Small-mesh multispecies fishermen hold a range of other federal permits (Table 25).

Table 25. List of permits held by small-mesh multispecies fishermen

Permit Code/Description		Permit Code/Description	
Groundfish Permits		LOA1	AMERICAN LOBSTER-TRAP-AREA1-2001
A	Individual Limited Access	LOA2	AMERICAN LOBSTER-TRAP-AREA2-2001
B	Fleet Limited Access	LOA3	AMERICAN LOBSTER-TRAP-AREA3-2001
C	Small Vessel	LOA4	AMERICAN LOBSTER-TRAP-AREA4-2001
D	Hook	LOA5	AMERICAN LOBSTER-TRAP-AREA5-2001
E	Combination	LOA5W	LOBSTER AREA5 TRAP WAIVER - 2002
F	Individual Large Mesh	LOA6	AMERICAN LOBSTER-TRAP-AREA6-2001
G	Fleet Large Mesh	LOAOC	AMER LOB-TRAP-OUTER CAPE-2001
H	Open Handgear	MNKA	MONKFISH - CATEGORY A - 2000
I	Charter/Party	MNKB	MONKFISH - CATEGORY B - 2002
J	Possion limit for scallop Limited Access Permit	MNKC	MONKFISH - CATEGORY C - 2002
K	Non-regulated	MNKD	MONKFISH - CATEGORY D - 2002
HA	Open Handgear A	MNKE	MONKFISH - INCIDENTAL CAT E-2002
HB	Open Handgear B	MNKF	MONK-OFFSHORE-CAT F-2005
		MNKH	MONK-SO. 38 20' N-CAT H-2005
Other Permits		RCBA	RED CRAB - INCIDENTAL BYCATCH
FLS1	SUMMER FLOUNDER-COMMERCIAL-1996	SCP1	SCUP-COMMERCIAL MORATORIUM-2002
FLS2	SUMMER FLOUNDER-CHART/PARTY-1996	SCP2	SCUP - CHARTER/PARTY - 1999
HRGA	HERRING - ALL AREAS LIMITED ACCESS - 2007	SF1	SURF CLAM/OCEAN QUAHOG-1988
HRGB	HERRING-AREAS 2 AND 3 LIMITED ACCESS-2007	SMB1	SQUID/MACK/BUTT-COMMERCIAL-1995
HRGC	HERRING - LIMITED ACCESS INCIDENTAL -2007	SMB2	SQUID/MACK/BUTT-CHARTER-1988
HRGD	HERRING-OPEN ACCESS POSSESSION LIMIT-2007	SMB3	SQUID/BUTTERFSH-INCIDENTAL-2002
LO1	AMER LOBSTER-COMMERCIAL	SMB4	ATLANTIC MACKEREL - 2003
LO2	AMER LOBSTER-CHARTER/PARTY-1999	SMB5	SQUID/MACK/BUTT-CATCH/PROC-1988

5.4.1.2 Permit Ownership

Information on the small-mesh multispecies fishery holdings of individuals and entities is included in this action to support the analysis of impacts. Permit holdings for the subset of permits that would qualify for a small-mesh limited access permit are included in the section above.

In developing Amendment 18 to the Northeast Multispecies FMP, through which a 5% permit cap was established on Northeast multispecies limited access permits (in addition to a cap on Potential Sector Contribution), the ability to query the permit holdings data has improved substantially. The DRAFT data in this document are the PDT's current best estimate of small-mesh permit holdings by an individual or entity. There continues to be forward progress on improving the data provided. Much effort has been spent to troubleshoot queries and provide the Council with robust data. Absolute determinations of permit holdings are ultimately the responsibility of the Analysis and Program Support Division (APSD) at the NMFS Greater Atlantic Fisheries Office (GARFO). Just as limited entry programs estimate potential permit qualifications, until those records are scrutinized after final action, often including a multiphase appeals process, there are changes in the data. The PDT is confident that the data herein portray the holdings in the fishery to within 1-2% of the true values.

Because the alternatives considered in this action would apply an accumulation limit to individuals, permit banks, or other entities, the fishery holdings data in this section are presented at the individual person ("Person_ID") and business ("Business_ID") levels. NMFS does not have data on percent interest in fishery permits of the individuals associated with them. Thus, it is assumed that each individual has 100% interest in a given permit.

5.4.2 Vessels

To land small-mesh multispecies, an open access (Category K) permit is required. The number of such permits issued in a year reflects the number of vessels potentially landing small-mesh multispecies. Since

1996, the number of open access (Category K) permits issued each year has ranged between 150 and 1,051, averaging 780 since 2012 (Table 26). Vessels landing small-mesh multispecies consists of all ranges of vessels, e.g., small (<50 GRT), medium (50-100 GRT), and large (>100 GRT).

Table 26. Number of open access (Category K) small-mesh multispecies issued annually, 1996-2017

Fishing year	Permits issued	Fishing year	Permits issued
1996	150	2007	1,022
1997	435	2008	998
1998	537	2009	948
1999	629	2010	904
2000	722	2011	815
2001	761	2012	806
2002	839	2013	777
2003	855	2014	774
2004	913	2015	781
2005	1,051	2016	794
2006	1,022	2017	747
Source: NEFSC VTR data, accessed 2017.			

5.4.3 Landings and revenue

5.4.3.1 Silver and offshore hake landings and revenue

Silver and offshore hake (collectively called as whiting) landings peaked in 1996 at 34 mil pounds, but the inflation adjusted real revenue (in 2016$) peaked in 1997 at $21 mil (Table 27). In 2006, the smallest amount of silver hake was landed, about 12 mil pounds, coinciding with the lowest revenue earned from silver hake landings. Since then, silver hake landings and revenues have been generally increasing. However, the recent years (2014-2016) average annual landings have remained around 14 mil pounds (Figure 15).

Table 27. Silver hake and offshore hake landings and inflation adjusted real revenue (1996-2016).

Year	Silver Hake (Pounds)	Offshore Hake (Pounds)	Total Whiting	
			Landings (lbs.)	Revenue (in 2016 US$)
1996	34,067,288	295,919	34,363,207	$20,104,652
1997	32,519,281	144,270	32,663,551	21,098,929
1998	29,032,464	418,409	29,450,873	17,647,988
1999	27,685,398	641,702	28,327,100	18,547,630
2000	25,783,296	339,202	26,122,498	15,417,194
2001	26,867,391	966,048	27,833,439	17,803,292
2002	17,670,148	359,265	18,029,413	10,039,930
2003	18,174,614	198,058	18,372,672	11,416,111
2004	17,326,446	334,321	17,660,767	11,148,088
2005	16,601,525	399,808	17,001,333	9,718,050
2006	11,675,903	220,721	11,896,624	7,467,833
2007	14,354,038	319,769	14,673,807	9,425,244
2008	13,719,542	356,606	14,076,148	8,905,187
2009	16,926,154	290,665	17,216,819	9,502,702
2010	16,997,195	246,054	17,243,249	11,684,081
2011	Masked due to confidential data		16,605,652	11,323,237
2012			15,292,637	10,129,930
2013			13,122,195	8,590,111
2014			15,673,535	11,223,912
2015			13,778,726	10,314,245
2016			13,144,811	10,003,356

Source: NEFSC VTR data, accessed 2017.
Note: Revenues derived using an average price of silver hake in 2016.

Peak landings in the Northern Management Area also occurred in 1996, at 8.9 mil pounds, which earned about $5 mil in real revenue. The lowest silver hake landings in the Northern Area occurred in 2005 with 1.69 mil pounds, earning $1.0 mil in real revenue. In recent years, landings in the Northern Area have averaged around 5 mil pounds, earning real revenue $3.7 to $4.7 mil (Table 28). Landings in the Southern Management Area used to account for two-thirds to nearly all landings until 2015, but the region's share has declined significantly at little over 50 percent in 2016. Southern landings have ranged from 6.8 mil pounds to 25.9 mil pounds. Peak landings in the Southern area in 1997 were 25.9 mil pounds, earning $16.7 mil in real revenue. This was also the year with peak revenue from silver hake. The lowest landings occurred in 2016 and were 6.8 mil lbs, earning $5.2 mil real revenue.

Table 28. Silver hake landings (pounds) and real revenue (in 2016$) by stock area.

Year	Northern Stock		Southern Stock	
	Landings (lbs.)	Real Revenue	Landings (lbs.)	Real Revenue
1996	8,897,537	$5,205,623	25,082,644	$14,674,935
1997	6,597,898	$4,261,894	25,847,569	$16,696,164
1998	4,941,691	$2,961,233	24,062,362	$14,419,005
1999	8,037,088	$5,262,414	19,550,376	$12,800,927
2000	6,899,595	$4,072,061	18,767,737	$11,076,500
2001	8,465,721	$5,414,987	18,301,397	$11,706,247
2002	6,003,694	$3,343,241	11,545,556	$6,429,304
2003	4,862,651	$3,021,475	13,224,516	$8,217,234
2004	2,542,059	$1,604,636	14,724,122	$9,294,376
2005	1,690,508	$966,303	14,890,106	$8,511,262
2006	2,058,312	$1,292,058	9,548,506	$5,993,856
2007	2,604,177	$1,672,709	11,744,654	$7,543,798
2008	1,780,815	$1,126,621	11,898,630	$7,527,594
2009	2,519,793	$1,390,782	14,346,639	$7,918,527
2010	3,664,364	$2,482,985	13,285,648	$9,002,398
2011	3,684,109	$2,512,159	12,760,759	$8,701,441
2012	3,496,552	$2,316,136	11,617,406	$7,695,436
2013	2,818,907	$1,845,326	10,167,854	$6,656,127
2014	5,178,960	$3,708,684	10,309,971	$7,383,032
2015	4,418,084	$3,307,214	9,211,141	$6,895,120
2016	6,262,859	$4,766,110	6,775,078	$5,155,914

Source: NEFSC VTR data, accessed 2017.
Note: Revenues derived using an average price of silver hake in 2016.

Figure 15. Whiting landings and real revenue (in 2016$), 1996-2016.

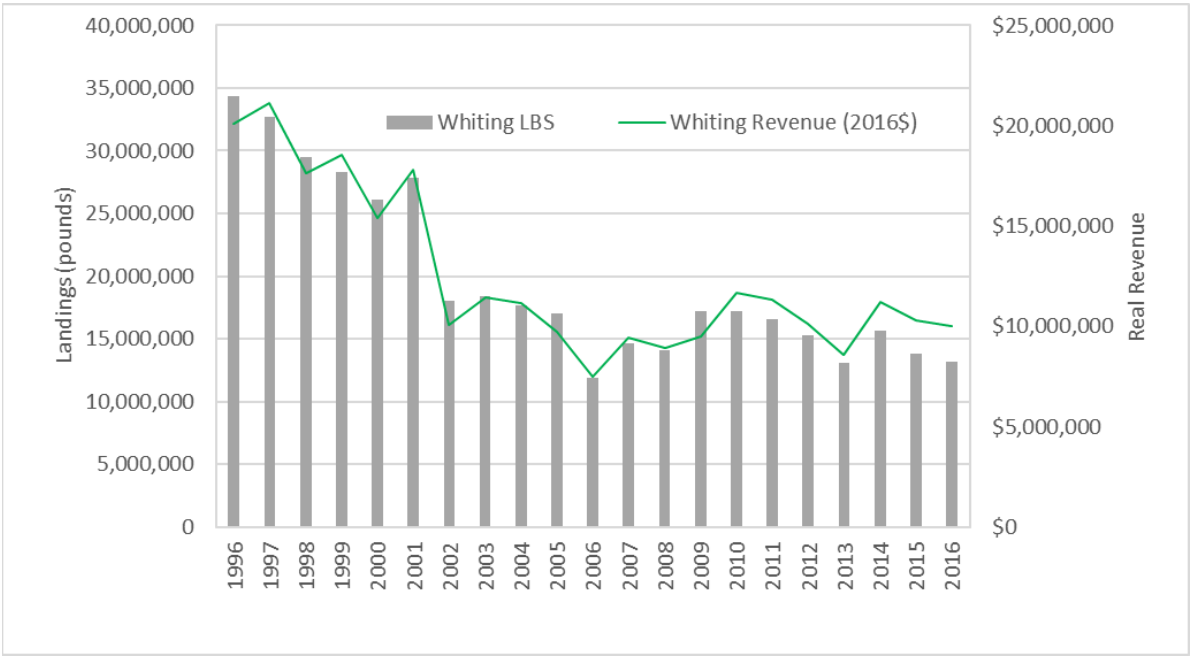


Figure 16 shows silver hake landings and revenues (in 2016$) from the Northern and Southern Areas. Over the past two decades, silver hake landings and revenues in the Southern Area fell substantially and is in a declining trend. Landings and revenues have saddled for the Northern Area, however. Landings in the Northern Area were stable around 6 mil pounds until 2003, but declined during 2004-2013. The recent years, Northern Area landings have been around 5 mil pounds compared to about 9 mil pounds in 1996. In 2016, the Southern and Northern Areas have had similar silver hake landings and revenues.

Figure 16. Silver hake landings and real revenues (in 2016$) by management area (North and South)

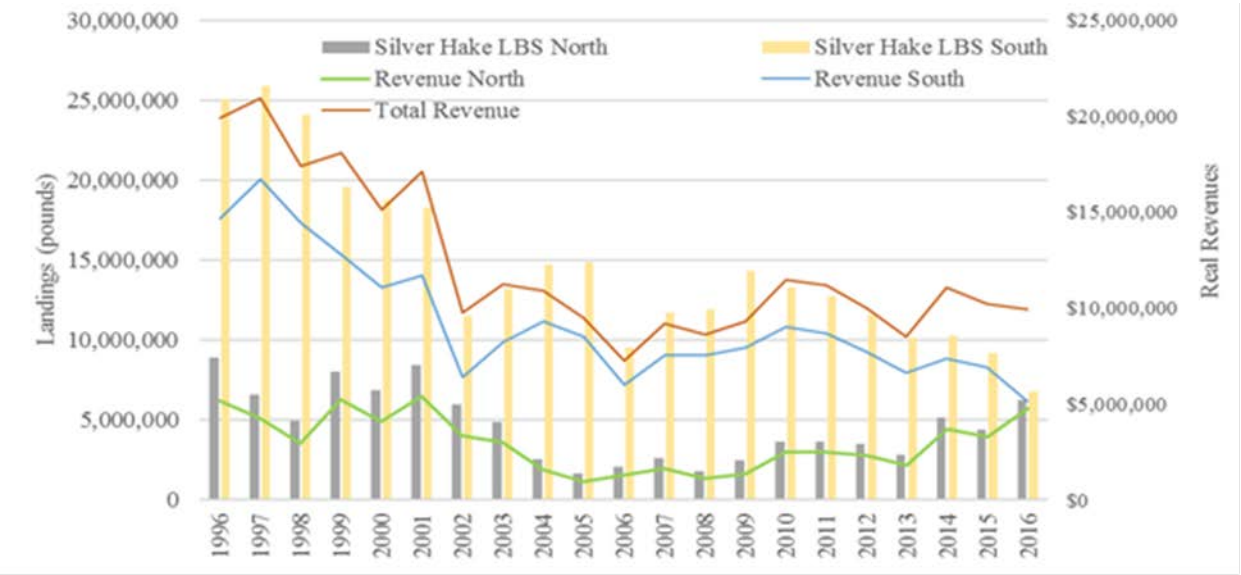


Figure 17 presents silver hake landings by gear types. Nearly all landings were made with trawl gear. Other gears—gillnet, mid-water trawl and other gears landed very nominal amount of silver hake.

Figure 17. Silver hake landings (lbs) by gear type, 1996-2016.

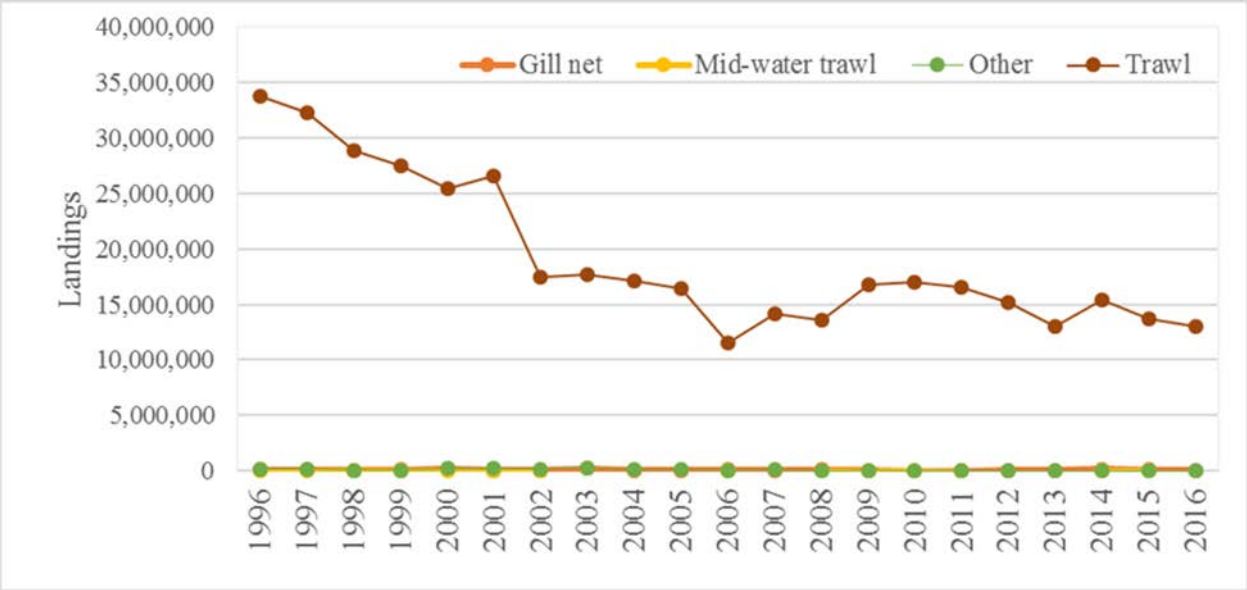
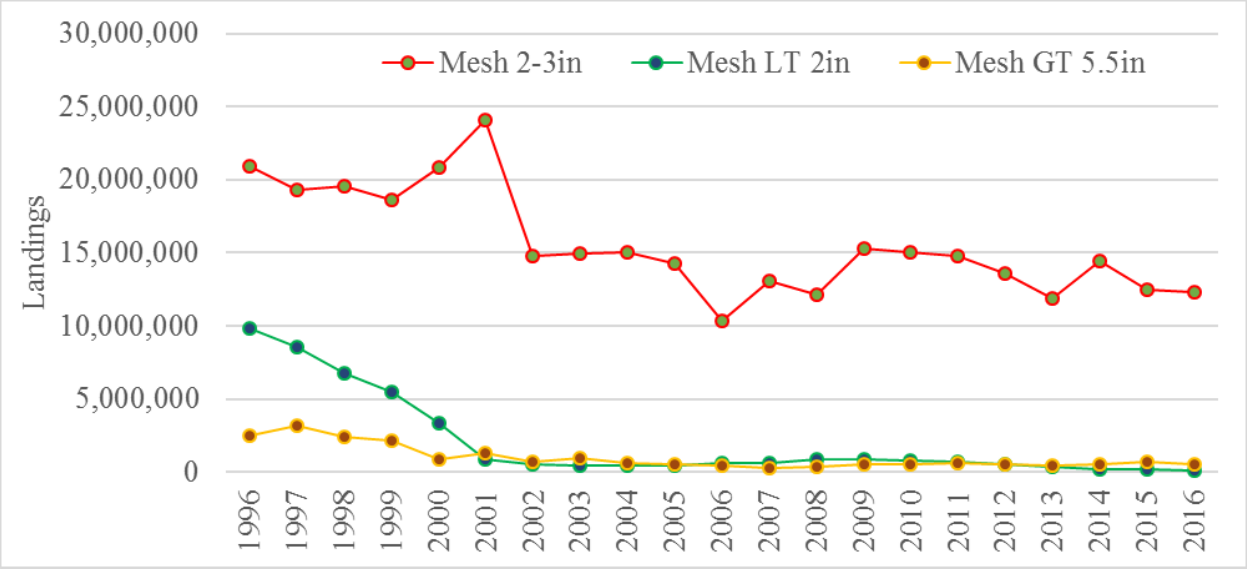


Figure 18 shows trends in silver hake landings for vessels fishing with trawls, by mesh size. The majority of landings were made with mesh size between 2" and 3". Prior to 2001, mesh sizes of less than 2" and greater than 5.5" were used to land a good volume of silver hake, but the landings by these mesh sizes declined sharply since 2001.

Figure 18. Silver hake landing (lbs) by mesh sizes, 1996-2016



Red hake landings and revenue peaked at 4.18 mil pounds and $2.675 mil in 2001 (Figure 19). However, they both declined sharply since 2002. Aggregate volume of red hake landings from the Southern Area is much higher relative to the landings from the Northern Area. Southern Area landings have ranged from 0.77 mil pounds in 2016 to 3.17 mil in 2002. Northern Area landings have ranged from 0.144 mil pounds in 2014 to 1.375 mil pounds in 1996.

Figure 19. Red hake landings (lbs) by management area and total red hake revenue (in 2016$).

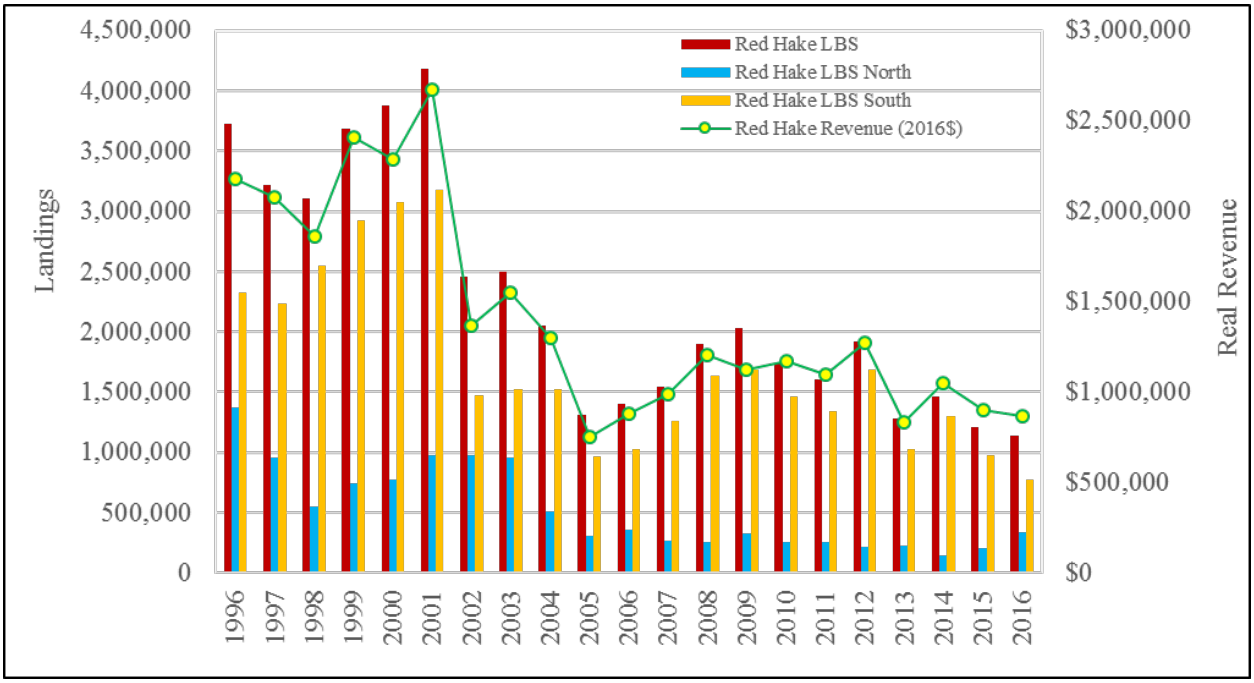


Figure 20. Red hake landing (lbs) by gear type, 1996-2016.

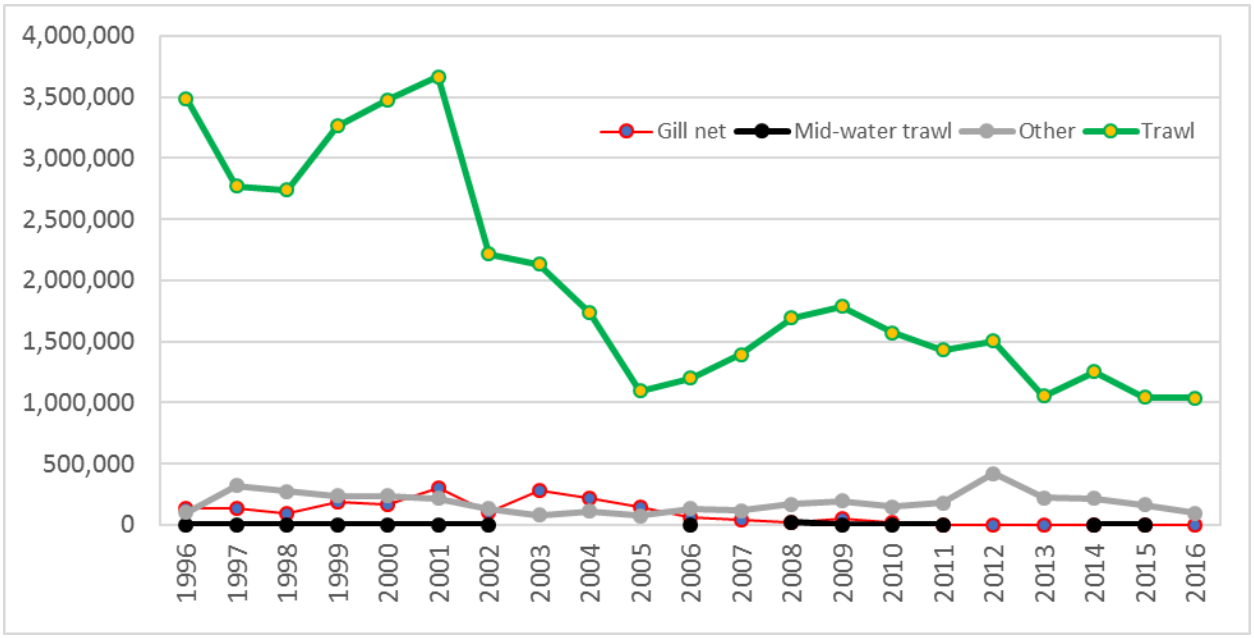


Figure 21 shows the trend in the small-mesh multispecies landings by trips with 2,000 lbs or more whiting. For the high-volume small-mesh multispecies landing trips, major portion of the landings had silver hake. The majority of the hake landings were made by the trips with 2,000 lbs. or more of whiting trips. However, the number of trips with 2,000 lbs. or more have declined precipitously from about 3,100 trips in 1996 to around 800 trips in 2016 (Figure 21). Figure 22 presents small-mesh multispecies landings and effort levels by management area (w/ trips 2,000 lbs. or more whiting). Until 2015, about

two thirds of hake landings used to come from the Southern Area, but the proportion of volumes are near equal in 2016. Figure 23 also examines the annual average CPUE levels (lbs./trip) by management area for the trips that landed 2,000 lbs. or more whiting. In recent years, the annual average CPUE has been increasing in both management areas. Figure 24 and Figure 25 show annual silver hake landings and corresponding number of trips (w/ trips 2,000 lbs or more) by mesh sizes in northern and southern area, respectively.

Figure 21. Annual silver hake and small-mesh multispecies landings (w/ trips ≥ 2,000 lbs whiting) and effort levels (no. of trips), 1996-2016.

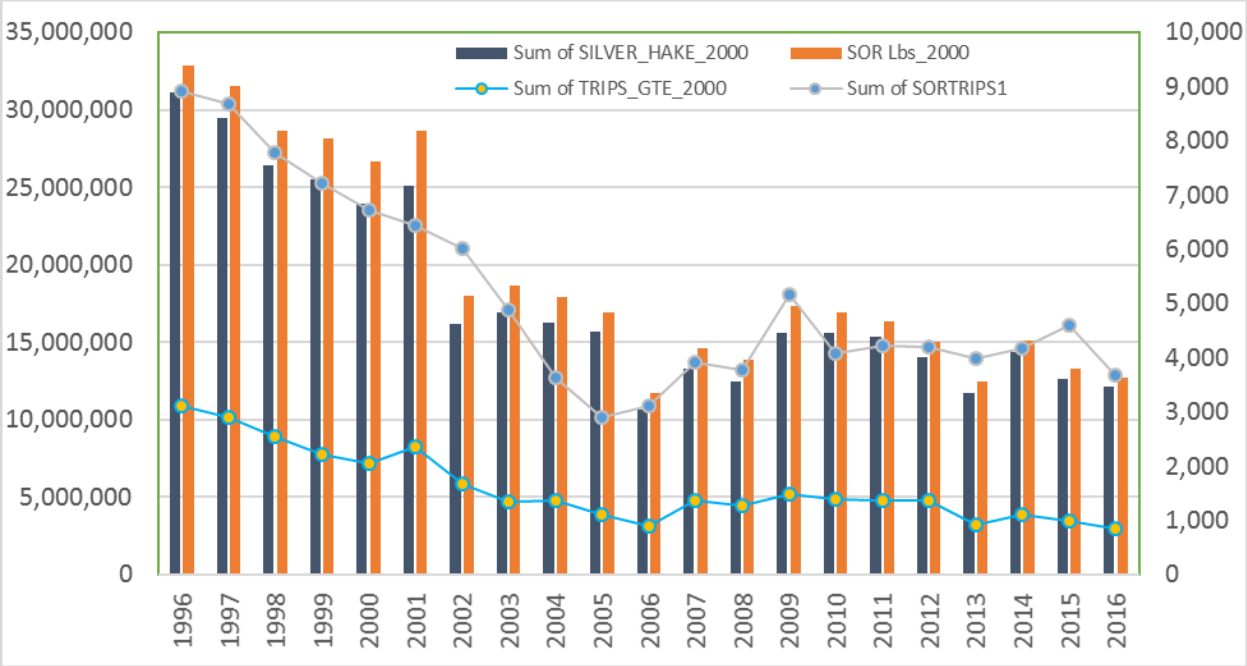


Figure 22. Small-mesh multispecies landings and effort levels by management area (w/ trips ≥ 2,000 lbs whiting), 1996-2016.

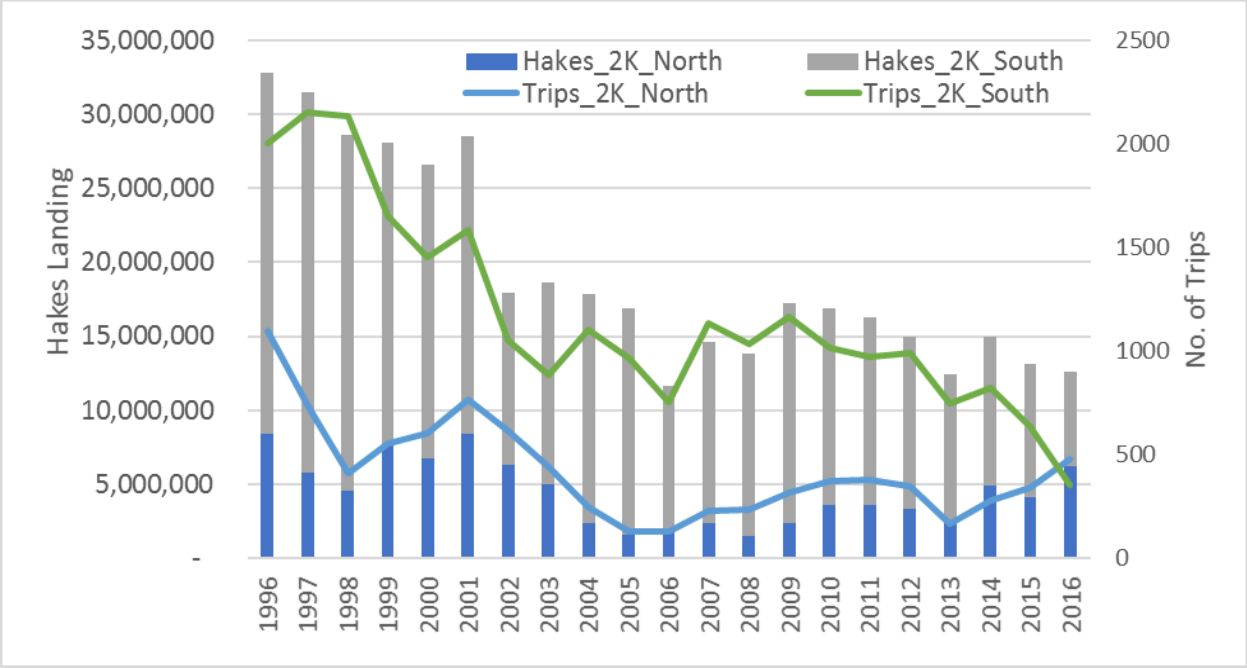


Figure 23. Small-mesh multispecies landings (lbs) and CPUE levels (lbs/trip) by management area (w/ trips ≥ 2,000 lbs.), 1996-2016.

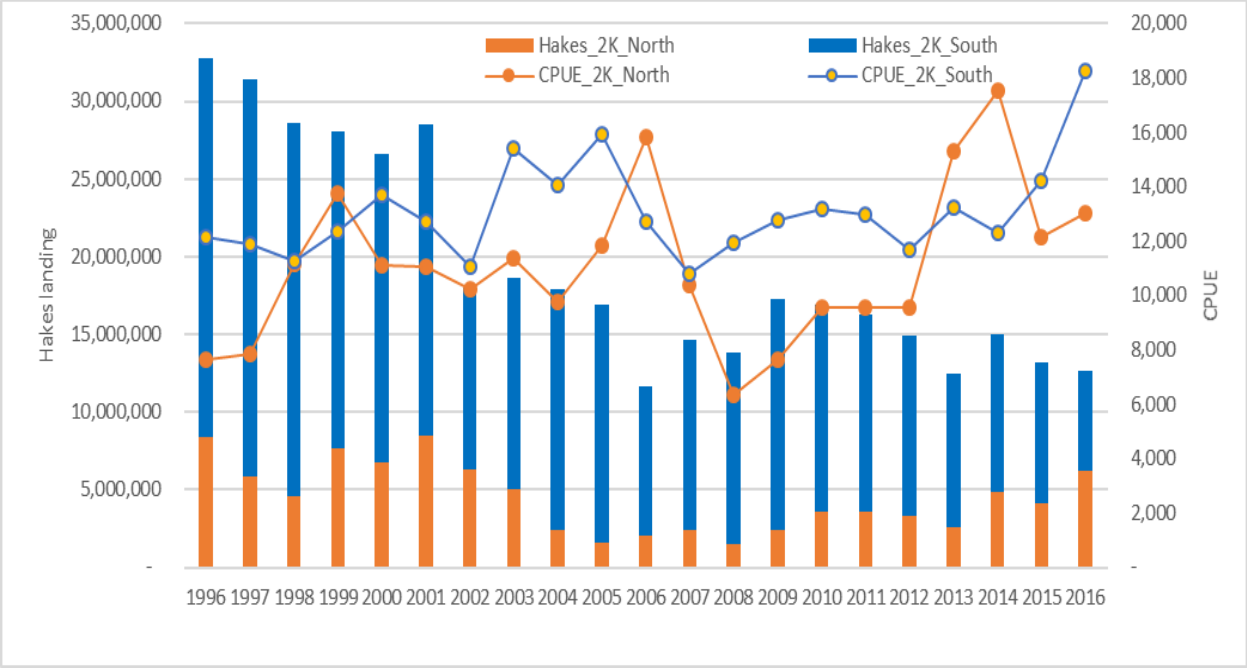


Figure 24. Silver hake landing (lbs) and number of trips (w/ trips ≥ 2,000 lbs whiting) by mesh size in the northern management area, 1996-2016.

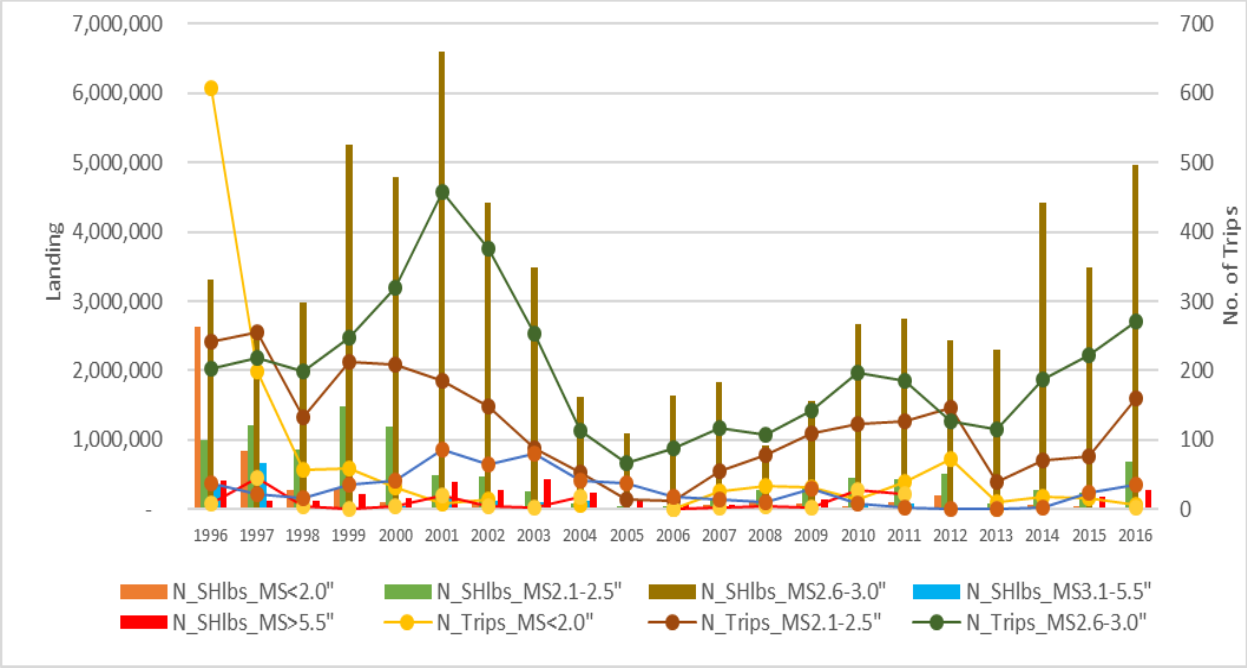
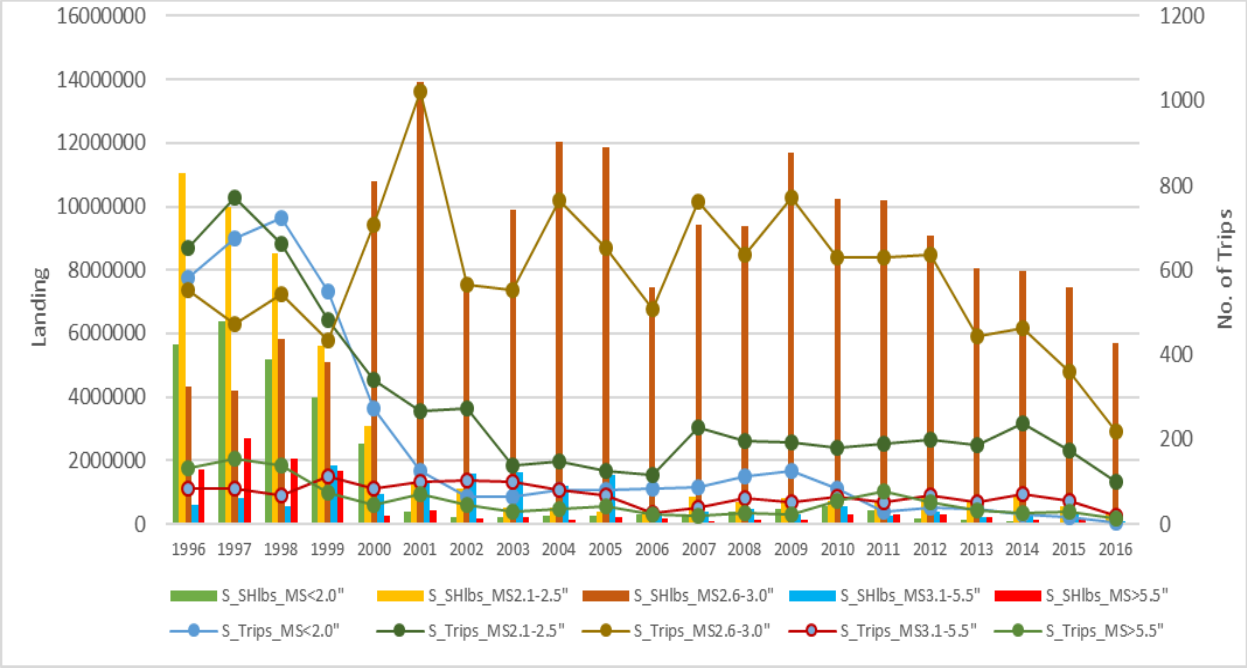


Figure 25. Silver hake landing (lbs) and number of trips (with trips ≥ 2,000 lbs whiting) by mesh sizes in the southern management area, 1996-2016.



Generally, silver hake prices are significantly higher than that of red hake. Both nominal (Figure 26) and real prices (Figure 27) of silver hake have risen since 2010. From 1996 to 2010, the real price of silver hake fluctuated around $0.60 per pound. The nominal price of red hake has also increased over the years,

but has fluctuated less than that of silver hake price. In 2016, the average real price of silver and red hake were $0.76 and $0.48 per pound, respectively.

Figure 26. Nominal prices of silver and red hake, 1996-2016.

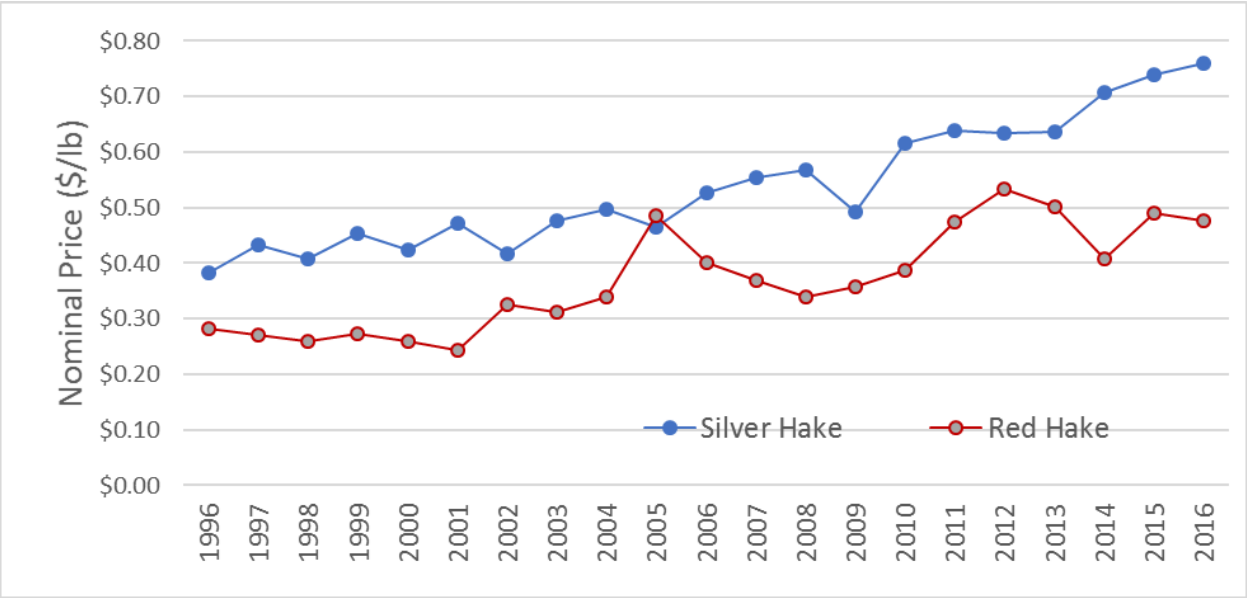
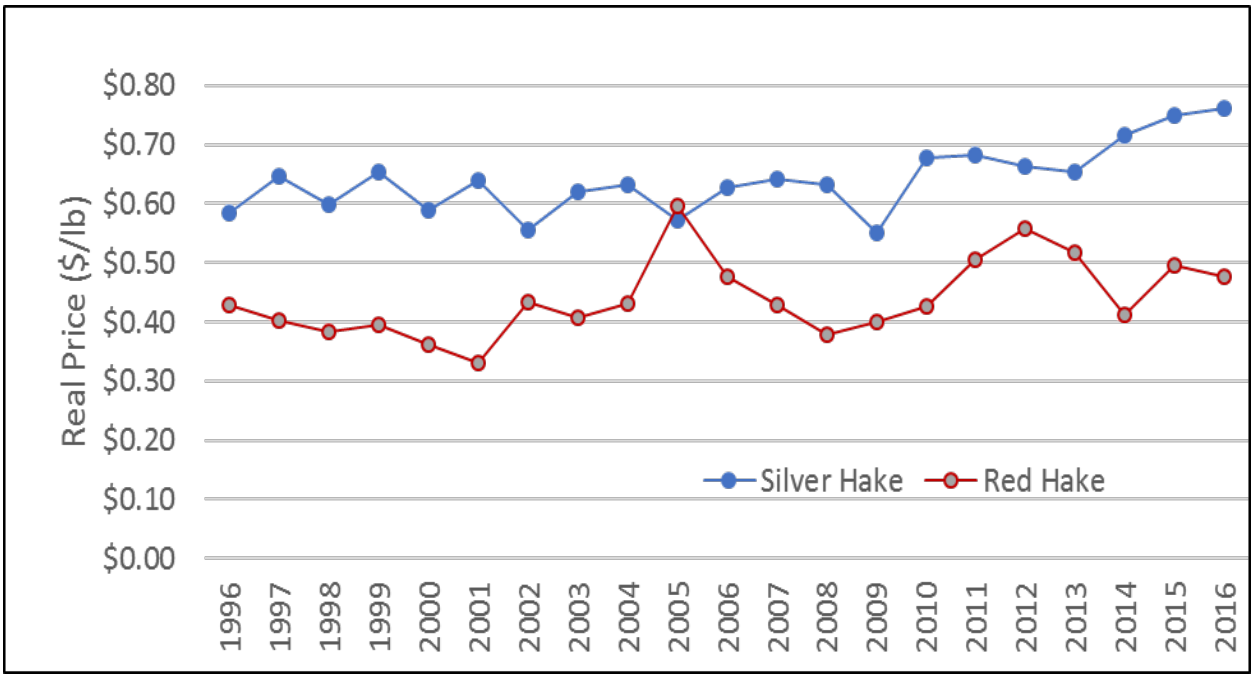
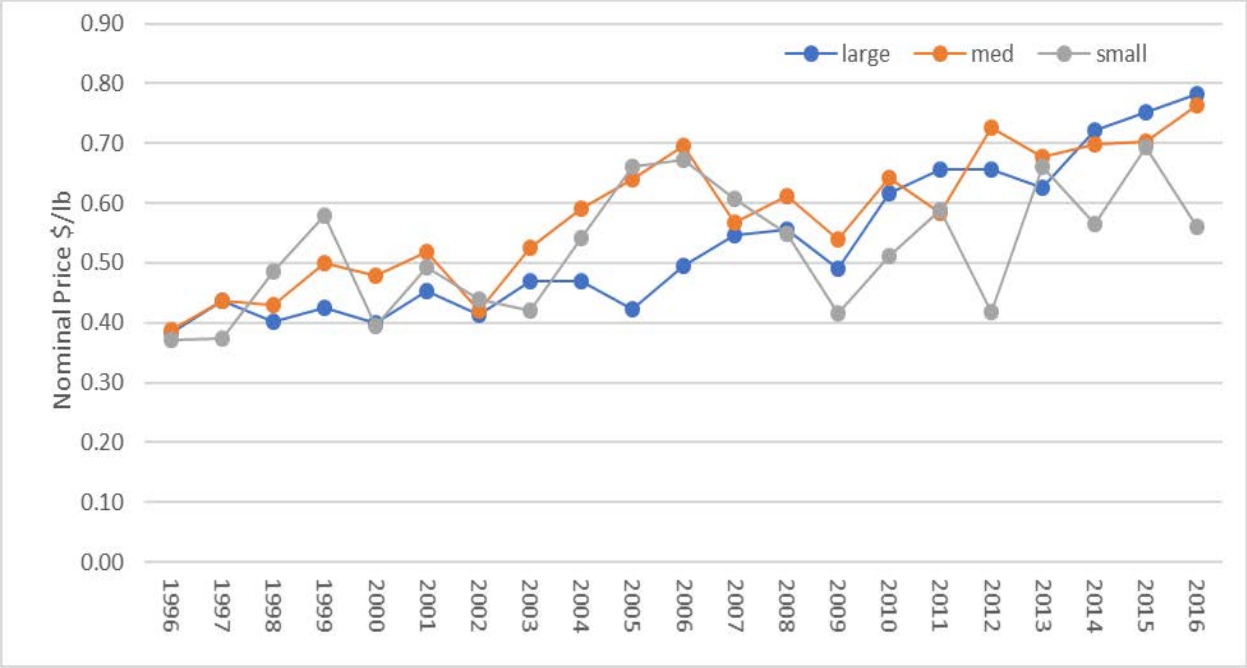


Figure 27. Inflation adjusted real prices (in 2016$) of silver and red hake, 1996-2016.



Nominal prices of silver hake were lowest for the landings of large size vessels (>100 GRT) for 57% of the years from 1996 to 2009. However, the prices have since been comparable with those of medium size vessels (50-100 GRT) and higher than those of small size vessels (<50 GRT). Since 2014, landings by large size vessels fetch highest price (Figure 28).

Figure 28. Nominal price ($/lb) of silver hake by vessel size classes, 1996-2016

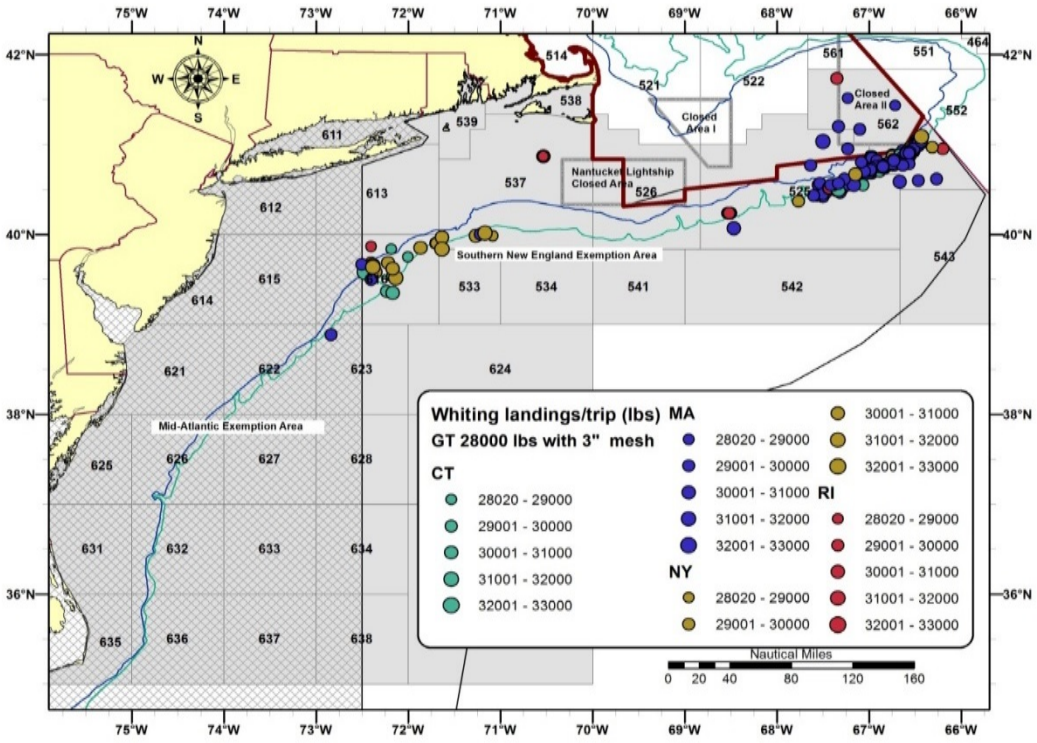


Whiting landings are regulated by possession limits that vary with the trawl mesh size and by stock area. These limits have helped maintain catches at or below sustainable levels since becoming effective in 2003. Since this amendment is considering increasing the Southern whiting possession limit, it is important to characterize the fishery with respect to landings per trip and the geographical distribution of fishing effort in the Southern stock area.

Landings of silver hake come from a variety of fishing activities, including small mesh trawl fishing that targets silver and offshore hake, small mesh trawl fishing that targets other species (e.g. shrimp, squid, herring), and large mesh fishing targeting groundfish, skates, monkfish, and summer flounder. Vessels using trawls with 2.5 inch or smaller mesh may not possess more than 3,500 pounds of silver and offshore hake, while vessels using trawls with 2.5 to 3-inch mesh may not possess more than 7,500 pounds of silver and offshore hake. Vessels using larger mesh may possess up to 30,000 pounds of silver and offshore hake.

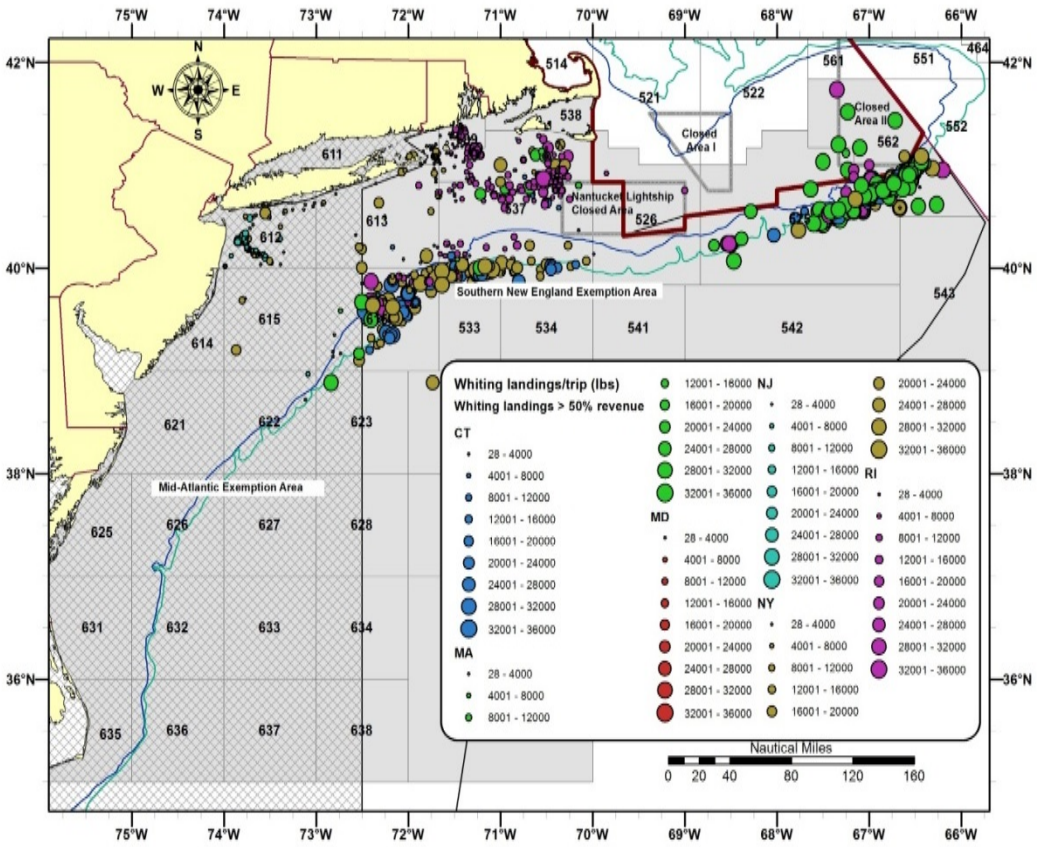
Vessels using 3 inch or larger mesh may possess and land up to 30,000 pounds of whiting. Nearly all of the high landings on trips targeting whiting are made by vessels fishing along the Mid-Atlantic continental shelf edge and along the Southern edge and eastern portion of Georges Bank (Map 4). Almost all trips landing more than 28,000 pounds and targeting whiting fished in the Southern New England Exemption Area, according to VTR data. Trips landed fish in CT (mainly New London), MA (mainly New Bedford), NY (mainly Montauk), and RI (mainly Point Judith). Most trips landing in NY were reported to fish around and just north of Hudson Canyon in statistical areas 537 to 616. Most of the trips landing in MA and RI were reported to fish on Southern Georges Bank, east of Munson Canyon, in statistical areas 525 and 562. According to the data, some trips appear to have ventured into the Gulf of Maine/Georges Bank exemption area (delineated by the red line in Map 4), but the reported positions on the VTRs are probably erroneous and the trip actually fished on the Southern edge of Georges Bank, in the Southern New England Exemption Area.

Map 4. Reported fishing locations and state of landing for 2009-2011 trips targeting whiting while using trawls having 3 inch or larger mesh and landing more than 28,000 pounds. Source: Dealer reported landings data matched to VTR data.



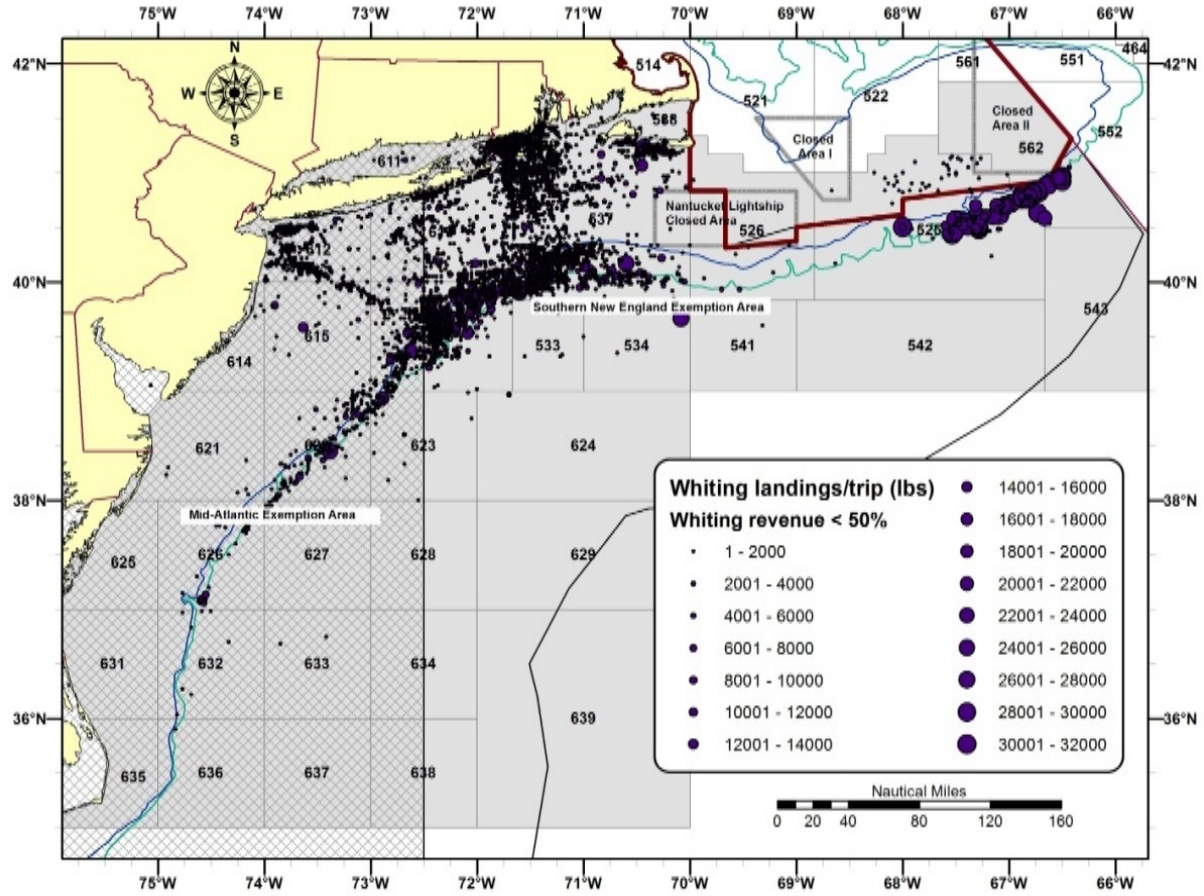
Trips targeting whiting but landings less than 28,000 pounds are more diversified, geographically (Map 5). In addition to the above trips, there are more trips spread out along the Southern New England shelf edge in statistical areas 537 and 616, some trips using 3-inch mesh and other trips using smaller mesh. There is also an inshore whiting fishery using 2.5-inch or smaller mesh inshore in Southern New England, from Block Island to Martha's Vineyard in statistical area 537. There was also a small inshore whiting fishery in statistical area 613, off Ambrose Lightship, landing whiting in NJ (Point Pleasant and Belford) and NY (Southern Long Island).

Map 5. Reported fishing locations and state of landing for 2009-2011 trips targeting whiting while using trawls. Source: Dealer landings data matched to VTR data.



Whiting are also landed by larger mesh fisheries targeting other species, over a wider geographical range (Map 6). These trips range along the shelf edge from VA to MA, many trips targeting squids, summer flounder, and other species with a variety of mesh sizes. More inshore, trips fishing for other species often land whiting when fishing from NJ (Hudson Canyon) to RI and MA (statistical areas 537 and 538).

Map 6. Reported fishing locations for 2009-2011 trips targeting species other than whiting while using trawls. Source: Dealer landings data matched to VTR data.

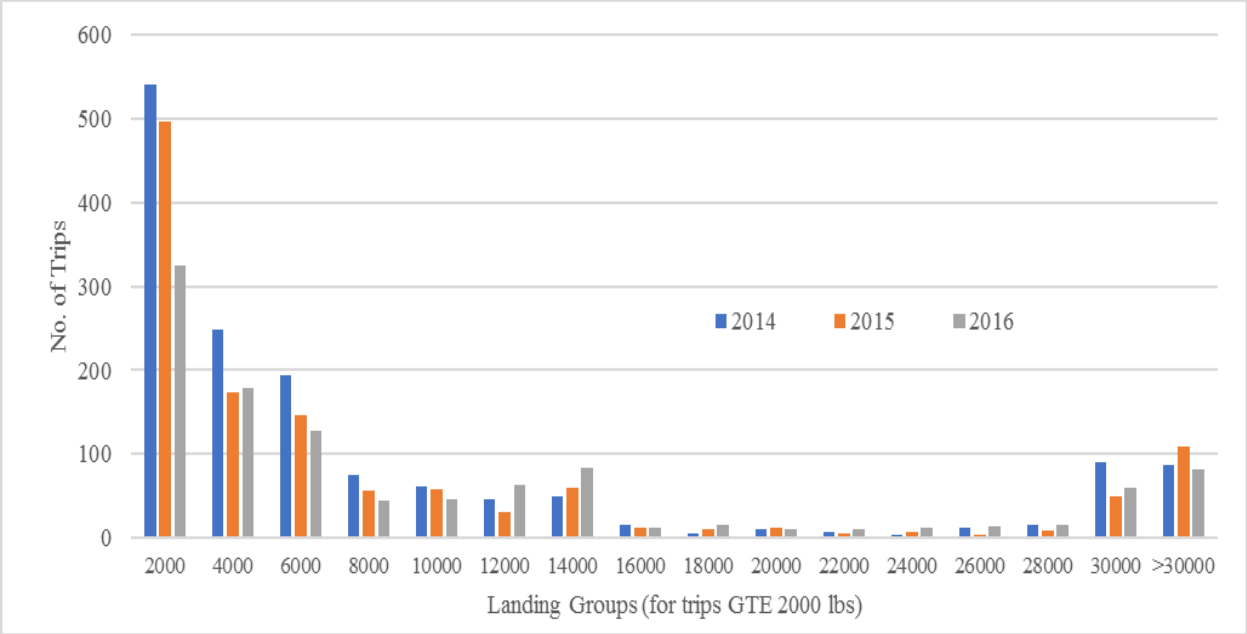


Frequency of trips landing in 2014-2016

For the trips that landed 2,000 or more pounds of silver hake, majority of those trips landings below 8000 pounds in recent years (2014-2016). There were also trips that landed around 30,000 pounds and more. However, the maximum landing in a trip was around 43,000 pounds during the recent years.[15] Figure 29 presents the frequency of trips by landing volume in recent years and Figure 30 presents the cumulative number of trips for the landing volume. The nature of landings and corresponding trip numbers have similar patterns as in during 1999-2001 and 2009-2011.

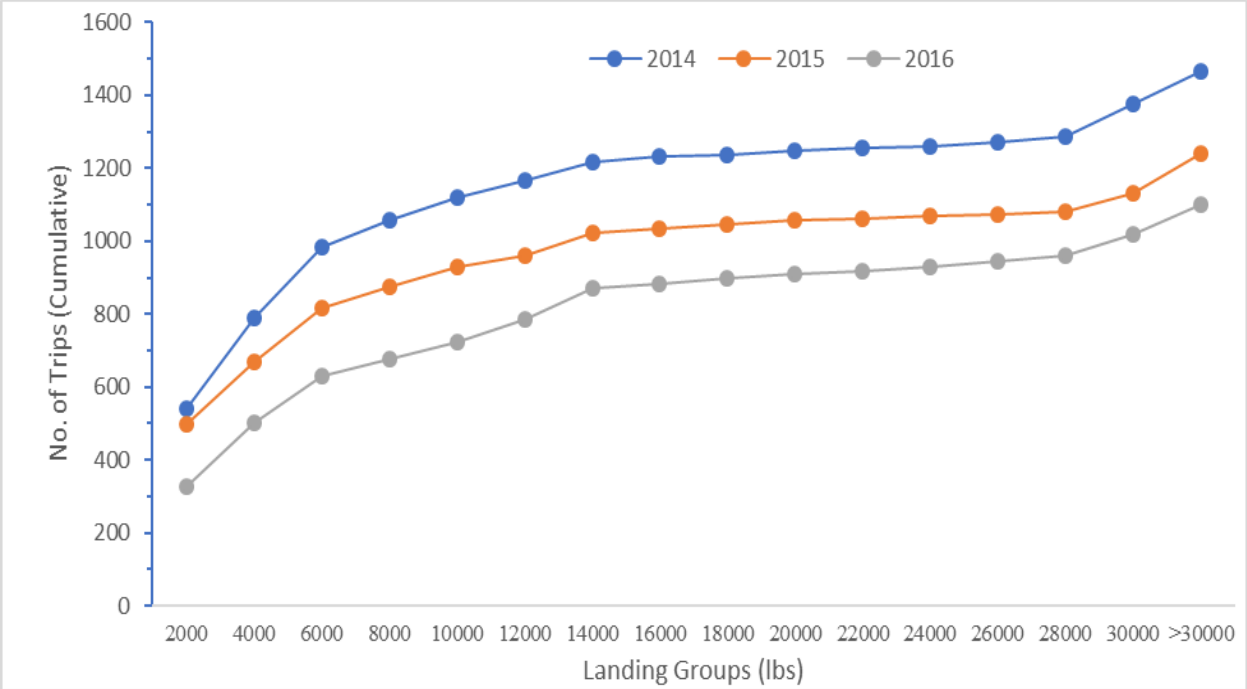
15 There are a few trips in this figure that appear to land more than 30,000 pounds of silver hake, more than the legal limit. This may reflect landings from different trips being reported as being landed in the same day for a permit or reporting mistakes by the dealer. However, the vast majority of trips are reported to land LTE 30,000 pounds.

Figure 29. Frequency of silver hake landings per trip, 2014-2016.



Source: VTR landings with trips landings less than 2,000 pounds are excluded.
Note: Landing group example, i.e., 2,000= 2,000-4,000 pounds, 4,000=4,000-6,000, etc. The last two groups in X-axis is landing volume of 30,000 pounds and greater than 30,000 pounds.

Figure 30. Cumulative frequency of whiting landings per trip, 2014-2016.



Source: VTR landings with trips landings less than 2,000 pounds have been excluded from the figure.
Note: Landing group example, i.e., 2,000= 2,000-4,000 pounds, 4,000=4,000-6,000, etc. The last two groups in X-axis is the group of 30,000 pounds and greater than 30,000 pounds.

5.4.3.2 Red hake landings and revenue

Landings of red hake peaked in 2001 at 4.184 pounds and real revenue (inflation adjusted in 2016 $) was also the greatest ($2.7 mil) in this year (Table 29). The lowest red hake landings occurred in 2016; while in 2005, there was the least amount of revenue earned from red hake ($0.8 mil). Peak landings in the Northern management area were 1.4 mil pounds in 1996, which earned $0.9 mil in real revenue (Table 30). The lowest red hake landings in the Northern area occurred in 2008 with 0.21 mil pounds, earning $0.13 mil in real revenue. Landings in the Northern area have dropped significantly since 2005, earning real revenue ranged from $0.13 mil to $0.26 mil.

Landings of red hake in the Southern area also account for over two-thirds of the total red hake landings (Table 30). Peak landings in the Southern area were in 2001 and were 3.173 mil pounds, earning approximately $1.8 mil in real revenue. The lowest landings occurred in 2016 and were 0.774 mil pounds, earning approximately $0.510 mil (and is also the lowest revenue from red hake in the Southern stock area over the past two decades).

The distribution of trips that landed red hake is skewed in recent years (2014-2016), as considerable number of trips landed less than 400 pounds of red hake in a fishing trip (Figure 31). The cumulative distribution of trips with red hake landings indicate that majority of the trips had landings below 2,000 pounds although few trips had landings up to 11000 pounds (Figure 32).

Table 29. Annual red hake landings (pounds) and real revenue (1996-2016).

Year	Red Hake (lbs.)	Real Revenue	Year	Red Hake (lbs.)	Real Revenue
1996	3,724,557	$2,179,102	**2006**	1,399,139	$878,277
1997	3,218,595	$2,079,042	**2007**	1,539,892	$989,100
1998	3,105,399	$1,860,863	**2008**	1,900,798	$1,202,528
1999	3,680,188	$2,409,663	**2009**	2,033,501	$1,122,377
2000	3,873,913	$2,286,338	**2010**	1,733,795	$1,174,825
2001	4,183,559	$2,675,958	**2011**	1,610,371	$1,098,097
2002	2,454,275	$1,366,697	**2012**	1,919,186	$1,271,280
2003	2,493,860	$1,549,594	**2013**	1,276,089	$835,359
2004	2,055,735	$1,297,651	**2014**	1,463,920	$1,048,322
2005	1,312,231	$750,078	**2015**	1,204,890	$901,936
			2016	1,136,298	$864,736
Source: NEFSC VTR data, accessed 2017.					

Table 30. Annual red hake landings (pounds) and real revenue by Northern and Southern stock area.

Year	Management Area		Real Revenue (in 2016$)	
	Northern	Southern	Northern	Southern
1996	1,375,579	2,328,133	$866,253	$1,466,111
1997	958,034	2,234,905	$460,400	$1,074,024
1998	554,729	2,548,361	$404,636	$1,858,849
1999	738,533	2,924,662	$804,388	$3,185,453
2000	777,783	3,073,408	$644,964	$2,548,575
2001	978,333	3,173,806	$553,603	$1,795,942
2002	972,855	1,470,423	$368,041	$556,275
2003	959,220	1,522,054	$928,486	$1,473,287
2004	512,011	1,523,985	$315,496	$939,063
2005	304,297	962,503	$164,994	$521,882
2006	360,189	1,030,961	$226,499	$648,304
2007	271,366	1,263,629	$130,816	$609,150
2008	254,272	1,639,477	$147,734	$952,550
2009	328,889	1,689,948	$258,457	$1,328,046
2010	253,054	1,467,152	$156,646	$908,198
2011	256,937	1,338,382	$186,801	$973,047
2012	210,717	1,683,686	$262,423	$2,096,830
2013	225,039	1,027,289	$217,011	$990,641
2014	144,304	1,296,283	$140,541	$1,262,478
2015	209,078	972,686	$130,168	$605,576
2016	333,117	774,453	$219,660	$510,681

Source: NEFSC VTR data, accessed 2017.

Figure 31. Frequency of red hake landings per trip, 2014-2016.

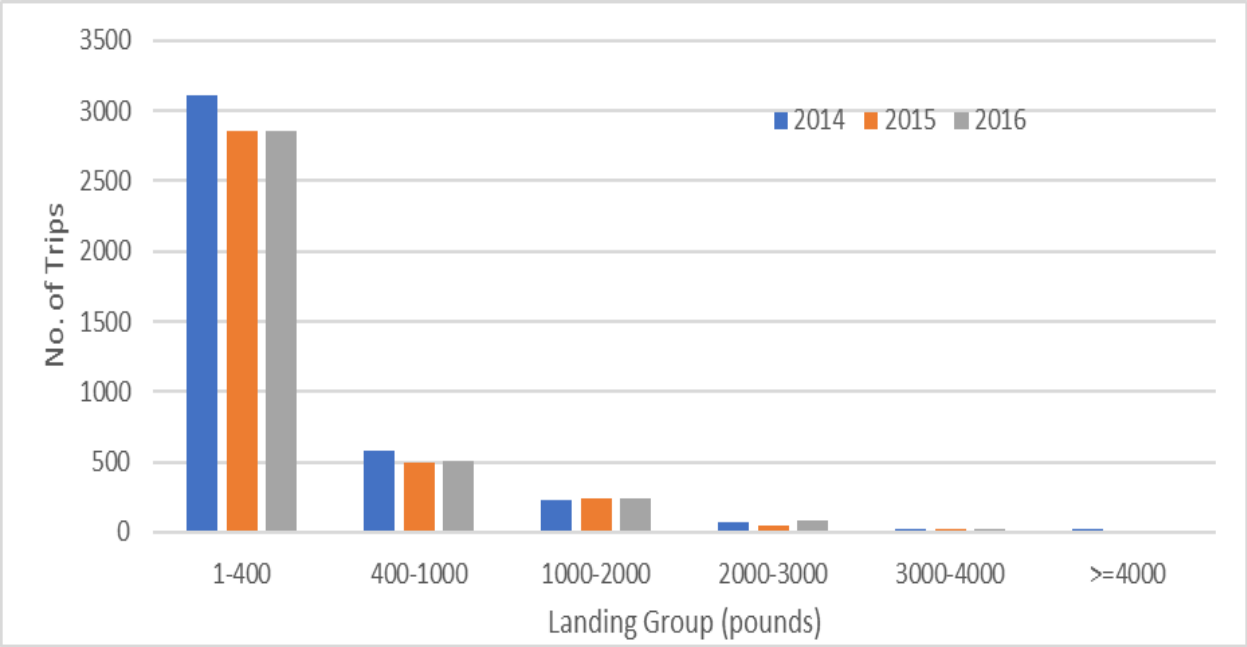
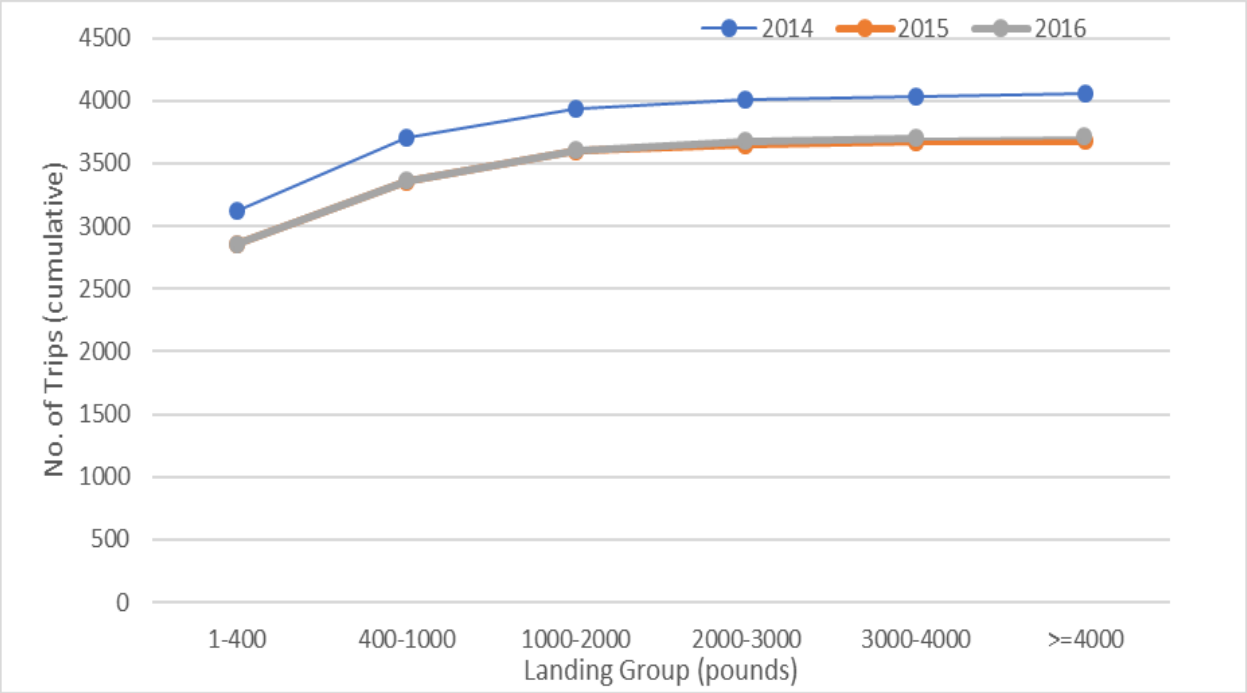


Figure 32. Cumulative frequency of red hake landings per trip, 2014-2016.



5.4.4 Price-Quantity Relationships

Over the past two decades, a simple regression analysis suggests an inverse relationship between the annual landings of small-mesh multispecies and annual average prices. Real price (in 2016$) decreased by about 0.01 cents for an increase in one metric ton of red hake landings. Similarly, real price of whiting decreased by about 0.0007 cents for an increase in a metric ton of whiting landings (Figure 33 and Figure 34).

Figure 33. Price – Quantity relationship for red hake, 1996-2016.

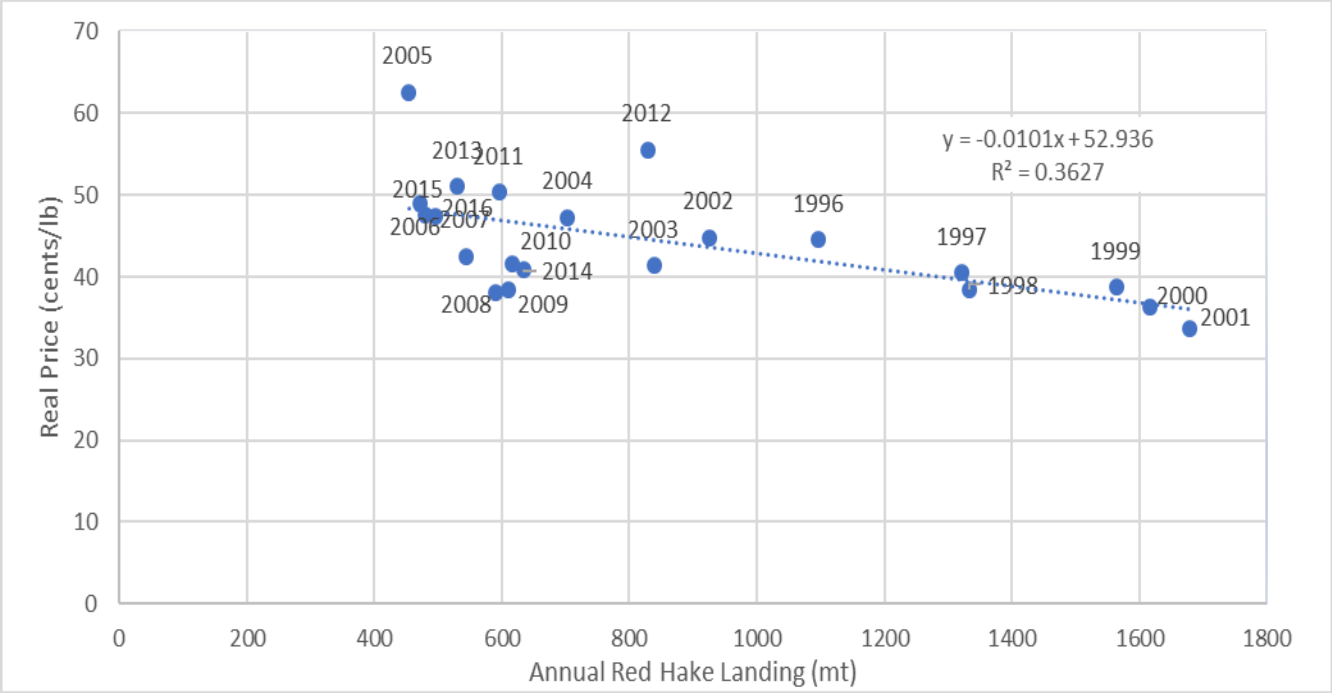
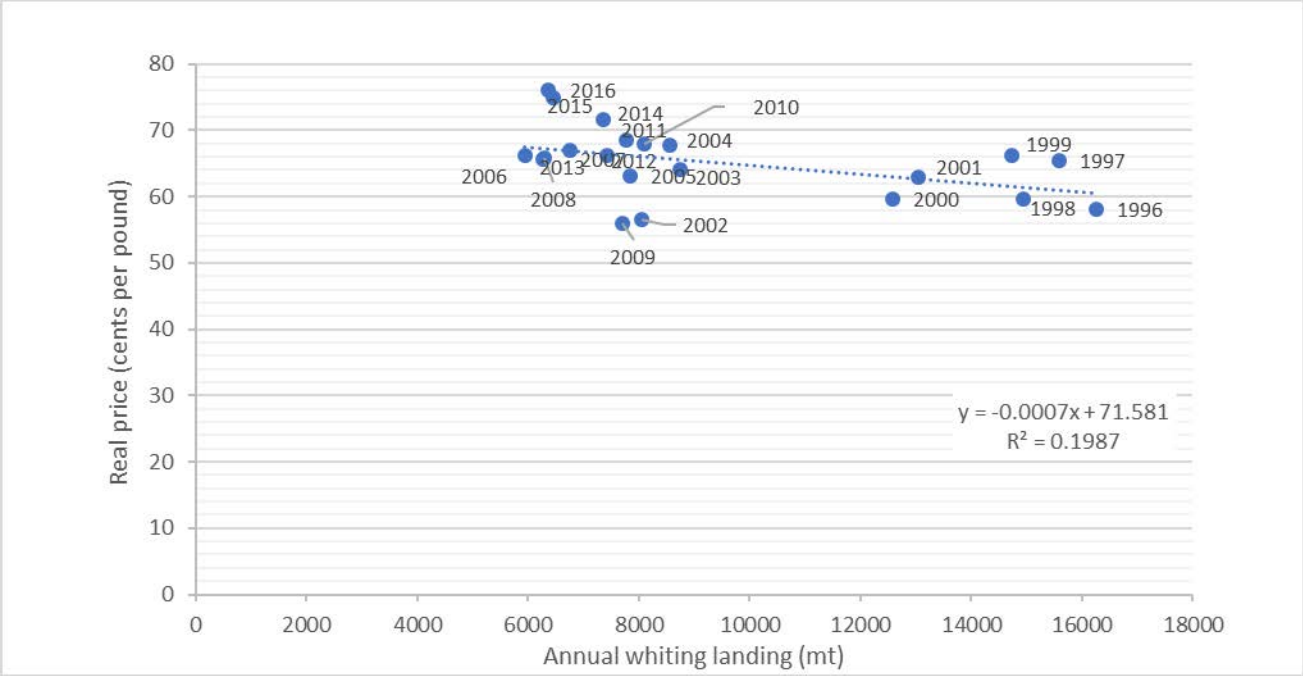


Figure 34. Price-Quantity relationship for whiting, 1996-2016.



5.4.5 Fishing Communities

5.4.5.1 Introduction

Consideration of the economic and social impacts on fishing communities from proposed fishery regulations is required by the National Environmental Policy Act (NEPA 1970) and the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA 2007).
National Standard 8 of the MSFCMA (16 U.S.C. § 1851(a)(8)) 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."*

A "fishing community" is defined in the MSFCMA (16 U.S.C. § 1802(17)), 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."*

Determining which fishing communities are "substantially dependent" on and "substantially engaged" in the small-mesh multispecies fishery can be difficult. 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 ports that may only have a small number of active vessels.

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

National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. "Sustained participation" is interpreted as continued access to the fishery within the constraints of the condition of the resource.

5.4.5.2 Communities of Interest

There have been over 238 port communities that have been a homeport or landing port to one or more active small-mesh multispecies vessels since 1996. These ports primarily occur from Maine to New

Jersey. The level of activity in the small-mesh multispecies fishery has varied across time. This section identifies the communities for which whiting and red hake are particularly important. Information in this section is largely based on demographic data collected by the U.S. Census and fishery data collected by NMFS, much of which are available on the NEFSC website (link???). Clay et al. (2007) has a detailed profile of each port, including important social and demographic information. While these data describe a community's dependence on the small-mesh multispecies fishery, it is important to remember that at least some of the individual vessels therein are even more dependent on the fishery. In some cases, groups of communities identified above have been disaggregated so that information specific to certain communities can be provided and so that important details about individual communities are not lost.

Community of Interest Criteria. There are 18 *Communities of Interest* for the small mesh multispecies fishery, which meet at least one of the following criteria (Table 31):

1. Cumulative whiting and red hake landings of at least 5M pounds (2,300 mt) between 1996-2016.
2. Whiting and red hake landings of at least 200,000 pounds (91 mt) in 2016.

Table 31. *Communities of Interest* in the small mesh multispecies fishery.

State	Community	Landings				
		≥5M lbs., 1996-2016	**≥200K lbs., 2016**	**≥500K lbs., 2016**	**≥1M lbs., 2016**	**≥3M lbs., 2016**
ME	Portland	√				
NH	Seabrook	√	√			
MA	Gloucester	√	√	√	√	√
	Boston		√			
	Provincetown	√	√			
	New Bedford	√	√	√	√	√
RI	Newport	√				
	Point Judith	√	√	√	√	√
CT	Stonington	√				
	New London	√	√	√		
NY	Greenport	√				
	Montauk	√	√	√	√	
	Shinnecock	√				
	Hampton Bay	√				
	Point Lookout	√				
	New York City	√	√			
NJ	Belford	√				
	Point Pleasant	√				

5.4.5.3 Community Characteristics

Table 32 presents some economic characteristics of top nine ports in landing small-mesh multispecies in 2016 – a subset of the *Communities of Interest*. The value of small-mesh multispecies to total value of all fish landed in those ports range between 1 to 90%. Gloucester (MA) had the largest number of trips (n=339 trips) whose revenues were >50% from whiting. The top port for landing whiting, New Bedford (MA) had about 1.1% of total port value of landing from hake species; Point Judith and Gloucester had 4% of fish value from small-mesh multispecies; Montauk had 7.6% of fish value from small-mesh multispecies; and New London had 15% of fish value from small-mesh multispecies.

Table 33 and Table 34 show participation of fishermen in terms of number of trips landing 2,000 lbs. or more small-mesh multispecies at various ports in 1996 and 2016. Many ports had begun to have few trips landed after 2001. Fishermen participation in landing silver hake in major ports have declined significantly over the past two decades, as only three ports in 2016 against nine in 1996 had over 100 trips that landed 2,000 lbs. or more silver hake. While many ports with trips 2,000 pounds or more have declined significantly in trip landings, only New Bedford, MA experienced a rise of trips with landing volumes of 2,000 lbs. or more. While many ports had begun to have few landed small-mesh multispecies trips as early as 1997, about 25% of the ports have maintained relatively stable number of trips landing one or more pounds throughout 1996-2016 due to the port's participation in other fisheries with incidental small-mesh multispecies landings.

Table 32. Top nine ports for landing whiting and their other economic characteristics in 2016.

ST	Top Ports in 2016	Dealers	Whiting Live LB	Red Hake Live LB	Whiting Value	Red Hake Value	Whiting Target Trips	Whiting Trips	Sum of Landing Events, all trips	Landing Live LB (All Fish)	Total Value (All Fish)	Ratio
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(I)	(J)	(K)	(E+F)/ (K)
MA	New Bedford	86	3,789,176	65,357	$3,461,340	$38,829	125	294	10,834	410,820,837	$326,329,306	0.011
RI	Point Judith	50	3,669,765	391,709	$2,065,797	$138,336	117	2,558	23,823	58,789,078	$55,731,437	0.040
MA	Gloucester	74	2,980,214	172,797	$2,028,907	$54,072	339	1,750	21,753	66,414,851	$52,854,591	0.039
NY	Montauk	42	1,186,498	218,359	$1,169,698	$130,414	122	878	10,369	12,601,398	$17,068,995	0.076
CT	New London	19	678,790	81,412	$664,795	$65,422	115	242	1,626	9,072,205	$4,881,024	0.150
NY	New York City	6	483,810	12,425	$310,474	$6,478	36	36	139	534,226	$349,813	0.906
NH	Seabrook	4	302,998	22,248	$250,985	$10,189	118	387	2,871	1,689,660	$2,725,660	0.096
MA	Provincetown	22	217,325	268	$80,425	$116	39	43	3,475	7,587,021	$8,187,669	0.010
MA	Boston	18	216,497	-	$170,223	$0	18	201	2,578	12,810,968	$16,961,715	0.010
Source: NMFS dealer data, accessed 2017.												

Table 33. Trips landing ≥ 2,000 pounds of small-mesh multispecies in Communities of Interest, 1996-2016.

Landed Port		1996		2016		Note
		trips	rank	trips	rank	
ME	Portland	453	2	<100	>3	Peak in 1996; generally declined trend since 1996; minimal since 2008.
NH	Seabrook	<100	>9	<100	>3	Fluctuating; peak in 2012.
	Rye	<100	>9	<100	>3	None or minimal until 2009; peak in 2012.
MA	Gloucester	409	3	230	1	Peak in 1996; fluctuated, but generally declining trend.
	Boston	<100	>9	<100	>3	None until 1998; fluctuating since; peak in 2015.
	Provincetown	110	9	<100	>3	Peak in 2001; declining since 2011.
	New Bedford	<100	>9	145	3	Peak in 2003; generally increasing trend.
RI	Newport	<100	>9	<100	>3	Peak in 2001; decreasing trend; zero since 2012.
	Point Judith	801	1	179	2	Peak in 1998; decreasing trend.
CT	Stonington	<100	>9	<100	>3	Peak in 2001; fluctuating trend.
	New London	159	8	<100	>3	Peak in 1996; declining trend.
NY	Greenport	201	6	<100	>3	Peak in 1996; declining trend; zero since 2012.
	Montauk	217	4	<100	>3	Peak in 1998; generally declining trend.
	Shinnecock	205	5	<100	>3	Peak in 1998; generally declining trend.
	Hampton Bay	<100	>9	<100	>3	Peak in 1997; declining trend.
	New York	<100	>9	<100	>3	None or minimal until 2011, then increasing.
NJ	Belford	<100	>9	<100	>3	Peak in 2009; fluctuating trend.
	Point Pleasant	174	7	<100	>3	Peak in 1997; declining trend.
Total		**2,967**		**563**		

Source: NEFSC VTR data, accessed 2017.

Table 34. Trips landing ≥ 1 pounds of small mesh multispecies in landing ports, 1996-2016.

Landed Ports		1996		2016		Notes
		Trips	Rank	Trips	Rank	
ME	Portland	793	3	175	7	Peak in 1996; generally decreasing.
NH	Portsmouth	566	5	<100	>11	Peak in 1996; generally decreasing.
	Rye	201	14	<100	>11	Peak in 1997; fluctuating
	Hampton	287	11	<100	>11	Peak in 1996, generally decreasing
	Seabrook	282	9	311	4	Peak in 2001; fluctuating.
MA	Newburyport	233	12	<100	>11	Peak in 1996, generally decreasing
	Gloucester	1,225	2	807	2	Peak in 1999; generally decreasing.
	Marblehead	164	19	<100	>11	Generally decreasing.
	Boston	<100	>21	150	9	Generally increasing.
	Scituate	195	16	159	8	Peak in 2012; fluctuating.
	Chatham	195	17	<100	>11	Peak in 1997, generally decreasing.
	Provincetown	220	13	<100	>11	Peak in 2001; decreasing since 2011.
	New Bedford	<100	>21	274	6	Increasing trend.
RI	Point Judith	1,736	1	1,735	1	Fluctuating; peak in 2013
	Newport	157	20	<100	>11	Decreasing trend.
CT	Stonington	196	15	277	5	Peak in 1999; fluctuating.
	New London	182	18	<100	>11	Peak in 1996; fluctuating.
NY	Greenport	251	10	<100	>11	Peak in 1996; minimal to none since 2001.
	Montauk	562	6	325	3	Peak in 2012; fluctuating trend.
	Shinnecock	516	7	<100	>11	Peak in 1998; generally decreasing.
	New York City	<100	>21	<100	>11	Fluctuating, generally low.
NJ	Brielle	<100	>21	<100	>11	Peak in 1997; fluctuating.
	Point Pleasant	629	4	109	11	Peak in 1997; generally decreasing.
	Belford	360	8	112	10	Peak in 1997; generally decreasing.
	Cape May	147	21	<100	>11	Peak in 1997, generally decreasing.
Total		10,360		5,498		*Source:* NEFSC VTR data, accessed 2017.

Table 35 presents cumulative landings of silver hake and red hake in major ports along with their share of landings to state's total landing of the species. New London and Stonington land nearly all (>95%) silver and red hake landings in Connecticut. Point Judith lands about 95% of Rhode Island's hake landings. New Bedford and Gloucester (MA) lands about 90% of the state's hake landings.

Table 35. Major landing ports with cumulative silver hake and red hake landings (pounds) and port's share landings to its corresponding state's landings for the species, 1996-2016.

State	Top Ports	Silver Hake (lbs.)	Red Hake (lbs.)	Percent of state landings	
				Silver hake	Red hake
ME	Portland	6,386,607	734,870	88%	79%
NH	Seabrook	4,233,393	1,233,921	73%	57%
MA	Gloucester	30,939,948	5,048,852	25%	54%
	New Bedford	77,886,117	3,071,112	64%	33%
	Provincetown	9,890,996	874,476	8%	9%
RI	Point Judith	91,435,748	11,851,279	95%	94%
	Newport	4,567,301	717,226	5%	6%
CT	New London	47,070,546	5,355,055	77%	78%
	Stonington	14,326,964	1,499,982	23%	22%
NY	Montauk	53,384,130	6,436,360	53%	65%
	Greenport	16,994,122	544,673	17%	6%
	Shinnecock	14,508,418	1,248,954	15%	13%
	Point Lookout	4,421,630	1,002,001	4%	10%
	Hampton Bay	9,119,913	223,728	9%	2%
NJ	Belford	4,776,479	1,076,711	34%	20%
	Point Pleasant	8,416,347	2,778,971	60%	52%
Source: NEFSC VTR data, accessed 2017.					

5.4.5.3.1 Small-mesh multispecies permits by state and port

In Maine, there has been an 81% decrease in the number of permits with landings of small mesh multispecies, from 113 in 1996 to 21 in 2016 (Table 36). There has also been a decrease in the number of ports landing small mesh multispecies, from 14 in 1996 to 3 in 2016. Portland has been the most active port in Maine throughout the time series, though it had a 78% decline in the number of active permits, 86 to 19. Most other ports in Maine landing small mesh multispecies had ≤3 permits landing.

In New Hampshire, there has been a 73% decrease in the number of permits with landings of small mesh multispecies, from 67 in 1996 to 18 in 2016 (Table 36). Portsmouth had the most number of permits landing in 1996, at 36, but that port has had under four permits landing since 2014. Hampton, Seabrook, and Rye, have had active ports through most of the time series, and in 2016, Seabrook had the highest number of active permits landing small mesh multispecies, at 14.

In Massachusetts, there has been a 39% decrease in the number of permits with landings of small mesh multispecies, from 338 in 1996 to 207 in 2016 (Table 36). Apart from a few years in the mid-2000s, Massachusetts has been the state with the highest number of active permits. The number of ports landing small mesh multispecies has fluctuated between 8 and 18 through the time series, and was 14 in 2016. Provincetown, and Gloucester had declines in the number of permits landing small-mesh multispecies, but that number increased in New Bedford and Boston during the time series.

In Rhode Island, there has been a 36% decrease in the number of permits with landings of small mesh multispecies, from 261 in 1996 to 166 in 2016 (Table 36). The number of ports landing small mesh multispecies has fluctuated between three and ten through the time series, and was three in 2016. The number of permits landing in Point Judith declined by about 25%; while there was a 91% decline in the number of permits reporting landings of these species in Newport that period.

In Connecticut, there has been a steady increase in the number of permits with landings of small mesh multispecies, from 3 in 1996 to 51 in 2016 (Table 36) – in contrast to other states. The number of ports landing small mesh multispecies has fluctuated between two and seven through the time series, and was five in 2016. Stonington (CT) had a near eight-fold increase in the number of permits reporting landing of small-mesh multispecies and the number of active permits in New London increased dramatically as well.

In New York, there has been a 48% decrease in the number of permits with landings of small mesh multispecies, from 235 in 1996 to 123 in 2016 (Table 36). The number of ports landing small mesh multispecies has fluctuated between eight and 18 through the time series, and was twelve in 2016. Montauk has had a stable number of permits landing small-mesh multispecies, but Hampton Bays experienced declines of 64% during 1996-2016.

In New Jersey, there has been a 41% decrease in the number of permits with landings of small mesh multispecies, from 170 in 1996 to 101 in 2016 (Table 36). The number of ports landing small mesh multispecies has fluctuated between four and 14 through the time series, and was nine in 2016. There were declines in permits landing small-mesh multispecies in Belford (40%) and Cape May (64%). However, the number of active permits in Barnegat and Point Pleasant have been fairly steady.

Table 36. Number of unique permits landing silver hake, offshore hake or red hake in each key port and state, 1996-2016.

State/Port	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Maine	**113**	**103**	**59**	**65**	**79**	**80**	**58**	**23**	**20**	**10**	**14**	**19**	**12**	**18**	**16**	**23**	**32**	**30**	**27**	**26**	**21**
Portland	86	82	37	46	59	63	42	14	10	5	10	14	12	13	11	14	21	23	21	24	19
New Hampshire	**67**	**74**	**67**	**69**	**84**	**103**	**91**	**64**	**75**	**42**	**37**	**43**	**42**	**68**	**30**	**32**	**40**	**29**	**30**	**22**	**18**
Hampton/Seabrook	17	25	22	18	24	23	33	23	29	17	16	18	21	28	16	13	19	16	25	18	14
Massachusetts	**338**	**326**	**401**	**413**	**406**	**350**	**338**	**299**	**215**	**145**	**110**	**153**	**178**	**218**	**182**	**181**	**200**	**200**	**192**	**190**	**207**
Gloucester	144	139	183	195	190	159	141	122	95	75	49	67	88	101	74	76	85	85	86	75	81
Boston	7	8	3	5	5	7	9	12	7	4	7	5	9	10	4	7	11	9	17	18	20
Provincetown	42	42	41	38	42	42	38	20	11	1	-	10	11	13	14	17	12	12	4	5	4
New Bedford	30	20	42	46	44	42	44	58	49	35	36	28	33	43	52	43	33	39	41	41	67
Rhode Island	**261**	**232**	**295**	**286**	**294**	**253**	**265**	**231**	**192**	**182**	**200**	**180**	**188**	**177**	**168**	**177**	**181**	**182**	**176**	**161**	**166**
Newport	52	37	64	61	78	64	53	49	31	20	24	18	16	16	10	8	7	6	3	6	4
Point Judith	203	186	201	197	183	182	195	179	159	154	167	150	161	154	149	158	156	163	165	152	160
Connecticut	**3**	**9**	**7**	**8**	**8**	**12**	**7**	**10**	**5**	**7**	**7**	**35**	**42**	**45**	**49**	**58**	**61**	**52**	**51**	**52**	**51**
Stonington	-	2	4	4	5	4	2	4	2	2	2	22	31	29	31	30	34	30	27	28	31
New London	2	2	2	2	2	2	2	2	2	2	2	7	4	4	2	8	12	13	13	10	12
New York	**235**	**272**	**250**	**285**	**238**	**238**	**223**	**159**	**150**	**120**	**141**	**159**	**168**	**161**	**156**	**133**	**157**	**151**	**140**	**120**	**123**
Greenport	32	35	28	35	17	16	8	8	3	5	2	4	5	2	5	2	-	2	1	2	-
Montauk	65	71	89	101	98	78	78	59	60	50	54	57	59	59	65	62	75	72	69	63	71
Shinnecock	-	-	-	-	-	-	-	-	-	5	4	8	10	11	6	8	12	14	18	9	6
Hampton Bay	87	111	94	97	94	103	94	65	56	4 1	54	56	54	49	48	34	42	40	33	29	32
Point Lookout	-	-	-	-	-	2	2	-	5	5	8	11	9	12	11	9	11	9	6	3	1
New York City	-	-	-	1	-	1	-	-	12	6	6	6	4	2	5	2	-	-	2	2	2
New Jersey	**170**	**175**	**168**	**162**	**151**	**149**	**100**	**99**	**82**	**66**	**91**	**87**	**107**	**103**	**98**	**95**	**78**	**93**	**100**	**80**	**101**
Belford	45	39	34	38	35	33	35	23	27	22	34	31	25	23	16	22	21	17	18	15	27
Point Pleasant	35	52	52	50	41	53	35	39	33	32	44	33	51	43	52	44	36	44	48	34	33

Source: NMFS permit data
State totals include other small ports.

5.4.5.3.2 Small-mesh multispecies landings by state and port

Table 37 lists silver hake and red hake landings by state for 1996-2016 and the percentage of those landings compared to the state's entire fish landings. For the most part, silver hake is a small percentage of each state's fish landings. CT, RI and NY are among the states with the largest proportion of silver hake landings when compared to the state's total landings. Silver hake landings in CT and NY have ranged from 2 to 16% of the state's total fish landings. The silver hake landings in RI have been 2-7% of the state's total fish landings. The proportion of silver hake landings to total fish landings in ME/NH/NJ combined has consistently been low. It dropped significantly since 1997 and the proportion has remained very low. The magnitude of silver hake landings is less in recent years than it had been during 1996-97. Red hake comprise an even smaller proportion of the state's landings for these states.

The proportion of silver hake to total fish landings has fluctuated much in all states over the past two decades. While landings in the last ten years have been some of the lowest amount of silver hake landings, this is apparent across all fisheries.

Table 37. Annual red and silver hake landings by state as percentage of total state landings.

State	Year	Landings (Live Pounds)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake	Silver Hake
ME, NH, NJ	1996	135,076	5,249,751	874,677,955	0.02%	0.60%
	1997	234,848	3,745,832	859,779,353	0.03%	0.44%
	1998	246,350	1,830,383	795,036,844	0.03%	0.23%
	1999	249,588	1,125,683	837,303,964	0.03%	0.13%
	2000	339,025	1,038,951	895,261,391	0.04%	0.12%
	2001	321,433	1,123,444	940,590,695	0.03%	0.12%
	2002	134,680	1,144,930	903,729,481	0.01%	0.13%
	2003	31,556	329,882	938,699,230	0.00%	0.04%
	2004	40,172	367,538	927,710,553	0.00%	0.04%
	2005	51,397	425,378	785,054,539	0.01%	0.05%
	2006	42,013	280,482	765,114,290	0.01%	0.04%
	2007	116,029	1,207,332	753,321,013	0.02%	0.16%
	2008	104,308	861,589	804,047,717	0.01%	0.11%
	2009	178,427	1,719,911	738,939,031	0.02%	0.23%
	2010	159,716	845,000	724,326,230	0.02%	0.12%
	2011	108,975	1,158,514	816,659,549	0.01%	0.14%
	2012	237,185	1,740,202	817,117,337	0.03%	0.21%
	2013	82,291	622,591	677,975,485	0.01%	0.09%
	2014	115,633	1,149,013	709,632,634	0.02%	0.16%
	2015	94,595	536,251	695,232,826	0.01%	0.08%
	2016	57,744	437,875	712,529,460	0.01%	0.06%
MA	1996	866,296	2,718,402	437,694,432	0.20%	0.62%
	1997	692,388	2,850,467	436,569,212	0.16%	0.65%
	1998	316,177	2,620,755	445,667,453	0.07%	0.59%
	1999	406,408	4,242,107	412,662,329	0.10%	1.03%
	2000	433,028	5,056,069	401,464,250	0.11%	1.26%
	2001	382,844	5,712,744	488,096,446	0.08%	1.17%

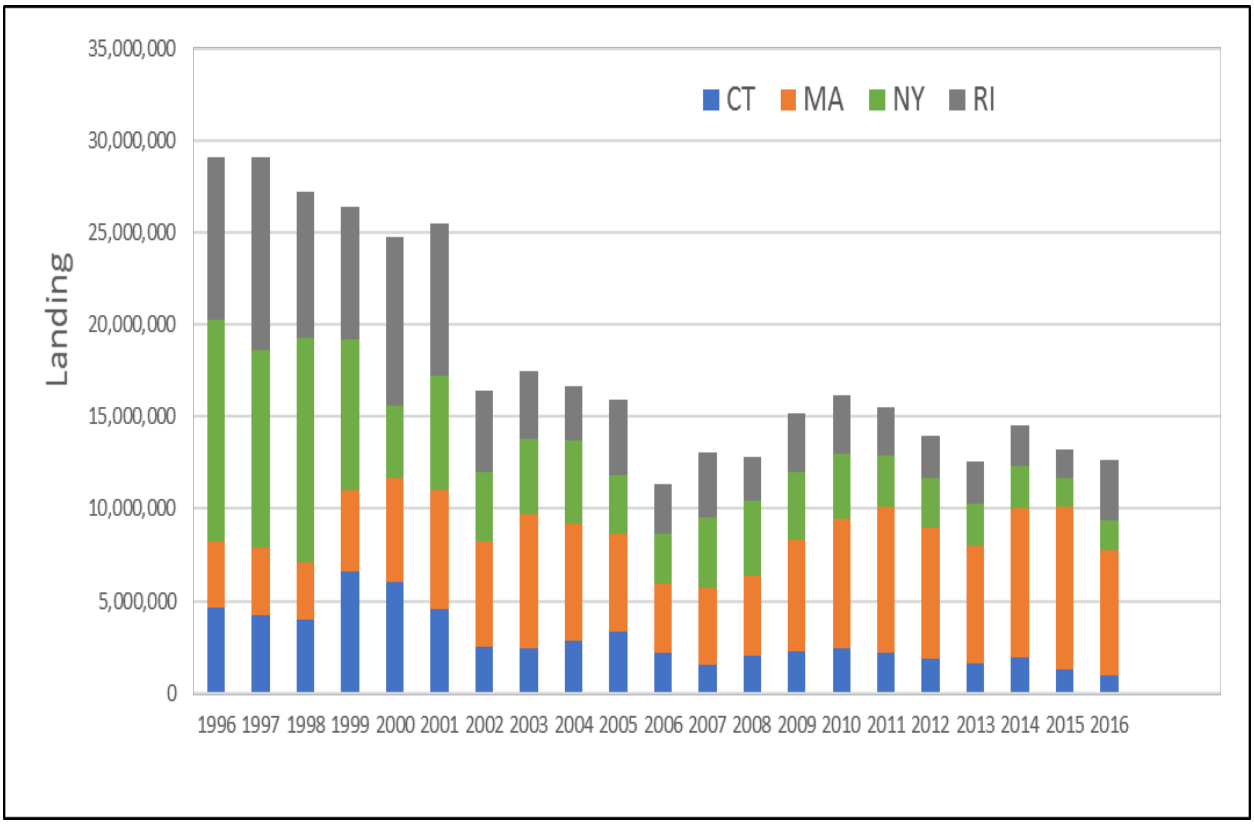
State	Year	Landings (Live Pounds)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake	Silver Hake
	2002	505,862	5,006,098	543,455,839	0.09%	0.92%
	2003	496,829	6,212,761	590,580,698	0.08%	1.05%
	2004	376,522	6,201,313	667,681,141	0.06%	0.93%
	2005	209,881	6,008,479	686,117,675	0.03%	0.88%
	2006	291,271	4,423,374	766,942,263	0.04%	0.58%
	2007	247,470	4,084,017	718,888,598	0.03%	0.57%
	2008	85,983	3,163,937	692,490,083	0.01%	0.46%
	2009	218,855	5,366,663	747,915,509	0.03%	0.72%
	2010	235,327	7,050,482	681,559,004	0.03%	1.03%
	2011	364,798	8,261,589	665,552,010	0.05%	1.24%
	2012	333,412	7,389,038	767,407,139	0.04%	0.96%
	2013	366,448	6,582,898	694,668,266	0.05%	0.95%
	2014	204,376	8,472,619	638,449,479	0.03%	1.33%
	2015	196,747	9,198,240	629,361,765	0.03%	1.46%
	2016	239,619	7,264,092	616,006,485	0.04%	1.18%
RI	1996	744,133	9,329,477	191,244,757	0.39%	4.88%
	1997	959,739	11,565,667	170,785,329	0.56%	6.77%
	1998	1,221,017	10,296,455	155,605,358	0.78%	6.62%
	1999	1,438,523	9,659,665	147,846,035	0.97%	6.53%
	2000	1,506,980	10,507,740	146,530,244	1.03%	7.17%
	2001	1,605,988	9,228,049	139,556,119	1.15%	6.61%
	2002	640,317	5,082,864	125,858,969	0.51%	4.04%
	2003	624,242	5,778,354	120,261,536	0.52%	4.80%
	2004	462,267	4,129,054	128,383,259	0.36%	3.22%
	2005	231,526	4,171,490	130,513,144	0.18%	3.20%
	2006	402,422	3,400,300	152,670,717	0.26%	2.23%
	2007	396,712	4,432,277	104,698,822	0.38%	4.23%
	2008	614,489	3,236,910	91,113,603	0.67%	3.55%
	2009	434,415	3,642,164	103,830,756	0.42%	3.51%
	2010	497,804	3,406,122	120,597,244	0.41%	2.82%
	2011	407,585	2,606,598	100,911,617	0.40%	2.58%
	2012	481,323	2,481,765	99,756,391	0.48%	2.49%
	2013	367,454	2,424,220	110,517,610	0.33%	2.19%
	2014	712,830	2,212,634	105,060,581	0.68%	2.11%
	2015	467,042	1,659,042	86,768,524	0.54%	1.91%
	2016	392,703	3,673,503	94,359,483	0.42%	3.89%
CT	1996	232,126	5,643,448	85,067,279	0.27%	6.63%
	1997	385,297	4,164,057	61,897,420	0.62%	6.73%
	1998	265,713	3,971,948	50,330,151	0.53%	7.89%
	1999	373,721	7,851,123	54,343,035	0.69%	14.45%
	2000	404,612	6,606,446	61,017,170	0.66%	10.83%
	2001	349,622	5,260,402	58,301,355	0.60%	9.02%
	2002	333,601	2,533,091	53,857,239	0.62%	4.70%
	2003	417,843	2,453,756	60,774,902	0.69%	4.04%

State	Year	Landings (Live Pounds)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake	Silver Hake
	2004	418,881	2,935,966	79,898,571	0.52%	3.67%
	2005	380,358	3,299,686	41,209,999	0.92%	8.01%
	2006	263,810	2,347,952	38,457,651	0.69%	6.11%
	2007	266,201	1,565,724	40,339,168	0.66%	3.88%
	2008	285,490	2,190,464	17,864,505	1.60%	12.26%
	2009	310,643	1,939,943	17,531,952	1.77%	11.07%
	2010	175,778	1,972,970	14,902,918	1.18%	13.24%
	2011	158,253	2,057,084	17,362,506	0.91%	11.85%
	2012	185,253	1,864,659	18,340,626	1.01%	10.17%
	2013	177,810	1,718,854	13,115,071	1.36%	13.11%
	2014	168,323	2,037,547	12,630,240	1.33%	16.13%
	2015	146,018	1,319,823	13,791,691	1.06%	9.57%
	2016	162,038	947,483	16,798,259	0.96%	5.64%
NY	1996	433,037	12,720,370	144,469,529	0.30%	8.80%
	1997	628,466	11,980,906	123,627,785	0.51%	9.69%
	1998	880,759	14,171,904	93,646,869	0.94%	15.13%
	1999	973,566	9,579,998	89,908,773	1.08%	10.66%
	2000	878,327	4,520,382	87,495,947	1.00%	5.17%
	2001	1,016,436	7,391,041	92,246,961	1.10%	8.01%
	2002	422,114	3,966,327	93,193,534	0.45%	4.26%
	2003	278,451	4,478,835	113,447,276	0.25%	3.95%
	2004	251,545	5,166,029	79,147,489	0.32%	6.53%
	2005	126,725	3,344,856	108,785,956	0.12%	3.07%
	2006	53,621	2,557,158	82,776,536	0.06%	3.09%
	2007	169,576	3,580,224	75,444,712	0.22%	4.75%
	2008	204,007	4,150,457	78,704,124	0.26%	5.27%
	2009	203,124	4,279,781	81,915,430	0.25%	5.22%
	2010	288,932	4,540,136	67,197,542	0.43%	6.76%
	2011	273,037	3,038,093	65,468,355	0.42%	4.64%
	2012	589,864	2,819,259	71,267,447	0.83%	3.96%
	2013	172,077	2,390,477	68,336,855	0.25%	3.50%
	2014	189,918	2,311,198	58,571,518	0.32%	3.95%
	2015	132,026	1,501,678	62,274,871	0.21%	2.41%
	2016	239,171	1,719,347	52,336,902	0.46%	3.29%

Source: NMFS dealer data, accessed 2017.

Figure 35 presents silver hake landings for four major states CT, MA, NY, and RI during 1996-2016. Landings have declined significantly for CT, NY, and RI, but it has increased in MA over the past two decades.

Figure 35. Annual silver hake landing (lbs.) for major states, 1996-2016.



Source: NEFSC VTR data

Table 38 presents cumulative landings of silver hake and red hake as well as landings of all fishes by those who landed small-mesh multispecies. Over the past two decades, the seven major states for small-mesh multispecies had ex-vessel revenue of about $330 M cumulatively from silver and red hakes. They cumulatively landed 404 M lbs. of silver hake and 46 M pounds of red hake during 1996-2016. The states of CT, MA and NY had relatively higher share of silver hake to total volume of all fishes. The share of silver hake to total fish landed ranged between 13 and 59% for silver hake, but it ranged between 3 and 7% for red hake.

Table 38. Small-mesh multispecies landings to total landed fish and real revenues from small-mesh multispecies during 1996-2016.

State Landed	Cumulative total landings (pounds), 1996 to 2016			Silver hake %	Red hake %	Cumulative total small-mesh multispecies revenue (in 2016$), 1996-2016
	Silver hake	Red hake	All fishes			
ME	7,222,442	928,770	36,431,971	20%	3%	$5,938,482
NH	5,785,746	2,173,208	43,283,055	13%	5%	$5,437,524
MA	122,158,823	9,414,785	299,480,845	41%	3%	$97,445,985
RI	96,181,561	12,582,948	380,917,239	25%	3%	$79,185,109
CT	61,400,882	6,887,390	103,385,398	59%	7%	$50,005,370
NY	99,872,171	9,901,463	245,856,488	41%	4%	$80,717,251
NJ	14,120,902	5,344,644	79,484,874	18%	7%	$13,290,361
Source: NEFSC VTR data, accessed 2017.						

Table 39 summarizes real revenue (in 2016$) from silver and red hake, as well as total revenue from all fishes per state. The proportion of total revenue that is made of silver hake and red hake is also displayed. In ME, there was about $1.8 mil in revenue from silver hake. These revenues comprised much less than 0.50 % of total state revenues. In 1996, silver hake landings made up approximately 0.46% of total state revenue. Following 1996, there has been a steady decline in revenue from silver hake landings; the revenue for red hake landings is only nominal. In NH, during the period 1996-2016, revenue from silver hake was less than $266,000 comprising less than 0.29-1.09% of total state fishing revenue. Revenue from red hake landings were $0-$11,000 during the past two decades. The greatest proportion of NH's revenue from silver hake was in 2012, at 1.09%. In 2016, the largest revenue from silver hake landings was about $265,000, representing approximately 0.79% of total state fishing revenues. Revenue from red hake landings are negligible.

Real revenue from silver hake landings in MA was $1.4 mil to $6.6 mil in 1996-2016; this was less than 1.25% of total state fishing revenues over the same time period. Revenue from red hake landings was $37,000 to $293,000, but this was less 0.10% of total MA fishing revenue. The largest revenue from silver hake on record in MA occurred in 2015; while, the greatest revenue from red hake landings occurred in 1996. Real revenue from silver hake landings in CT were $900,000-5.3M, approximately 1-11% of total state fishing revenue. The state has more dependency on silver hake than other states.

Revenue from red hake was less than 1% of total state fishing revenue. Revenue from silver hake was $1.0-6.7 million from 1996-2016 in RI; while revenue from red hake landings was $105,000-409,000 during this same time period. Revenue from silver hake ranged between 0.40% and 1.25% of total state fishing revenue; while revenue from red hake was 0.01-0.08% of total RI revenue for 1996-2016. In 1997, revenue of silver hake were highest in this time period, $6.7 million, representing about 5.74% of

total state fishing revenues. In NJ during the period 1996-2016, revenue from silver hake was $58,000-1.3 mil, comprising less than 1 percent of total state fishing revenue. Revenue from red hake landings were $21,000-162,000 comprising less than 0.12% of total state fishing revenues. Revenue from silver hake landings in NY were $1.4– $9.5 mil for 1996-2016, representing approximately 0.14-7.68% of total state fishing revenue. Revenue from red hake landings were $33,000-501,000.

Point Judith (RI) led all other ports in New England and the Mid-Atlantic in silver hake landings (cumulative) during 1996-2016 (Table 40). It ranked number one port for silver hake landing in 1996, but drops to the second in 2016. New Bedford (MA) has risen to number one port for silver hake landings in 2016. It also ranked 2nd for cumulative silver hake landings during 1996-2016. Gloucester (MA) ranked 3rd for silver hake landing in 2016 against 7th in 1996. New London (CT) was the second highest silver hake landings port in 1996, but it dropped to 5th rank in 2016. Hampton Bays (NY) used to be 3rd highest silver hake landing port in 1996, but the landings have significantly dropped over the recent past decade. Montauk (NY) had 6th in position in 1996 and it has risen to 4th in 2016. Portland (ME) was 5th in terms of silver hake landings in 1996, but now lands very nominal amount of silver hake. Over the past two decades, many ports declined significantly or had roller coaster landings of silver hake, but only few ports have risen such as New Bedford (MA).

Table 39. Annual red and silver hake revenue by state as percentage of total state revenue from all species landed (in 2016$).

State	Year	Real Revenue$ (in 2016 $)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake %	Silver Hake %
ME, NH, NJ	1996	$83,579	$2,891,282	$553,053,627	0.02%	0.52%
	1997	114,346	2,001,919	578,689,931	0.02	0.35
	1998	118,869	1,059,039	568,180,403	0.02	0.19
	1999	116,141	666,413	625,570,725	0.02	0.11
	2000	162,950	634,001	657,039,015	0.02	0.10
	2001	123,379	723,669	579,729,866	0.02	0.12
	2002	72,796	664,077	582,620,901	0.01	0.11
	2003	21,062	232,211	588,608,956	0.00	0.04
	2004	30,242	208,576	712,881,191	0.00	0.03
	2005	40,731	249,314	733,522,509	0.01	0.03
	2006	30,620	209,161	616,346,979	0.00	0.03
	2007	68,611	720,453	631,959,574	0.01	0.11
	2008	48,714	539,200	960,811,301	0.01	0.06
	2009	77,813	801,619	559,233,930	0.01	0.14
	2010	76,936	463,688	718,530,582	0.01	0.06
	2011	61,285	682,858	729,203,935	0.01	0.09
	2012	118,760	753,037	787,305,310	0.02	0.10
	2013	49,492	466,987	645,395,862	0.01	0.07
	2014	48,269	686,408	784,781,525	0.01	0.09
	2015	60,977	409,205	839,025,432	0.01	0.05
	2016	33,687	367,246	953,902,085	0.00	0.04
MA	1996	$292,604	$ 1,423,336	$ 354,813,675	0.08%	0.40%
	1997	220,609	1,707,444	335,870,277	0.07	0.51
	1998	137,076	1,945,140	303,207,370	0.05	0.64

State	Year	Real Revenue$ (in 2016 $)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake %	Silver Hake %
	1999	193,229	3,765,538	375,168,871	0.05	1.00
	2000	152,541	3,116,006	406,058,498	0.04	0.77
	2001	162,557	3,672,638	380,555,635	0.04	0.97
	2002	198,408	2,681,924	396,767,537	0.05	0.68
	2003	205,703	3,556,839	382,826,051	0.05	0.93
	2004	181,376	3,226,553	412,397,917	0.04	0.78
	2005	110,865	2,619,618	525,180,701	0.02	0.50
	2006	141,573	2,370,783	521,560,874	0.03	0.45
	2007	102,029	2,771,533	495,378,984	0.02	0.56
	2008	37,486	1,817,248	456,842,430	0.01	0.40
	2009	95,994	2,947,858	454,895,884	0.02	0.65
	2010	106,418	4,655,476	524,253,644	0.02	0.89
	2011	217,700	5,350,126	608,540,187	0.04	0.88
	2012	154,805	4,720,973	641,075,482	0.02	0.74
	2013	177,458	3,977,374	577,994,011	0.03	0.69
	2014	96,261	5,950,126	532,276,472	0.02	1.12
	2015	80,641	6,641,748	531,934,004	0.02	1.25
	2016	93,606	5,789,679	551,682,865	0.02	1.05
CT	1996	$116,635	$2,972,749	$74,062,957	0.16%	4.01%
	1997	143,908	2,601,921	49,469,812	0.29	5.26
	1998	101,002	2,203,375	50,673,560	0.20	4.35
	1999	124,807	5,333,610	55,735,732	0.22	9.57
	2000	152,852	4,112,245	43,869,735	0.35	9.37
	2001	127,800	3,034,987	42,315,180	0.30	7.17
	2002	173,493	1,556,305	37,060,444	0.47	4.20
	2003	181,440	1,904,723	38,903,959	0.47	4.90
	2004	244,601	2,576,816	42,453,554	0.58	6.07
	2005	257,722	2,682,740	46,170,692	0.56	5.81
	2006	123,251	1,803,293	43,920,616	0.28	4.11
	2007	115,390	1,337,347	113,831,627	0.10	1.17
	2008	143,281	1,631,360	19,849,400	0.72	8.22
	2009	149,402	1,185,177	18,101,243	0.83	6.55
	2010	83,487	1,475,543	17,621,509	0.47	8.37
	2011	93,776	1,775,359	21,489,480	0.44	8.26
	2012	93,483	1,458,559	22,314,891	0.42	6.54
	2013	119,859	1,384,493	15,772,953	0.76	8.78
	2014	105,623	1,608,181	14,777,207	0.71	10.88
	2015	113,212	1,178,550	15,885,776	0.71	7.42
	2016	108,280	916,271	17,552,807	0.62	5.22
RI	1996	$290,002	$4,925,297	$107,737,784	0.27%	4.57%
	1997	351,074	6,705,025	116,771,745	0.30	5.74
	1998	322,893	5,134,234	106,001,668	0.30	4.84
	1999	409,229	5,009,342	123,953,123	0.33	4.04

State	Year	Real Revenue$ (in 2016 $)			Percent of State Total	
		Red Hake	Silver Hake	State Total Fish	Red Hake %	Silver Hake %
	2000	374,198	5,072,685	112,847,004	0.33	4.50
	2001	356,784	4,888,249	93,044,759	0.38	5.25
	2002	217,938	2,271,329	86,341,056	0.25	2.63
	2003	199,315	2,656,768	86,204,277	0.23	3.08
	2004	133,489	2,335,531	90,365,851	0.15	2.58
	2005	123,411	2,277,910	112,524,612	0.11	2.02
	2006	172,630	2,021,788	116,499,501	0.15	1.74
	2007	131,258	2,485,517	89,120,387	0.15	2.79
	2008	170,525	2,057,383	94,725,109	0.18	2.17
	2009	105,341	1,734,468	73,005,442	0.14	2.38
	2010	155,479	2,149,914	66,480,286	0.23	3.23
	2011	153,475	1,539,593	87,788,026	0.17	1.75
	2012	145,889	1,502,363	92,577,343	0.16	1.62
	2013	125,140	1,172,182	89,087,625	0.14	1.32
	2014	201,379	1,401,353	87,571,112	0.23	1.60
	2015	167,116	1,035,256	83,079,048	0.20	1.25
	2016	138,747	2,066,775	93,869,978	0.15	2.20
NY	1996	$ 290,356	$8,533,867	$132,577,474	0.22%	6.44%
	1997	347,708	9,476,900	134,007,315	0.26	7.07
	1998	447,511	9,261,065	120,519,848	0.37	7.68
	1999	490,463	6,714,212	107,883,701	0.45	6.22
	2000	449,489	3,610,342	85,190,382	0.53	4.24
	2001	455,536	5,716,788	74,634,612	0.61	7.66
	2002	251,495	2,838,853	68,392,698	0.37	4.15
	2003	155,935	3,985,483	67,310,567	0.23	5.92
	2004	142,469	4,374,076	58,898,394	0.24	7.43
	2005	92,543	3,048,590	69,332,543	0.13	4.40
	2006	33,214	2,209,247	68,798,442	0.05	3.21
	2007	90,815	2,631,610	178,768,749	0.05	1.47
	2008	91,741	2,902,670	163,776,138	0.06	1.77
	2009	88,098	2,813,426	92,720,876	0.10	3.03
	2010	141,561	3,377,231	54,741,356	0.26	6.17
	2011	134,017	2,380,544	73,728,506	0.18	3.23
	2012	501,343	2,350,640	981,627,657	0.05	0.24
	2013	122,804	1,981,182	273,397,523	0.04	0.72
	2014	118,963	1,953,728	111,758,203	0.11	1.75
	2015	84,951	1,386,133	1,021,745,226	0.01	0.14
	2016	142,356	1,522,726	171,153,810	0.08	0.89

Table 40. Silver hake landings (in metric tons) for major ports in a state and their rankings in 1996 and 2016.

State	CT		MA				ME	NH	NJ			NY						RI	
Port	New London	Stonington	New Bedford	Gloucester	Provincetown	Boston	Portland	Seabrook	Point Pleasant	Belford	Cape May	Montauk	Hampton Bays	Greenport	Freeport	New York City	Point Lookout	Point Judith	Newport
1996		N/A	53	862	265		1436				62	943	2310	2274	223	N/A	N/A	4010	
1997			10	805	424		561		617		144	1653	1721	1792	269	N/A	N/A	4913	
1998			28	836		0.28	75		418		75	1703	2232	2263	231	N/A	N/A	4417	237
1999			78	1004	759		63		239		24	1266	1187	1602	280		N/A	4172	163
2000			486	1081	633	0.58		89	223		8.86	1060	696	167	128	N/A	N/A	4296	381
2001			1182	619	711		13		297		33	2343	908	14	80	N/A		3609	577
2002			1196	489	564				289		7.46	1165	455	12	144	N/A		2149	156
2003			2417	232	71				32		1.98	1424	495	25	82	N/A	N/A	2372	249
2004			2536	227	22				57		5.14	1522	464		13	332.33	4.82	1724	
2005			2267	453					94		1.62	1216	200		N/A	26.68	49.39	1814	
2006			1875	126	N/A				45		4.69	736	212				94.74	1486	51
2007	254		1475	320	20		0.16		224		1.59	934	268	4.86			113.97	1937	49
2008	401	110	1142	123	134				162		10	1487	180	10			105.51	1418	
2009	321		1872	313	217				358		21	1590	189				52.96	1634	
2010	300	361	2542	293	240				181		6.80	1549	179	1.34			174.41	1530	
2011	315	276	2980	442	264	49			194		14	980	163				210.57	1163	
2012	513		2656	602	29				191		3.37	1044	111	N/A	N/A	N/A	99.07	1109	
2013	610	113	2456	444	41				104			1032	36		N/A	N/A	12.91	1093	2.84
2014			3120	687					153	152		919	86		N/A		14.60	1003	
2015	536		3000	863	142				57			614	43		N/A		13.87	752	0.35
2016	333	36	1719	1352					17	13	1.12	538	16	N/A	N/A			1665	
1996-2016	20286	6941	35093	12173	4943	492	2291	2020		2250	438	25717	12150	8201	1453	1271	956	48266	2687
Rank 1996	2			7	9		5		8			6	3	4	10			1	10
Rank 2016	5	10	1	3	8	9		7				4				6		2	
Rank 96-16	4	8	2	5	9				10			3	6	7				1	

Source: NMFS Dealer data

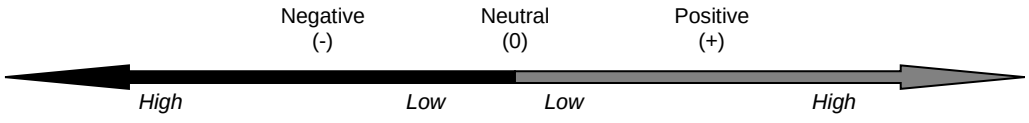
Note: Reporting by less than three dealers are masked in black for data confidentiality requirement.

6.0 ANALYSIS OF IMPACTS ON VECS

This EA evaluates the potential impacts using the criteria outlined in the following table. Impacts from all alternatives are judged relative to the baseline conditions, as described in Section 5.0, and compared to each other.

Table 41. Impact definitions and qualifiers

Impact Definition			
	Direction		
VEC	**Positive (+)**	**Negative (-)**	**Neutral (0)**
Red Hake Stocks, Silver and Offshore Hake Stocks, Non-target Species and Bycatch, and Protected Resources	**Actions that increase stock/population size**	**Actions that decrease stock/population size**	**Actions that have little or no positive or negative impacts to stocks/populations**
Physical Environment and EFH	Actions that improve the quality or reduce disturbance of habitat	Actions that degrade the quality or increase disturbance of habitat	Actions that have no positive or negative impact on habitat quality
Fishery Related Businesses & Communities	Actions that increase revenue and social well-being of fishermen and/or associated businesses	Actions that decrease revenue and social well-being of fishermen and/or associated businesses	Actions that have no positive or negative impact on revenue and social well-being of fishermen and/or associated businesses
Impact Qualifiers:			
Low (L, as in low positive or low negative)	To a lesser degree, but not significant		
High (H; as in high positive or high negative)	To a substantial degree, but not significant		
Likely	Some degree of uncertainty associated with the impact		



6.1 Target species

6.1.1 Red Hake Stocks

6.1.1.1 ACL Specifications

6.1.1.1.1 Updated specifications (preferred)

Stock biomass has increased considerably in the northern management area and declined considerably in the southern management area. In the northern area, strong year-classes have appeared and are now of commercial size. In the south, lack of recruitment and unfavorable conditons have contributed to declining stock biomass, while catches have remained relatively stable. Because of this, the 2016 catches were sufficiently high to cause overfishing (NEFMC 2017).

The proposed 2018-2020 red hake specifications (Table 42) account for these substantial changes in biomass and are expected to allow the fishery to improve utilization of optimum yield in the northern management area and reduce the risk of overfishing of southern red hake. The proposed ACLs for both stocks are set at a level that is appropriate for the updated stock biomass estimate. Unlike other stocks, red hake are targeted to supply a local bait market and some trips therefore target red hake or sell the incidental red hake catch on trips targeting silver hake. The catch limits coupled with in-season accountability measures influence fishing behavior therefore are effective in preventing overfishing.

For the northern stock (stock areas shown in Map 1), if catches increase to the ACL, the risk of causing overfishing is only about 8% (the risk of overfishing when catches equal the ABC is estimated to be 10%). It is likely that northern red hake catches are expected to increase from present levels, because northern management area fishing effort has been increasing and the northern silver hake ACL is also expected to increase. Nonetheless, the risk of overfishing northern red hake is low with the proposed specifications and **the alternative is expected to have a low negative (but insignificant) biological impact on the northern red hake stock compared to No Action**.

On the other hand, the catches of southern red hake are near the proposed ACL and stable landings are likely to trigger in-season accountability measures. The 2016 southern red hake landings of 332 mt were 9% greater than the proposed TAL. Thus, accountability measures will reduce the southern red hake possession limit from 5,000 to 400 lbs. when landings reach 90% of the 274 mt TAL, potentially modifying fishing behavior to avoid catching southern red hake. Although the proposed ACL for southern whiting is also lower than status quo, the catches have been well below the proposed southern whiting ACL and therefore significant changes in the amount of small-mesh multispecies fishing effort is unlikely, but possible. Total small-mesh multispecies fishing effort has been relatively stable with respect to catch, the number of vessels, and the number of fishing trips taken (NEFMC 2017).

The estimated risk of overfishing if catches equal the proposed ACL of 1,007 mt is about 12%. At the current catch (1,094 mt), the risk of overfishing is estimated to be 31%. The proposed catch limits are not intended to promote stock rebuilding, but are consistent with levels that are expected to produce MSY. The lower specifications are consistent with MSY and the stock is not expected to continue declining and could increase under favorable conditions. Since No Action could allow additional fishing for red hake and accounting for the above factors, **this alternative is expected to reduce the risk of overfishing and therefore have a high positive biological impact on the stock of southern red hake compared to No Action.**

Table 42**.** Differences between the proposed ACL specifications and the No Action ACL specifications.

Stock		2016-2017 Specifications (mt)	2018-2020 Specifications (mt)	Percent Change
Northern	ABC	496	721	+45%
Red	ACL	471	685	+45%
Hake	TAL	120	274	+128%
Southern	ABC	1,717	1,060	-38%
Red	ACL	1,631	1,007	-38%
Hake	TAL	746	305	-59%

6.1.1.1.2 No Action

For the northern red hake stock, the No Action specifications (Table 42) much lower than the proposed 2018-2020 specifications. These specifications would be more restrictive than otherwise necessary, but are still within catch limits based on the best available science. For that reason, and given the current stock status, the **No Action alternative is expected to result in low positive, but insignificant biological impacts**, since the lower catch limit would further reduce the risk of overfishing (to less than 1%) by setting a management target that would be more risk adverse than the specifications formula would otherwise allow.

For the southern red hake stock, the No Action specifications (Table 42) are considerably higher than the most recent recommendation from the SSC. These specifications are, therefore, higher than is sustainable for these stocks and would be inconsistent with the requirements of the FMP and the Magnuson-Stevens Act. Existing southern red hake catch is above the proposed ACL, but much lower than the No Action ACL and TAL specifications. Unless effort and catch increase by substantial amounts, the No Action specifications would not trigger an in-season accountability measure. **Therefore, the No Action specifications are expected to result in high negative biological impacts, given the current catches and status of the southern red hake stock.**

6.1.2 Silver and Offshore Hake Stocks

6.1.2.1 ACL Specifications

6.1.2.1.1 Updated specifications (Section 4.1.1; preferred)

Stock biomass has increased considerably in the northern management area and declined considerably in the southern management area. In the northern area low mortality and favorable conditions for survival and growth have increased the number of large fish and promoted productivity of the stock. In the northern stock area (Map 1), the fishery is highly restricted.

In the south, lack of recruitment and unfavorable conditions have contributed to declining stock biomass, while catches have remained relatively stable well below overfishing levels (NEFMC 2017). Catch in both areas has been well below the ACLs, although some moderate increases in the number of fishing vessels, the number of trips, and the amount of silver hake landed have occurred in the northern management area (Section 5.1.3)

Fishing with small-mesh trawls is allowed via exemptions from large-mesh groundfish regulations, which restricts fishing to six specific areas and seasons (Table 43 and Map 1). Furthermore, prices for red and silver hake are heavily influenced by foreign demand and profits after deducting shipping costs to the NY fish markets restrict profits. Fishermen are also required to use raised footrope trawls in all but the Cultivator Shoals Area to minimize groundfish bycatch. Successful fishing with this gear requires specialized knowledge that only a few fishermen have mastered and requires additional investment by vessels already rigged to use other types of trawls.

As such, the specifications (Table 43**) are expected to result in low negative biological impacts to the northern silver hake stock, when compared to No Action.** At 2016 catch levels, the risk of overfishing is estimated to be less than 1%, while the risk of overfishing at the proposed ACL is also estimated to be less than 1%.

In the southern stock area (Map 1), whiting catches have also been well below the ACL, partly due to market demand and partly due to recent vessel overhauls by some of the more active participants in the small-mesh fishery. Although the regulations are not as strict as they are in the northern stock area and do not require vessels to use a raised footrope trawl, the fishery is still specialized and requires special skill to fish in the areas where silver hake are caught, primarily along the shelf edge. Unless market demand and prices dramatically rise, it is unlikely that silver hake and whiting catches will approach the ACL.

Although whiting catches are not currently constrained by the ACL specifications, the proposed changes reduce the catch limits so that overfishing is less likely to occur compared to No Action. Any increases in fishing effort would be constrained by the in-season accountability measures if effort and landings increase.

Since the proposed specifications keep the catch limits consistent with updated assessment of stock biomass and reduce the potential for overfishing by setting appropriate limits, **the proposed specifications are expected to result in a low positive biological impact to the southern stocks of silver and offshore hake** (collectively known as whiting). At 2016 catch levels, the risk of overfishing is estimated to be less than 1%, while the risk of overfishing at the proposed ACL is also estimated to be less than 1%[16].

Table 43**.** Differences between the proposed ACL specifications and the No Action ACL specifications.

Stock		2015-2017 Specifications (mt)	2018-2020 Specifications (mt)	Percent Change
Northern Silver Hake	ABC	24,383	31,030	+27%
	ACL	23,161	29,475	+27%
	TAL	19,949	26,604	+33%
Southern Whiting	ABC	31,180	19,395	-38%
	ACL	29,621	18,425	-37%
	TAL	23,833	14,465	-39%

[16] The southern whiting specifications include the relatively low and infrequent catches of offshore hake. Because the status of the offshore hake stock is unknown and catches are highly variable, it is not possible to assess the impacts on offshore hake.

6.1.2.1.2 No Action (Section 4.1.2)

For the northern area, the No Action specifications are lower than the proposed 2018-2020 specifications (Table 43). These specifications would be more restrictive than otherwise necessary, but are still within catch limits based on the best available science. For that reason, **the No Action specifications, given the current status of the stock, are expected to result in neutral biological impacts**.

For the southern whiting stocks, the No Action specifications (Table 43) are higher than the most recent recommendation from the SSC. These specifications are, therefore, higher than is sustainable for these stocks and are inconsistent with the requirements of the FMP and the Magnuson-Stevens Act. However, catches in the southern area are well below both the proposed and No Action specifications and are not expected to increase to the level of the No Action specifications in the coming years. The southern silver hake stock is not overfished, or experiencing overfishing. Therefore, the **No Action specifications are expected to result in low negative to neutral biological impacts** on the southern silver hake.

6.2 Non-Target Species and Bycatch

6.2.1 ACL Specifications (Section 4.1)

The proposed changes to ACL specifications are not expected to change the distribution and timing of small-mesh fishing effort. Some increase in trips targeting northern silver hake and southern whiting is expected however, particularly due to increasingly restrictive large-mesh groundfish regulations and due to reactivation of some small-mesh fishery vessels that have undergone recent overhauls. Neither the proposed or No Action specifications are expected to make a meaningful difference in this regard, however, but place an upper limit on the amount of small-mesh fishing that could occur. Recent increases in fishing to target silver hake have occurred in the northern management area, which would have increased bycatch of haddock and other species. The raised footrope trawl however is required in the Gulf of Maine exemption areas and is more selective for reducing catches of flatfish, i.e. flounders, monkfish, and skates.

Thus, compared to No Action (Section 4.1.2), the proposed 2018-2020 specifications are expected to have a low negative biological impact on non-target species and bycatch.

No Action is expected to have a positive, but insignificant biological impact on species commonly caught in the small-mesh fishery (see Section 5.1.4), compared to baseline environmental conditions. Catch limits coupled with exemption area boundaries and seasons and specific gear requirements such as the raised footrope trawl are intended to keep bycatch at acceptably low levels.

6.3 Physical Environment and Essential Fish Habitat

6.3.1 ACL Specifications (Section 4.1)

Due to potential shifts in effort from south to north, increases in small-mesh multispecies fishing effort in the northern management area, coupled with potential effort shifts from the large-mesh trawl and gillnet groundfish fishery, **the proposed specifications (described in Section 4.1.1; preferred) would have a low negative impact on habitat, when compared to the No Action alternative.**

Increases in catch and fishing activity as a result of the proposed changes in specifications are not expected, since the specifications themselves are not the driving factor for changes in effort. Except for northern silver hake, the proposed change in specifications range from a decrease of 38% for southern

silver hake (Table 42) to an increase of 27% for northern red hake (Table 43), but large changes in fishing activity are not expected because of restrictive regulations and limited market demand. As discussed in Section 6.1.1.1.1, restrictive regulations include specific management areas and seasons in the Gulf of Maine and on Georges Bank where small-mesh multispecies can be targeted with small-mesh trawls.

There have however been modest increases in small-mesh multispecies fishing effort in the northern management area, primarily in Small-Mesh Area I, inside of Ipswich Bay. Most of this fishing activity (see Map 1) occurs on relatively sandy bottom that have patchy areas of more vulnerable hard bottom. In this area, these hard bottom areas are well known and vessels using trawls try to avoid them to prevent net damage. Unlike some other species, silver and red hake are associated with deeper and sandy/mud bottoms (NMFS 1999 and NMFS 2004; also NEFMC 2014; Volume 2 and Appendix B). This trend of increasing small-mesh multispecies fishing effort in the Gulf of Maine is expected to continue due to higher productivity of silver and red hake stocks and increasingly conservative regulations in the large-mesh groundfish fishery to protect and rebuild cod. Many of the vessels entering the small-mesh multispecies fishery used to take trips directed on large-mesh multispecies (including cod, haddock, plaice, etc.). Given that small-mesh multispecies fishing is typically associated with less vulnerable habitats, this effort shift may actually have a positive effort on EFH across the large- and small-mesh multispecies fishery combined.

No Action (described in Section 4.1.2), maintaining the existing specifications, is not expected to change fishing effort or behavior, and therefore **is expected to have neutral impacts on habitat relative to current conditions**. As described above, the catch limits are not the primary factor in limiting effort in this fishery.

6.4 Protected Resources

6.4.1 ACL Specifications (Section 4.1)

6.4.1.1 Updated specifications (Section 4.1.1; preferred)

The commercial whiting fishery is prosecuted primarily with bottom otter trawl gears. Protected species (ESA listed and MMPA protected species) are known to interact with this gear type and therefore have the potential to be affected by Alternative 1. Although the proposed ACLs increase by 27-45 percent in the northern management area and decrease by 35-38% in the southern management area, (Table 42 and Table 43), total small-mesh multispecies fishing effort is not expected to change significantly because the silver hake limits are well above catches since the 1990s and due to constraints caused by restrictive regulations and limited marked demand. The proposed specifications are therefore, are within the range of specifications authorized previously for these species.

Specifications themselves are not the driving factor in fishing behavior. As discussed in Section 6.1.1.1, restrictive regulations for small-mesh fishing to keep large-mesh groundfish catches below acceptable levels, limited market demand, and market forces are the primary factors limiting small-mesh fishing in the northern management area (Map 1). Because of these factors, total catch for northern silver hake has remained relatively stable over the last 10 years, but there have been some modest increases in fishing effort in the northern management area in the recent few years, primarily in Small-Mesh Area I. This trend is expected to continue, particularly in response to improved productivity of northern silver and red hake, as well as increasingly restrictive regulations for the large-mesh multispecies fishery to protect and rebuild cod.

Although the proposed specifications are expected to result in minimal to no increase in effort, if any effort does increase for a particular stock as a result of the proposed specifications, there is the potential for interactions with protected resources to also increase. However, as fishing behavior will be confined to areas that: 1) are already subject to fishing by bottom trawls in the GOM, GB, and SNE and therefore, in areas which have been considered by NMFS in its assessment of fishery effects to protected species (ESA and non-ESA listed species), and 2) have been determined to be areas where takes are not expected to so great that the continued existence of the species is jeopardized (NMFS 2013; Waring et al. 2014).

There have however been modest increases in small-mesh multispecies fishing effort in the northern management area, primarily in Small-Mesh Area I, inside of Ipswich Bay. This trend is likely to continue in the short term (under this alternative and under No Action) because the small-mesh multispecies stocks have become more abundant and groundfish measures (particularly for cod fishing) have become more restrictive. These trends are likely to cause a small effort shift from groundfish fishing (possibly from the gillnet fishery) and from the southern management area into the small-mesh multispecies fishery in the northern management area. Taking this information into consideration, impacts to protected species are provided below.

MMPA (Non-ESA Listed) Species Impacts

The whiting fishery overlaps with the distribution of non-ESA listed species of marine mammals (cetaceans and pinnipeds). As a result, marine mammal interactions with fishing gear used to prosecute the small-mesh multispecies fishery are possible (i.e., see Section 5.2). Ascertaining the risk of an interaction and the resultant potential impacts on marine mammals is uncertain because quantitative analyses have not been performed and data are limited. However, NMFS has considered, the most recent (2010-2014) information on marine mammal interactions with commercial fisheries (Hayes et al. 2017; https://www.nefsc.noaa.gov/fsb/take_reports/nefop.html).

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 have 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, the potential biological removal (PBR) level has not been exceeded for any of the non-ESA listed marine mammal species identified (see Section 6.3 in 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 level, 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, 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 NEFOP observer reports (https://www.nefsc.noaa.gov/fsb/take_reports/nefop.html) and the most recent five years of information presented in Hayes et al. (2017) are a collective representation of commercial fisheries interactions with non-ESA listed species of marine mammals, and does not address the effects of the small-mesh multispecies fishery specifically, the information does demonstrate that thus far, operation of this 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 [aside from those species (pilot whales and bottlenose dolphin stocks) noted above].

Taking into consideration the above information, overall Alternative 1 is expected to have a low negative impact on non-ESA listed species of marine mammals.

ESA Listed Species Impacts

The small-mesh multispecies fishery uses small-mesh bottom trawl gear to target whiting and red hake. As provided in Section 5.2, ESA listed species of sea turtles, Atlantic sturgeon, and Atlantic salmon are vulnerable to interactions with this gear type, with interactions often resulting in the serious injury or mortality to the species. Taking this into consideration, Alternative 1 is likely to result in low negative impacts to these ESA listed species.

However, ascertaining the level of negative impacts to these ESA listed species as a result of the Alternative 1 are difficult and somewhat uncertain, as quantitative analysis has not been performed. However, NMFS has considered, to the best of our ability, how the fishery has operated in regards to listed species since 2013, when NMFS issued a Biological Opinion (Opinion) on the operation of seven commercial fisheries, including the groundfish FMP, and its impact on ESA listed species (NMFS 2013). The 2013 Opinion, which considered the best available information on observed or documented ESA listed species interactions with gear types used to prosecute the seven FMPs (e.g., gillnet, bottom trawl, and pot/trap), concluded that the these 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. 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 NE Multispecies FMP is currently covered by the incidental take statement authorized in NMFS 2013 Opinion.

Taking into consideration the above information, as well as information on the operation of the whiting fishery since 2013, we expect Alternative 1 to result in low negative impacts to ESA listed species. Specifically, while specifications have fluctuated since 2013, fishing behavior (gear quantity, tow time, area fished) over this time period has not changed significantly. As overall specifications under Alternative 1 are no greater than those authorized since 2013, and the resultant fishing behavior (e.g., gear quantity, tow time, location fished) under these conditions are not expected to change significantly from current operating conditions, the Alternative 1 is not expected to introduce any new risks or additional takes to ESA listed species that have not already been considered and authorized by NMFS to date (NMFS 2013, NMFS 2017). As a result, impacts of the Alterantive 1 on ESA listed species are not expected to be different from those already considered by NMFS (NMFS 2013, NMFS 2017). For these reasons, Alternative 1 would likely have low negative impacts on ESA listed species.

Overall Impacts

Overall, alternative 1 is expected to have low negative impacts on protected resources. Relative to the No Action Alternative, impacts are expected to have a low positive impact relative to No Action because of the potential of a small shift in effort from the southern management area to the northern management area where observed takes in the small-mesh multispecies fishery have been less frequent.

6.4.1.2 No Action (Section 4.1.2)

The No Action alternative maintains existing specifications authorized under Amendment 19 (NEFMC 2012) and the 2015-2017 specifications (NEFMC 2015). As a result, fishing behavior (e.g., effort) in the small mesh component of the multispecies fishery is expected to remain the same as were analyzed.

Impacts of the No Action alternative on protected species are expected to be similar in magnitude compared to those under preferred Alternative 1 (Section 4.1.1), given that under both quota scenarios, fishing effort and behavior is not likely to be significantly different. Based on this, we expect the overall impacts of the No Action on protected species to be low negative (for information and rationale to support this conclusion see Section 6.4.1.1). **Relative to Alternative 1, impacts of the No Action would be low negative for the reasons outlined in the previous section on Alternative 1 impacts.**

6.5 Fishery-Related Businesses and Communities

The analysis of impacts on fishery-related businesses and communities characterizes the magnitude and extent of the economic and social impacts likely to result from the alternatives considered for the 2018-2020 small-mesh multispecies fishery specifications. National Standard 8 requires the Council to consider the importance of fishery resources to affected communities and provide those communities with continuing access to fishery resources, but it does not allow the Council to compromise the conservation objectives of the management measures. Thus, continued overall access to fishery resources is a consideration, but not a guarantee that fishermen will be able to use a particular gear type, harvest a particular species of fish, fish in a particular area, or fish during a certain time of the year.

6.5.1 ACL Specifications (Section 4.1)

6.5.1.1 Updated specifications (Section 4.1.1; preferred)

This alternative would revise the ACL specifications for northern and southern stocks of silver and red hakes based on updated stock assessments. Table 8 shows the proposed specifications for 2018-2020 fishing years.

The proposed specifications described in Section 4.1.1 would increase the northern red and silver hake TALs by 128 and 33%, respectively, but reduce the TALs of the southern red and whiting stocks by 59 and 39% respectively. Table 44 compares red and silver hake landings and revenues to 2017 TALs and the proposed TALs in this alternative.

Relative to No Action, this alternative may result in ***positive*** impacts to small-mesh multispecies fishery-related businesses and communities. If fishermen perceive that management decisions are being made based on the most recent assessment information, their *Attitudes, Beliefs, and Values* towards fishery management are expected to be more favorable relative to No Action. There may also be long-term positive social impacts regarding the *Historical Dependence on and Participation in* the fishery, as this alternative is designed to ensure that harvesting within OFL, ABC, ACL, and TAL constraints provides for a sustainable fishery. Continued access to the resource, has positive economic and social impacts.

Considering recent fishery performance, landings of northern silver hake and southern whiting were well below the 2017 TALs and the proposed 2018-2020 TALs. Even with a 39% reduction in the southern whiting TAL, constant landings and no change in the southern management area effort would land 27%

of the TAL. Although the increase in the northern silver hake TAL triggers[17] is 5,990 mt, with an estimated value of $8.6 million, other factors are likely to constrain catch and effort in the fishery, such that only modest increases in the northern area silver hake landings can be expected. Since red hake is a constraining species, reducing the TAL could reduce silver hake landing, unless some of the vessels fishing in south shift their effort to northern areas.

Although 2016 landings exceeded the northern red hake TAL by 35% and in-season accountability measures were triggered, the proposed TAL specification would be 128% higher. Landings are likely to increase by 58 mt in 2018, valued at about $50,000. This increase is possible because the TAL would increase by 128% (Table 44) and the in-season accountability measure would occur later in the season, and might not be triggered at all. Landings in 2016 were 332 mt, or 9% above the proposed 2018-2020 specification. A 90% TAL trigger would impose a 400 lbs. possession limit when landings reach 293 mt (Table 44), or 58 mt below 2016 landings. Discounting for minor landings that would be likely with a 400 lbs. possession limit, the proposed specifications would curtail red hake landings by 58 mt, valued at $63,000.

Most of the red hake landings occur in RI, NY, and CT, so any reductions in red hake landings would be felt most in these states (Table 45). Of the total value, 47% of revenue from red hake landings come from trips using 2.5 to 3-inch mesh which is primarily used to target whiting. Accounting for 38% of the value are trips using trawls with 2.1 to 2.5 inch mesh (Table 46), primarily used to target squid and other species. Vessels using the smaller mesh actually account for more of the landings, but the value is less due to seasonal and market factors. The squid fishery typically occurs earlier than the winter/spring whiting fishery on Georges Bank and in Southern New England, so the largest effect on trips will be in the whiting fishery. If triggered, changes in catches of species targeted in the southern management area with small-mesh trawls (whiting, squid, butterfish, herring) are unlikely to be affected by the in-season accountability measure.

Not accounting for a small potential for increases in effort and landings of northern silver hake, the expected change in revenue compared to 2016 is a minor reduction of $13,000. Increases in northern silver hake landings could total $8.6 million, but due to aforementioned factors, such a large increase is highly unlikely. With the preferred alternative and updated specifications, landings of small-mesh multispecies could increase somewhat in NH and MA from more trips targeting northern silver hake, but a small decrease in landings is expected from a southern red hake in-season accountability measure, particularly in RI, NY, and CT.

Taking the above factors into consideration, the proposed specifications is expected to have a low positive impact on fishery-related businesses and communities, compared to No Action. Over the long-term, the proposed specifications are intended to reduce the risk of overfishing to maintain a healthy, sustainable stock which would in turn maximize revenues.

6.5.1.2 No Action (Section 4.1.2)

No action would maintain the current specifications, resulting in lower northern red and silver hake TALs, but higher TALs of the southern red and whiting stocks, relative to the proposed specifications. If No Action is selected, the primary result would be to maintain biomass targets based on outdated assessment results.

[17] The TAL trigger for northern red hake is 37.9% of the TAL. The difference between the proposed and status quo TAL triggers is 5,990 mt.

The impacts of No Action on fishery-related businesses and communities is expected to be ***negative***. Selecting No Action is unlikely to have immediate substantial social impacts, as it would maintain the current method used to determine the specifications for this stock. However, if fishermen perceive that fishery managers are not making use of the best available science by incorporating information from a more recent assessment into their decisions, there may be negative social impacts on fishermen's *Attitudes, Beliefs, and Values* concerning fishery management. The continued use of outdated information to set specifications would likely reinforce any perceptions of inadequacy and feelings of mistrust. There could also be long-term negative social impacts to the *Historical Dependence on and Participation in* the small-mesh multispecies fishery. If specifications are not revised based on updated assessments, the resulting biomass targets may be inappropriate. aUse of targets that are too high could lead to overfishing, which would threaten continued access to fishery resources. If targets are too low, socioeconomic benefits to the small-mesh multispecies fishery and related communities may be unnecessarily limited.
Relative to the revised specifications, No Action would reduce the likelihood of an in-season southern red hake accountability measure being triggered in 2018-2020, which would have positive fishery impacts. On the other hand, No Action would almost guarantee that the in-season accountability measure for northern red hake would be triggered. As northern red hake biomass has increased and the higher landings per trip would trigger an incidental 400 lb. limit earlier in the season, reducing revenues and potentially increasing discards.

Even without raising the northern silver hake TAL, No Action is unlikely to constrain fishing effort for northern silver hake and southern whiting. In the short-term, the revenues from small-mesh multispecies landings may be slightly higher than with the proposed specifications, because the southern red hake accountability measures would not be triggered. This however may allow overfishing to continue and require further cuts over the long-term. **Taking the above factors into account, the No Action alternative could have a low positive impact in short term, but due to higher discards of northern red hake and the specter of lower catches of southern red hake in the long term, the No Action alternative is expected to have a low negative impact on fishery-related businesses and communities in the long-term.**

Table 44. Landings and revenues of small-mesh multispecies stocks in fishing year 2016 compared to Total Annual Landings (TAL) limits for 2017 and those proposed for 2018-2020. Landings were calculated from the 2016-2017 VTRs. Revenues were derived from trip matching and for non-matching trips, allocations by state and gear type. Whiting represent the combined landings of silver and offshore hakes.

The potential change in landings represents the difference in the TAL trigger for in-season accountability measures or (for southern red hake) the amount that 2016 landings exceeded the proposed TAL trigger for 2018-2020.

Stock	Landings (mt)	Revenues (million)	Dealers	Vessels	Trips	Trips > Incidental limit	2017 TAL	Proposed annual TAL (mt)	Percent change	Potential change in landings (mt)[18]	Value (million)
Northern silver hake	3,085	$4.416	108	44	1,081	462	19,949	26,604	33%	5,990	$8.6
Northern red hake	162	$0.140	108	44	1,081	152	120	274	128%	58	$0.1
Southern whiting	3,843	$5.809	146	109	1,920	324	23,833	14,465	-39%	0	$0.0
Southern red hake	332	$0.365	146	109	1,920	293	746	305	-59%	-58	-$0.1
Total	7,422	$10.730			3,001		44,648	41,648	-6.7%	5.990	$8.6

[18] Represents the difference between the proposed and status quo TAL triggers, which would trigger a reduction in the possession limit to 2,000 lbs. whiting or 400 lbs. of red hake.

Table 45. Landings by state reported from southern management area statistical areas on FY 2016 VTRs

State	Whiting (lbs)	Whiting $	Red hake (lbs)	Red hake $	Red hake $.	Dealers.	Ports.	Vessels.	Whiting trips	Trips > 2000 lbs. whiting	Trips > 400 lbs. red hake	Percent
CT	829,999	$712,867	109867	$81,605	29.88%	23	2	10	217	42	43	14.7%
MA	1,960,764	$1,503,909	43052	$30,441	11.14%	27	12	26	150	74	23	7.8%
NC	1,024	$171	214	$25	0.01%	7	4	5	11	0	0	0.0%
NJ	64,170	$46,646	21346	$16,096	5.89%	20	6	15	106	9	14	4.8%
NY	932,970	$683,618	131985	$65,094	23.83%	32	3	12	265	50	54	18.4%
RI	2,407,048	$1,302,927	240790	$79,849	29.23%	31	4	36	1161	149	158	53.9%
VA	2,725	$215	925	$35	0.01%	6	4	5	10	0	1	0.3%
Grand Total	**6,198,700**	**$4,250,353**	**548179**	**$273,146**	**100.00%**	**146**	**35**	**109**	**1920**	**324**	**293**	**100.0%**

Table 46. Trawl landings by mesh reported on FY 2016 VTRs.

Mesh	Whiting (lbs)	Whiting $	Percent	Red hake (lbs)	Red hake $	Percent.	Dealers.	Ports.	Vessels.	Whiting trips	Trips > 2000 lbs whiting	Red hake > 400 lbs.
Trawl												
<= 2.0	80,723	$39,110	0.5%	33,244	$10,149	2.5%	71	25	41	201	7	18
2.1-2.5	1,476,729	$837,304	9.9%	401,634	$156,693	38.2%	111	30	82	1109	231	237
2.6-3.0	10,437,054	$7,041,874	83.1%	341,349	$193,547	47.2%	92	23	49	642	492	141
3.1-5.5	372,680	$293,207	3.5%	97,108	$40,950	10.0%	91	19	61	498	35	51
>= 5.5	339,082	$224,319	2.6%	22,539	$8,662	2.1%	181	46	111	701	32	9
Trawl Total	**12,706,268**	**$8,435,814**	**99.6%**	**895,874**	**$410,002**	**99.9%**	546	143	344	**3151**	**797**	**456**

6.6 Cumulative Effects Analysis

A cumulative effects analysis (CEA) is required by the Council on Environmental Quality (CEQ) (40 CFR part 1508.7). The purpose of CEA is to consider the combined effects of many actions on the human environment over time that would be missed if each action were evaluated separately. CEQ guidelines recognize that it is not practical to analyze the cumulative effects of an action from every conceivable perspective, but rather, the intent is to focus on those effects that are truly meaningful. A formal cumulative impact assessment is not necessarily required as part of an EA under NEPA as long as the significance of cumulative impacts have been considered (U.S. EPA 1999). The following remarks address the significance of the expected cumulative impacts as they relate to the federally-managed small-mesh multispecies fishery.

6.6.1 Consideration of VECs

In Section 5.0 (Affected Environment), the VECs that exist within the small-mesh multispecies fishery environment are identified. Therefore, the significance of the cumulative effects will be discussed in relation to the VECs listed below.

1. Target species (Red, Silver, and Offshore Hake Stocks)
2. Non-target species and Bycatch
3. Physical Environment and Essential Fish Habitat
4. Protected Resources
5. Fishery-related businesses and communities

6.6.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the small-mesh multispecies fishery, which targets red, silver, and offshore hakes. The core geographic scope for each of the VECs is focused on the Western Atlantic Ocean (Sections 5.0). The core geographic scopes for the managed resources are the range of the management units (Section 5.1). For non-target species, those ranges may be expanded and would depend on the biological range of each individual non-target species in the Western Atlantic Ocean (Section 5.1.4). For habitat, the core geographic scope is focused on EFH within the EEZ but includes all habitat utilized by red, silver, and offshore hakes and other non-target species in the Western Atlantic Ocean (Section 5.3). The core geographic scope for protected resources can be considered the overall range of these VECs in the Western Atlantic Ocean (Section 5.2). For fishery-related businesses and communities, the core geographic boundaries are defined as those U.S. fishing communities directly involved in the harvest or processing of the managed resources, which were found to occur in coastal states from Maine through North Carolina (Section 5.4).

6.6.3 Temporal Boundaries

The temporal scope of past and present actions for VECs is primarily focused on actions that have occurred after FMP implementation (Section 3.2.5). For endangered and other protected resources, the scope of past and present actions is on a species-by-species basis (Section 5.2) and is largely focused on the 1980s and 1990s through the present, when NMFS began generating stock assessments for marine mammals and sea turtles that inhabit waters of the U.S. EEZ. The temporal scope of future actions for all five VECs extends to the end of the 2017 fishing year, when specifications would be re-evaluated. This period was chosen because it is the effective length of the action, and because the dynamic nature of

resource management for these three species and lack of information on projects that may occur in the future make it very difficult to predict impacts beyond this timeframe with any certainty.

6.6.4 Actions Other Than Those Proposed in this Document

The impacts of each of the alternatives considered in this specifications document are given in Sections 6.1 through 6.5. Table 47 presents meaningful past (P), present (Pr), or reasonably foreseeable future (RFF) actions to be considered other than those actions being considered in this specifications document. These impacts are described in chronological order and qualitatively, as the actual impacts of these actions are too complex to be quantified in a meaningful way. When any of these abbreviations occur together (i.e., P, Pr, RFF), it indicates that some past actions are still relevant to the present and/or future actions.

Table 47. Impacts of Past (P), Present (Pr), and Reasonably Foreseeable Future (RFF) Actions on the five VECs (not including those actions considered in this specifications document).

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
P, Pr Original FMP and subsequent Amendments and Frameworks to the FMP	Established commercial fishery management measures	**Indirect Positive** Regulatory tool available to rebuild and manage stocks	**Indirect Positive** Reduced fishing effort	**Indirect Positive** Reduced fishing effort	**Indirect Positive** Reduced fishing effort	**Indirect Positive** Benefited domestic businesses
P, Pr Amendment 12 (2000)	Defined overfishing thresholds and optimum yield (OY). Established the Cultivator Shoals Area, possession limits and gear specifications	**Direct Positive** Measures prevent overfishing and produce MSY.	**Direct Positive** Specific area, seasonal, and gear measures to minimize bycatch, particularly of regulated groundfish.	**Direct Positive** Measures limit the amount and extent of fishing effort.	**Direct Positive** Measures limit the amount and extent of fishing effort	**Direct Positive** Allows a fishery to continue by minimizing bycatch of regulated multispecies.
P, Pr Framework Adjustment 38 (2000)	Establishes an exempted small mesh fishery in the inshore Gulf of Maine, from Jul 1 to Nov 30; requires exempted grate or raised footrope trawl gear; includes incidental catch restrictions.	**Neutral** Measures do not regulate catches of target species.	**Direct Positive** Specific area, seasonal, and gear measures to minimize bycatch, particularly of regulated groundfish.	**Direct Positive** Measures limit the amount and extent of fishing effort. Raised footrope trawl reduces bottom impacts.	**Direct Positive** Measures limit the amount and extent of fishing effort	**Direct Positive** Allows a fishery to continue by minimizing bycatch of regulated multispecies.

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[P, Pr] Amendment 19 (2013)	Revised overfishing definitions and established specification and catch monitoring framework and accountability measures.	**Direct Positive** Specifications and adjustments change in response to stock biomass and discarding to prevent overfishing and produce MSY.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Direct Positive** Ensures that overfishing does not occur or becomes persistent, producing OY.
[P, Pr] 2015-2017 Specifications Package (2015)	Adjusted catch specifications to be consistent with recent changes in stock biomass and discarding.	**Direct Positive** Prevents overfishing and produces MSY.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Direct Positive** Ensures that overfishing does not occur or becomes persistent, producing OY.
[P, Pr] 2016-2017 Specifications Package for red hake (2016)	Adjusted catch specifications to be consistent with large year class of northern red hake and a decline in southern red hake biomass.	**Direct Positive** Reduces discarding of northern red hake and prevents catch of southern red hake from causing overfishing.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Neutral** Measures do not reduce effort or require more selective gear and do not change exemption areas.	**Direct Positive** Ensures that overfishing does not occur or becomes persistent, producing OY. Allows higher landings of northern red hake.
[P, Pr] Summer Flounder, Scup, and Black Sea Bass Specifications	Establish quotas, RHLs, other fishery regulations (commercial and recreational)	**Indirect Positive** Regulatory tool to specify catch limits, and other regulation; allows response to annual stock updates	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Benefited domestic businesses

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[P, Pr] Squid, Mackerel, and Butterfish Amendments (5 to 15) and Specifications	Establish limited access, seasonal quotas and accountability measures, other fishery regulations	**Indirect Negative** Potentially increased fishing effort on southern whiting and red hakes.	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Positive** Reduced effort levels; gear requirements	**Indirect Negative** Seasonal closures and redirected effort can depress whiting prices.
[P, Pr, RFF] Development, Application, and Revision of Standardized Bycatch Reporting Methodology	Established acceptable level of precision and accuracy for monitoring of bycatch in fisheries	**Neutral** May improve data quality for monitoring total removals of managed resource	**Neutral** May improve data quality for monitoring removals of non-target species	**Neutral** Will not affect distribution of effort	**Neutral** May increase observer coverage and will not affect distribution of effort	**Potentially Indirect Negative** May impose an inconvenience on vessel operations
[P,Pr] Omnibus Amendment ACLs/AMs Implemented	Establish and apply ACLs and AMs for all three plan species	**Potentially Indirect Positive** Pending full analysis	**Potentially Indirect Positive** Pending full analysis	**Potentially Indirect Positive** Pending full analysis	**Potentially Indirect Positive** Pending full analysis	**Potentially Indirect Positive** Pending full analysis
[P] Multispecies Amendment 13 (2003), Framework Adjustments 40A, 40B, 41, and 42	Splits and allocates Category A and B DAS to allow fishing on healthy stocks while rebuilding other stocks; adopted Georges Bank yellowtail flounder rebuilding strategy.	**Indirect Negative** Greater restrictions on groundfish fishing makes small-mesh multispecies an attractive option, potentially increasing mortality.	**Indirect Positive** Addresses mortality and bycatch of depleted groundfish stocks, but no specific measures for the small-mesh multispecies fishery.	**Indirect Positive** Small-mesh fishery typically occurs in areas with less vulnerable substrate than that where groundfishing occurs.	**Neutral** May shift effort into the small-mesh multispecies fishery, but could increase or decrease protected species interactions.	**Indirect Positive** Potentially allows the Georges Bank small-mesh multispecies fishery to continue, accounting for bycatch of a regulated species.

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[P,Pr] Multispecies Amendment 16 (2009)	Implementation of sector management catch shares and monitoring. Groundfish catches of sector vessels declared out of the fishery attributed to the "Other" fishery category. Many small-mesh multispecies vessels are also enrolled in a groundfish sector.	**Indirect positive** Sector vessels without a groundfish allocation may not fish if they cannot account for their bycatch.	**Direct Positive** Bycatch of regulated groundfish are monitored. Catches count against a sector Annual Catch Entitlement (ACE).	**Indirect Positive** Sector vessels without a groundfish allocation may not fish if they cannot account for their bycatch.	**Indirect Positive** Sector vessels without a groundfish allocation may not fish if they cannot account for their bycatch.	**Indirect Negative** Potentially increases small-mesh fishing costs.
[P,Pr] Multispecies FMP Framework 48 (2013)	Established a Georges Bank yellowtail flounder sub-ACL for the small-mesh multispecies and other fisheries, as a fixed percentage of the US ABC.	**Neutral** Does not change mortality of small-mesh multispecies stocks.	**Direct Positive** Limits bycatch of Georges Bank yellowtail flounder in the fishery.	**Neutral** Unlikely to change fishing effort amount or distribution.	**Neutral** Unlikely to change fishing effort amount or distribution.	**Indirect Positive** Potentially allows the Georges Bank small-mesh multispecies fishery to continue, accounting for bycatch of a regulated species.
[P,Pr] Multispecies FMP Framework 51 (2014)	Established a gear-based reactive accountability measure (AM) for GB yellowtail flounder require a small-mesh vessel to use approved selective trawl gear; implemented Gulf of Maine cod rebuilding strategy.	**Potentially Indirect Negative** Restrictions on Gulf of Maine cod fishing causing effort shift into the small-mesh multispecies fishery.	**Direct Positive** Requires more selective gear when GB yellowtail flounder bycatch exceeds acceptable level.	**Indirect Negative** May reduce effort in Cultivator Shoals Area and Georges Bank, shifting to areas with more vulnerable habitat.	**Neutral** Could shift effort to areas with higher or lower protected species interactions.	**Indirect Positive or Direct Negative** Measure allows fishery to operate without a payback provision, but increases gear costs.

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[P,Pr] Monkfish Amendment 2/MSB Amendment 9 Areas	Prohibits fishing for monkfish, squid, mackerel, and butterfish in Lydonia and Oceanographer Canyons (Map 7). Does not apply to trips targeting only small-mesh multispecies	**Neutral** Curtails effort in some areas but effort shifts occur. Some prohibited trips target both squid and small-mesh multispecies.	**Potentially Direct Positive or Direct Negative** Area closures may reduce bycatch of some species, while effort shifts may increase bycatch of other species	**Direct Positive** Reduces impacts of bottom-tending small-mesh multispecies trawls on deep-sea corals and other benthos.	**Neutral** Trips partially targeting small-mesh multispecies may shift to locations where protected species are equally vulnerable.	**Direct Negative and Indirect Positive** Increases fishing costs by causing effort shifts to potentially sub-optimal locations, but long-term benefits accrue from undisturbed habitat.
[P,Pr] Tilefish Amendment 1 Areas	Prohibits the use of bottom-tending mobile gear around tilefish habitat and clay outcrops of Lydonia, Oceanographer, Veatch, and Norfolk Canyons (Map 7).	**Neutral** Curtails effort in some areas but effort shifts occur.	**Potentially Direct Positive or Direct Negative** Same as above.	**Direct Positive** Reduces impacts on clay outcrops associated with Tilefish HAPCs.	**Neutral** Same as above.	**Direct Negative** Increases fishing costs by causing effort shifts to potentially sub-optimal locations.
[P,Pr] Northeast Canyons and Seamounts Marine National Monument	Closes to fishing the shelf-slope region from Oceanographer to Lydonia Canyons and an area surrounding four deep-sea seamounts (Map 7).	**Neutral** Small-mesh multispecies fishing trips occur in the Canyons portion and relocated to the east and west along the shelf edge.	**Potentially Direct Positive or Direct Negative** Same as above.	**Direct Positive** Reduces impacts on a broad range of corals and other benthos for about 40 miles of the shelf edge.	**Neutral** Same as above.	**Direct Negative** Increases fishing costs by causing effort shifts to potentially sub-optimal locations. Some increase in steaming costs

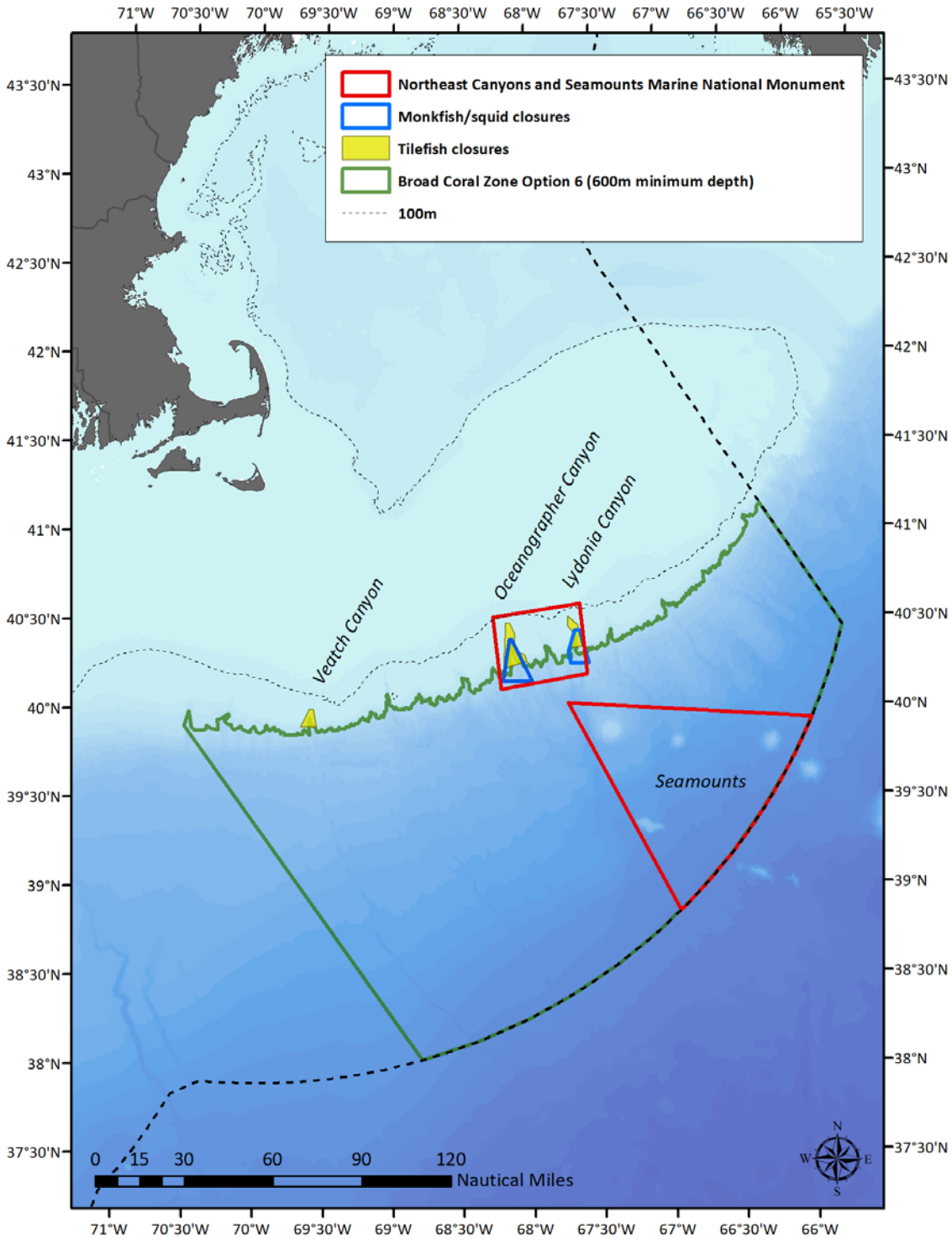
Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[RFF] Northeast Canyons and Seamounts Marine National Monument	Authority over fishing activity in the Monument is proposed to be turned back over to the FMCs.	**Neutral** Fishing trips that were dislocated by the designation could return, but increases in fishing mortality are not expected.	**Potentially Direct Positive or Direct Negative** Opposite as above.	**Direct Positive** NEFMC is considering closing a larger area (Map 7) to mobile-tending gears that would have less impact on certain types of fishing.	**Neutral** Opposite as above.	**Direct Positive** Reduces costs by allowing more fishing in optimum locations. Some reduction in steaming costs.
[RFF] Multispecies FMP Framework 57	Specifies 2018 Georges Bank yellowtail flounder sub-ACL and prohibits possession of Atlantic halibut	**Neutral** Unlikely to change effort and fishing mortality on target species	**Potentially Direct Positive** Limits mortality on overfished stocks.	**Neutral** Unlikely to change the amount or distribution of small-mesh fishing	**Neutral** Unlikely to change the amount or distribution of small-mesh fishing	**Potentially Indirect Negative** Measures to reduce mortality on bycatch species could increase fishing cost.
[RFF] Limited Access Amendment 22	Establish qualifications for vessels to participate in the small-mesh fishery; establish additional limits for incidental catch for non-qualifying vessels	**Direct Positive** Limited access would make regulations more effective to limit catch of target species.	**Direct Positive** Limited access would make regulations more effective to limit bycatch of non-target species.	**Potentially Indirect Negative** Changes in possession limits could increase fishing effort in the northern management area (with more vulnerable habitat), but could also limit increases in fishing effort.	**Potentially Indirect Positive** Changes in possession limits could reduce fishing effort in the southern management area where there are more interactions, and could also limit increases in overall fishing effort.	**Direct Positive or Negative** Potentially reduces costs to vessels that qualify; non-qualifying vessels and ports where they land could experience a decline in fishery revenue.

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[RFF] MAFMC Squid, Mackerel, and Butterfish Amendment 20	Removes latent limited access permits from the directed fishery and allows vessels to qualify for an incidental permit with a 5,000 pound longfin squid limit. Reduces the trimester closure from 2,500 to 250 pounds per day.	**Indirect Negative** Non-qualifying vessels may increase fishing effort on small-mesh multispecies.	**Direct Positive** Shifts in effort will use larger, more selective mesh to fish for whiting, which has a graduated possession limit.	**Neutral** Measures are unlikely to increase total small-mesh trawl effort, but only change the target species. Gears used in squid and whiting fisheries are similar but use different size mesh.	**Direct Positive** May reduce squid fishing in summer in favor of winter/spring whiting fishing when protected species are less available.	**Potentially Direct Negative** Minor increase in fishing costs to target a difference species. Some boats may need modification, or larger boats may be required in the winter/spring whiting fishery. Negative impact on whiting prices when Squid Trimester 2 closes.
[RFF] MAFMC Squid Specifications for 2018-2020	Adjustments to specifications to prevent overfishing and achieve OY. The proposed DAH is 2% higher than 2015-2017 because of lower squid discards. A squid buffer for the summer season may also be considered.	**Indirect Negative** Squid effort in the summer (during Trimester 2) may be redirected to target southern whiting.	**Indirect Positive** Effort shifts into the whiting fishery would mean that most vessels would be using more selective (i.e. 3-inch instead of 2-inch) mesh.	**Neutral** Shifts in effort into the whiting fishery are unlikely to encounter more vulnerable habitat or change impacts of gear on habitat.	**Neutral to Low Positive** Squid and whiting fishery often occurs in the same area, but some vessels may fish on Georges Bank rather than Southern New England waters.	**Potentially Indirect Negative** Earlier closure of the Trimester 2 squid fishery could increase landings of southern whiting when vessels redirect, reducing prices for whiting from the northern exemption areas.
[RFF] Deep-sea Coral Amendment	Considers closure of broad zones to mobile-tending bottom gears to protect deep-sea corals and other species	**Neutral** Analysis shows a very low impact on small-mesh multispecies fishing.	**Potentially Direct Negative** Minor increase in bycatch of continental shelf species like yellowtail flounder.	**Direct Positive** NEFMC is considering closing a larger area (Map 7) to mobile-tending gears that would have less impact on certain types of fishing.	**Neutral** Effects are uncertain.	**Neutral** Analysis shows a very low impact on small-mesh multispecies fishing.

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
P, Pr, RFF Agricultural runoff	Nutrients applied to agricultural land are introduced into aquatic systems	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality negatively affects resource
P, Pr, RFF Port maintenance	Dredging of coastal, port and harbor areas for port maintenance	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
P, Pr, RFF Beach nourishment	Offshore mining of sand for beaches	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Mixed** Positive for mining companies, possibly negative for fishing industry
	Placement of sand to nourish beach shorelines	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Positive** Beachgoers like sand; positive for tourism
P, Pr, RFF Marine transportation	Expansion of port facilities, vessel operations and recreational marinas	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Mixed** Positive for some interests, potential displacement for others
P, Pr, RFF Installation of pipelines, utility lines and cables	Transportation of oil, gas and energy through pipelines, utility lines and cables	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Reduced habitat quality	**Potentially Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
P, Pr, RFF Offshore disposal of dredged materials	Disposal of dredged materials	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality negatively affects resource viability

Action	Description	Impacts on Red, Silver, and Offshore Hake Stocks	Impacts on Non-target Species and Bycatch	Impacts on the Physical Environment and EFH	Impacts on Protected Species	Impacts on Fishery-related Businesses and Communities
[RFF] Offshore Wind Energy Facilities (within 3 years)	Construction of wind turbines to harness electrical power (Several proposed from ME through NC, including NY/NJ, DE, and VA)	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Potentially Direct Negative** Localized decreases in habitat quality possible	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
[Pr, RFF] Liquefied Natural Gas (LNG) terminals (within 3 years)	Transport natural gas via tanker to terminals offshore and onshore (1 terminal built in MA; 1 under construction; proposed in RI, NY, NJ and DE)	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Potentially Direct Negative** Localized decreases in habitat quality possible	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects

Map 7. Relationship between Present and Reasonable Foreseeable Future actions that close or would close areas to small-mesh multispecies fishing. Option 6 is the NEFMC's preferred alternative in the Deep-sea Corals Amendment.



6.6.4.1 Past and Present Actions

The historical management practices of the Council have resulted in positive impacts on the health of the red, silver, and offshore hakes stocks (Section 6.1). Numerous actions have been taken to manage the commercial and recreational fisheries for these three species through amendment and framework adjustment actions. In addition, the specifications process is intended to provide the opportunity for the Council and NMFS to regularly assess the status of the fishery and to make necessary adjustments to ensure that there is a reasonable expectation of meeting the objectives of the FMP and the targets associated with any rebuilding programs under the FMP. The statutory basis for Federal fisheries management is the MSA. To the degree with which this regulatory regime is complied, the cumulative impacts of past, present, and reasonably foreseeable future federal fishery management actions on the VECs should generally be associated with positive long-term outcomes. Constraining fishing effort through regulatory actions can often have negative short-term socioeconomic impacts. These impacts are usually necessary to bring about long-term sustainability of a given resource, and as such, should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon the small-mesh multispecies and other related fisheries that have incidental catches of red, silver, and offshore hakes.

Non-fishing activities were considered when determining the combined effects from past, present, and reasonably foreseeable future actions. Each activity that has been considered as part of this cumulative impact analysis is weighted the same as any other. We lack the resources to quantify whether any one non-fishing activity would result in greater impacts to a particular VEC versus any other (this includes global climate change). Non-fishing activities that introduce chemical pollutants, sewage, changes in water temperature, salinity, dissolved oxygen, and suspended sediment into the marine environment pose a risk to all of the identified VECs. Human-induced non-fishing activities tend to be localized in near-shore areas and marine project areas where they occur. Examples of these activities include, but are not limited to agriculture, port maintenance, beach nourishment, coastal development, marine transportation, marine mining, dredging and the disposal of dredged material. Wherever these activities co-occur, they are likely to work additively or synergistically to decrease habitat quality and, as such, may indirectly constrain the sustainability of the managed resources, non-target species, and protected resources. Decreased habitat suitability would tend to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that would reduce fishing effort could then negatively impact human communities. The overall impact to the affected species and their habitats on a population level is unknown, but likely neutral to low negative, since a large portion of these species have a limited or minor exposure to these local non-fishing perturbations.

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

6.6.4.2 Reasonably foreseeable future actions

In fishing year 2012, ACLs and AMs were first implemented for red, silver, and offshore hake stocks (as well as other Council managed species) to ensure that catch and landings limits are not exceeded and overfishing does not occur. Monitoring of catch since 2012 was completed and summarized in NEFMC 2014 and NEFMC 2017, indicating that catches of red, silver, and offshore hakes stocks were generally well below the ABCs and overfishing was not occurring.

In the 2016 assessment update (summarized in NEFMC 2017), the southern red hake stock biomass has been declining and stable catches appear to have caused overfishing for the first time in 2016. Also the biomass has sunk below the threshold and the stock has appeared to have become overfished. If this finding does not change, the Council will initiate an amendment to address the overfished status and begin a rebuilding program. Measures to rebuild southern red hake are likely going to be difficult to develop because around 70% of the catch comes from estimated discards in both the whiting and squid fisheries.

In 2014 catches of northern red hake were 27.5% above the ABC and the in-season AM (a reduction in possession limit to discourage targeting and encourage fishing where red hake are less abundant) was adjusted post hoc to reduce future risk of overfishing. Since then, the northern red hake catches also exceeded the ACL and the TAL trigger was lowered to 37.9% of the TAL to account for those overages. These in-season AMs applied to the 2014-2016 fishing years and will continue into the future subject to future revisions, if needed. In 2016, the catches did not exceed the ACL, possibly indicating that the most recent TAL trigger adjustment from 45% of the TAL to 37.9% of the TAL was not needed to prevent the catch from exceeding the ACL. Coupled with the increase in the proposed northern red hake specifications for 2018-2020, the low TAL trigger may not be needed in the near future either. If the northern red hake catch remains below the ACL, the Council may include an appropriate adjustment to raise the northern red hake TAL trigger in a future action.

As a result, the Reasonably Foreseeable Future Actions over the next three years may include the adjusted northern red hake AM and potential implementation or adjustment of accountability measures and other Council recommended adaptive adjustments to the way this new system of catch limits and accountability functions and interacts with the fishery regulations in place.

The Council has begun development of Amendment 22 to establish limited access qualification criteria for vessels to participate in the small-mesh multispecies fishery. The stated purpose of the amendment is to freeze the footprint of the fishery so that rapid increases in effort do not occur and contribute to unmanageable catches of non-target species. Without taking action in Amendment 22, new entrants to the fishery could cause catches to increase and exceed the limits, particularly for "choke" species for which current catches are near or have in the recent past exceeded established limits. Other limits on groundfish catches may also impact the fishery, which would be exacerbated if the number of vessels in the fishery substantially increases. Because market demand is dominated by external forces, significant increases in red hake and whiting catches could also have negative effects on price, having a negative impact on traditional fishermen and communities.

Five qualification alternatives have been developed and the qualifying vessels account for 85-95% of the 2014-2016 small-mesh multispecies landings on trips that exceed 2000 lbs. of whiting and 400 lbs. of red hake. The Council plans to conduct public hearings on Draft Amendment 22 in early 2018, choose final alternatives, and submit the amendment for approval in late 2018. If the Council chooses a limited access alternative and it is approved by NMFS, the limited access program and associated measures are likely to become effective at the start of the 2019 fishing year.

For many of the proposed non-fishing activities to be permitted under other federal agencies (such as beach nourishment, offshore wind facilities, etc.), those agencies would conduct examinations of potential impacts on the VECs. The MSA (50 CFR §600.930) imposes an obligation on other federal agencies to consult with the Secretary of Commerce on actions that may adversely affect EFH. The eight Fishery Management Councils are engaged in this review process by making comments and recommendations on any federal or state action that may affect habitat, including EFH, for their managed species and by commenting on actions likely to substantially affect habitat, including EFH.

In addition, under the Fish and Wildlife Coordination Act (Section 662), “whenever the waters of any stream or other body of water are proposed or authorized to be impounded, diverted, the channel deepened, or the stream or other body of water otherwise controlled or modified for any purpose whatever, including navigation and drainage, by any department or agency of the U.S., or by any public or private agency under federal permit or license, such department or agency first shall consult with the U.S. Fish and Wildlife Service (USFWS), Department of the Interior, and with the head of the agency exercising administration over the wildlife resources of the particular state wherein the” activity is taking place. This act provides another avenue for review of actions by other federal and state agencies that may impact resources that NMFS manages in the reasonably foreseeable future.

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

6.6.5 Magnitude and significance of cumulative effects

In determining the magnitude and significance of the cumulative effects, the additive and synergistic effects of the proposed action, as well as past, present, and future actions, must be taken into account. The following section discusses the effects of these actions on each of the VECs.

6.6.5.1 Red, silver, and offshore hake stocks

Those past, present, and reasonably foreseeable future actions, whose effects may impact the managed resources and the direction of those potential impacts, are summarized in Table 47. The indirectly negative actions described in this table are localized in near-shore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on the managed resources is expected to be limited due to a lack of exposure to the population at large. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal system may be of a larger magnitude, although the impact on productivity of the managed resources is unquantifiable. As described above (Section 6.6.4.2), NMFS has several means under which it can review non-fishing actions of other federal or state agencies that may impact NMFS’ managed resources prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on resources under NMFS’ jurisdiction.

Climate change is already impacting fishery resources by shifting distributions, abundances, and phenology of species and the communities that depend on them. For example, cold water species are shifting northward. Some of these shifts are in response to warming waters and some are in response to changes in population abundance and age-structure. Water temperatures are known to exert significant influence different life stages, on reproductive and developmental processes, growth rates, and increase the likelihood of disease. Shifts in red and silver hake distribution in surveyed areas was evaluated and documented by Nye et al. 2009 and Nye et al. 2011. With shifting species distribution, loss of habitat, and changes in mortality, the ability of some fish stocks to respond to harvesting pressure may be reduced, while the ability of other fish stocks may be increased.

These impacts are expected to intensify in the future, increasing the need for a better understanding of which fishery resources are the most vulnerable. NMFS has developed a tool for rapidly assessing and indexing the vulnerability of fish stocks to climate change. The index can help fishery managers identify

high vulnerability stocks and more effectively target limited research and assessment resources on stocks of highest concern. The methodology combines a stock's exposure and sensitivity (which includes adaptive capacity) to estimate overall vulnerability. Pilot tests have found the methodology to be robust across temperate and tropical ecosystems. A full assessment has been developed in the northeast U.S. for all managed fish and shellfish species in the spring of 2014 (Nelson et al. in prep).

Past fishery management actions taken through the FMP and annual specification process have had a positive cumulative effect on the managed resources. It is anticipated that the future management actions, described in Table 48, will result in additional indirect positive effects on the managed resources through actions which reduce and monitor bycatch, protect habitat, and protect ecosystem services on which red, silver, and offshore hakes productivity depends. The 2012 fishing year was the first year of implementation for an amendment which requires specification of ACLs/AMs and catch accountability (77 FR 19138 and 78 FR 20260) and this process has been carried forward into the 2015-2017 proposed measures. Implementation of ACLs and AMs represents a major change to the current management program and is expected to lead to improvements in resource sustainability over the long-term. These impacts could be broad in scope, but the impacts were evaluated in the EIS for Amendment 19 (NEFMC 2013). Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to red, silver, and offshore hakes have had a positive cumulative effect.

Catch limits for each of the managed resources have been specified to ensure these stocks are managed in a sustainable manner, and measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts from annual specification of management measures established in previous years on the managed resources are largely dependent on how effective those measures were in meeting their intended objectives (i.e., preventing overfishing, achieve OY) and the extent to which mitigating measures were effective. The proposed action in this document would positively reinforce the past and anticipated positive cumulative effects on the red, silver, and offshore hakes stocks, by achieving the objectives specified in the FMP. Therefore, the proposed action would not have any significant effect on the managed resources individually or in conjunction with other anthropogenic activities (see the table below).

Table 48. Summary of the effects of past, present, and reasonably foreseeable future actions on red, silver, and offshore hake stocks.

Action	Past to the Present	Reasonably Foreseeable Future
Original FMP and subsequent Amendments and Frameworks to the FMP	**Direct Positive**	
Red, Silver, and Offshore Hakes Specifications	**Direct Positive**	
Developed, Apply, and Redo Standardized Bycatch Reporting Methodology	**Indirect Neutral**	
Amendment to address ACLs/AMs implemented	**Direct Positive**	
Agricultural runoff	**Indirect Negative**	
Port maintenance	**Uncertain – Likely Indirect Negative**	
Offshore disposal of dredged materials	**Indirect Negative**	
Beach nourishment – Offshore mining	**Indirect Negative**	
Beach nourishment – Sand placement	**Indirect Negative**	
Marine transportation	**Indirect Negative**	
Installation of pipelines, utility lines and cables	**Uncertain – Likely Indirect Negative**	
National Offshore Aquaculture Act of 2007	**Potentially Indirect Negative**	
Offshore Wind Energy Facilities (within 3 years)		**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals (within 3 years)		**Uncertain – Likely Indirect Negative**
Convening Gear Take Reduction Teams (within 3 years)		**Indirect Positive**
Strategy for Sea Turtle Conservation for the Atlantic Ocean and the Gulf of Mexico Fisheries (within next 3 years)		**Indirect Positive**
Summary of past, present, and future actions excluding those proposed in this specifications document	**Overall, actions have had, or will have, positive impacts on red, silver, and offshore hakes stocks**	

6.6.5.2 Non-target species and Bycatch

Those past, present, and reasonably foreseeable future actions, whose effects may impact non-target species and bycatch and the direction of those potential impacts, are summarized in Table 47. The effects of indirectly negative actions described in this table are localized in nears-shore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on non-target species and bycatch is expected to be limited due to a lack of exposure to the population at large. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal system may be of a larger magnitude, although the impact on productivity of non-target resources and the oceanic ecosystem is unquantifiable. As described above (Section 6.6.4.2), NMFS has several means under which it can review non-fishing actions of other federal or state agencies that may impact NMFS' managed resources prior to permitting or implementation of those projects. At this time, NMFS can consider impacts to non-target species and bycatch (federally-managed or otherwise) and comment on potential impacts. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on resources within NMFS' jurisdiction.

Past fishery management actions taken through the FMP and annual specification process have had a positive cumulative effect on non-target species and bycatch. In particular, the small-mesh multispecies fishery is managed through specific exemptions from large-mesh multispecies regulations in such a way to minimize interactions with non-target species and bycatch. Specifically, these regulations include exemption areas and seasons in the northern management area that through prior experimental fishing permits have been shown to have acceptably low bycatch rates of large-mesh groundfish. In the southern management area, vessels may target red, silver, and offshore hakes year round, but operate in areas where large mesh multispecies catches are low. Concern about these species is however changing, particularly for distressed or overfished species like yellowtail and windowpane flounders.

Implementation and application of a standardized bycatch reporting methodology (SBRM) would have a particular impact on non-target species by improving the methods which can be used to assess the magnitude and extent of a potential bycatch problem. The redevelopment of the SBRM will result in better assessment of potential bycatch issues and allow more effective and specific management measures to be developed to address a bycatch problem. On-going research is being conducted through cooperative research and other programs to improve selectivity characteristics of small-mesh nets used by vessels targeting whiting and squids, particularly focused on reducing bycatch of yellowtail and windowpane flounders, species with sub-ACLs and subject to AMs. Use of these gears may be approved as an AM or as a technical measure in future management actions if they are shown to be effective.

It is anticipated that future management actions, described in Table 49, will result in additional indirect positive effects on non-target species through actions which reduce and monitor bycatch, protect habitat, and protect ecosystem services on which the productivity of many of these non-target resources depend. The impacts of these future actions could be broad in scope, and it should be noted the managed resource and non-target species are often coupled in that they utilize similar habitat areas and ecosystem resources on which they depend. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful have had a positive cumulative effect on non-target species.

Catch limits for each of the managed resources have been specified to ensure these rebuilt stocks are managed in a sustainable manner, and measures are consistent with the objectives of the FMP under the guidance of the MSA. The proposed actions in this document have impacts that range from neutral to positive or negative impacts, and would not change the past and anticipated positive cumulative effects on non-target species and thus, would not have any significant effect on these species individually or in conjunction with other anthropogenic activities (see table below).

Table 49. Summary of the effects of past, present, and reasonably foreseeable future actions on the non-target species and bycatch.

Action	**Past to the Present**		**Reasonably Foreseeable Future**
Original FMP and subsequent Amendments and Frameworks to the FMP	**Direct Positive**		
Red, Silver, and Offshore Hakes Specifications	**Indirect Positive**		
Developed, Apply, and Redo Standardized Bycatch Reporting Methodology	**Neutral**		
Amendment to address ACLs/AMs implemented	**Potentially Indirect Positive**		
Agricultural runoff	**Indirect Negative**		
Port maintenance	**Uncertain – Likely Indirect Negative**		
Offshore disposal of dredged materials	**Indirect Negative**		
Beach nourishment – Offshore mining	**Indirect Negative**		
Beach nourishment – Sand placement	**Indirect Negative**		
Marine transportation	**Indirect Negative**		
Installation of pipelines, utility lines and cables	**Uncertain – Likely Indirect Negative**		
National Offshore Aquaculture Act of 2007	**Potentially Indirect Negative**		
Offshore Wind Energy Facilities (within 3 years)			**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals (within 3 years)		**Uncertain – Likely Indirect Negative**	
Convening Gear Take Reduction Teams (within 3 years)			**Indirect Positive**
Strategy for Sea Turtle Conservation for the Atlantic Ocean and the Gulf of Mexico Fisheries (within next 3 years)			**Indirect Positive**
Summary of past, present, and future actions excluding those proposed in this specifications document	**Overall, actions have had, or will have, positive impacts on the non-target species.**		

6.6.5.3 Physical Environment and Essential Fish Habitat

Those past, present, and reasonably foreseeable future actions, whose effects may impact habitat (including EFH) and the direction of those potential impacts, are summarized in Table 47. The direct and indirect negative actions described in this table are localized in near-shore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on habitat is expected to be limited due to a lack of exposure to habitat at large. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal system may be of a larger magnitude, although the impact on habitat and EFH is unquantifiable. As described above (Section 6.6.4.2), NMFS has several means under which it can review non-fishing actions of other federal or state agencies that may impact NMFS' managed resources and the habitat on which they rely prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of direct and indirect negative impacts those actions could have on habitat utilized by resources under NMFS' jurisdiction.

Climate change is expected to have an impact on the physical characteristics and essential fish habitat aspects of marine ecosystems, and possibly change the very nature of these ecosystems. Increased frequency and intensity of extreme weather events, like hurricanes, may change the physical structure of coastal areas. Water circulation, currents, and the proportion of source waters/freshwater intrusion have been observed to be changing (Ecosystem Assessment Program, NEFSC, 2012) which influences salinity, water column stratification, transport of nutrients, and food web processes. All of these factors, in addition to others like ocean acidification and changes to water chemistry (Rebuck et al. in prep), threaten living elements of the marine environment, such as corals and shellfish, and may be related to the observed shifts in the planktonic community structure that forms the basis of the marine food web.

Past fishery management actions taken through the FMP and annual specification process have had a positive cumulative effect on habitat and EFH. The actions have constrained fishing effort at a large scale and locally, and have implemented gear requirements, which may reduce habitat impacts. As required under these FMP actions, EFH and HAPCs were designated for the managed resources. It is anticipated that the future management actions, described in Table 50, will result in additional direct or indirect positive effects on habitat through actions which protect EFH for federally-managed species and protect ecosystem services on which these species' productivity depends. These impacts could be broad in scope. All of the VECs are interrelated; therefore, the linkages among habitat quality and EFH, managed resources and non-target species productivity, and associated fishery yields should be considered. For habitat and EFH, there are direct and indirect negative effects from actions which may be localized or broad in scope; however, positive actions that have broad implications have been, and it is anticipated will continue to be, taken to improve the condition of habitat. There are some actions, which are beyond the scope of NMFS and Council management such as coastal population growth and climate changes, which may indirectly impact habitat and ecosystem productivity. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to habitat have had a neutral to positive cumulative effect.

Catch limits for each of the managed resources have been specified to ensure that red, silver, and offshore hakes stocks are managed in a sustainable manner, and measures are consistent with the objectives of the FMP under the guidance of the MSA. The proposed actions in this document would not change the past and anticipated cumulative effects on habitat and thus, would not have any significant effect on habitat individually or in conjunction with other anthropogenic activities (see table below).

Table 50. Summary of the effects of past, present, and reasonably foreseeable future actions on the physical environment and EFH.

Action	Past to the Present		Reasonably Foreseeable Future
Original FMP and subsequent Amendments and Frameworks to the FMP	**Indirect Positive**		
Red, Silver, and Offshore Hakes Specifications	**Indirect Positive**		
Developed, Apply, and Redo Standardized Bycatch Reporting Methodology	**Neutral**		
Amendment to address ACLs/AMs implemented	**Potentially Indirect Positive**		
Agricultural runoff	**Direct Negative**		
Port maintenance	**Uncertain – Likely Direct Negative**		
Offshore disposal of dredged materials	**Direct Negative**		
Beach nourishment – Offshore mining	**Direct Negative**		
Beach nourishment – Sand placement	**Direct Negative**		
Marine transportation	**Direct Negative**		
Installation of pipelines, utility lines and cables	**Uncertain – Likely Direct Negative**		
National Offshore Aquaculture Act of 2007	**Direct Negative**		
Offshore Wind Energy Facilities (within 3 years)			**Potentially Direct Negative**
Liquefied Natural Gas (LNG) terminals (within 3 years)		**Potentially Direct Negative**	
Convening Gear Take Reduction Teams (within 3 years)			**Indirect Positive**
Strategy for Sea Turtle Conservation for the Atlantic Ocean and the Gulf of Mexico Fisheries (within next 3 years)			**Indirect Positive**
Summary of past, present, and future actions excluding those proposed in this specifications document	**Overall, actions have had, or will have, direct negative to indirect positive impacts on the physical environment and EFH.**		

6.6.5.4 Protected Resources

Those past, present, and reasonably foreseeable future actions, whose effects may impact the protected resources and the direction of those potential impacts, are summarized in Table 47. The indirectly negative actions described in this table are localized in near-shore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on protected resources, relative to the range of many of the protected resources, is expected to be limited due to a lack of exposure to the population at large. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal system may be of a larger magnitude, although the impact on protected resources either directly or indirectly is unquantifiable. As described above (Section 6.6.4.2), NMFS has several means, including ESA, under which it can review non-fishing actions of other federal or state agencies that may impact NMFS' protected resources prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on protected resources under NMFS' jurisdiction.

Past fishery management actions taken through the FMP and annual specification process have had a positive cumulative effect on ESA-listed and MMPA protected species through the reduction of fishing effort (potential interactions) and implementation of gear restrictions, open seasons, and exemption areas. It is anticipated that the future management actions, specifically those recommended by the ALWTRT and the development of strategies for sea turtle conservation described in Table 47, will result in additional indirect positive effects on the protected resources. These impacts could be broad in scope. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to protected resources have had a positive cumulative effect.

Catch limits for each of the managed resources have been specified to ensure that red, silver, and offshore hakes stocks are managed in a sustainable manner, and measures are consistent with the objectives of the FMP under the guidance of the MSA. The proposed actions in this document would not change the past and anticipated cumulative effects on ESA-listed and MMPA protected species and thus, would not have any significant effect on protected resources individually or in conjunction with other anthropogenic activities (Table 51).

For sea turtles, changes to both their marine and terrestrial environment due to climate change pose a challenge. Recent studies suggest that warming temperatures at nesting beaches could have the strongest impacts on sea turtle populations due to reduced nest success and recruitment (Santidrian-Tomillo et al. 2012; Saba et al. 2012). Additionally, increased severity of extreme weather events may create erosion and damage to turtle nest and nesting sites (Goldenberg et al 2001; Webster et al 2005, IPCC 2013), resulting in a further reduction in nest success and recruitment. These potential declines in the success of nesting could have profound effects on the abundance and distribution of sea turtles. Moreover, warming air temperature can also affect the demography of sea turtle populations because the sex ratio of hatchling sea turtles is determined by the temperature during incubation in nesting beaches. Female offspring are produced at warmer temperatures and thus climate change could lead to a lower ratio of males in the population. Changes in water circulation near nesting beaches could affect the early life history stages of sea turtles by transporting passively-drifting hatchlings to waters that may have increased predation rates (Shillinger et al. 2012). Furthermore, prey availability and quality may also be affected by climate change but these projections are far less certain.

Marine mammals are subject to impacts from global climate change through climate variability, water temperature changes, changes to ocean currents, changes in impact primary productivity and prey species availability. For example, shifts in zooplankton patch formation, which have already been observed,

could affect the feeding opportunities and therefore populations of North Atlantic Right Whales (NEQ website). Susceptibility to disease, changes in toxicant exposure, and decreased reproductive success with rising ocean temperatures and related climate-ecosystem changes is also of concern (Burek et. al, 2008). Species that migrate to feeding grounds in polar regions (including many baleen whale populations) may be more susceptible to climate change in the near-term since conditions in the polar regions are changing more rapidly than in temperate regions.

Table 51. Summary of the effects of past, present, and reasonably foreseeable future actions on the protected resources.

Action	Past to the Present	Reasonably Foreseeable Future
Original FMP and subsequent Amendments and Frameworks to the FMP	**Indirect Positive**	
Red, Silver, and Offshore Hakes Specifications	**Indirect Positive**	
Developed, Apply, and Redo Standardized Bycatch Reporting Methodology	**Neutral**	
Amendment to address ACLs/AMs implemented	**Potentially Indirect Positive**	
Agricultural runoff	**Indirect Negative**	
Port maintenance	**Uncertain – Likely Indirect Negative**	
Offshore disposal of dredged materials	**Indirect Negative**	
Beach nourishment – Offshore mining	**Indirect Negative**	
Beach nourishment – Sand placement	**Indirect Negative**	
Marine transportation	**Indirect Negative**	
Installation of pipelines, utility lines and cables	**Potentially Direct Negative**	
National Offshore Aquaculture Act of 2007	**Potentially Indirect Negative**	
Offshore Wind Energy Facilities (within 3 years)		**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals (within 3 years)	**Uncertain – Likely Indirect Negative**	
Convening Gear Take Reduction Teams (within 3 years)		**Indirect Positive**
Strategy for Sea Turtle Conservation for the Atlantic Ocean and the Gulf of Mexico Fisheries (within next 3 years)		**Indirect Positive**
Summary of past, present, and future actions excluding those proposed in this specifications document	**Overall, actions have had, or will have, positive impacts on protected resources.**	

6.6.5.5 Fishery-related businesses and communities

Those past, present, and reasonably foreseeable future actions, whose effects may impact human communities and the direction of those potential impacts, are summarized in Table 47. The indirectly negative actions described in this table are localized in near-shore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on human communities is expected to be limited in scope. It may, however, displace fishermen from project areas. Agricultural runoff may be much broader in scope, and the impacts of nutrient inputs to the coastal system may be of a larger magnitude. This may result in indirect negative impacts on human communities by reducing resource availability; however, this effect is unquantifiable. As described above (Section 6.6.4.2), NMFS has several means under which it can review non-fishing actions of other federal or state agencies prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on human communities.

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

Past fishery management actions taken through the FMP and annual specification process have had both positive and negative cumulative effects by benefiting domestic fisheries through sustainable fishery management practices, while at the same time potentially reducing the availability of the resource to all participants. Sustainable management practices are, however, expected to yield broad positive impacts to fishermen, their communities, businesses, and the nation as a whole. It is anticipated that the future management actions, described in Table 52, will result in positive effects for fishing-related businesses and communities due to sustainable management practices, although additional indirect negative effects on some businesses and communities could occur through management actions that may implement gear requirements or area closures and thus, reduce revenues. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to fishing-related businesses and communities have had an overall positive cumulative effect.

Catch limits and possession limits for each of the managed resources have been specified to ensure these rebuilt stocks are managed in a sustainable manner, and measures are consistent with the objectives of the FMP under the guidance of the MSA. The impacts from annual specification measures established in previous years on the managed resources are largely dependent on how effective those measures were in meeting their intended objectives and the extent to which mitigating measures were effective. Overages may alter the timing of commercial fishery revenues (revenues realized a year earlier), and there may be impacts on some fishermen caused by unexpected reductions in their opportunities to earn revenues in the commercial fisheries in the year during which the overages are mitigated.

Despite the potential for negative short-term effects on fishing-related businesses and communities, the expectation is that there would be a positive long-term effect on them due to the long-term sustainability of red, silver, and offshore hake stocks. Overall, the proposed actions in this document would not change the past and anticipated cumulative effects on fishing-related businesses and communities and thus, would not have any significant effect on them individually, or in conjunction with other anthropogenic activities (see table below).

Table 52. Summary of the effects of past, present, and reasonably foreseeable future actions on fishing-related businesses and communities.

Action	Past to the Present		Reasonably Foreseeable Future
Original FMP and subsequent Amendments and Frameworks to the FMP	**Direct Positive**		
Red, Silver, and Offshore Hakes Specifications	**Direct Positive**		
Developed, Apply, and Redo Standardized Bycatch Reporting Methodology	**Potentially Indirect Negative**		
Amendment to address ACL/AMs implemented	**Potentially Direct Positive**		
Agricultural runoff	**Indirect Negative**		
Port maintenance	**Uncertain – Likely Mixed**		
Offshore disposal of dredged materials	**Indirect Negative**		
Beach nourishment – Offshore mining	**Mixed**		
Beach nourishment – Sand placement	**Positive**		
Marine transportation	**Mixed**		
Installation of pipelines, utility lines and cables	**Uncertain – Likely Mixed**		
National Offshore Aquaculture Act of 2007	**Uncertain – Likely Mixed**		
Offshore Wind Energy Facilities (within 3 years)			**Uncertain – Likely Mixed**
Liquefied Natural Gas (LNG) terminals (within 3 years)		**Uncertain – Likely Mixed**	
Convening Gear Take Reduction Teams (within 3 years)			**Indirect Negative**
Strategy for Sea Turtle Conservation for the Atlantic Ocean and the Gulf of Mexico Fisheries (within next 3 years)			**Indirect Negative**
Summary of past, present, and future actions excluding those proposed in this specifications document	**Overall, actions have had, or will have, positive impacts on fishing-related businesses and communities.**		

6.6.6 Preferred action on all VECs

The Council has identified its preferred action alternatives in Section 4.0. The cumulative effects of the range of actions considered in this document can be considered to make a determination if significant cumulative effects are anticipated from the preferred alternatives. The direct and indirect impacts of the proposed action on the VECs are described in Section 5.0. The magnitude and significance of the cumulative effects, which include the additive and synergistic effects of the preferred alternatives, as well as past, present, and future actions, have been taken into account throughout Section 6.6. The action proposed in this annual specifications document builds off action taken in the original FMP and subsequent amendments and framework documents. When this action is considered in conjunction with all the other pressures placed on fisheries by past, present, and reasonably foreseeable future actions, it is not expected to result in any significant impacts, positive or negative. Based on the information and analyses presented in these past FMP documents and this document, there are no significant cumulative effects associated with the preferred alternatives in this document (Table 53).

Table 53. Magnitude and significance of the cumulative effects; the additive and synergistic effects of the 2015-2017 preferred alternatives, as well as past, present, and future actions.

VEC	Status in 2013 (for greater detail also see NEFMC 2014)	Net Impact of P, Pr, and RFF Actions	Impact of the Preferred Alternatives for 2018-2020, relative to No Action	Significant Cumulative Effects
Red, Silver, and Offshore Hake Stocks	Complex and variable (Section 6.1.1 and 6.1.2)	Direct positive (Section 6.6.5.1)	Mixed (Sections 6.1.1 and 6.1.2)	**None**
Non-target Species and Bycatch	Complex and variable (Section 6.2)	Direct positive (Section 6.6.5.2)	Low negative (Sections 6.2)	**None**
Physical Environment and EFH	Complex and variable (Section 6.3)	Indirect positive (Section6.6.5.3)	Low negative (Sections 6.3)	**None**
Protected Resources	Complex and variable (Section 6.4)	Indirect positive (Section6.6.5.4)	Neutral (Sections 6.4)	**None**
Fishery-related Businesses and Communities	Complex and variable (Section 6.5)	Direct positive (Section6.6.5.5)	Short-term low positive; Long-term positive (Sections 6.5)	**None**

7.0 RELATIONSHIP TO APPLICABLE LAWS (To Be Updated and Modified)

7.1 Magnuson-Stevens Fishery Conservation and Management Act - Consistency with National Standards

Section 301 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) requires that regulations implementing any fishery management plan or amendment be consistent with the ten national standards listed below.

7.1.1 National Standard 1

Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery for the United States fishing industry.

The proposed action is compliant with MSA National Standard 1 requirements for an acceptable biological catch (ABC) and interim ABC control rule, and ACL, and accountability measures (AMs). The proposed specifications for fishing years 2018-2020 are consistent with the ABC set through this process and are intended to ensure that overfishing will not take place in the small-mesh multispecies fishery and that the red, silver, and offshore hake stocks will not become overfished.

7.1.2 National Standard 2

Conservation and management measures shall be based on the best scientific information available.

The measures in this action are based on the best and most recent scientific information available including the red and silver hake stock assessments (NEFSC 2017), which includes an independent peer review, as updated by the NEFSC in NEFMC 2014, and recommendations from the Council's Science and Statistical Committee for setting ABCs for northern red and silver hake and southern red hake and whiting.

7.1.3 National Standard 3

To the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit or in close coordination.

The proposed action manages each individual small-mesh multispecies stock as a unit throughout its range. Management measures applied to one stock typically apply to the entire range of the stock. To the extent possible while achieving the management objectives and preventing overfishing on individual stocks, management measures in the proposed action and that exist in the FMP apply throughout the range and often throughout both stock areas. This consistency improves understanding, compliance and enforceability, which minimizes costs to the government.

7.1.4 National Standard 4

Conservation and management measures shall not discriminate between residents of different states. If it becomes necessary to allocate or assign fishing privileges among various United States fishermen, such allocation shall be: (A) fair and equitable to all such fishermen; (B)

reasonably calculated to promote conservation; and (C) carried out in such a manner that no particular individual, corporation, or other entity acquires an excessive share of such privileges.

The proposed measures are the same for all vessels in the small-mesh multispecies fishery regardless of the state of residence of the owner or operator of the vessels. Although any fishing mortality control (including possession limits and quotas) result in the allocation of fishery resources, the measures in the proposed action are reasonably expected to promote conservation by continuing to prevent overfishing and rebuild overfished stocks.

7.1.5 National Standard 5

Conservation and management measures shall, where practicable, consider efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.

The proposed action maintains the efficiency of vessel operations under the total allowable landings (TAL). The TAL allows flexibility for business planning, operational safety and capability of the fleet to catch the ACL/TAL without exceeding it. None of the measures in this action directly allocates small-mesh fishery catches and, therefore, none has economic allocation as its sole purpose.

7.1.6 National Standard 6

Conservation and management measures shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches.

The proposed action, developed with input of small-mesh multispecies fishermen and processors, accounts for the market-driven nature of the fishery by updating the TAL consistent with changes in the fishery, and allowing flexibility to reach the TAL without exceeding it.

7.1.7 National Standard 7

Conservation and management measures shall, where practicable, minimize costs and avoid unnecessary duplication.

The proposed action would simplify management regulations by adjusting the TAL for fishing years 2018-2020 to be consistent with the stocks' changes in biomass. The proposed action does not duplicate other fishing regulations or fishery management measures. The NE Multispecies FMP is the only management plan that sets harvest limits and fishing regulations for the small-mesh multispecies fishery.

7.1.8 National Standard 8

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 impacts on such communities.

The proposed action was developed with the input of small-mesh multispecies fishery vessel owners and processors that supported the measures because the specifications would assist them economically by making harvesting operations efficient. This flexibility would keep the small-mesh multispecies fishery economically viable and sustainable. Due to the small size of the small-mesh multispecies fishery, there

are a limited number of participants, and consequently a limited number of communities. This action is not expected to change the individuals or communities affected by this fishery.

7.1.9 National Standard 9

Conservation and management measures shall, to the extent practicable, (A) minimize bycatch and (B) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

The proposed action is not expected to have any impact on bycatch of red, silver, or offshore hakes, or other species.

7.1.10 National Standard 10

Conservation and management measures shall, to the extent practicable, promote safety of human life at sea.

The proposed action allows flexibility for vessels to harvest when conditions are optimal, reducing exposure to safety hazards at sea. This management action does not change any of the measures designed to promote the safety of human life at sea, and no measure in the proposed action reduces the flexibility of vessel operators to respond to hazardous conditions at sea.

7.1.11 Magnuson-Stevens Act FMP Requirements

Section 303 (a) of FCMA contains 15 required provisions for FMPs that are listed below. The requirement applies to the FMP, and in some cases, the FMP as amended, and not the submission document for the proposed action.

(1) Contain the conservation and management measures, applicable to foreign fishing and fishing by vessels of the United States;

Foreign fishing is not allowed under this management plan or this action, so specific measures are not included to specify and control allowable foreign catch.

(2) Contain a description of the fishery;

An updated description of the fishery is included in the SAFE Report for Fishing Year 2016 (NEFMC 2017).

(3) Assess and specify the present and probable future condition of, and the maximum sustainable yield and optimum yield from, the fishery, and include a summary of the information utilized in making such specification;

This proposed action would set specifications that are consistent with sustainable and optimum yield (Section 3.2.4). The information utilized to make this decision is summarized, along with an update assessment of northern red and silver hake and southern red and silver hake, is contained in the SAFE Report for Fishing Year 2016 (NEFMC 2017).

(4) Assess and specify – (A) the capacity and the extent to which fishing vessels of the United States, on an annual basis, will harvest the optimum yield specified under paragraph (3); (B) the portion of such optimum yield which, on an annual basis, will not be harvested by

fishing vessels of the United States and can be made available for foreign fishing; and (C) the capacity and extent to which United States fish processors, on an annual basis, will process that portion of such optimum yield that will be harvested by fishing vessels of the United States;

Vessels operating in the fishery and those that have been permitted to fish for small-mesh multispecies have the capacity to harvest optimum yield. Existing regulatory restrictions to manage large-mesh multispecies bycatch and limits on domestic and foreign market demand limit catch.

(5) Specify the pertinent data which shall be submitted to the Secretary with respect to commercial, recreational, and charter fishing in the fishery, including, but not limited to, information regarding the type and quantity of fishing gear used;

Vessels on small-mesh multispecies trips must submit Vessel Trip Reports (VTRs) for each fishing trip. Dealers are also required to submit reports on the purchases of small-mesh multispecies from permitted vessels. Current reporting requirements are detailed in 50 CFR 648.7.

(6) Consider and provide for temporary adjustments, after consultation with the Coast Guard and persons utilizing the fishery, regarding access to the fishery for vessels otherwise prevented from harvesting because of weather or other ocean conditions affecting the safe conduct of the fishery;

The proposed action does not contain any measures that would penalize vessels that were prevented from harvesting small-mesh multispecies because of weather of other ocean conditions.

(7) Describe and identify essential fish habitat for the fishery based on the guidelines established by the Secretary under section 305 (b)(1)(A), minimize to the extent practicable adverse effects on such habitat caused by fishing, and identify other actions to encourage the conservation and enhancement of such habitat;

Essential fish habitat for red, silver, and offshore hakes was defined in the Omnibus Essential Fish Habitat (EFH) Amendment 1 (NEFMC 1998, implemented in 1999). The designations were updated via Omnibus EFH Amendment 2 and will go into effect in January 2018[19]. Differences between the original and updated EFH designations are explained in Section 2.2.2 of Volume 2 of the Omnibus EFH Amendment 2 FEIS (NEFMC 2017). This action does not change the EFH designations.

(8) In the case of a fishery management plan that, after January 1, 1991, is submitted to the Secretary for review under section 304(a) (including any plan for which an amendment is submitted to the Secretary for such review) or is prepared by the Secretary, assess and specify the nature and extent of scientific data which is needed for effective implementation of the plan;

[19] Note that the EFH designations will be effective with the ROD on the amendment (1/4/2018) but the spatial management measures will not take effect until April or May with the final rule.

Scientific needs are continuously reviewed and revised by the Council's Research Steering Committee and the Northeast Stock Assessment Workshop, which consult with NMFS, the Council and its Plan Development Teams, Science and Statistical Committee and species oversight committees about scientific data needs.

(9) Include a fishery impact statement for the plan or amendment (in the case of a plan or amendment thereto submitted to or prepared by the Secretary after October 1, 1990) which shall assess, specify, and describe the likely effects, if any, of the conservation and management measures on – (A) participants in the fisheries and fishing communities affected by the plan or amendment; and (B) participants in the fisheries conducted in adjacent areas under the authority of another Council, after consultation with such Council and representatives of those participants;

Impacts on fishing communities affected by this action can be found in Section 6.5.

(10) Specify objective and measurable criteria for identifying when the fishery to which the plan applies is overfished (with an analysis of how the criteria were determined and the relationship of the criteria to the reproductive potential of stocks of fish in that fishery) and, in the case of a fishery which the Council or the Secretary has determined is approaching an overfished condition or is overfished, contain conservation and management measures to prevent overfishing or end overfishing and rebuild the fishery;

The Amendment 19 to the NE Multispecies FMP (NEFMC 2011) established criteria to determine whether the small-mesh multispecies stocks were either in an overfished condition, subject to overfishing, or both. This action does not change those criteria.

(11) Establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority – (A) minimize bycatch; and (B) minimize the mortality of bycatch which cannot be avoided;

This action does not include changes to the current Standardized Bycatch Reporting Methodology implemented under the Standardized Bycatch Reporting Methodology Omnibus Amendment (Amendment 15 to the NE Multispecies FMP; NEFMC 2007) implemented in February 2008 and the second Standardized Bycatch Reporting Methodology Omnibus Amendment (Amendment 20 to the NE Multispecies FMP; NEFMC 2015) implemented in June 2015 (CFR 80:125 p 37182-37199). This methodology is expected to assess the amount and type of bycatch in the small-mesh multispecies fishery and help identify ways the fishery can minimize bycatch and mortality of bycatch which cannot be avoided.

(12) Assess the type and amount of fish caught and released alive during recreational fishing under catch and release fishery management programs and the mortality of such fish, and include conservation and management measures that, to the extent practicable, minimize mortality and ensure the extended survival of such fish;

Recreational catches are a very small proportion of total catches of red and silver hakes and are almost non-existent for offshore hake. As such, the catches are accounted for within the 5%

allowance for management uncertainty, but were estimated in the SAFE Report for Fishing Year 2016 (NEFMC 2017).

(13) Include a description of the commercial, recreational, and charter fishing sectors which participate in the fishery and, to the extent practicable, quantify trends in landings of the managed fishery resource by the commercial, recreational, and charter fishing sectors;

Amendment 19 as updated by the SAFE Report (NEFMC 2014) provides a description of the commercial small-mesh multispecies fishery. There is no recreational or charter fishing that target small-mesh multispecies, but red and silver hake are often captured for bait, particularly in the fishery that targets bluefin tuna.

(14) To the extent that rebuilding plans or other conservation and management measures which reduce the overall harvest in a fishery are necessary, allocate any harvest restrictions or recovery benefits fairly and equitably among the commercial, recreational, and charter fishing sectors in the fishery;

No stocks are subject to catch restrictions to rebuild stocks and any vessel may currently enter the fishery by obtaining a Multispecies Category K permit.

(15) Establish a mechanism for specifying annual catch limits in the plan (including a multiyear plan), implementing regulations or annual specifications, at a level such that overfishing does not occur in the fishery, including measures to ensure accountability;

The proposed action maintains an ABC, annual catch limit, total allowable landings and accountability measures that would prevent overfishing and ensure accountability.

7.2 National Environmental Policy Act of 1969 (NEPA)

7.2.1 Finding of No Significant Environmental Impact (FONSI)

National Oceanic and Atmospheric Administration Administrative Order (NAO) 216-6 (May 20, 1999) contains criteria for determining the significance of the impacts of a proposed action. In addition, the Council on Environmental Quality (CEQ) regulations at 40 C.F.R. 1508.27 state that the significance of an action should be analyzed both in terms of "context" and "intensity." Each criterion listed below is relevant to making a finding of no significant impact and has been considered individually, as well as in combination with the others. The significance of this action is analyzed based on the NAO 216-6 criteria and CEQ's context and intensity criteria. These include:

1) Can the proposed action reasonably be expected to jeopardize the sustainability of any target species that may be affected by the action?

The proposed action establishes catch and landing limits for each small-mesh multispecies stock that are consistent with the FMP objectives and the recommendations of the Council's SSC. The proposed measures are not expected to result in overfishing. The proposed action will ensure the long-term sustainability of harvests from small-mesh multispecies stocks. The biological impacts of the proposed action on target species are analyzed in Sections 6.1.1 and 6.1.2.

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

The proposed action establishes catch and landing limits for each small-mesh multispecies stock and therefore is not expected to significantly alter fishing methods or activities. The proposed action is not expected to jeopardize the sustainability of any non-target species. The biological impacts of the proposed action on non-target species are analyzed in Section 6.2.

3) Can the proposed action reasonably be expected to cause substantial damage to the ocean and coastal habitats and/or essential fish habitat as defined under the Magnuson-Stevens Act and identified in FMPs?

The proposed action as described in Section 4.0 of the EA is not expected to cause substantial damage to the ocean, coastal habitats, and/or EFH as defined under the MSA and identified in the FMP. In general, bottom-tending mobile gear, primarily otter trawls, has the potential to adversely affect EFH for the species detailed in Section 5.3.2 of the EA. The specifications proposed in this action could, under certain conditions, increase the amount of time that bottom trawling vessels spend fishing for small-mesh multispecies in the northern management area, but the adverse impacts of this increased level of fishing on benthic habitats would not be expected to be significant. In the southern management area, changes in fishing effort or distribution are not expected because the whiting catch has been stable below the proposed limits and the red hake TAL is only 9% above 2016 landings. If landings exceed the TAL trigger (90% of the TAL), a 400 lbs. incidental possession limit would become effective but because red hake are generally not a primary target, substantial changes in fishing activity are not expected in the short period when the 400 lbs. possession limit is in place.

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

The propose action does not alter the manner in which the industry conducts fishing activities for the target species. Therefore, no changes in fishing behavior that would affect safety are anticipated. The overall effect of the proposed actions on these fisheries, including the communities in which they operate, will not adversely impact public health or safety.

5) Can the proposed action reasonably be expected to adversely affect endangered or threatened species, marine mammals, or critical habitat of these species?

The proposed action is not expected to alter fishing activities, lead to a substantial increase of fishing effort, or alter the spatial and/or temporal distribution of current fishing effort (see Section 3.2.5) in a manner that would increase interaction rates with protected species. Some redistribution of fishing effort to avoid excessive catches of southern red hake are expected, but this redistribution is expected to be relatively minor in time and space with respect to the seasonal distribution of endangered or threatened species and marine mammals. In addition, measures in place to protect endangered or threatened species, marine mammals, and critical habitat for these species would remain in place (see discussion in Section 6.4).

This action falls within the range of impacts considered in the batch Biological Opinion for the Small Mesh Multispecies Fishery (December 16, 2013). However, On October 17, 2017, GARFO's Protected Resources Division reinitiated consultation on the batch Biological Opinion and determined that allowing this fishery to continue during the reinitiation period will not violate ESA sections 7(a)(2) and 7(d). It was also determined that allowing this fishery to continue during the reinitiation period will not increase the likelihood of interactions with species above the amount that would otherwise occur if consultation had not been reinitiated. Therefore, conducting the proposed action during the reinitiation period would

not be likely to jeopardize the continued existence of any whale, sea turtle, Atlantic salmon, or sturgeon species."

6) Can the proposed action be expected to have a substantial impact on biodiversity and/or ecosystem function within the affected area (e.g., benthic productivity, predator-prey relationships, etc.)?

The proposed action establishes catch and landing limits for small-mesh multispecies stocks. The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. The action is not expected to substantially alter fishing methods or activities or fishing effort or the spatial and/or temporal distribution of current fishing effort.

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

The proposed action is not expected to have a substantial impact on the natural or physical environment. The proposed action is not expected to alter fishing methods or activities or substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Therefore, there are no social or economic impacts interrelated with significant natural or physical environmental effects.

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

The impacts of the proposed measures on the human environment are described in Section 5.0 of the EA. The proposed action merely establishes catch and landing limits for the small-mesh multispecies stocks. The proposed action is based upon measures contained in the FMP which have been in place since 2012. In addition, the scientific information upon which the annual quotas are based has been peer-reviewed and is the most recent information available. Therefore, the measures contained in this action are not expected to be highly controversial.

9) Can the proposed action reasonably be expected to result in substantial impacts to unique areas, such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas?

Historic or cultural resources such as shipwrecks may be present in the area where the small-mesh multispecies fishery is prosecuted. However, vessels try to avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would result in substantial impacts to unique areas.

10) Are the effects on the human environment likely to be highly uncertain or involve unique or unknown risks?

The impacts of the proposed action on the human environment are described in Section 5.0 of the EA. The proposed action establishes catch and landing limits for each small-mesh multispecies stock. The proposed action is not expected to significantly alter fishing methods or activities, and is not expected to significantly increase fishing effort or the spatial and/or temporal distribution of current fishing effort. The measures contained in this action are not expected to have highly uncertain, unique, or unknown risks on the human environment.

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

As discussed in Section 6.6, the proposed action is not expected to have cumulatively significant impacts when considered with the impacts from other fishing and non-fishing activities. The improvements in the

condition of the stock (i.e. preventing overfishing) are expected to generate cumulative positive impacts overall. The proposed action, together with past and future actions are not expected to result in significant cumulative impacts on the biological, physical, and human components of the environment.

12) Is the proposed action likely to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural or historical resources?

Although shipwrecks may be present in the area where fishing occurs, including some registered on the National Register of Historic Places, vessels typically avoid fishing too close to wrecks due to the possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would adversely affect the historic resources listed above.

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

The proposed action establishes catch and landing limits for small-mesh multispecies stocks. There is no evidence or indication that this fishery has ever resulted in the introduction or spread of nonindigenous species. The proposed action is not expected to significantly alter fishing methods or activities, and is not expected to significantly increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Therefore, it is highly unlikely that the proposed action would be expected to result in the introduction or spread of a non-indigenous species.

14) Is the proposed action likely to establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration?

The proposed action establishes catch and landing limits for small-mesh multispecies stocks. The proposed action is not expected to significantly alter fishing methods or activities, and is not expected to significantly increase fishing effort or the spatial and/or temporal distribution of current fishing effort. When new stock assessment or other biological information about these species becomes available in the future, then the specifications may be adjusted according to the FMP and MSA. Therefore, the proposed action will not result in significant effects, nor does it represent a decision in principle about a future consideration.

15) Can the proposed action reasonably be expected to threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment?

The proposed action establishes catch and landing limits for small-mesh multispecies stocks. The proposed action is not expected to alter fishing methods or activities such that they threaten a violation of Federal, State, or local law or requirements imposed for the protection of the environment. The proposed action has been found to be consistent with other applicable laws (see Sections 7.3 to 7.10).

16) Can the proposed action reasonably be expected to result in cumulative adverse effects that could have a substantial effect on the target species or non-target species?

The impacts of the proposed action on the biological, physical, and human environment are described in Section 5.0. The cumulative effects of the proposed action on target and non-target species are detailed in Section 6.6.5. The proposed action is not expected to significantly increase fishing effort or substantially alter the spatial and/or temporal distribution of current fishing effort. The improvements in the condition of the stock through implementation of ACLs based on the MSY-based fishing mortality target contained in the FMP are expected to generate positive impacts overall.

DETERMINATION

In view of the information presented in this document and the analysis contained in the supporting Environmental Assessment, it is hereby determined that the proposed actions in this specification package will not significantly impact the quality of the human environment as described above and in the Environmental Assessment. In addition, all beneficial and adverse impacts of the proposed action have been addressed to reach the conclusion of no significant impacts. Accordingly, preparation of an Environmental Impact Statement for this action is not necessary.

_____ _____

John K. Bullard
Regional Administrator, Greater Atlantic Region, NMFS Date

7.3 Marine Mammal Protection Act (MMPA)

None of the specifications proposed in this document are expected to alter fishing methods or activities. Therefore, this action is not expected to affect marine mammals or critical habitat in any manner not considered in previous consultations on the fisheries.

For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see Sections 5.2 and 6.4.

7.4 Endangered Species Act (ESA)

Section 7 of the Endangered Species Act requires Federal agencies conducting, authorizing, or funding activities that affect threatened or endangered species to ensure that those effects do not jeopardize the continued existence of listed species. The proposed action is not expected to substantially change the amount of small-mesh fishing effort or the way the fishery is prosecuted, due to market limitations and restrictions on when and where vessels may use small-mesh trawls to target red hake and whiting.

Based on the information available at this time (Sections 5.2 and 6.4), the Council believes that NMFS will concur that the action proposed for the small-mesh multispecies fishery would not be likely to jeopardize any ESA-listed species or alter or modify any critical habitat.

7.5 Coastal Zone Management Act (CZMA)

Section 307(c)(1) of the Coastal Zone Management Act (CZMA) of 1972, as amended, requires that all Federal activities that directly affect the coastal zone be consistent with approved state coastal zone management programs to the maximum extent practicable. The CZMA provides measures for ensuring stability of productive fishery habitat while striving to balance development pressures with social, economic, cultural, and other impacts on the coastal zone. It is recognized that responsible management of both coastal zones and fish stocks must involve mutually supportive goals. The Council has developed this specification package and will submit it to NMFS; NMFS must determine whether this action is consistent to the maximum extent practicable with the CZM programs for each state (Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, and North Carolina). Letters documenting NMFS' determination will be sent to the coastal zone management program offices of each state.

7.6 Administrative Procedure Act (APA)

Section 553 of the APA establishes procedural requirements applicable to informal rulemaking by Federal agencies. The purpose of these requirements is to ensure public access to the Federal rulemaking process, and to give the public adequate notice and opportunity for comment. At this time, the NEFMC is not requesting any abridgement of the rulemaking process for this action.

7.7 Information Quality Act (IQA)

Utility of Information Product

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

so that intended users may have a full understanding of the proposed action and its implications. The intended users of the information contained in this document include individuals involved in the small-mesh multispecies fishery, (e.g., fishing vessels, processors, fishery managers), and other individuals interested in the management of the small-mesh multispecies fishery. The information contained in this document will be helpful and beneficial to owners of vessels holding limited access small-mesh multispecies permits since it will notify these individuals of the measures contained in this specification package. This information will enable these individuals to adjust their management practices and make appropriate business decisions. Until a proposed rule is prepared and published, this document is the principal means by which the information contained herein is available to the public. The information provided in this document is based on the most recent available information from the relevant data sources. The information contained in this document includes detailed and relatively recent information on the small-mesh multispecies resource and, therefore, represents an improvement over previously available information. This document will be subject to public comment through proposed rulemaking, as required under the Administrative Procedure Act and, therefore, may be improved based on comments received.

This document is available in several formats, including printed publication, and online through the NEFMC's web page (www.nefmc.org). The *Federal Register* notice that announces the proposed rule and the final rule and implementing regulations will be made available in printed publication, on the website for the Greater Atlantic Regional Fisheries Office (www.greateratlantic.fisheries.noaa.gov), and through the Regulations.gov website. The *Federal Register* documents will provide metric conversions for all measurements.

Integrity of Information Product

The information product meets the standards for integrity under the following types of documents:

Other/Discussion (e.g., Confidentiality of Statistics of the Magnuson-Stevens Fishery Conservation and Management Act; NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics; 50 CFR 229.11, Confidentiality of information collected under the Marine Mammal Protection Act.)

Prior to dissemination, information associated with this action, independent of the specific intended distribution mechanism, is safeguarded from improper access, modification, or destruction, to a degree commensurate with the risk and magnitude of harm that could result from the loss, misuse, or unauthorized access to or modification of such information. All electronic information disseminated by NMFS adheres to the standards set out in Appendix III, "Security of Automated Information Resources," of OMB Circular A-130; the Computer Security Act; and the Government Information Security Act. All confidential information (e.g., dealer purchase reports) is safeguarded pursuant to the Privacy Act; Titles 13, 15, and 22 of the U.S. Code (confidentiality of census, business, and financial information); the Confidentiality of Statistics provisions of the Magnuson-Stevens Act; and NOAA Administrative Order 216-100, Protection of Confidential Fisheries Statistics.

Objectivity of Information Product

For purposes of the Pre-Dissemination Review, this document is considered to be a "Natural Resource Plan." Accordingly, the document adheres to the published standards of the Magnuson-Stevens Act; the Operational Guidelines, Fishery Management Plan Process; the Essential Fish Habitat Guidelines; the National Standard Guidelines; and NOAA Administrative Order 216-6, Environmental Review Procedures for Implementing the National Environmental Policy Act. This information product uses information of known quality from sources acceptable to the relevant scientific and technical

communities. Several sources of data were used in the development of the specification package. These data sources included, but were not limited to, historical and current landings data from the Commercial Dealer database, vessel trip report (VTR) data, and fisheries independent data collected through the NMFS bottom trawl surveys. The analyses contained in this document were prepared using data from accepted sources. These analyses have been reviewed by members of the Whiting Plan Development Team (see Section 10.0) and by the SSC where appropriate.

Despite current data limitations, the conservation and management measures considered for this action were selected based upon the best scientific information available. The analyses important to this decision used information from the most recent complete calendar years, generally through 2016. The data used in the analyses provide the best available information on the number of permits, both active and inactive, in the fishery, the catch (including landings and discards) by those vessels, the landings per unit of effort (LPUE), and the revenue produced by the sale of those landings to dealers, as well as data about catch, bycatch, gear, and fishing effort from a subset of trips sampled at sea by government observers. Specialists (including professional members of plan development teams, technical teams, committees, and Council staff) who worked with these data are familiar with the most current analytical techniques and with the available data and information relevant to the small-mesh multispecies fishery. The policy choice is clearly articulated in Section 3.1 that being the management alternative considered in this action.

The supporting science and analyses, upon which the policy choice was based, are summarized and described in the SAFE Report for Fishing Year 2016 (NEFMC 2017), Sections 6.0 of this document, and in the Amendment 19 EA. All supporting materials, information, data, and analyses within this document have been, to the maximum extent practicable, properly referenced according to commonly accepted standards for scientific literature to ensure transparency. The review process used in preparation of this document involves the responsible Council, the Northeast Fisheries Science Center, the Greater Atlantic Regional Fisheries Office, and NOAA Fisheries Service Headquarters. The Center's technical review is conducted by senior level scientists with specialties in population dynamics, stock assessment methods, population biology, and the social sciences.

The Council review process involves public meetings at which affected stakeholders have opportunity to provide comments on the document. Review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. The Council also utilizes its Scientific and Statistical Committee to review the background science and assessment to approve the Overfishing Limits (OFLs) and Allocable Biological Catch (ABCs), including the effects those limits would have on other specifications in this document. The Scientific and Statistical Committee, or SSC, serves as the primary scientific and technical advisory body to the Council and is made up of scientists that are independent of the Council. A list of current committee members can be found at https://www.nefmc.org/committees/scientific-and-statistical-committee.

Final approval of the action proposed in this document and clearance of any rules prepared to implement resulting regulations is conducted by staff at NOAA Fisheries Service Headquarters, the Department of Commerce, and the U.S. Office of Management and Budget. In preparing this action for the NE Multispecies FMP, NMFS, the Administrative Procedure Act, the Paperwork Reduction Act, the Coastal Zone Management Act, the Endangered Species Act, the Marine Mammal Protection Act, the Information Quality Act, and Executive Orders 12630 (Property Rights), 12866 (Regulatory Planning), 13132 (Federalism), and 13158 (Marine Protected Areas). The Council has determined that the proposed action is consistent with the National Standards of the Magnuson-Stevens Act and all other applicable laws.

7.8 Paperwork Reduction Act (PRA)

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

7.9 Regulatory Flexibility Act (RFA)

The purpose of the Regulatory Flexibility Analysis (RFA) is to establish a principle of regulatory issuance that agencies shall endeavor, consistent with the objectives of the rule and of applicable statutes, to fit regulatory and informational requirements to the scale of businesses, organizations, and governmental jurisdictions subject to regulation. To achieve this principle, agencies are required to solicit and consider flexible regulatory proposals and to explain the rationale for their actions to assure such proposals are given serious consideration. The RFA does not contain any decision criteria; instead the purpose of the RFA is to inform the agency, as well as the public, of the expected economic impacts of various alternatives contained in the FMP or amendment (including framework management measures and other regulatory actions) and to ensure the agency considers alternatives that minimize the expected impacts while meeting the goals and objectives of the FMP and applicable statutes.

With certain exceptions, the RFA requires agencies to conduct an Initial Regulatory Flexibility Analysis (IRFA) for each proposed rule. The IRFA is designed to assess the impacts various regulatory alternatives would have on small entities, including small businesses, and to determine ways to minimize those impacts. An IRFA is conducted to primarily determine whether the proposed action would have a "significant economic impact on a substantial number of small entities." In addition to analyses conducted for the RIR, the IRFA provides:

1) A description of the reasons why action by the agency is being considered;
2) A succinct statement of the objectives of, and legal basis for, the proposed rule;
3) A description and, where feasible, an estimate of the number of small entities to which the proposed rule will apply;
4) A description of the projected reporting, record-keeping, and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirements of the report or record; and,
5) An identification, to the extent practicable, of all relevant federal rules, which may duplicate, overlap, or conflict with the proposed rule.

If it is clear that an action would not have adverse or disproportional impacts to small entities, the RFA allows Federal agencies to certify the proposed action(s) as not having a "significant impact on a substantial number of small entities", rather than preparing an IRFA. The agency must then prepare a certification memo to the Small Business Administration (SBA) that documents:

1) A statement of basis and purpose of the rule;
2) A description and estimate of the number of small entities to which the rule applies;
3) A description and estimate of economic impacts on small entities, by entity size and industry;
4) An explanation of the criteria used to evaluate whether the rule would impose significant economic impacts;

5) An explanation of the criteria used to evaluate whether the rule would impose impacts on a substantial number of small entities; and,
6) A description of, and explanation of the basis for, assumptions used.

The decision on whether or not to certify is generally made after the final decision on the preferred alternatives for the action and may be documented at either the proposed rule or the final rule stage.

Description of reasons why action by the agency is being considered

The purpose of the actions and need for management is described in Section 3.1. Briefly, the purpose of these actions is to set red and silver hake specifications for the 2018-2020 fishing years. The small-mesh multispecies specifications are intended to meet the goals and objectives for this fishery by establishing catch limits that promote sustainable yield and prevent overfishing.

Statement of the objectives of, and legal basis for, the proposed actions

The objective of the preferred alternatives and other alternatives, including No Action, are described in Section 4.0, as well as in Amendment 19 to the Northeast Multispecies FMP. Amendment 19 established a process and framework for setting annual catch limits (ACLs) and accountability measures (AMs), as required by the 2007 reauthorization of the MSA.

Description and estimate of the number of small entities to which the proposed rule will apply

Small entities include "small businesses," "small organizations," and "small governmental jurisdictions." The Small Business Administration (SBA) has established size standards for all major industry sectors in the U.S., including commercial finfish harvesters (NAICS code 114111), commercial shellfish harvesters (NAICS code 114112), other commercial marine harvesters (NAICS code 114119), for-hire businesses (NAICS code 487210), marinas (NAICS code 713930), seafood dealers/wholesalers (NAICS code 424460), and seafood processors (NAICS code 311710). A business primarily involved in finfish harvesting is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual receipts not in excess of $20.5 million for all its affiliated operations worldwide. For commercial shellfish harvesters, the other qualifiers apply and the receipts threshold is $5.5 million. For other commercial marine harvesters, for-hire businesses, and marinas, the other qualifiers apply and the receipts threshold is $7.5 million. A business primarily involved in seafood processing is classified as a small business if it is independently owned and operated, is not dominant in its field of operation (including its affiliates), and has combined annual employment, counting all individuals employed on a full-time, part-time, or other basis not in excess of 500 employees[20] for all its affiliated operations worldwide. For seafood dealers/wholesalers, the other qualifiers apply and the employment threshold is 100 employees. A small organization is any not-for-profit enterprise which is independently owned and operated and is not dominant in its field.

[20] In determining a concern's number of employees, SBA counts all individuals employed on a full-time, part-time, or other basis. This includes employees obtained from a temporary employee agency, professional employee organization or leasing concern. SBA will consider the totality of the circumstances, including criteria used by the IRS for Federal income tax purposes, in determining whether individuals are employees of a concern. Volunteers (i.e., individuals who receive no compensation, including no in-kind compensation, for work performed) are not considered employees. Where the size standard is number of employees, the method for determining a concern's size includes the following principles: (1) the average number of employees of the concern is used (including the employees of its domestic and foreign affiliates) based upon numbers of employees for each of the pay periods for the preceding completed 12 calendar months; (2) Part-time and temporary employees are counted the same as full-time employees. [*PART 121—SMALL BUSINESS SIZE REGULATIONS §121.106*]

Small governmental jurisdictions are governments of cities, boroughs, counties, towns, townships, villages, school districts, or special districts, with population of fewer than 50,000.

The proposed actions regulate commercial fish harvesting entities engaged in the Northeast multispecies limited access fishery and the small-mesh multispecies fishery. For the purposes of the RFA analysis, the ownership entities, not the individual vessels, are considered as regulated entities.

Ownership entities in regulated commercial harvesting businesses

Individually-permitted vessels may hold permits for several fisheries, harvesting species of fish that are regulated by several different fishery management plans, even beyond those impacted by the proposed actions. Furthermore, multiple permitted vessels and/or permits may be owned by entities affiliated by stock ownership, common management, identity of interest, contractual relationships, or economic dependency. For the purposes of this analysis, ownership entities are defined by those entities with common ownership personnel as listed on permit application documentation. Only permits with identical ownership personnel are categorized as an ownership entity. For example, if five permits have the same seven personnel listed as co-owners on their application paperwork, those seven personnel form one ownership entity, covering those five permits. If one or several of the seven owners also own additional vessels, with sub-sets of the original seven personnel or with new co-owners, those ownership arrangements are deemed to be separate ownership entities for the purpose of this analysis.

Ownership entities are identified on June 1st of each year based on the list of all permit numbers, for the most recent complete calendar year, that have applied for any type of Northeast Federal fishing permit. The current ownership data set is based on calendar year 2013 permits and contains gross sales associated with those permits for calendar years 2011 through 2013. Ownership entities are classified into the categories established by the SBA (primarily finfish, primarily shellfish, or primarily for-hire businesses) based on which activity generated the greatest gross revenue in calendar year 2013. The determination as to whether the entity is large or small is based on the average revenue from 2011 through 2013.

Directly regulated small-mesh multispecies fishing entities

The small-mesh exempted fishery allows vessels to harvest species in designated areas using mesh sizes smaller than the minimum mesh size required by Regulated Mesh Area (RMA) regulations. To participate in the small-mesh multispecies (whiting) exempted fishery, vessels must hold either a limited access multispecies permit (categories A, C, D, E or F) or an open access multispecies permit (category K). Note that a vessel cannot hold more than one of these Northeast multispecies permits at a time, but that a business entity that holds may hold multiple numbers of these permits. The current red hake possession limit at the start of the fishing season is 3,000 lbs. in the northern management area and 5,000 lbs. elsewhere. Initial possession limits for silver and offshore hake combined vary by exemption area, management area (north or south) and mesh size used.

Limited access multispecies permit holders can target small-mesh multispecies with mesh smaller than the minimum regulated mesh size when not fishing under a DAS and while declared out of the fishery using VMS. Limited access multispecies permit holders may land whiting or red hake on any DAS or sector trip, up to the possession limits for vessels using mesh greater than 3-inches specified at §648.86(d)(1)(iii), or the incidental possession limit specified at §648.86(d)(4), if triggered for that stock.

An open access, Category K permit holder may fish for small-mesh multispecies when participating in an exempted fishing program. This category includes all gear types. These permits are required to submit VTRs, but are not subject to VMS requirements. Vessels with open access category K permits are subject

to the same possession limits and accountability measures for small-mesh multispecies that limited access permit holders are.

Therefore, entities holding one or more limited access multispecies permits or one or more open access Category K multispecies permits are the entities holding permits that are directly regulated by the proposed action – these are the permits that have the potential to land small-mesh multispecies for commercial sale. These include entities that could not be classified into a business type because they did not earn revenue from landing and selling fish in 2013 and so are considered to be small.

[??? Section to be Updated]

There were 1,087 distinct ownership entities based on calendar year 2013 permits that could potentially target small-mesh multispecies. Of these, 1,069 are categorized as small and 18 are categorized as large entities per the SBA guidelines (see tables below).

Table 54. Description of directly regulated small-mesh multispecies fishing entities by business type and size.

Business Type	Number of entities	Number of small entities
Primarily finfish	383	383
Primarily shellfish	433	415
Primarily for-hire	106	106
Not Classified (no revenue)	165	165
Total Number of Regulated Entities	**1,087**	**1,069**

Table 55. Description of directly regulated small-mesh multispecies fishing entities by gross sales.

Sales category	Number of entities	Number of small entities	Mean gross sales	Median gross sales	Mean permits per entity	Max permits per entity
<$50K	372	372	$ 11,144	$ 1,700	1.23	30
$50-100K	114	114	$ 73,398	$ 73,510	1.18	3
$100-500K	308	308	$ 243,720	$ 224,295	1.49	5
$500K-1mil	121	121	$ 702,378	$ 691,322	1.52	5
$1-5.5mil	154	151	$ 1,953,605	$ 1,599,791	2.10	13
$5.5-20.5mil	15	3	$ 9,851,628	$ 7,405,052	9.53	28
$20.5mil+	3	0	$ 22,115,947	$ 20,622,616	16.67	19

Directly regulated, active small-mesh multispecies fishing entities impacted

While 1,087 commercial entities are directly regulated by the proposed action, not all of these entities land small-mesh multispecies for commercial sale. Commercial entities that do not land small-mesh multispecies for sale, while regulated by the proposed action, will not be impacted by the proposed action. Commercial fishing harvesting entities that land small-mesh multispecies for sale are both directly regulated and possibly impacted by the proposed actions.

To estimate the number of commercial entities that may experience impacts from the proposed action, active small-mesh multispecies entities are defined as those entities containing permits that are directly regulated and that landed any silver hake or red hake in 2013 for commercial sale. These active small-mesh multispecies entities are described in the following three tables, and are a subset of those entities described in the tables above. There are 298 potentially impacted, directly regulated commercial entities, 295 (99.0%) of which are classified as small entities.

Table 56. Description of potentially impacted, directly regulated active small-mesh multispecies fishing, by business type and size.

Business Type	Number of entities	Number of small entities
Primarily finfish	179	179
Primarily shellfish	80	77
Primarily for-hire	39	39
Total	**298**	**295**

Table 57. Description of potentially impacted, directly regulated, active small-mesh multispecies fishing entities, gross sales.

Sales category	Number of entities	Number of small entities	Mean gross sales	Median gross sales	Mean permits per entity	Max permits per entity
<$50K	37	37	$ 21,758	$ 21,132	1	3
$50-100K	32	32	$ 77,191	$ 79,737	1	2
$100-500K	129	129	$ 265,592	$ 244,317	1	5
$500K-1mil	58	58	$ 707,809	$ 702,582.50	2	4
$1-5.5mil	39	39	$ 1,768,741	$ 1,379,304	2	10
$5.5-20.5mil	4	1	$ 14,054,224	$ 15,076,518	17	28

Table 58. Total number of potentially impacted, directly regulated entities landing small-mesh multispecies by stock area and number classified as small.

Stock	Vessels and entities	Total	Small
Northern Red Hake	Number of business entities	32	32
Northern Silver Hake	Number of business entities	120	119
Southern Red Hake	Number of business entities	151	150
Southern Silver Hake	Number of business entities	123	120

Note: Entities may be landing more than one stock listed in the above table.

Description of the projected reporting, record-keeping and other compliance requirements of the proposed rule, including an estimate of the classes of small entities which will be subject to the requirement and the type of professional skills necessary for the preparation of the report or records

The proposed actions do not introduce any new reporting, record keeping, or other compliance requirements.

Identification of all relevant Federal rules, which may duplicate, overlap or conflict with the proposed rule

The proposed actions do not duplicate, overlap or conflict with any other Federal Rules.

Significance of economic impacts on small entities

Substantial Number Criterion

In colloquial terms, substantial number refers to "more than a few." The vast majority of the regulated entities impacted by this action (99%) are considered small, and therefore preferred alternative will have impacts on a substantial number of small entities.

Significant Economic Impacts

The outcome of "significant economic impact" can be ascertained by examining two factors: disproportionality and profitability. Disproportionality refers to whether or not the regulations place small commercial entities at a significant competitive disadvantage to large commercial entities. Profitability refers to whether or not the regulations significantly reduce profits for a substantial number of small commercial entities.

Description of impacts on small entities

The proposed actions will impact all commercial entities, large and small, harvesting silver or red hake, in both the northern and southern management area. This section estimates impacts to all these entities-large and small; an analysis that was based only on small entities was not possible. However, 295 of 298 (995) of directly regulated commercial entities potentially impacted by the proposed action are small business entities. Small commercial entities are not placed at a significantly competitive disadvantage by either the proposed changes to the ACLs or by the proposed changes to the northern red hake possession limits and in-season accountability measures. All 32 of commercial entities harvesting red hake in the northern management area are small; therefore the preferred possession limit and accountability measures for the stock will not have disproportional impacts on the small entities that harvest northern red hake.

Overall, the net impact on profits from the preferred alternative for the proposed 2018-2020 specifications is expected to be neutral to low positive, compared to the no action alternative. The preferred alternative is expected to be more effective at reducing the risk of overfishing, thereby increasing the likelihood that the fishery will remain a viable source of fishing revenues for small-mesh multispecies entities in the long term.

Impacts from the proposed actions are summarized separately below for 1) alternatives for the 2018-2020 ACLs for northern and southern stocks of silver and red hake. Detailed discussion of the analyses that estimated the impacts of these alternatives is included in Section 6.5.

Alternatives for 2018-2020 ACL specifications

Two alternatives are considered and described in detail in Section 4.1: the preferred alternative (updated specifications) and No Action (no change from the 2016 specifications). While the catch limits for silver hake and red hake in the southern management area are more restrictive in the preferred alternative than in the no action alternative, the lower limits are not expected to be binding. Landings of southern silver hake and southern red hake in 2016 were well below both the 2016 TAL. The 2016 landings are below the proposed 2018-2020 specifications preferred alternative (see table below), but southern red hake landings would exceed the TAL trigger by a minor amount. Therefore, impact on profitability from the preferred alternative, which lowers the ACLs for the southern whiting and red hake stocks, is expected to be neutral, relative to the no action alternative.

The specifications proposed by the preferred alternative for both red hake and silver hake in the northern management area are less restrictive than those under the no action alternative. The less restrictive TAL proposed by the preferred alternative can be expected to have neutral or low positive impacts on profit relative to the TAL under the no action alternative, depending on market conditions (whether the market price for these species remains constant or changes, which partially depends on the elasticity of demand for these species). Assuming that demand for these species is highly elastic and market price for these species remains constant, the ability to land additional amounts of stocks in the northern area would be expected to have a low positive, but likely small, impact on profitability, relative to the no action alternative.

Overall, the expected impact from the proposed changes to the ACL specifications is neutral to low positive, relative to the no-action alternative.

Table 59. Landings of small-mesh multispecies stocks in fishing year 2016 compared to Total Annual Landings (TAL) limits for 2016 and those proposed for 2018-2020.

Stock	2016 Landings (mt)	2016 TAL (mt)	Proposed annual TAL (mt)	Percent change in annual TAL
Northern silver hake	3,085	19,949	26,604	+33%
Northern red hake	162	120	274	+128%
Southern whiting	3,843	23,833	14,465	-39%
Southern red hake	332	746	305	-59%

7.10 Regulatory Impact Review

Introduction

Executive Order 12866 requires a Regulatory Impact Review (RIR) in order to enhance planning and coordination with respect to new and existing regulations. This Executive Order requires the Office of Management and Budget (OMB) to review regulatory programs that are considered to be "significant."

A "significant" regulatory action for E.O. 12866 purposes is one that may:

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

2. Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;
3. Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or
4. Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

Section 5.0 assesses of the costs and benefits of the proposed actions. The analysis included in this RIR and the IRFA above further demonstrates that the proposed actions are not "significant" because they will not have an annual effect on the economy of $100 million or more, or adversely affect in a material way the economy or a sector of the economy, productivity, jobs, the environment, public health, or safety, or State, local, or tribal governments or communities.

Objectives

The objectives of the Northeast Multispecies FMP, as they relate to small-mesh multispecies, are to manage fisheries catching red, silver, and offshore hake that maintain stock size at levels capable of sustaining MSY on a continuing basis. In addition to existing restrictions on fishing through exemption areas and seasons to minimize groundfish bycatch, other measures are intended to optimize size selectivity and keep landings from temporarily flooding limited market demand. These measures include red and silver hake possession limits. The silver hake possession limits are higher when a vessel uses large mesh, providing an incentive to avoid catching juvenile or small silver hake. Amendment 19 established and specified catch and landings limits which are deemed to be sustainable, including accountability measures which either reduce the risk that catches will exceed the ACL or to account for those overages in later seasons if they do occur.

Consistent with these objectives, this action seeks to update the catch limits, based on the best scientific information available, without increasing the probability of overfishing. There should be no adverse impacts on yield, management compatibility, or enforcement.

Affected Entities

Entities affected by this action are entities that fish for small-mesh multispecies, and therefore may be affected by a change in the ACLs for these species or a change in the possession limits and accountability measures for these species. The primary entities affected by this regulation are commercial fishing entities that target small-mesh multispecies. Some fishing entities may possess small-mesh multispecies for use as bait. However, these entities are not expected to be negatively impacted by the proposed actions. Recreational fishermen generally do not target small-mesh multispecies, and are not expected to be impacted the proposed action. Consumers of these species are not expected to be adversely affected by the proposed actions.

The number of affected entities was estimated by the number of entities that had trips that landed any amount of red or silver hake in 2013. These entities are described in the following three tables:

Table 60. Description of affected entities by business type.

Business Type	Number of entities
Primarily finfish	208
Primarily shellfish	95
Primarily for-hire	128

Not Classified (no revenue)	3
Total Number of Regulated Entities	**434**

Table 61. Description of affected entities by gross sales.

Sales category	Number of entities	Mean gross sales	Median gross sales	Mean permits per entity	Max permits per entity
<$50K	85	$ 18,722	$ 14,569	1.12	3
$50-100K	55	$ 76,104	$ 76,264	1.16	4
$100-500K	170	$ 264,565	$ 241,921	1.41	5
$500K-1mil	72	$ 698,048	$ 694,213	1.53	4
$1-5.5mil	48	$ 1,701,401	$ 1,358,191	2.27	10
$5.5-20.5mil	4	$ 14,054,224	$ 15,076,518	16.5	28

Table 62. Total number of entities landing small-mesh multispecies by stock area and number classified as small.

Stock	Vessels and entities	Total
Northern Red Hake	Number of business entities	41
Northern Silver Hake	Number of business entities	143
Southern Red Hake	Number of business entities	246
Southern Silver Hake	Number of business entities	146

Note: Entities may be landing more than one stock listed in the table above.

Problem statement

The purpose of the measures proposed in this action is set forth in Section 3.1.

Analysis of alternatives

Executive Order 12866 mandates that proposed measures be analyzed below in terms of:

1) Changes in net benefits and costs to stakeholders,
2) Changes to the distribution of benefits and costs within the industry,
3) Changes in income and employment,
4) Cumulative impacts of the regulation, and
5) Changes in other social concerns.

The preferred alternative for the proposed 2015-207 ACLs specifications is expected to result in neutral to low positive impacts to entities that land small-mesh multispecies for commercial sale. There are no expected negative impacts to entities related to commercial harvest of small-mesh multispecies (e.g. dealers, fishing gears suppliers) from the preferred alternative, relative to the no-action alternative.

The preferred alternative for the northern red hake possession limits and accountability measures is estimated to result in low positive impacts to affected entities. Compared to the no-action alternative, it is estimated that fewer trips that land northern red hake will have reduced northern red catch and revenue from landings. In addition, predicted revenues from landing northern red hake are higher under the preferred alternative than they are under the No Action alternative (4.1.2). The non-preferred action alternative may yield higher landings and revenues in the short term, but it is not preferred because of the need to minimize the risk of exceeding the TAL from northern red hake, as occurred in 2012 and 2013. Finally, the preferred alternative for the northern red hake possession limits and accountability measures is expected to minimize the risk of exceeding the ACL and may yield positive long term benefits by maintaining a sustainable fishery for those entities that land small-mesh multispecies.

There are no expected substantial distributional issues, and neutral to low positive expected impacts on income and employment related to slightly increased fishing opportunities. The cumulative impacts of management and regulations are not expected to change from those described in the underlying 2015-2017 Specifications Environmental Assessment (EA) in this document and in the Environmental Impact Statement for Amendment 19 (NEMFC 2013). There are no other expected social concerns.

Determination of Executive Order 12866 significance

The proposed actions are not expected to have any adverse impact on fishing vessels, purchasers of seafood products, ports, recreational anglers, and operators of party/charter businesses. The proposed actions are expected to have neutral to low positive, but not significant, impacts for commercial fishermen and associated businesses. In addition, there should be no interactions with activities of other agencies and no impacts on entitlements, grants, user fees, or loan programs. The proposed actions are also similar to specification adjustments in this or other NEFMC-managed fisheries, and as such do not raise novel legal or policy issues. As such, the proposed actions are not considered significant as defined by Executive Order 12866.

8.0 GLOSSARY

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Bottom tending static gear – All fishing gear that operates on or near the ocean bottom that is not actively worked; instead, the effectiveness of this gear depends on species moving to the gear

which is set in a particular manner by a vessel, and later retrieved. Some examples of bottom tending static gear are gillnets, traps, and pots.

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

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

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

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

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

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

Council – New England Fishery Management Council (NEFMC).

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

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

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

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

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

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

maturity. The EFH designation for most managed species in this region is based on a legal text definition and geographical area that are described in the Habitat Omnibus Amendment (1998).

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

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

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

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

Final preferred alternative – The management alternative chosen by the Council in the final amendment, submitted to the Secretary of Commerce for approval and if approved publication as a proposed rule.

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

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

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

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

FMP (Fishery Management Plan) – a document that describes a fishery and establishes measures to manage it. This document forms the basis for federal regulations for fisheries managed under the regional Fishery Management Councils. The New England Fishery Management Council prepares FMPs and submits them to the Secretary of Commerce for approval and implementation.

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

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

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

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

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

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

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

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

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

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

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

Meter – A measure of length, equal to 39.37 English inches, the standard of linear measure in the metric system of weights and measures. It was intended to be, and is very nearly, the ten millionth part of the distance from the equator to the north pole, as ascertained by actual measurement of an arc of a meridian.

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

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

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

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

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

Non-preferred alternative - All alternatives in the final amendment that were not chosen as a "final preferred alternative" are by definition non-preferred alternatives.

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

Northern stock area – for red and silver hake, fish are assumed to be in the southern stock area when the catches originate from fishing in statistical areas 464 to 515, or area 561. See map at http://www.nero.noaa.gov/nero/fishermen/charts/stat1.html.

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

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

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

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

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

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

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

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

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

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

Preferred alternative – An alternative that was favored by the Council in the draft amendment document and DEA based on analysis available at that time and based on input from the Whiting Advisory Panel.

Proposed Rule – a federal regulation is often published in the Federal Register as a proposed rule with a time period for public comment. After the comment period closes, the proposed regulation may be changed or withdrawn before it is published as a final rule, along with its date of implementation and response to comments.

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

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

Recruitment – the amount of fish added to the fishery each year due to growth and/or migration into the fishing area. For example, the number of fish that grow to become vulnerable to fishing gear in

one year would be the recruitment to the fishery. "Recruitment" also refers to new year classes entering the population (prior to recruiting to the fishery).

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

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

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

Small-mesh multispecies – red hake, silver hake, and offshore hake

Small-mesh trawls – specified trawls that are exempt from large-mesh fishery regulations pertaining to trawl with cod end mesh greater than 5.5 or 6 inches square or diamond.

Southern stock area – for red and silver hake, fish are assumed to be in the southern stock area when the catches originate from fishing in statistical areas 521 to 543, area 562, or areas 611 to 639. See map at http://www.nero.noaa.gov/nero/fishermen/charts/stat1.html.

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

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

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

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

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

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

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

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

TAL – Total allowable landings, which for whiting management is equivalent to the ACL minus the dead discard rate. The Federal TAL pertains to landings taken by Federally permitted vessels and excludes landings made by vessel with no Federal permits that fish in state waters

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

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

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

9.0 INDEX

10.0 REFERENCES

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