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

**APRIL 30, 2018**

**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 description of alternatives, 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 low market prices and restrictive regulations to avoid unacceptable bycatch, 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 48).

| 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<br>South: High positive | North: Low positive<br>South: High negative |
| **Silver and offshore hake stocks Section 6.1.2** | North: Low negative<br>South: Low positive | North: Neutral<br>South: Low negative to neutral |
| **Non-target species Section 6.2** | Low negative | Neutral |
| **Protected resources Section 6.3** | Neutral | Neutral |
| **Physical environment and essential fish habitat Section 6.4** | Low negative | Neutral |
| **Fishery-related businesses and communities Section 6.5** | Low positive | Short term: Low positive<br>Long term: Low negative |

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## 2.4 LIST OF ACRONYMS

| | |
|---|---|
| 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 |

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# 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.

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 (NEFMC 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 markets. 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)<br>$F_{MSY}$ Proxy (2.78 kt/kg) | $B_{MSY}$ Proxy (6.42 kg/tow)<br>$F_{MSY}$ Proxy (n/a) |
| Southern Silver Hake | ½ $B_{MSY}$ Proxy (0.83 kg/tow)<br>$F_{MSY}$ Proxy (34.19 kt/kg) | $B_{MSY}$ Proxy (1.65 kg/tow)<br>$F_{MSY}$ Proxy (n/a) |

#### 3.2.2.2 Red hake

*Red hake is <u>overfished</u> 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.*

*<u>Overfishing</u> 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)<br>$F_{MSY}$ Proxy (0.163 kt/kg) | $B_{MSY}$ Proxy (n/a)<br>$F_{MSY}$ Proxy (n/a) |
| Southern Red Hake | ½ $B_{MSY}$ Proxy (0.51 kg/tow)<br>$F_{MSY}$ Proxy (3.038 kt/kg) | $B_{MSY}$ Proxy (n/a)<br>$F_{MSY}$ Proxy (n/a) |

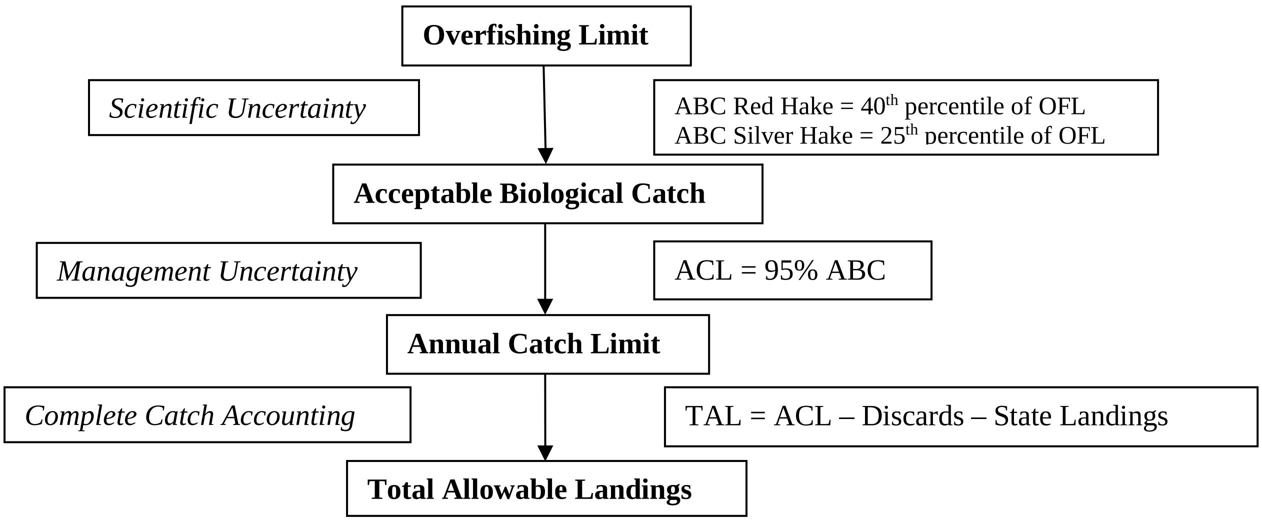
#### 3.2.2.3 Offshore hake

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 require an annual review and three-year adjustment cycle 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

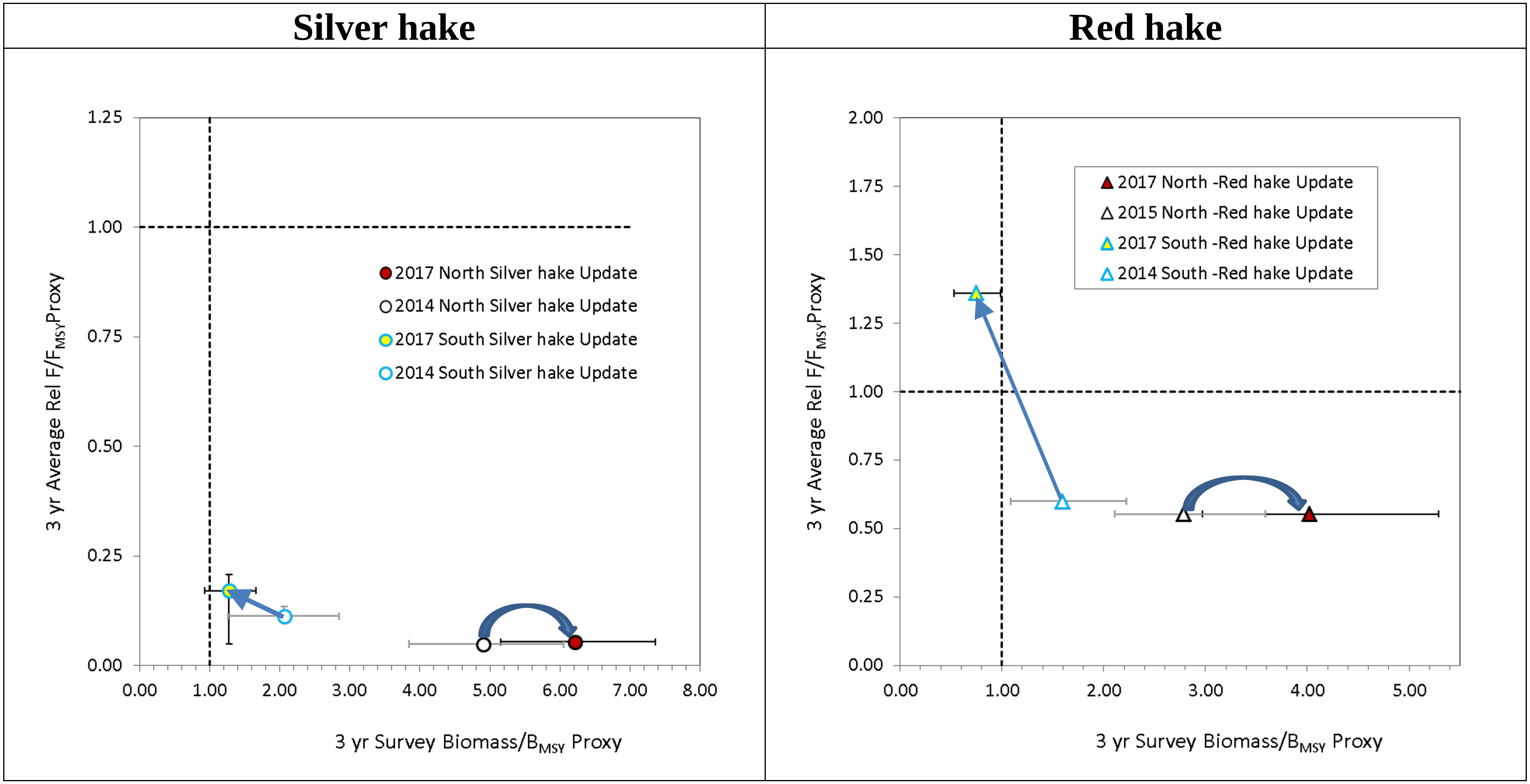
#### 3.2.4.1 Stock Status

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 of southern red hake 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 ($F_{target}$) at current biomass levels ($B_t$), 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, $F_{target}$ is defined as the mortality that would produce the ACL at existing stock biomass and size selectivity. Expressed as an equation:

$$OY = F_{target} \text{ x } (B_t)$$

For a rebuilt stock, $B_t$ is always greater than $B_{MSY}$ (stock biomass capable of sustaining MSY over time). $F_{target}$ 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, $B_t$ is the current stock biomass level estimated or projected from the most recent assessment, and $F_{target}$ is the fishing mortality rate objective that will achieve the desired rebuilding. If the current F, $F_{target}$, or $B_t$ 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 ($F_{target}$) is the rate that will achieve the plan objectives with an acceptable degree of safety or precaution. Factors to be considered in setting $F_{target}$ will be calculated through periodic stock assessments and include the stock size relative to $B_{MSY}$, 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 $F_{target}$ provided the stock rebuilding projections are within the Council's range of precaution.

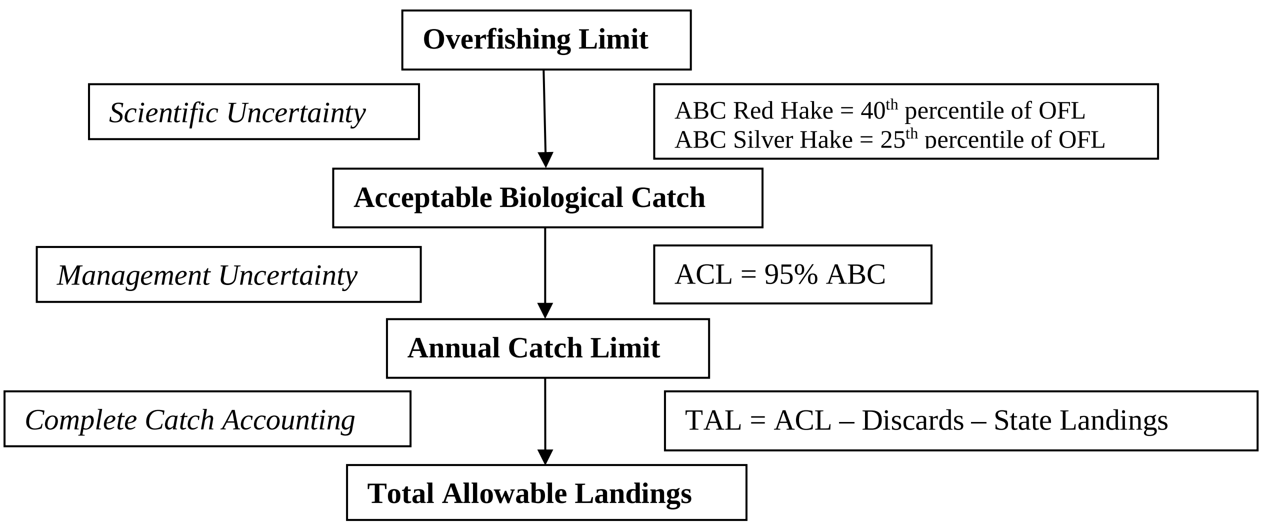
For an overfished stock (no stock is currently overfished), for example, the Council would set a target rate to rebuild the stock within a maximum time, usually not to exceed ten years. On a rebuilt stock, the Council should set $F_{target}$ safely below the threshold level that will produce MSY. In 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 $B_{MSY}$. Thus, the Council will consider social, economic, and ecological factors in setting the $F_{target}$ 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 $F_{MSY}$. 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 40$^{th}$ percentile of the distribution of scientific uncertainty estimates was chosen as an appropriate level of precaution. For silver hake, a more conservative 25$^{th}$ 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)

An update assessment was performed by the Northeast Fisheries Science Center (NEFSC). 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). These estimates included the ABC at the 25$^{th}$ percentile for silver hake and the 40$^{th}$ percentile for red hake, separately for the northern and southern management areas.

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

<table>
<tr><th></th><th>May</th><th>Jun</th><th>July</th><th>Aug</th><th>Sep</th><th>Oct</th><th>Nov</th><th>Dec</th><th>Jan</th><th>Feb</th><th>Mar</th><th>Apr</th></tr>
<tr><td>Cultivator</td><td></td><td colspan="5">June 15 – October 31</td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>GOM* Grate</td><td></td><td></td><td colspan="5">July 1 – November 30</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Small I</td><td></td><td></td><td colspan="5">July 15 – November 30</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Small II</td><td colspan="2">– June 30</td><td></td><td></td><td></td><td></td><td></td><td></td><td colspan="4">January 1 –</td></tr>
<tr><td rowspan="2">Cape Cod††</td><td></td><td></td><td></td><td></td><td colspan="3">Sept 1 – Nov 20</td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td colspan="4">September 1 – December 31</td><td></td><td></td><td></td><td></td></tr>
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* 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.<br>90% of TAL | 400 lbs.<br>90% of TAL | 400 lbs.<br>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.

[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.”

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 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.)

[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."

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%.

The Council's Scientific and Statistical Committee (SSC) approved new specifications (Section 3.2.4.4) for the 2018-2020 fishing years based on an assessment update for 2016 prepared by the Northeast Fisheries Science Center (NEFSC) and recommendations by the Plan Development Team. The specifications would apply the approved Annual Catch Limit framework adopted in Amendment 19, incorporating precautionary buffers to account for scientific and management uncertainty in accordance with National Standard 1.

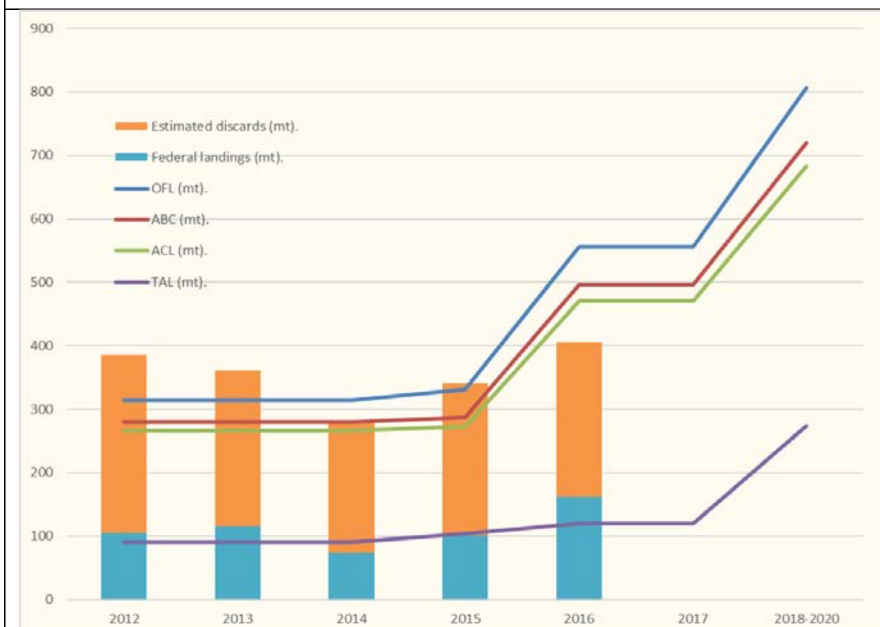
The following figure summarizes the past, current, and proposed specifications by stock.

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

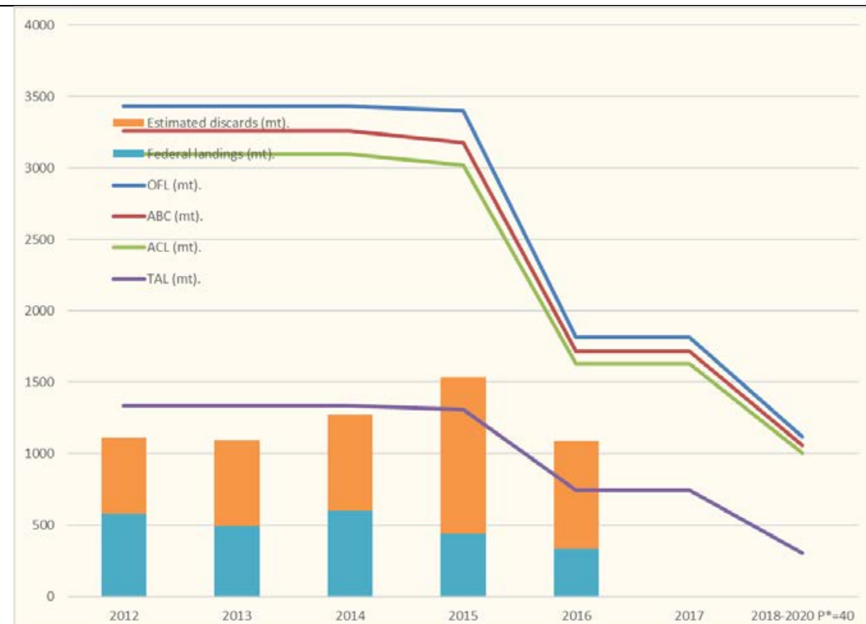
**Northern silver hake**


**Southern whiting**


**Northern red hake**



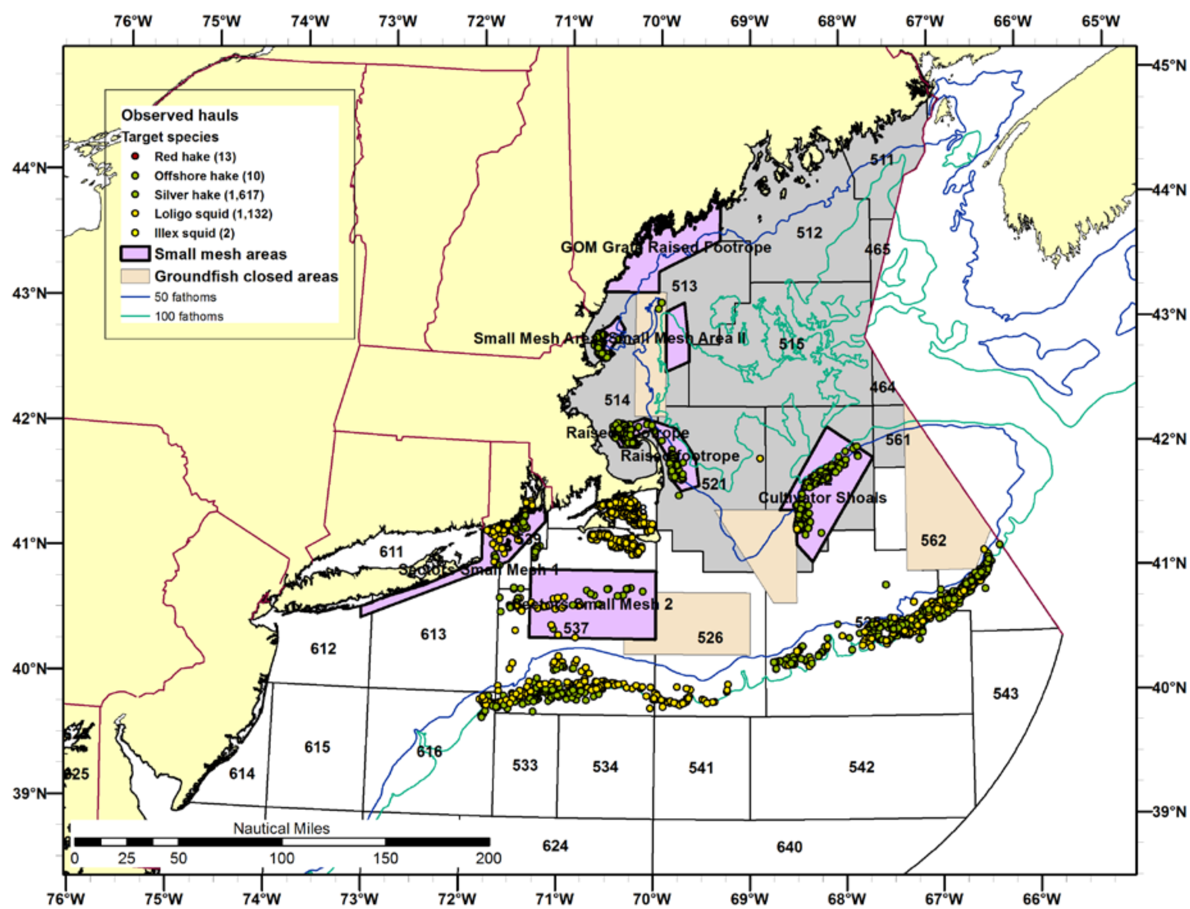

**Southern red hake**



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 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 were experiencing overfishing, the deadline for ending that overfishing was 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 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. 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 ACL8-2020 fishing years. 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).

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

| Stock | OFL (mt) | ABC (mt) | ACL (mt) | 2016 Catch % ACL | TAL (mt) | 2016 Landings % 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

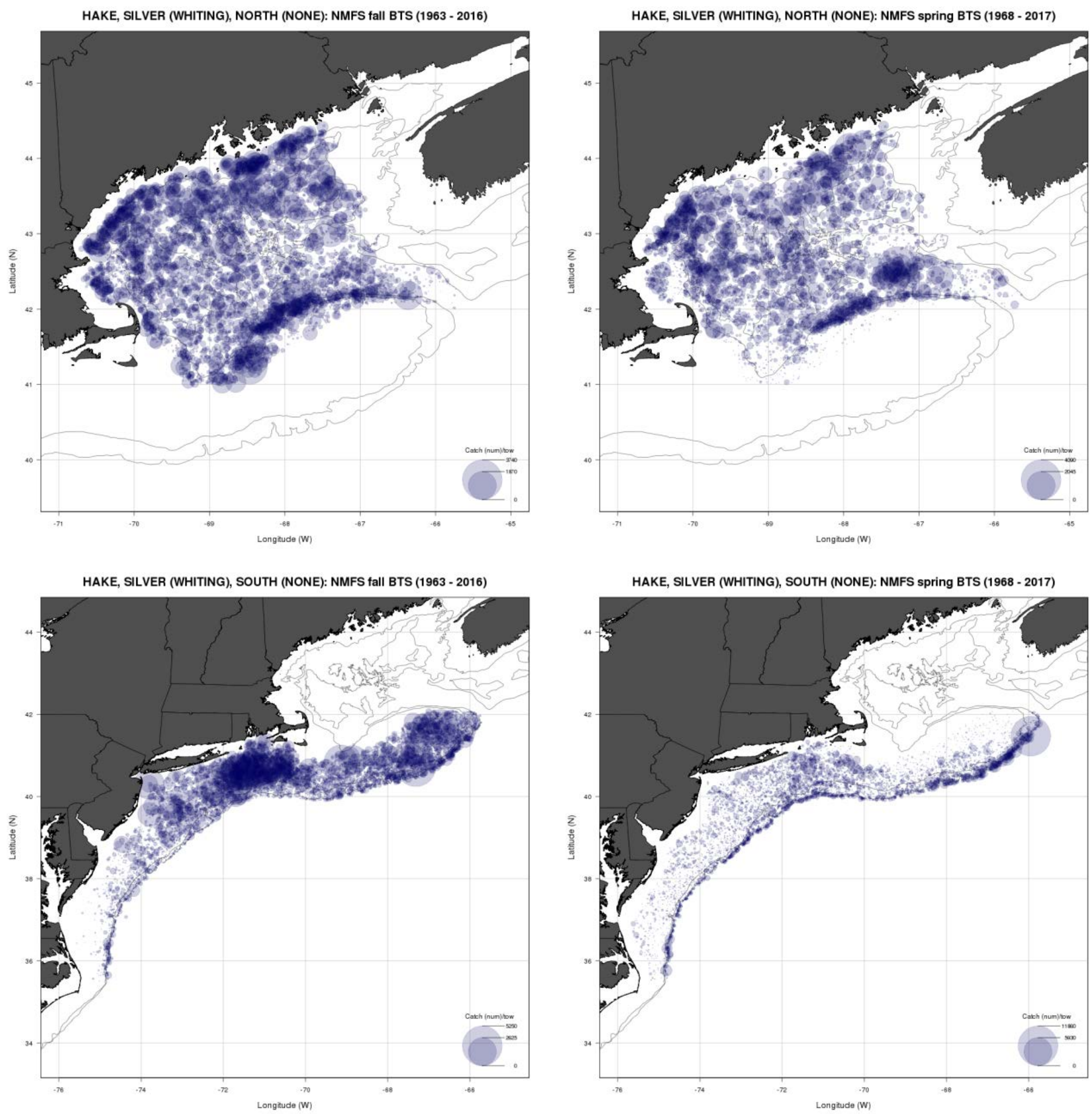
#### 5.1.1.1 Silver hake

Silver hake, *Merluccius bilinearis*, also known as whiting, range from the Grand Banks of Southern Newfoundland to South Carolina (Brodziak *et al.* 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

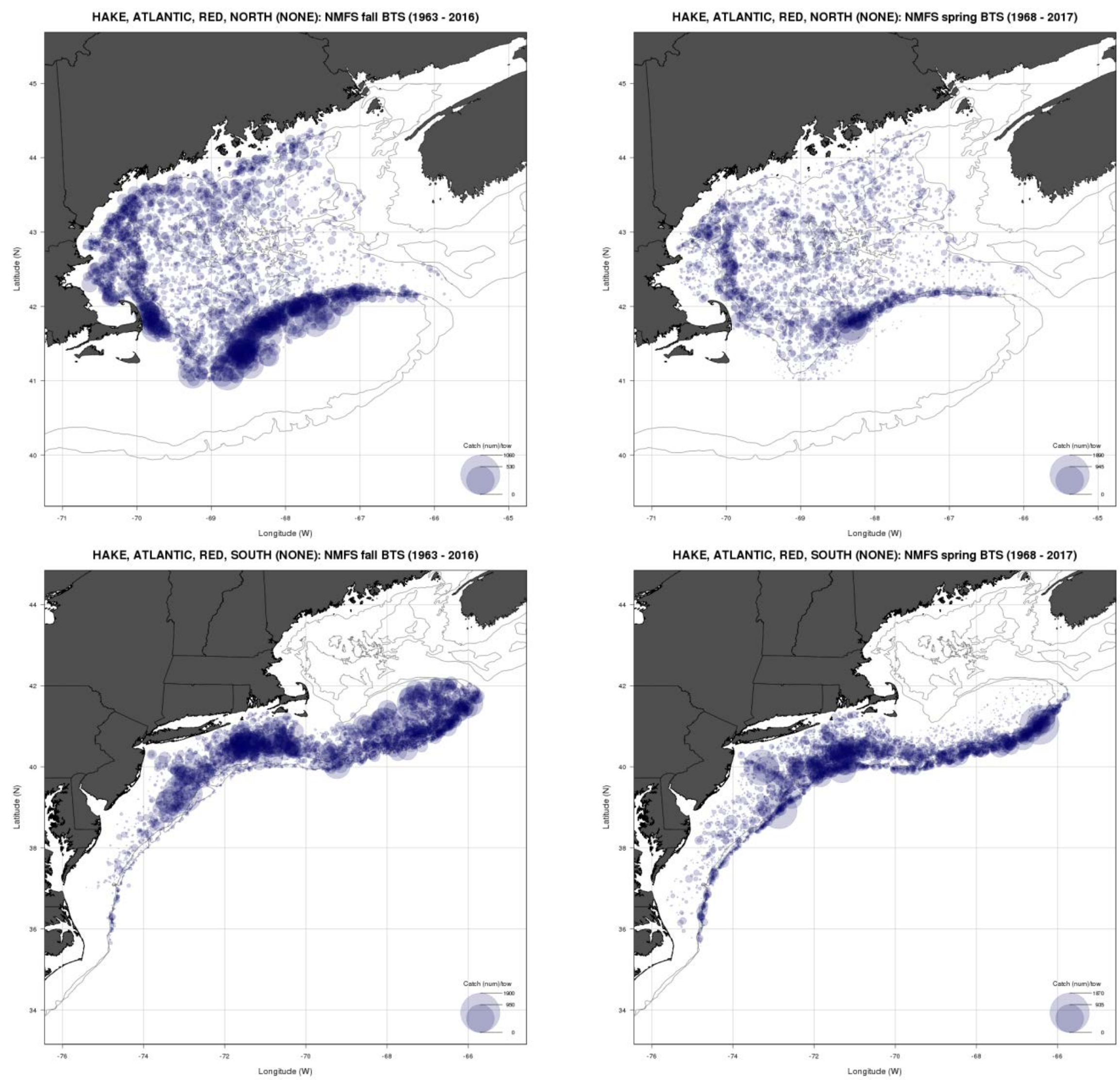
Red hake, *Urophycis chuss*, is a demersal gadoid species distributed from the Gulf of St. Lawrence to North Carolina, and are most abundant from the western Gulf of Maine through Southern New England waters. Red hake are separated into northern and southern stocks for management purposes. The northern 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, 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)., 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 11-13°C. 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 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.

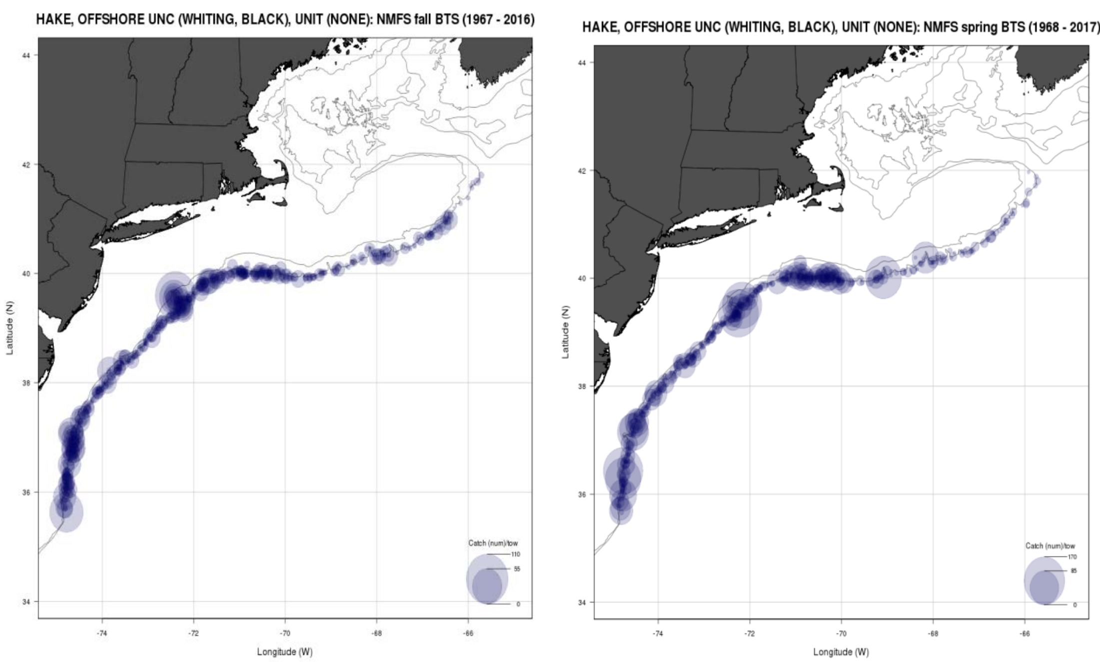
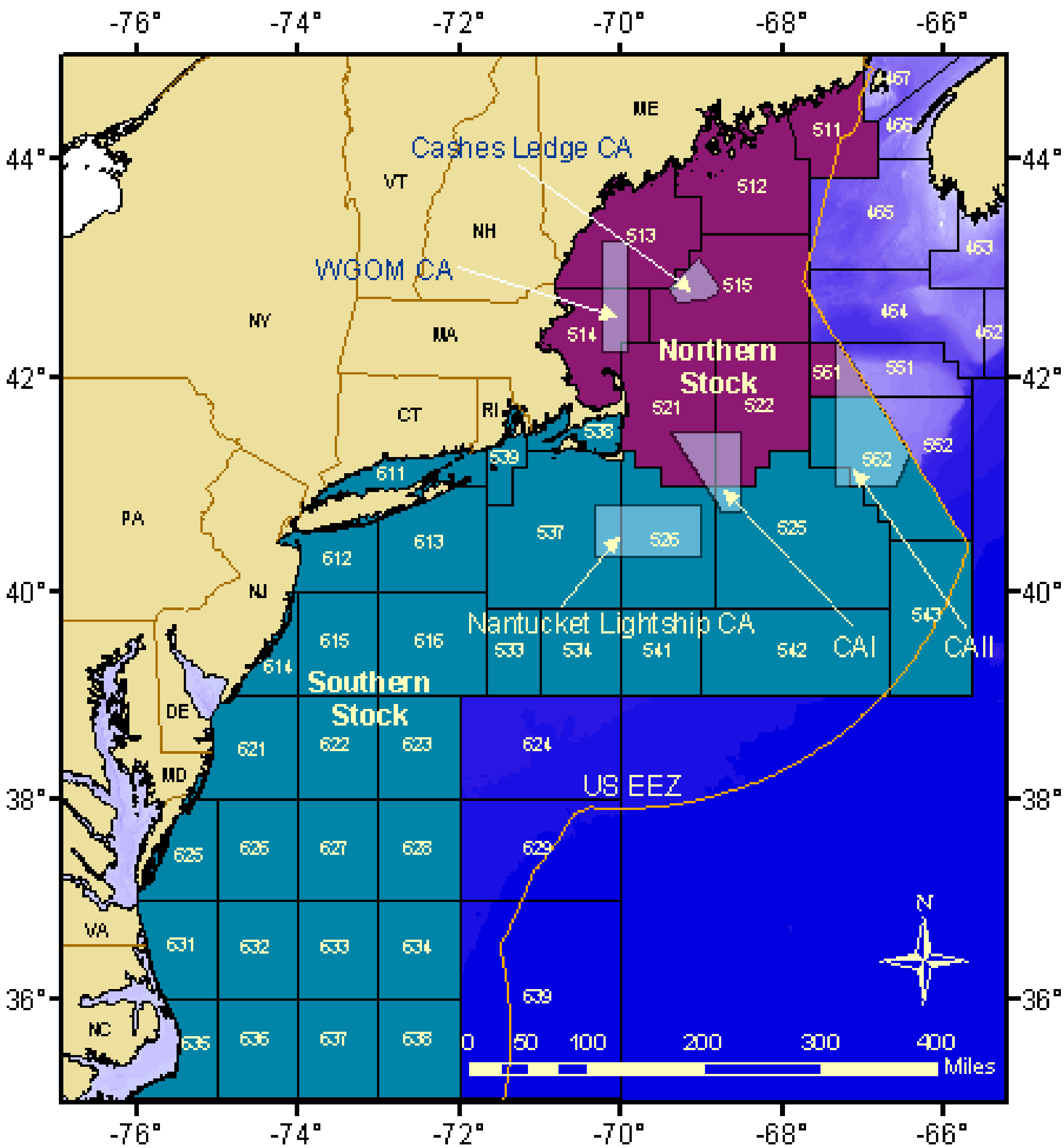


Figure 6. Statistical area used to define red and silver hake in the northern and southern management areas. Offshore hake statistical areas are restricted to the southern management region only.




## 5.1.2 Stock status

An update assessment (NEFSC 2017) was performed by the Northeast Fisheries Science Center (NEFSC). 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 was 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 are described in the overfishing definitions for the northern and southern stocks (see Section 3.2.2.1). Overfishing thresholds are based on annual exploitation ratios (catch divided by arithmetic fall survey biomass) averaged from 1973-1982 (Table 3). Catch per tow is in “Albatross” units.

In the northern management area (Figure 7 below and Table 33 in NEFMC 2017), 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 (Figure 8 below and Table 34 in NEFMC 2017), 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.

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 highlights 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 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. percentile on the OFL distribution of scientific uncertainty estimates, corresponding to a low probability of overfishing.

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.

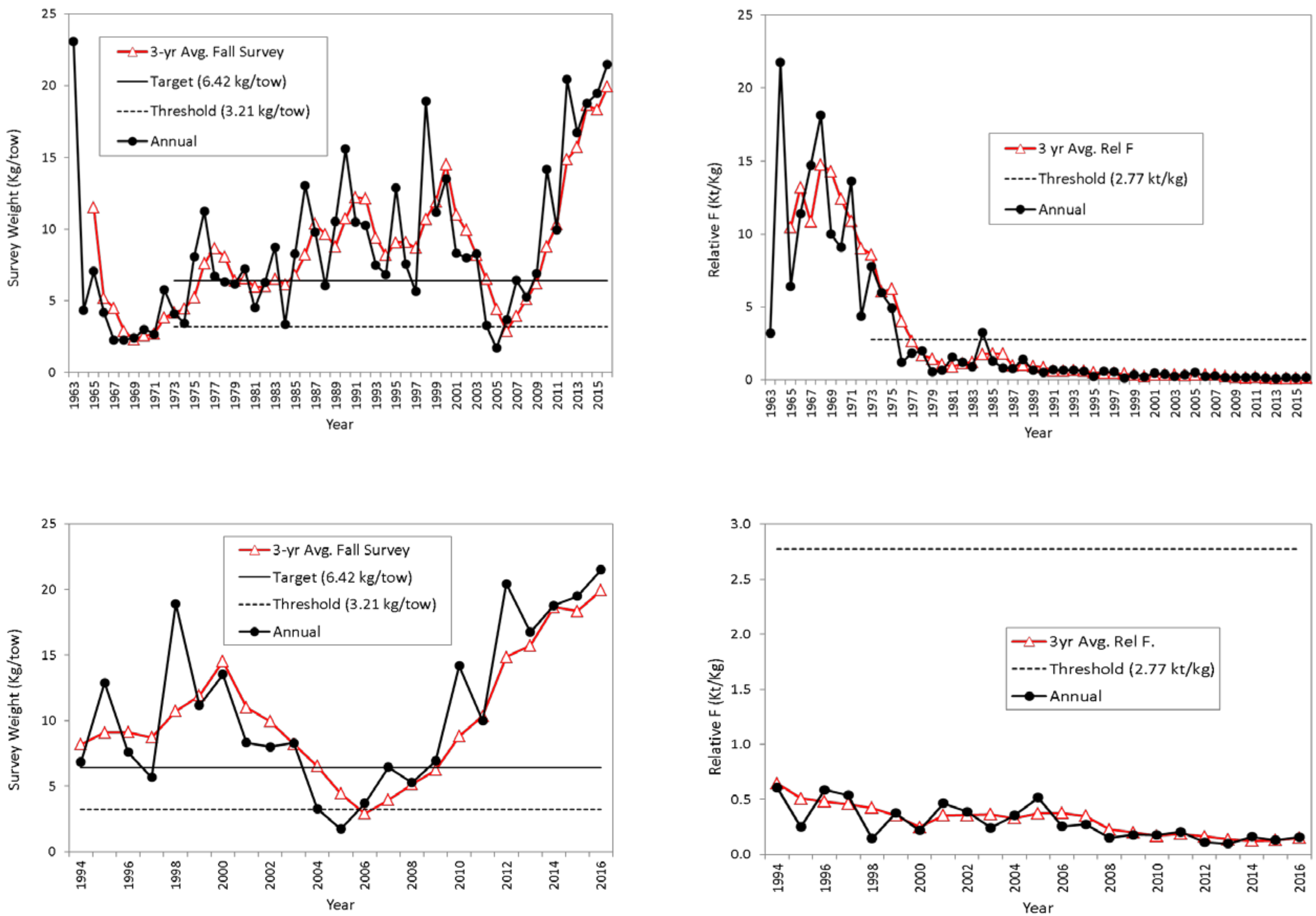
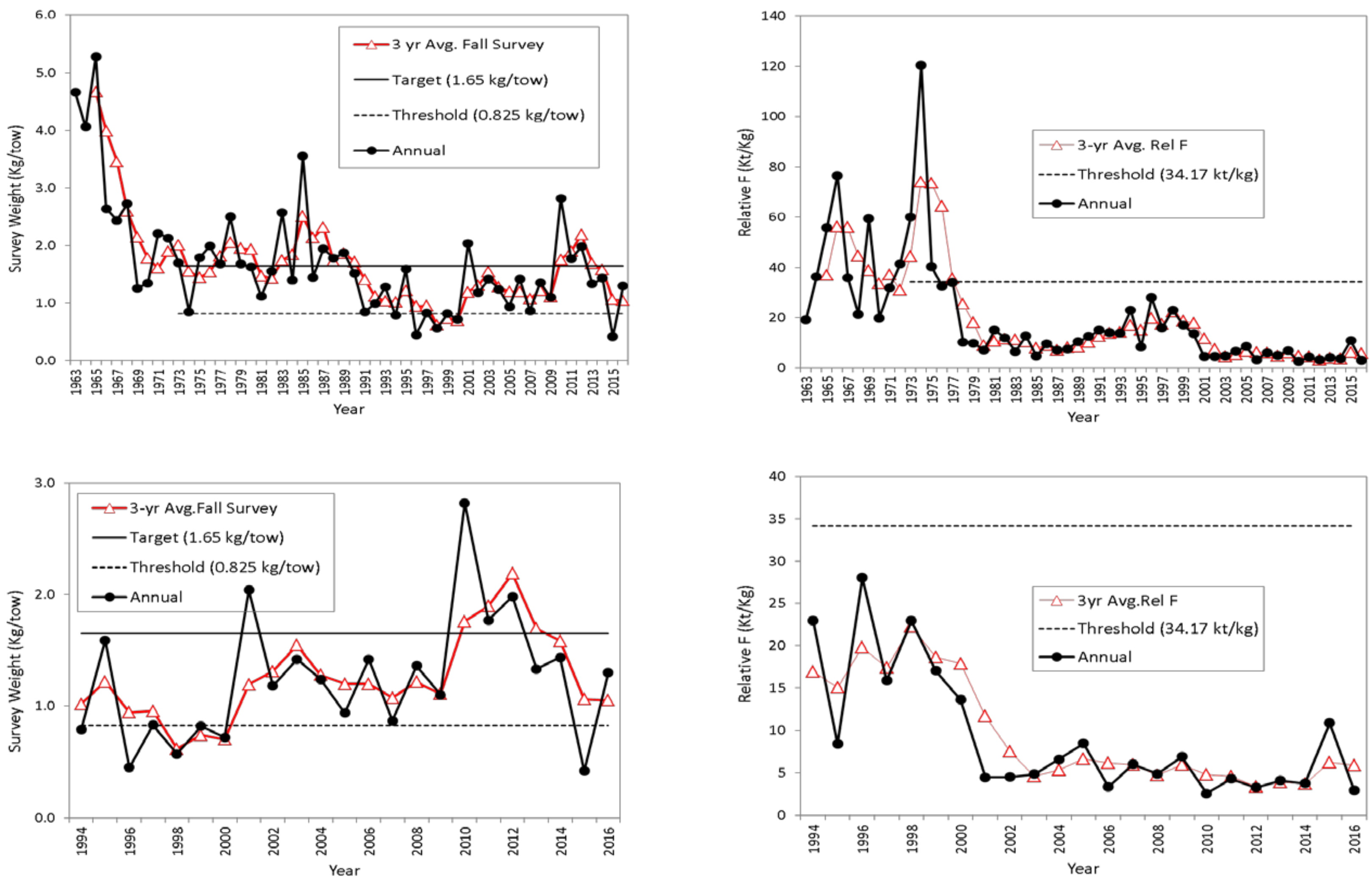


Figure 8. ***Southern silver hake*** fall survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the fall survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the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



### 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 (see Tables 33 and 34 in NEFMC 2017. In the absence of an analytical assessment for red hake, the biological reference points for both the northern and southern silver stocks are described and specified in the overfishing definitions for northern and southern stocks (see Section 3.2.2.2 and Table 4).

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.

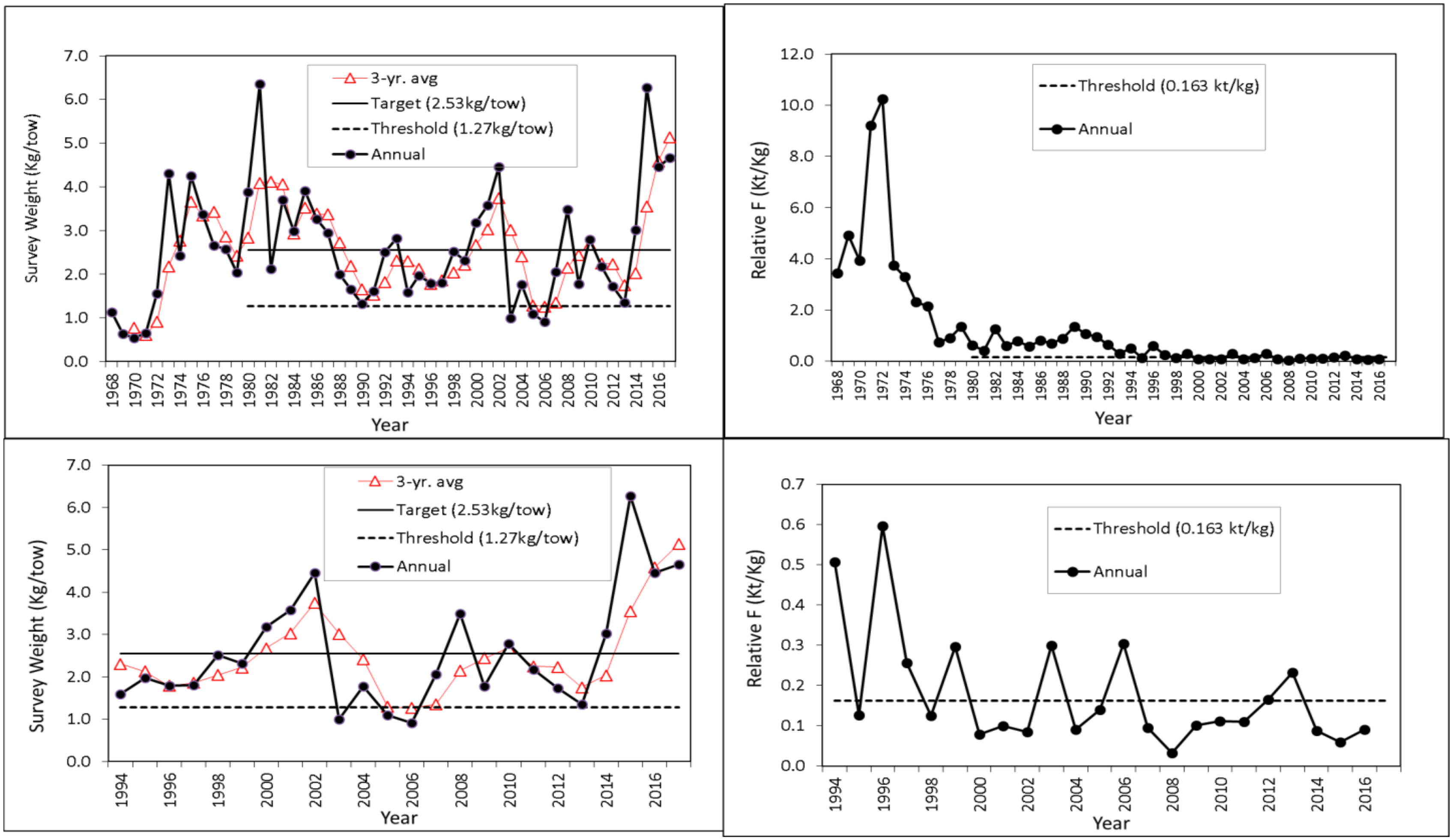
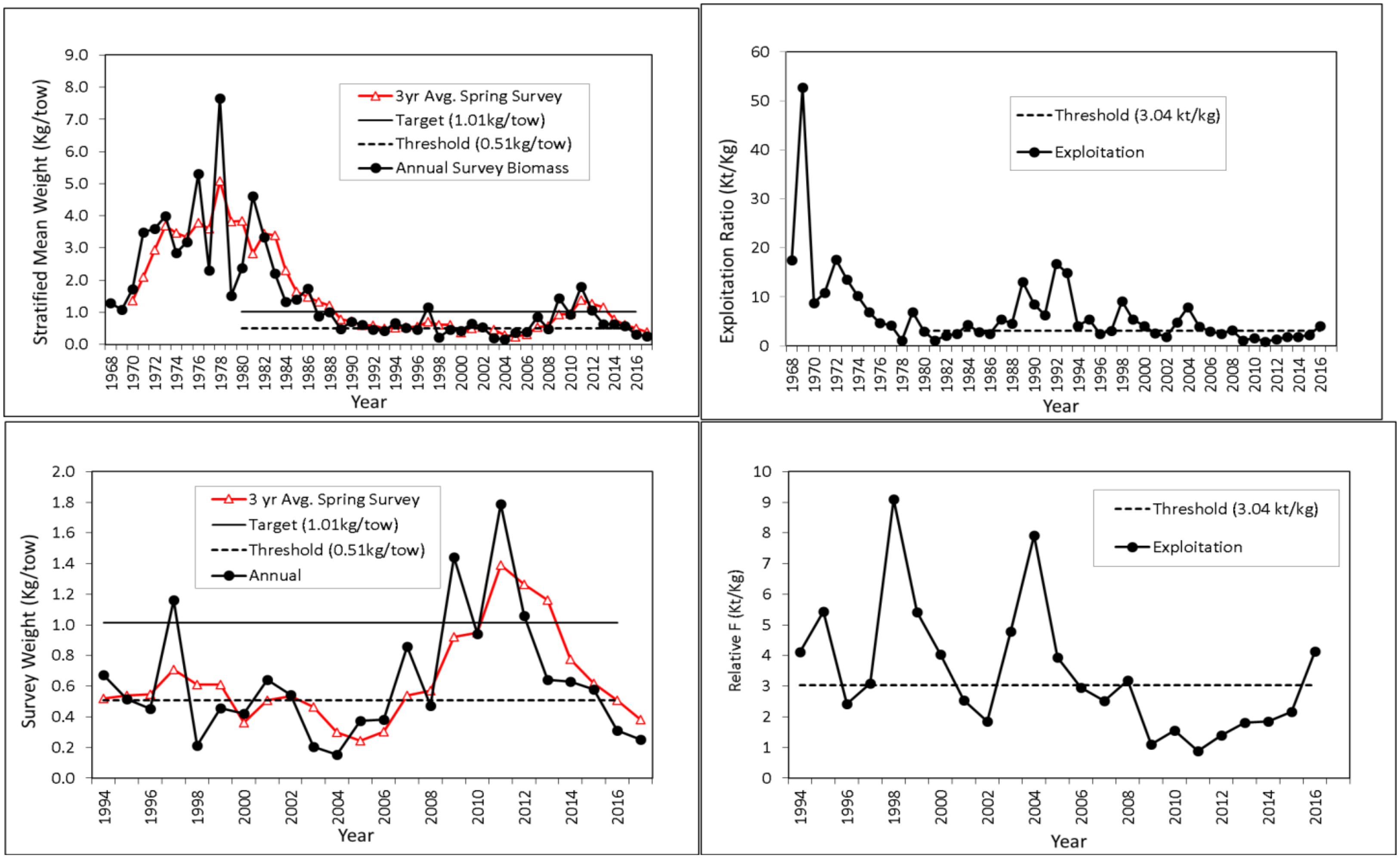


Figure 10. ***Southern red hake*** spring survey biomass in kg/tow (LEFT) and relative exploitation ratios (RIGHT) of the total catch to the spring survey indices in kt/kg and associated 3-yr moving averages (red lines). The horizontal dash lines represent the biomass and overfishing thresholds and the 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 Role in the Ecosystem

#### 5.1.3.1 Silver hake

The characteristics of silver hake were summarized in the 2010 benchmark assessment (NEFSC 2011), which included estimates of per capita and total consumption of silver hake by predators. The EFH Source Document for Silver Hake (NMFS 1999) provides more details about the life history and habitat characteristics of silver hake.

As adults, silver hake are generally found and caught on silt-sand and sandy bottoms of the Gulf of Maine, Georges Bank, Southern New England, and in the Mid-Atlantic. Depth ranges and distribution are partially temperature dependent. In the spring, silver hake move inshore to warming shallow waters to feed and spawn. Larger silver hake tend to inhabit deeper water, particularly in the Gulf of Maine and the outer continental shelf of Georges Bank, Southern New England, and the Mid-Atlantic. Commercial vessels target silver hake in Ipswich and Massachusetts Bays in the late spring to fall and in the offshore waters in the winter and spring.

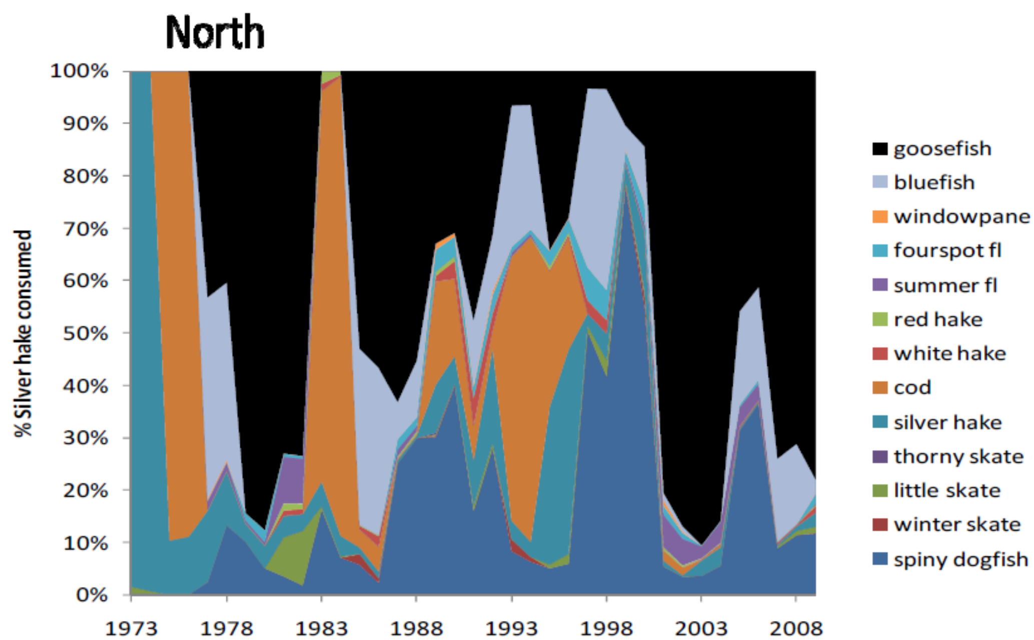
As adults, silver hake are primarily piscivorous (Bowman 1984) and somewhat cannibalistic (i.e. they consume smaller individuals of the same species). The also prey on squids, crustacea, and small fish as juveniles (Schaefer 1960; Domanevsky and Nozdrin 1963; Dexter 1969; Edwards and Bowman 1979; Bowman 1984; Waldron 1993; Helser *et al.* 1995).

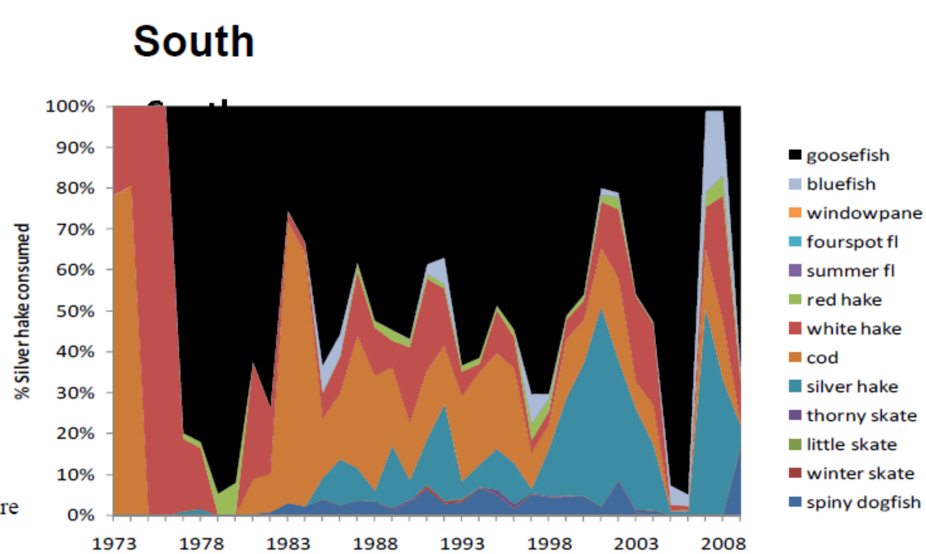
Total consumption estimates in NMFS 2011 were derived from the food habitats data, which samples randomly selected stomachs of fish caught in the NMFS spring and fall bottom trawl surveys. Per capita consumption was estimated using a gastric evacuation model (Eggers 1977, Elliott and Persson 1978), then scaled up to the abundance of primary predators determined by analytical assessments or swept area estimated abundance. The results indicated that in the north (roughly equivalent to the northern management area) the primary predators were goosefish (aka monkfish), spiny dogfish, cod, and bluefish (Figure 11). In the south, the primary predators included goosefish, silver hake, cod, and white hake.

Estimated total consumption ranged from 4,000 mt in 197 to 167,700 mt in 1986. Consumption declined from a peak in the mid-1980s to a low of 38,000 to 54,000 mt in the late-1980s and early-1990s, peaked again at 129,800 mt in 2000, then declined to 71,000 mt in 2009. More recent estimates of total consumption of silver hake are unavailable, but given recent trends in silver hake abundance and biomass, consumption has probably increased in the northern management area and declined in the southern management area. Most of the consumed silver hake were less than 25 cm, mostly comprised of age 0 (< 15 cm) and age 1 silver hake.

Since silver hake consumption is high (possibly an order of magnitude more than commercial catch) and also are a key predator, it is thought that silver hake play a key role in the ecosystem of the NE Region. This ecological importance was one of the key considerations when the Council set the Allocable Biological Catch using a conservative buffer to account for scientific uncertainty (NEFMC 2013). It is also for this relative ecological importance that silver hake are commonly included in multispecies trophic models that are being developed to evaluate the dynamics of managed species on Georges Bank and other areas (for more information on trophic models see [https://www.nefsc.noaa.gov/ecosys/modeling/](https://www.nefsc.noaa.gov/ecosys/modeling/)).

Figure 11. Proportion of consumption of silver hake by predators captured by the NMFS spring and fall bottom trawl survey. Estimates of total consumption were made during the 2010 benchmark assessment (NMFS 2011).




igure

### 5.1.3.2 Red hake

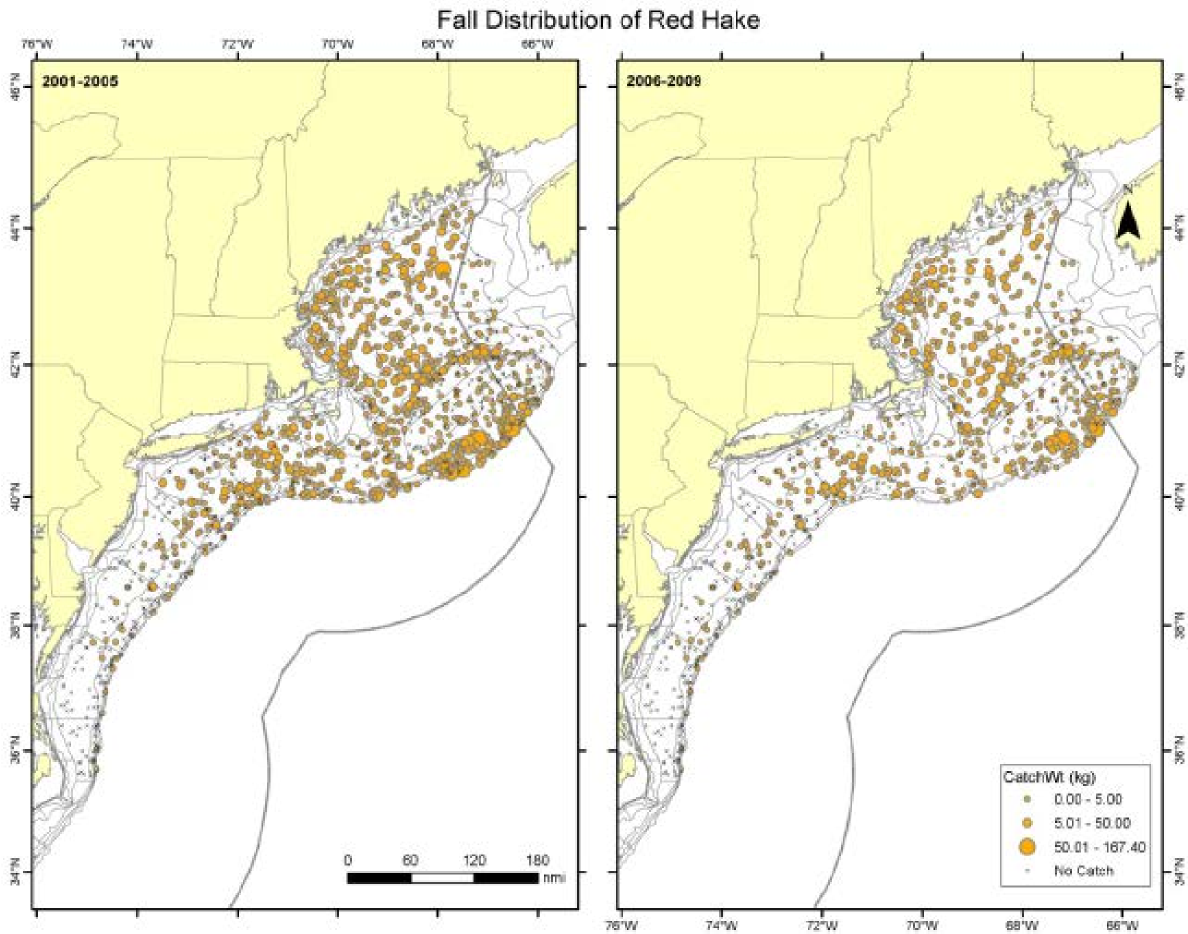
Red hake are distributed shelf-wide in the Mid-Atlantic and on Georges Bank, and throughout the Gulf of Maine (Map 2). According to the EFH Source Documents (NEFSC 1999a), red hake prey on many crustaceans, mysids, euphausids, and amphipods using their chin barbells to seek bottom prey, often using chemoreceptors at night. Adult red hake also prey on juvenile and small demersal and pelagic fish.

Although per capita and total consumption of red hake by specific predators was not reported in the 2011 benchmark assessment (NEFSC 2011), as it was for silver hake, total consumption was estimated and compared to commercial catch. In recent years, the consumption of red hake by predators was 4-8 times the amount of commercial catch.

Primary predators were identified from stomachs sampled in the spring and fall bottom trawl survey, but do not include birds, marine mammals, and other non-teleost predators. The primary predators sampled by the bottom trawl survey included spiny dogfish (*Squalus acanthias*), little skate (*Raja ocellata*), winter skate (*Raja erinacea*), thorny skate (*Raja radiata*), silver hake (*Merluccius bilinearis*), Atlantic cod (*Gadus morhua*), whit hake (*Urophycis tenuis*), fourspot flounder (*Paralichthys oblongus*), summer flounder (*Paralichthys dentatus*) windowpane flounder (*Scophthalmus aquosus*), sea raven (*Hemitripterous americanus*), and goosefish (*Lophius americanus*).

Red hake have a general, varied diet and have a broad variety of predators over a wide distribution. Although they are important food items for a wide variety of species, they are not considered as playing a key role in the ecosystem. Shelter from predators is however a key requirement for red hake (Steiner *et al.* 1982). Juvenile red hake are often found in depressions and are often associated with living sea scallops.

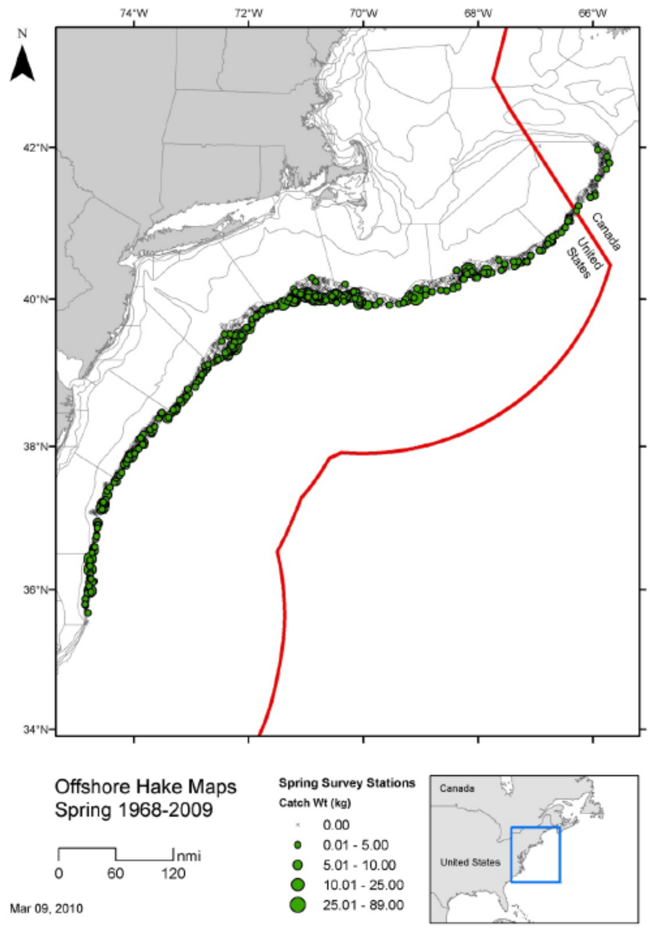
Map 2. Distribution of red hake weight per tow in the fall bottom trawl survey from 2001-2009 (from NEFSC 2011).




## 5.1.3.3 Offshore hake

Unlike silver and red hakes, offshore hake are commonly caught on the offshore edge of the spring and fall bottom trawl survey (Map 3) and total or per capita consumption of offshore hake by predators were not estimated in the benchmark assessment (NEFSC 2011). Because offshore hake inhabit a different depth range and area than do silver hake, the predators of offshore hake are likely to be very different than they are for silver hake.

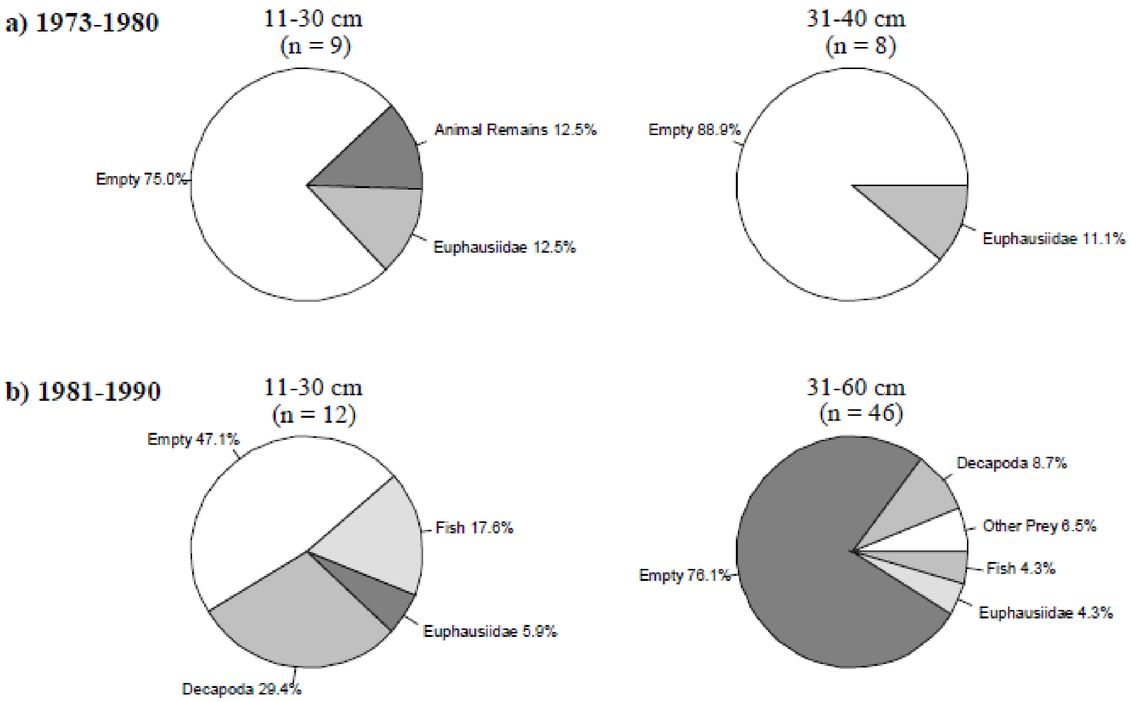
Map 3. Distribution of offshore hake from the NEFSC spring survey (catch weight per tow, kg), 1968-2009 (from NEFSC 2011).




The EFH source document (NMFS 1999b) reports that small juvenile offshore hake are prey for goosefish (*Lophius americanus*), fish, and larger conspecifics. Based on stomach contents collected by the NMFS spring and fall bottom trawl surveys, the EFH source document reports that offshore hake consume fish and invertebrates, with some diet differences with age. Frequent diet items include euphausids, unspecified fish, and unspecified decapods (Figure 12).

Because of their distribution, offshore hake do not appear to play a central role in the ecosystem of the Mid-Atlantic, Southern New England, or Georges Bank. Few if any offshore hake have been observed in the Gulf of Maine, probably due to water temperature and different water mass characteristics.

Figure 12. Abundance (percent occurrence) of the major prey items in the diet of offshore hake collected during NEFSC bottom trawl surveys from 1973-1980 and 1981-1990. The 11-30 cm size range corresponds, at least roughly, to juveniles, and the 31-60 cm size class corresponds to adults. The category "animal remains" refers to unidentifiable animal matter. Methods for sampling, processing, and analysis of samples differed between the time periods [see Reid *et al.* (1999) for details] (from NMFS 1999b).




## 5.1.3.4 With protected species

Most marine mammals have a broad diet of marine organisms, often focused on large zooplankton or squids that are not usually the target of commercial fisheries, keeping competition low between catch and food for marine mammals. Kaschner and Pauly (2005) estimated this competitive interaction worldwide in the 1990s using a biomass based food consumption model and population estimates. Prey taxa were grouped into nine broad categories, two of them being "Miscellaneous fishes" (MF) and "Small pelagic fishes". Diet composition of MF to which small-mesh multispecies would belong ranged from less than 10% for baleen whales, less than 15% for pinnipeds and large toothed whales, to about 25% for dolphins. Kaschner and Pauly (2005) noted that these values represent ocean-basin mean values and that localized competition between fishery catch and marine mammals can nonetheless occur in local areas and in specific seasons.

More recently, Smith *et al.* 2015, estimated consumption of marine mammals residing in the NE US large marine ecosystem by 12 broad taxa (Table 10). Small-mesh multispecies with some other hakes that are not targeted by US fisheries comprise the 'Small gadids' group. These values were derived by estimating per capita total consumption based on body weight and inferred diet composition from the literature, residence time and seasons on the NE continental shelf and the Gulf of Maine, and abundance trend information from NE region stock assessments.

Myticetes marine mammals (e.g. minke, fin, sei, and right whales) are classified as filter feeders or have a specialized diet. Odontocetes marine mammals (e.g. pilot whales and dolpins) eat fish and squids, including pelagic fishes like mackerel and forage fishes like herring. These two groups of marine mammal consumed relatively low amounts of small gadids.

Pinnipeds (e.g. gray and harbor seals) also eat fish including the gadids (cod-like fish), flatfish (flounders), and clupeids (e.g. herring). Small gadid consumption was significant for bottlenose dolphin (17%), Atlantic white-sided dolphin (25%), common dolphin (15%), harbor seal (31%), and harbor seals (20%). Small gadid consumption estimates were the primary diet item only for white-sided dolphin and harbor seal.

Table 10. Percent total diet composition estimates for marine mammals residing in the NE US large marine ecosystem (derived from estimates by Smith *et al.* 2015).

| | Large gadids | Small gadids | Flatfish | Clupeids | Scombrids | Sandlance | Meso-pelagics | Misc. fish | Benthic invertebrates | Squid | Shrimp | Zooplankton | Total (thousand mt) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Fin whale** | 0.4% | 0.3% | 0.0% | 8.7% | 4.0% | 5.2% | 0.3% | 3.4% | 0.0% | 3.6% | 63.1% | 11.0% | 316.1 |
| **Humpback whale** | 0.0% | 2.3% | 0.0% | 11.9% | 7.6% | 20.0% | 0.0% | 18.7% | 0.0% | 1.0% | 36.4% | 2.1% | 48.4 |
| **Right whale** | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% | 15.2% | 84.8% | 17.7 |
| **Sei whale** | 1.6% | 0.2% | 0.0% | 7.0% | 1.6% | 3.8% | 1.7% | 3.9% | 0.0% | 5.5% | 32.6% | 42.1% | 89.4 |
| **Minke whale** | 12.6% | 3.1% | 0.0% | 29.5% | 3.3% | 15.8% | 0.0% | 1.4% | 0.0% | 0.6% | 32.7% | 0.8% | 96.8 |
| **Pilot whale** | 0.0% | 1.2% | 0.0% | 2.7% | 14.1% | 0.0% | 0.5% | 9.0% | 0.8% | 71.7% | 0.0% | 0.0% | 85.2 |
| **Bottlenose dolphin** | 6.3% | 16.8% | 0.1% | 6.3% | 4.2% | 0.6% | 0.0% | 50.4% | 0.4% | 14.7% | 0.0% | 0.0% | 4.7 |
| **Atlantic white-sided dolphin** | 9.0% | 25.2% | 0.1% | 18.0% | 4.5% | 8.1% | 8.1% | 5.4% | 0.9% | 20.7% | 0.0% | 0.0% | 11.1 |
| **Common dolphin** | 0.1% | 15.4% | 0.0% | 8.3% | 20.7% | 1.0% | 8.0% | 23.9% | 0.1% | 22.4% | 0.0% | 0.0% | 87.7 |
| **Harbor porpoise** | 4.8% | 31.2% | 0.1% | 28.4% | 5.7% | 8.5% | 2.8% | 14.2% | 0.6% | 2.8% | 0.9% | 0.0% | 3.5 |
| **Gray seal** | 19.5% | 8.1% | 12.9% | 9.0% | 2.9% | 36.2% | 0.0% | 8.1% | 0.5% | 2.9% | 0.0% | 0.0% | 20.5 |
| **Harbor seal** | 9.5% | 20.3% | 12.9% | 12.6% | 1.1% | 24.9% | 0.0% | 9.9% | 1.1% | 7.0% | 0.6% | 0.0% | 97.7 |
| **Total** | 3.4% | 5.2% | 1.7% | 10.8% | 6.1% | 9.0% | 1.2% | 7.7% | 0.2% | 12.3% | 32.0% | 10.1% | 880.2 |

### 5.1.4 Landings and discards of target species

#### 5.1.4.1 Commercial fishery

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).

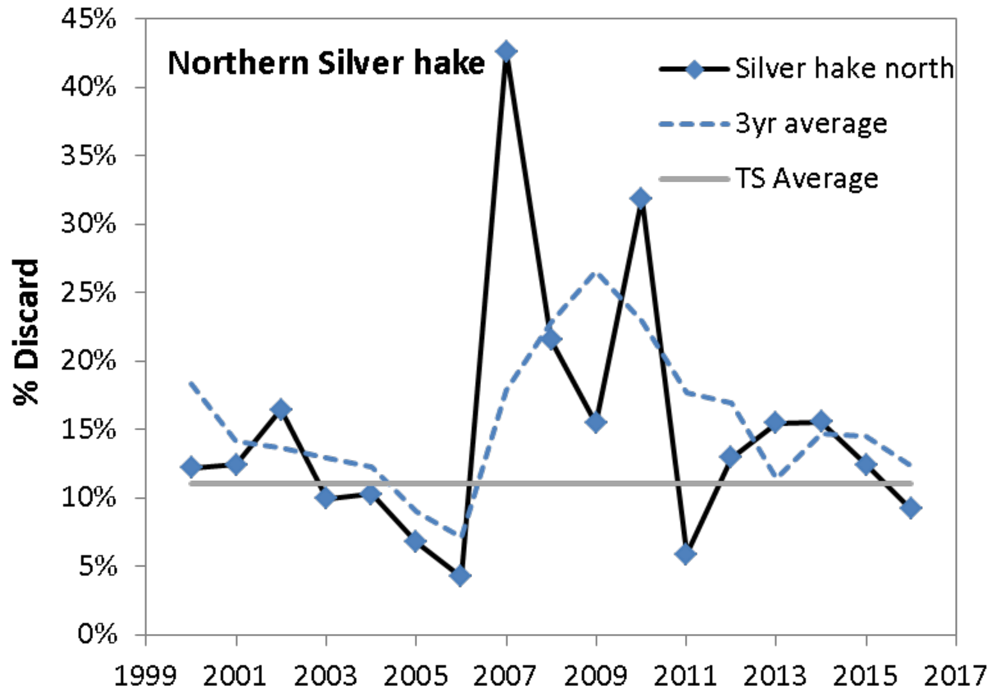
Red and silver hake discards were estimated by applying the observed discard to total landings ratio (D/K_all) to total landings of all trips from a stratum. Strata used for this analysis included gear type, three-digit statistical area, and half-year. Landings data with no matching observed trips in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

<u>Silver hake</u>

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 have been steadily declining but variable and currently estimated at 310 mt in 2016 (Figure 14). 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 5.1.4). 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 5.1.4). 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 14). The three-year moving average was approximately 11% of the total catch in 2016.

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



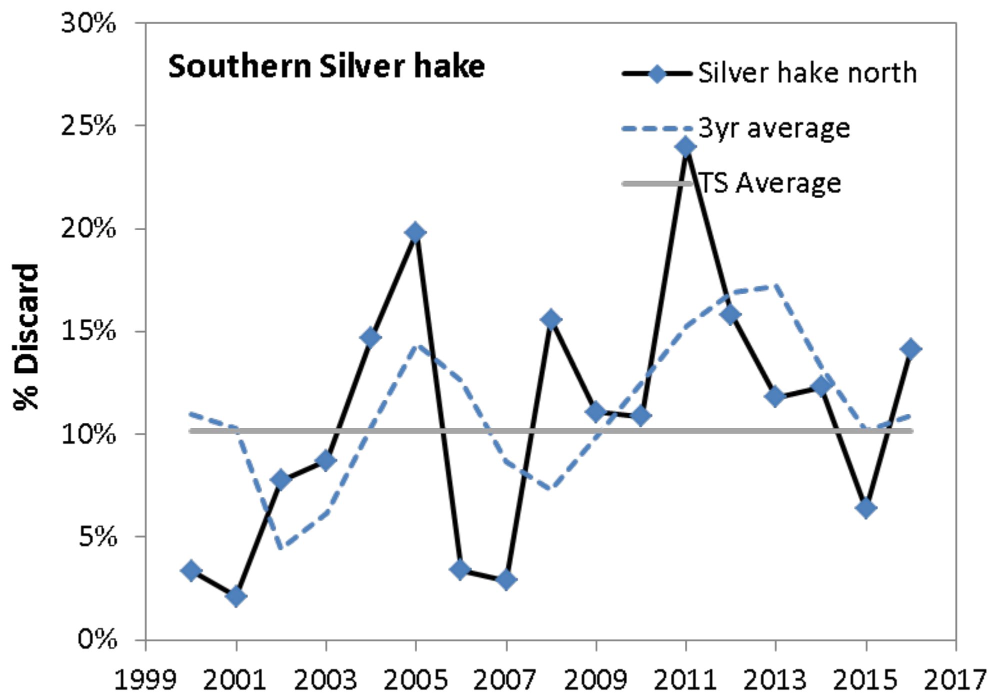
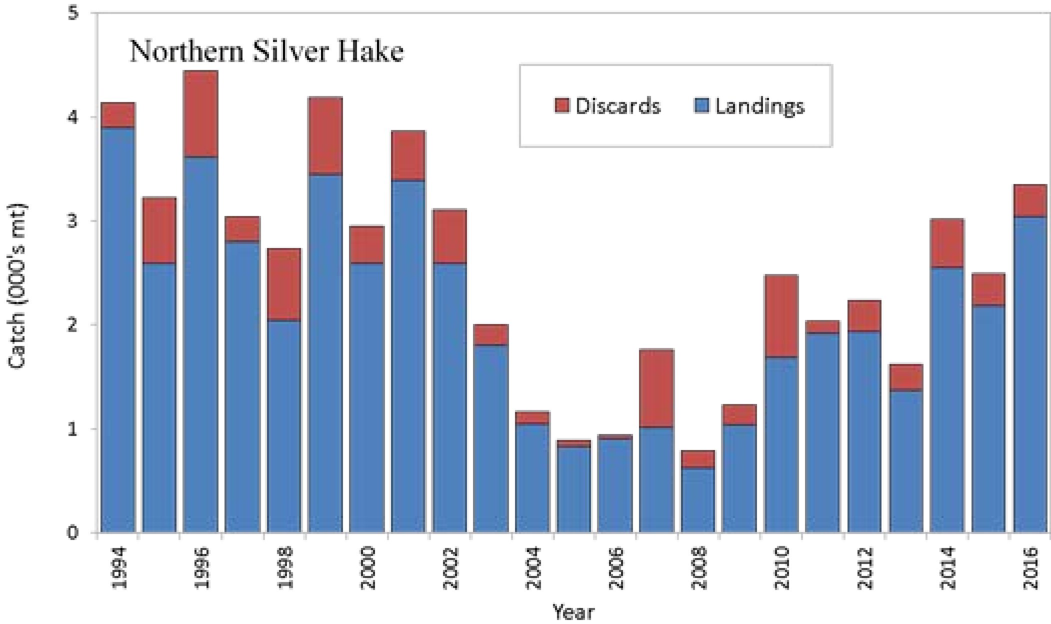
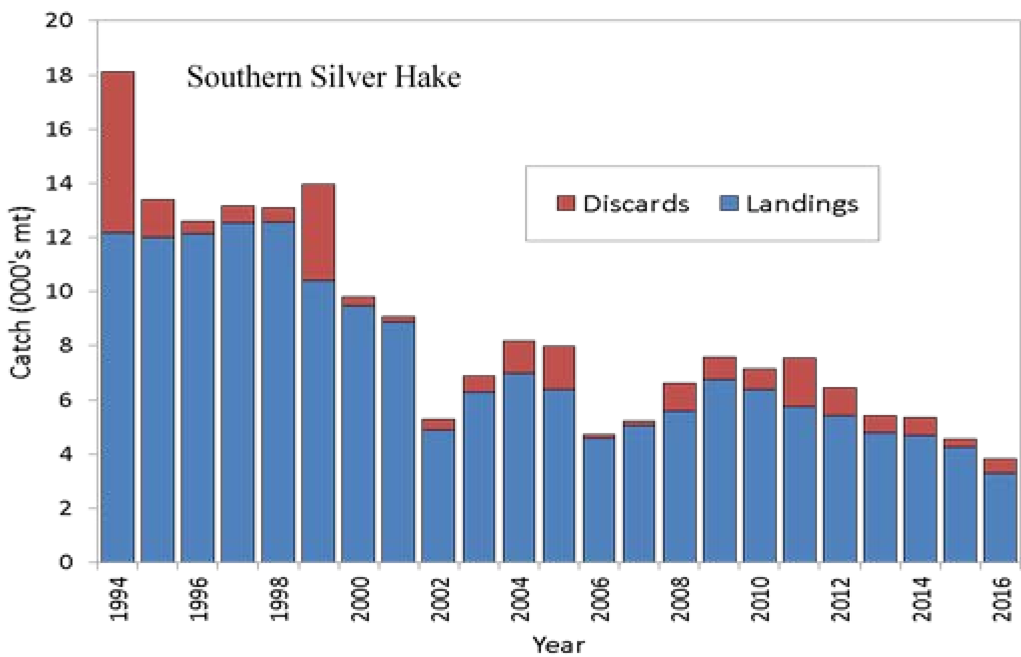



Figure 14. Landings and estimated nominal discards (mt) for northern and southern stocks of silver hake, 2000-2010. Source: NEFSC 2011a, updated by Whiting PDT analysis.



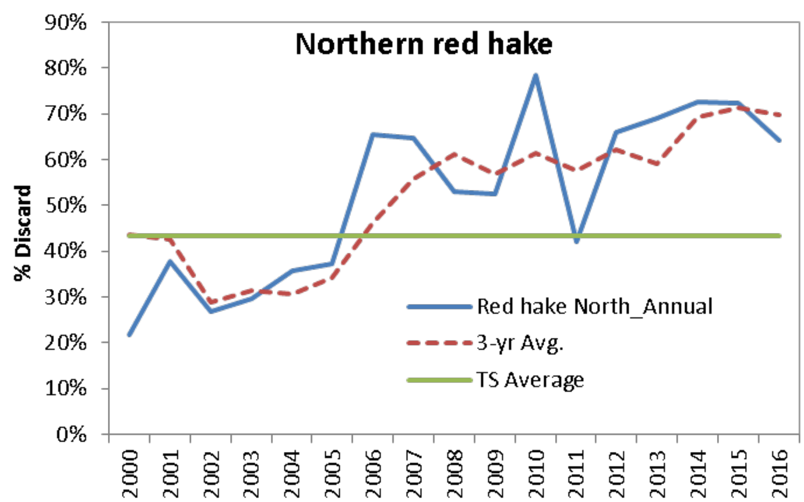

Red hake

Red hake discards were comparatively high, ranging from 10-40% from 2000-2003, increasing to 50-80% from 2005 to present (Figure 15), 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 16). This discard increase drove the 2010 discards to 78%, from 52% in 2008 and 51% in 2009 (Figure 15). 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 15, 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 15. Northern and southern red hake discard rate (percent of total catch).



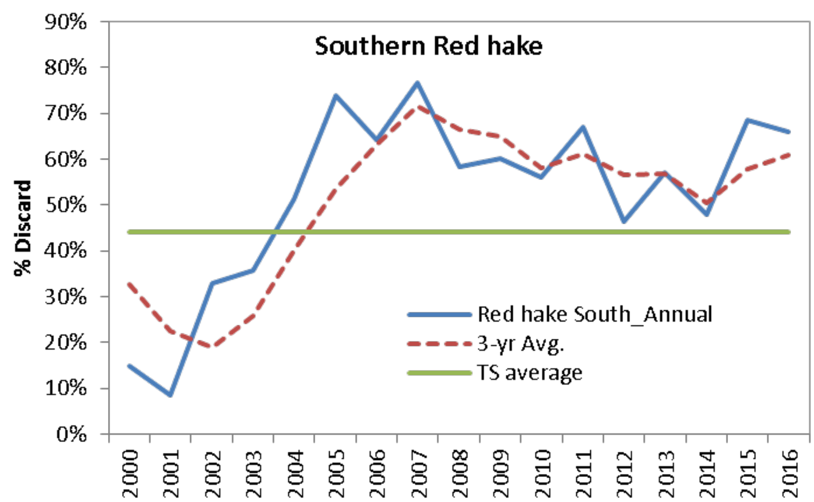
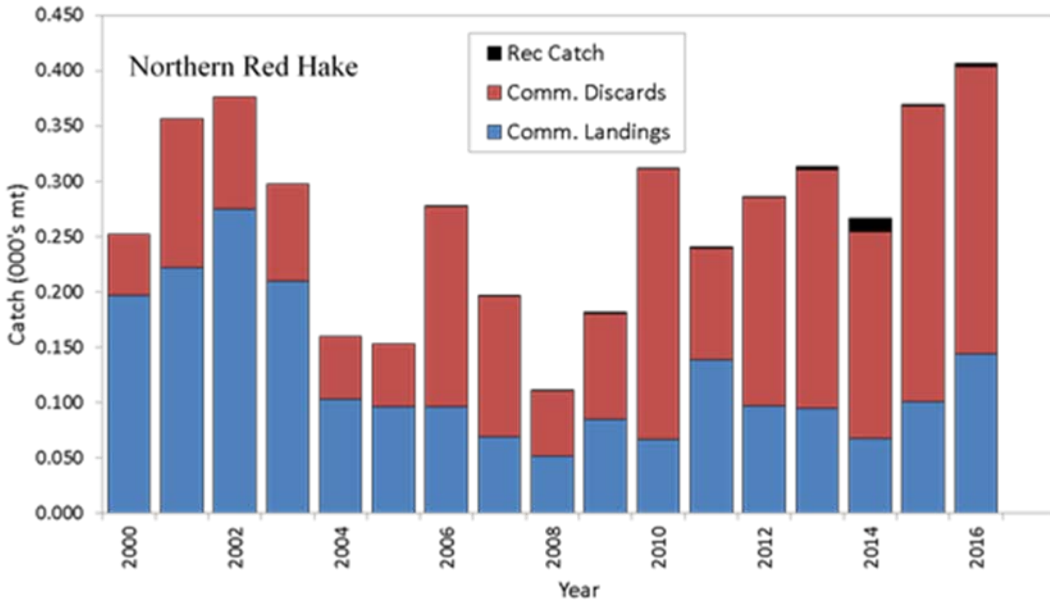
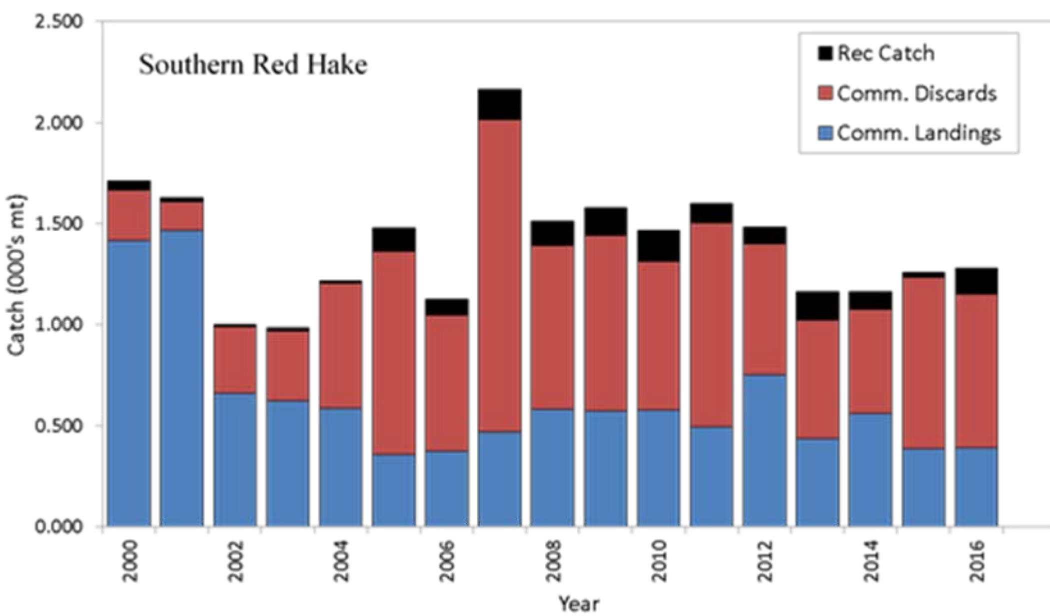



Figure 16. Landings and estimated nominal discards (mt) for northern and southern stocks of red hake, 2000-2010. Source: NEFSC 2011a, updated by Whiting PDT analysis.




## 5.1.4.2 Recreational catch and other landings

Catches of silver and red hakes by recreational fishermen and by commercial vessels that are only permitted to fish in state waters (less than 3 miles and internal waters) are a very minor component of total catch (Table 11). Over the five years since implementation of catch accounting in 2012, state landings overall have averaged 1.2% of the total, with a maximum of 6.4% for southern whiting (i.e. silver and offshore hakes) in 2012. Over the same period, state landings averaged 0.9% of total catch, with a maximum of 12% of southern red hake in 2016. The reasons for the increase of southern red hake recreational landings is unknown.

Recreational catch (Table 12) over the available time series has been low compared to Federal landings and catches from commercial boats, with notable exceptions of 66.5 mt of northern red hake in 1981, 23.4 mt of northern silver hake in 1995, 6.5 mt of southern red hake in 2002, and 7.4 mt of southern silver hake in 1983.

Table 11. Fishing year 2012-2016 landings by state-permitted commercial vessels and recreational landings summaries from annual catch monitoring (NEFMC 2014 and NEFMC 2017).

| Fishing year | Stock<br>Northern red hake | Northern silver hake | Southern red hake | Southern whiting | Grand Total |
|---|---|---|---|---|---|
| **2012** | | | | | |
| Catch (mt) | 386 | 2,199 | 1,152 | 6,496 | 10,233 |
| State landings proportion | 0.0% | 0.6% | 3.5% | 6.4% | 4.6% |
| Recreational landings proportion | 0.1% | 0.3% | 3.4% | 0.0% | 0.5% |
| **2013** | | | | | |
| Catch (mt) | 361 | 1,734 | 1,099 | 5,746 | 8,940 |
| State landings proportion | 0.0% | 1.7% | 0.2% | 0.2% | 0.5% |
| Recreational landings proportion | 0.7% | 2.6% | 6.7% | 0.0% | 1.4% |
| **2014** | | | | | |
| Catch (mt) | 278 | 2,991 | 1,277 | 5,653 | 10,199 |
| State landings proportion | 0.0% | 0.4% | 0.3% | 0.1% | 0.2% |
| Recreational landings proportion | 0.0% | 0.0% | 0.0% | 0.0% | 0.0% |
| **2015** | | | | | |
| Catch (mt) | 340 | 2,543 | 1,538 | 4,007 | 8,428 |
| State landings proportion | 0.0% | 0.4% | 0.1% | 0.0% | 0.2% |
| Recreational landings proportion | 0.6% | 0.7% | 1.6% | 0.0% | 0.5% |
| **2016** | | | | | |
| Catch (mt) | 405 | 3,419 | 1,093 | 3,843 | 8,760 |
| State landings proportion | 0.0% | 0.3% | 0.2% | 0.1% | 0.2% |
| Recreational landings proportion | 0.7% | 1.5% | 12.0% | 0.0% | 2.1% |
| **Total catch 2012-2016** | 1,770 | 12,886 | 6,159 | 25,745 | 46,560 |
| **State landings proportion** | 0.0% | 0.6% | 0.8% | 1.7% | 1.2% |
| **Recreational landings proportion** | 0.4% | 0.9% | 4.4% | 0.0% | 0.9% |

Table 12. Annual recreational catch (landings and dead discards, A+B1) of silver and red hake by management area. Catch by vessels fishing from ME, NH, and MA were assigned to the northern management area, while other NE region catches were assigned to the southern

management area. MRIP Recreational Catch Time Series Query, December 1, 2017. URL: https://www.st.nmfs.noaa.gov/SASStoredProcess/do?.

| . | Management Northern | | | Southern | | | |
|---|---|---|---|---|---|---|---|
| Calendar yea | Red hake | Silver hake | Total (mt) | Red hake | Silver hake | Total (mt) | Grand Total |
| 1981 | 66.5 | 9.9 | 76.4 | | | | 76.4 |
| 1982 | 2.7 | 4.6 | 7.3 | | | | 7.3 |
| 1983 | 0.0 | 1.8 | 1.8 | | 7.4 | 7.4 | 9.1 |
| 1984 | 3.1 | 0.9 | 3.9 | 2.5 | 0.0 | 2.5 | 6.5 |
| 1985 | | 1.5 | 1.5 | 0.0 | | 0.0 | 1.5 |
| 1986 | 0.0 | 0.0 | 0.0 | | 0.0 | 0.0 | 0.0 |
| 1987 | 0.5 | | 0.5 | 0.3 | | 0.3 | 0.8 |
| 1988 | 8.8 | | 8.8 | 0.0 | 3.4 | 3.4 | 12.2 |
| 1989 | 1.5 | | 1.5 | 1.2 | 0.0 | 1.2 | 2.7 |
| 1990 | 11.6 | 0.0 | 11.6 | 0.0 | | 0.0 | 11.6 |
| 1991 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1992 | 1.6 | | 1.6 | 0.1 | 0.0 | 0.1 | 1.7 |
| 1993 | 0.0 | 0.0 | 0.0 | 0.6 | 0.0 | 0.6 | 0.6 |
| 1994 | 0.5 | 0.1 | 0.6 | 0.0 | | 0.0 | 0.6 |
| 1995 | 1.0 | 23.4 | 24.4 | | 0.0 | 0.0 | 24.4 |
| 1996 | 1.6 | 1.2 | 2.7 | 0.0 | 0.0 | 0.0 | 2.7 |
| 1997 | 0.0 | 0.0 | 0.0 | 0.4 | 0.0 | 0.4 | 0.5 |
| 1998 | 0.0 | 0.0 | 0.0 | 1.5 | 0.0 | 1.5 | 1.5 |
| 1999 | 0.0 | 0.0 | 0.0 | 1.8 | 0.0 | 1.8 | 1.8 |
| 2000 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2001 | 1.0 | 0.0 | 1.0 | 0.2 | 0.0 | 0.2 | 1.3 |
| 2002 | 0.9 | 0.0 | 0.9 | 6.5 | 0.0 | 6.5 | 7.4 |
| 2003 | 0.0 | 0.0 | 0.0 | 0.7 | 0.0 | 0.7 | 0.7 |
| 2004 | 0.0 | 0.6 | 0.6 | 0.5 | 0.0 | 0.6 | 1.2 |
| 2005 | 0.0 | 0.0 | 0.0 | 0.2 | | 0.2 | 0.2 |
| 2006 | 0.1 | 0.0 | 0.1 | 0.3 | 0.0 | 0.3 | 0.4 |
| 2007 | 0.1 | | 0.1 | 0.1 | | 0.1 | 0.2 |
| 2008 | 0.4 | 0.0 | 0.4 | 0.4 | 0.0 | 0.4 | 0.8 |
| 2009 | 0.9 | 0.1 | 1.0 | | | | 1.0 |
| 2010 | 0.3 | 0.7 | 1.0 | 0.0 | | 0.0 | 1.0 |
| 2011 | 0.1 | 5.6 | 5.7 | 0.0 | | 0.0 | 5.8 |
| 2012 | 0.1 | 1.8 | 1.9 | 0.1 | | 0.1 | 2.0 |
| 2013 | 3.2 | 35.2 | 38.4 | 0.0 | | 0.0 | 38.4 |
| 2014 | 1.6 | 9.5 | 11.1 | 0.0 | | 0.0 | 11.1 |
| 2015 | 1.4 | 10.1 | 11.5 | 0.0 | | 0.0 | 11.5 |
| 2016 | 1.6 | 23.0 | 24.7 | 0.4 | 0.0 | 0.4 | 25.0 |
| 2017 | 0.8 | 7.2 | 8.0 | 0.0 | 0.5 | 0.5 | 8.4 |

### 5.1.5 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 14 and Table 15).

In the northern area (Table 13, 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 23).

In the southern area, the top discards were comprised of red hake, spiny dogfish, butterfish, silver hake, little skate, and haddock (Table 13, 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 13. 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 |
|---|---|---|---|
| Red hake | 91.4 | 224.1 | 209.6 |
| Haddock | 476.8 | 241.0 | 353.0 |
| Winter skate | 6.8 | 114.9 | 98.4 |
| Spiny dogfish | 98.3 | 90.7 | 399.2 |
| Butterfish | 4.0 | 4.2 | 1.5 |
| Little skate | 12.3 | 29.1 | 44.6 |
| Silver hake | 175.2 | 34.5 | 133.5 |
| Barndoor skate | 2.9 | 4.0 | 7.5 |
| Atlantic herring | 20.2 | 77.3 | 4.6 |
| Monkfish | 0.9 | 2.6 | 5.7 |
| Summer flounder | 4.8 | 1.5 | 1.5 |
| Yellowtail flounder | 3.0 | 13.7 | 7.9 |
| Witch flounder | 1.5 | 4.9 | 14.0 |
| Winter flounder | 5.6 | 2.3 | 1.5 |
| Ocean pout | 0.1 | 0.7 | 0.6 |
| American plaice | 4.0 | 3.2 | 10.5 |
| Cod | 0.7 | 0.8 | 1.4 |
| Windowpane | 1.1 | 0.2 | 5.6 |
| White hake | 1.3 | 2.6 | 1.4 |
| Smooth skate | 0.0 | 0.0 | 0.0 |
| Thorny skate | 0.4 | 0.0 | 0.4 |
| Pollock | 0.9 | 0.1 | 0.2 |
| Redfish | 0.7 | 1.4 | 0.1 |
| Total | 913.0 | 853.8 | 1302.6 |

**Southern**

| Species | Calendar year 2014 | 2015 | 2016 |
|---|---|---|---|
| Red hake | 657.0 | 1099.0 | 1400.6 |
| Haddock | 199.9 | 233.7 | 76.0 |
| Winter skate | 29.7 | 13.4 | 285.2 |
| Spiny dogfish | 534.9 | 376.3 | 130.8 |
| Butterfish | 376.5 | 260.4 | 161.2 |
| Little skate | 140.2 | 66.6 | 171.1 |
| Silver hake | 619.0 | 101.5 | 231.5 |
| Barndoor skate | 37.2 | 51.7 | 151.9 |
| Atlantic herring | 1.5 | 11.4 | 0.0 |
| Monkfish | 4.4 | 24.5 | 135.6 |
| Summer flounder | 21.7 | 129.5 | 93.4 |
| Yellowtail flounder | 1.5 | 0.0 | 0.8 |
| Witch flounder | 9.6 | 57.2 | 9.7 |
| Winter flounder | 15.1 | 0.2 | 25.6 |
| Ocean pout | 58.3 | 5.2 | 13.3 |
| American plaice | 0.0 | 0.0 | 0.1 |
| Cod | 0.3 | 0.0 | 1.1 |
| Windowpane | 2.3 | 0.0 | 2.0 |
| White hake | 0.0 | 0.1 | 1.1 |
| Smooth skate | 0.0 | 0.0 | 0.0 |
| Thorny skate | 0.0 | 0.0 | 0.0 |
| Pollock | 0.1 | 0.0 | 0.5 |
| Redfish | 0.0 | 0.0 | 0.0 |
| Total | 2709.3 | 2430.9 | 2891.5 |

Table 14. 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 15. 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 16 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 16. 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 |
| Hooded seal (*Cystophora cristata*) | Protected (MMPA) | No |

| Species | Status[2] | *Potential to interact with small-mesh multispecies fishing gear?* |
|---|---|---|
| **Sea Turtles** | | |
| Leatherback sea turtle *coriacea*))) | Endangered | Yes |
| Kemp's ridley sea turtle *kempii*))) | Endangered | Yes |
| Green sea turtle, *mydas*))) | Threatened | Yes |
| Loggerhead sea turtle *caretta*), Northwest Atlantic Ocean DPS), Northwest Atlantic Ocean DPS), Northwest Atlantic Ocean DPS | Threatened | Yes |
| Hawksbill sea turtle *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 16). 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.* 2014, 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

Table 16 provides a list of protected species of sea turtle, marine mammal, and fish species present in the affected environment of the small-mesh multispecies fishery, and that may also be affected by the operation of this fishery; that is, have the potential to become entangled or bycaught in the fishing gear used to prosecute the fishery. To aid in the identification of MMPA protected species potentially affected by the action, the MMPA List of Fisheries and marine mammal stock assessment reports for the Atlantic Region were referenced (http://www.nmfs.noaa.gov/pr/sars/region.htm; http://www.nmfs.noaa.gov/pr/interactions/fisheries/lof.html). To aid in identifying ESA listed species potentially affected by the action, the 2013 Biological Opinion issued by NMFS on the operation of seven commercial fisheries, including the multispecies (including small-mesh) FMP, and its impact on ESA listed species was referenced (NMFS 2013). The 2013 Opinion, which considered the best available information on ESA listed species and observed or documented ESA listed species interactions with gear types (e.g., gillnet, bottom trawl, and pot/trap) used to prosecute the seven FMPs, concluded that the seven fisheries may adversely affect, but was not likely to jeopardize the continued existence of any ESA listed species. The Opinion included an incidental take statement (ITS) authorizing the take of specific numbers of ESA listed species of sea turtles, Atlantic salmon, and Atlantic sturgeon[6]. Reasonable and prudent measures and terms and conditions were also issued with the ITS to minimize impacts of any incidental take.

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

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 multispecies (including small-mesh) FMP is currently covered by the incidental take statement authorized in NMFS 2013 Opinion. It should be noted that while the potential for interactions with right whales and the small-mesh multispecies fishery exists, there has never been an interaction with right whales on trips targeting small-mesh multispecies on any observed trip (see Section 5.2.4.1).

As the primary concern for both MMPA protected and ESA listed species is the potential for the fishery to interact (e.g., bycatch, entanglement) with these species it is necessary to consider (1) species occurrence in the affected environment of the fishery and how the fishery will overlap in time and space with this occurrence; and (2) data and observed records of protected species interaction with particular fishing gear types, in order to understand the potential risk of an interaction. Information on species occurrence in the affected environment of the small-mesh multispecies fishery is provided below, while information on protected species interactions with specific fishery gear is provided in section 5.2.4.

Sea Turtles

Kemp's ridley, leatherback, the North Atlantic DPS of green and the Northwest Atlantic DPS of loggerhead sea turtle. 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).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). 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 2004; 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 16). 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 17. 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.<br>• 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*. 2014; 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*. 2014; 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 (35$^{o}$N) (Waring *et al*. 2007, 2014, 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 18. 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.<br>• **January-May**: low densities found from Georges Bank to Jeffreys Ledge.<br>• **June-September**: large densities found from Georges Bank through the Gulf of Maine.<br>• **October-December**: intermediate densities found from southern Georges Bank to southern Gulf of Maine.<br>• 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).<br>• Less common south of Cape Hatteras, NC, although schools have been reported as far south as the Georgia /South Carolina border.<br>• **January-May**: occur from waters off Cape Hatteras, NC, to Georges Bank (35º to 42ºN).<br>• **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.<br>• **Winter**: distributed in the Mid-Atlantic Bight, extending into oceanic waters.<br>• 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.<br>• **July-September**: concentrated in the northern Gulf of Maine (waters < 150 meters); low numbers can be found on Georges Bank.<br>• **October-December**: widely dispersed in waters from NJ to Maine; seen from the coastline to deep waters (>1,800 meters).<br>• **January-March**: intermediate densities in waters off NJ to NC; low densities found in waters off NY to Gulf of Maine.<br>• **April-June**: widely dispersed from NJ to ME; seen from the coastline to deep waters (>1,800 meters). |
| Bottlenose Dolphin | **Western North Atlantic Offshore Stock**<br>• Distributed primarily along the outer continental shelf and continental slope in the Northwest Atlantic from Georges Bank to FL.<br>• Depths of occurrence: ≥40 meters<br>**Western North Atlantic Northern Migratory Coastal Stock**<br>• 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.<br>• Cold water months (e.g., January-March): stock occupies coastal waters from Cape Lookout, NC, to the NC/VA border.<br>**Western North Atlantic Southern Migratory Coastal Stock**<br>• **October-December**: stock occupies waters of southern NC (south of Cape Lookout)<br>• **January-March**: stock moves as far south as northern FL.<br>• **April-June**: stock moves north to waters of NC.<br>• **July-August**: stock is presumed to occupy coastal waters north of Cape Lookout, NC, to the eastern shore of VA. |

<table>
<tr><th>Species</th><th>Prevalence and Approximate Months of Occurrence</th></tr>
<tr><td>Pilot Whales: Short- and Long-Finned</td><td><u>Short-Finned Pilot Whales</u><ul><li>Except for area of overlap (see below), primarily occur south of 40ºN</li><li>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., 35ºN and south) .</li></ul><u>Long-Finned Pilot Whales</u><ul><li>Except for area of overlap (see below), primarily occur north of 42ºN.</li><li>Winter to early spring : primarily distributed along the continental shelf edge-slope.</li><li>Late spring through fall (: movements and distribution shift onto/within Georges Bank, the Great South Channel, and Gulf of Maine.</li></ul><u>Area of Species Overlap:</u> between approximately 38ºN and 41ºN.</td></tr>
<tr><td>Harbor Seal</td><td><ul><li>Primarily distributed in waters from NJ to ME; however, increasing evidence indicates that their range is extending into waters as far south as Cape Hatteras, NC (35ºN).</li><li>Year Round: waters of ME</li><li>September-May: waters from New England to NJ.</li></ul></td></tr>
<tr><td>Gray Seal</td><td><ul><li>Distributed in waters from NJ to ME.</li><li>Year Round: waters from ME to MA.</li><li>September-May: waters from Rhode Island to NJ.</li></ul></td></tr>
<tr><td>Harp Seal</td><td><ul><li>Winter-Spring (approximately January-May): waters from ME to NJ.</li></ul></td></tr>
<tr><td>Hooded Seal</td><td><ul><li>Winter-Spring (approximately January-May): waters of New England.</li></ul></td></tr>
<tr><td colspan="2">Notes:<br>[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.<br><br>Sources: Waring et al. 1992, 2007, 2014, 2015, 2016; Hayes et al. 2017; Payne and Heinemann 1993; Payne et al. 1984; Jefferson et al. 2009.</td></tr>
</table>

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 2015). 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).

<u>Atlantic Salmon (Gulf of Maine DPS)</u>

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.7 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[8] 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).9 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[10] 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., bycatchring 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 2006-2010; 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

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7 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.

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

9 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).

10 Murray 2015 defined the Mid-Atlantic as the boundaries of the Mid-Atlantic Ecological Production; roughly waters west of 71$^{o}$W to the North Carolina/South Carolina border)

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).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). 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, the 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*. 2014; Waring *et al*. 2015; Waring *et al*. 2016; Hayes *et al*. 2017; 82 FR 3655 (January 12, 2017)).11 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 for 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). d) 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).

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

Table 19. 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,12 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.13

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

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

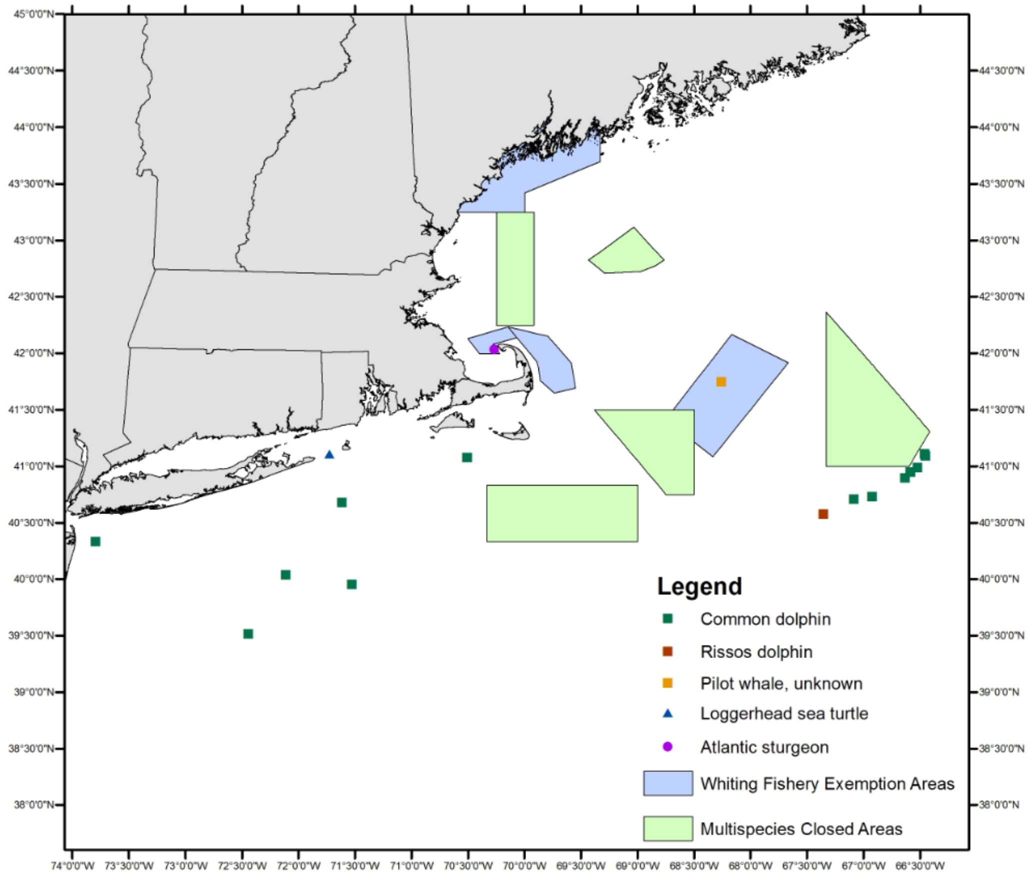
### 5.2.4.1 Observed Protected Species Interactions with the Whiting Fishery

The information provided in Table 20 and Map 4 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 20. Observed Protected Species Interactions with the Whiting Fishery from 2007-2016. Source: Data provided by GARFO 2017.

| 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 4. Observed takes of protected species in the small-mesh multispecies fishery. Source: Data provided by GARFO 2017



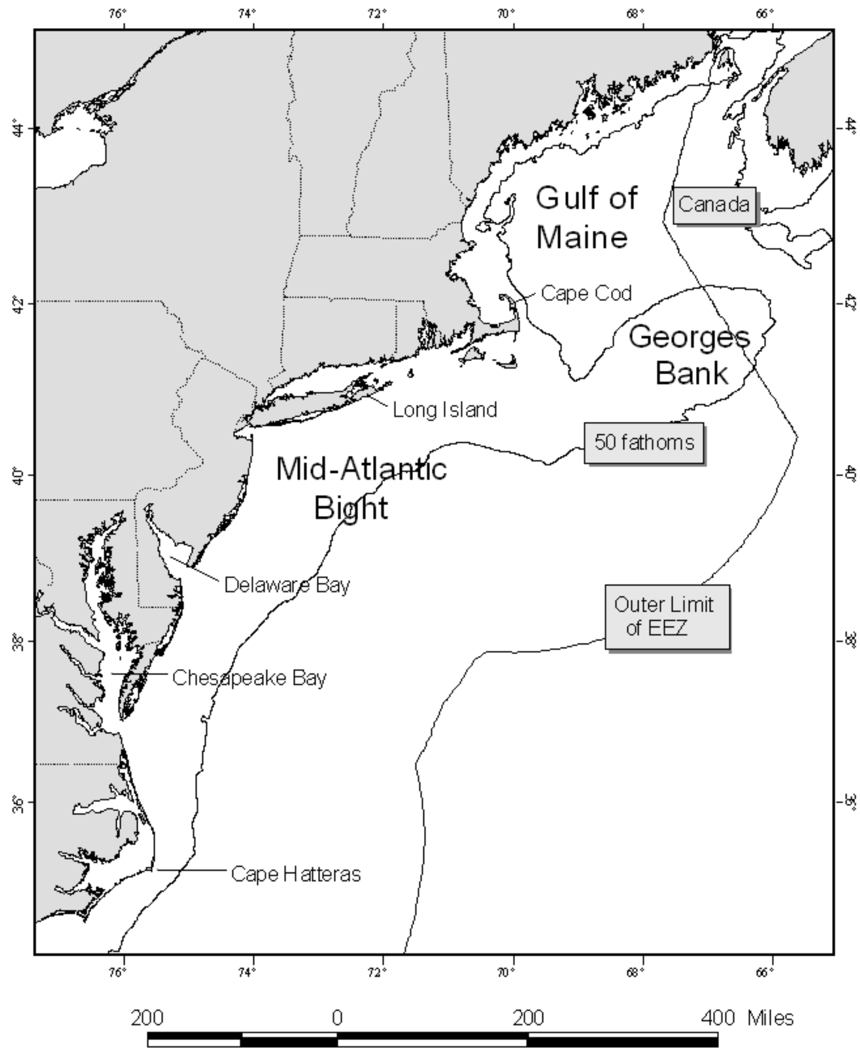

## 5.3 Physical Environment and EFH

### 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 5). The following paragraphs contains additional habitat information about these regions.

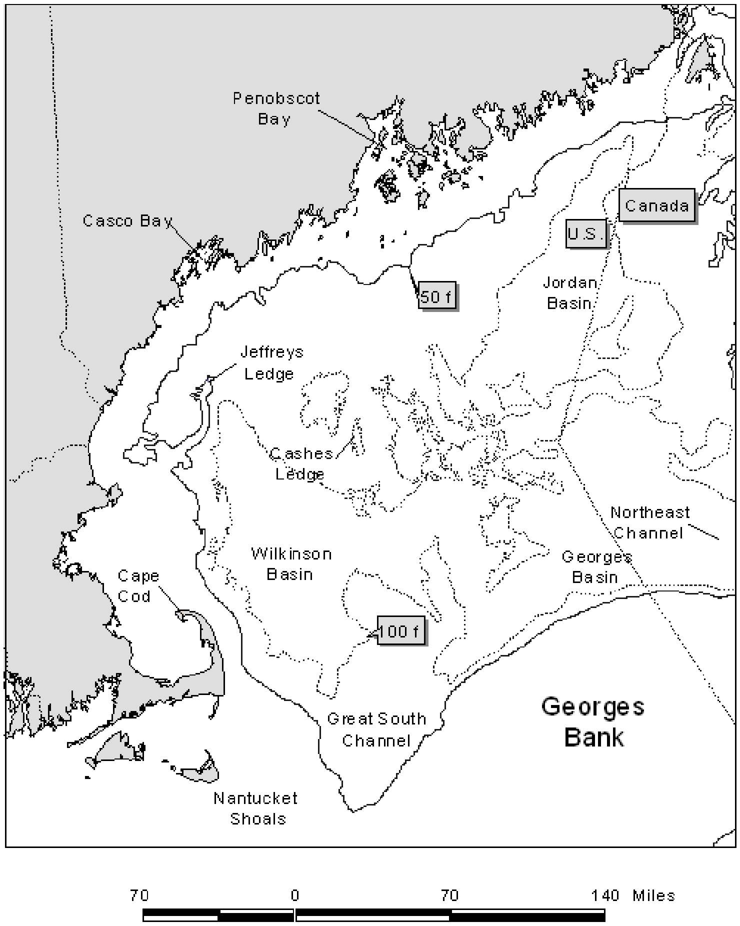
Map 5. Northeast U.S. Shelf.




### 5.3.1.1 Gulf of Maine

The Gulf of Maine is bounded on the east by Browns Bank, on the north by the Nova Scotia (Scotian) Shelf, on the west by the New England states, and on the south by Cape Cod and Georges Bank (Map 6). The Gulf of Maine is a boreal environment characterized by relatively cold waters and deep basins, with a patchwork of various sediment types. There are 21 distinct basins separated by ridges, banks, and swells. Depths in the basins exceed 820 ft. (250 m), with a maximum depth of 1,148 ft (350 m) in Georges Basin, just north of Georges Bank. High points within the Gulf of Maine include irregular ridges, such as Cashes Ledge, which peaks at 30 ft (9 m) below the surface.

Map 6. Gulf of Maine. Source: Stevenson et al. (2004).




The Gulf of Maine is an enclosed coastal sea that was glacially derived and contains a system of deep basins, moraines, and rocky protrusions. The Gulf of Maine is topographically diverse from the rest of the continental border of the U.S. Atlantic coast. Very fine sediment particles created and eroded by the glaciers have collected in thick deposits over much of the seafloor of the Gulf of Maine, particularly in its deep basins. These mud deposits blanket and obscure the irregularities of the underlying bedrock, forming topographically smooth terrains, although localized rocky features are present, for example in Jordan Basin (see the Council's Draft Deep-Sea Coral Amendment). In the rises between the basins, other materials are usually at the surface. Unsorted glacial till covers some morainal areas, sand predominates on some high areas, and gravel, sometimes with boulders, predominates others. Bedrock is the predominant substrate along the western edge of the Gulf of Maine, north of Cape Cod in a narrow band out to a water depth of about 197 ft. (60 m). Mud predominates in coastal valleys and basins that often abruptly border rocky substrates. Gravel, often mixed with shell, is common adjacent to bedrock outcrops and in fractures in the rock. Gravel is most abundant at depths of 66 - 131 ft. (20 - 40 m), except off eastern Maine where a gravel-covered plain exists to depths of at least 328 ft. (100 m). Sandy areas are relatively rare along the inner shelf of the western Gulf of Maine, but are more common south of Casco Bay, especially offshore of sandy beaches (Stevenson, et al. 2004).

The geologic features of the Gulf of Maine, coupled with the vertical variation in water properties (e.g., salinity, depth, temperature), provide a great diversity of habitat types that support a rich biological community. To illustrate this, a brief description of benthic invertebrates and demersal (i.e., bottomdwelling) fish that occupy the Gulf of Maine is provided below. Additional information is provided in Stevenson et al. (2004), which is incorporated by reference.

The most common groups of benthic invertebrates in the Gulf of Maine reported by Theroux and Wigley (1998) in terms of numbers collected were annelid worms, bivalve mollusks, and amphipod crustaceans. Bivalves, sea cucumbers, sand dollars, annelids, and sea anemones dominated biomass. Watling (1998) identified seven different bottom assemblages that occur on the following habitat types:

1. Sandy offshore banks: fauna are characteristically sand dwellers with an abundant interstitial component;
2. Rocky offshore ledges: fauna are predominantly sponges, tunicates, bryozoans, hydroids, and other hard bottom dwellers;
3. Shallow [<197 ft. (60 m)] temperate bottoms with mixed substrate: fauna population is rich and diverse, primarily comprised of polychaetes and crustaceans;
4. Primarily fine muds at depths of 197 - 459 ft. (60 - 140 m) within cold Gulf of Maine Intermediate Water: fauna are dominated by polychaetes, shrimp, and cerianthid anemones;
5. Cold deep water, muddy bottom: fauna include species with wide temperature tolerances which are sparsely distributed, diversity low, dominated by a few polychaetes, with brittle stars, sea pens, shrimp, and cerianthids also present;
6. Deep basin, muddy bottom, overlaying water usually 45 - 46°F (7 - 8°C): fauna densities are not high, dominated by brittle stars and sea pens, and sporadically by tube-making amphipods; and
7. Upper slope, mixed sediment of either fine muds or mixture of mud and gravel, water temperatures always >46°F (8°C): upper slope fauna extending into the Northeast Channel.

Two studies (Gabriel 1992; Overholtz & Tyler 1985) reported common demersal fish species by assemblages in the Gulf of Maine and Georges Bank:

- Deepwater/Slope and Canyon: offshore hake, blackbelly rosefish, Gulf stream flounder;
- Intermediate/Combination of Deepwater Gulf of Maine-Georges Bank and Gulf of Maine-Georges Bank Transition: silver hake, red hake, goosefish (monkfish);
- Shallow/Gulf of Maine-Georges Bank Transition Zone: Atlantic cod, haddock, pollock;
- Shallow water Georges Bank-southern New England: yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin;
- Deepwater Gulf of Maine-Georges Bank: white hake, American plaice, witch flounder, thorny skate; and
- Northeast Peak/Gulf of Maine-Georges Bank Transition: Atlantic cod, haddock, pollock.

### 5.3.1.2 Georges Bank

Georges Bank is a shallow (10 - 492 ft. [3 - 150 m]), elongated (100 mi.(161 km) wide by 20 mi (322 km) long) extension of the continental shelf that was formed during the Wisconsinian glacial episode. It has a steep slope on its northern edge, a broad, flat, gently sloping southern flank, and steep submarine canyons on its eastern and southeastern edges. It has highly productive, well-mixed waters and strong currents. The Great South Channel lies to the west. Natural processes continue to erode and rework the sediments on Georges Bank. Erosion and reworking of sediments by the action of rising sea level as well as tidal and storm currents may reduce the amount of sand and cause an overall coarsening of the bottom sediments (Valentine & Lough 1991).

Bottom topography on eastern Georges Bank consists of linear ridges in the western shoal areas; a relatively smooth, gently dipping seafloor on the deeper, easternmost part; a highly energetic peak in the north with sand ridges up to 30 m high and extensive gravel pavement; and steeper and smoother topography incised by submarine canyons on the southeastern margin. The central region of Georges Bank is shallow, and the bottom has shoals and troughs, with sand dunes superimposed within. The area west of the Great South Channel, known as Nantucket Shoals, is similar in nature to the central region of Georges Bank. Currents in these areas are strongest where water depth is shallower than 164 ft. (50 m). Sediments in this region include gravel pavement and mounds, some scattered boulders, sand with storm-generated ripples, and scattered shell and mussel beds. Tidal and storm currents range from moderate to strong, depending upon location and storm activity.

Oceanographic frontal systems separate the water masses of the Gulf of Maine and Georges Bank from oceanic waters south of Georges Bank. These water masses differ in temperature, salinity, nutrient concentration, and planktonic communities. These differences influence productivity and may influence fish abundance and distribution.

Georges Bank has historically had high levels of both primary productivity and fish production. The most common groups of benthic invertebrates on Georges Bank in terms of numbers collected were amphipod crustaceans and annelid worms, while sand dollars and bivalves dominated the overall biomass (Theroux & Wigley 1998). Using the same database, Theroux and Grosslein (1987) identified four macrobenthic invertebrate assemblages that occur on similar habitat type:

1. The Western Basin assemblage is found in comparatively deep water (492 - 656 ft. [150 - 200 m]) with relatively slow currents and fine bottom sediments of silt, clay, and muddy sand. Fauna are comprised mainly of small burrowing detritivores and deposit feeders, and carnivorous scavengers.
2. The Northeast Peak assemblage is found in variable depths and current strength and includes coarse sediments, consisting mainly of gravel and coarse sand with interspersed boulders, cobbles, and pebbles. Fauna tend to be sessile (coelenterates, brachiopods, barnacles, and tubiferous annelids) or free-living (brittle stars, crustaceans, and polychaetes), with a characteristic absence of burrowing forms.
3. The Central Georges Bank assemblage occupies the greatest area, including the central and northern portions of Georges Bank in depths <328 ft. (100 m). Medium-grained shifting sands predominate this dynamic area of strong currents. Organisms tend to be small to moderately large with burrowing or motile habits. Sand dollars are most characteristic of this assemblage.
4. The Southern Georges Bank assemblage is found on the southern and southwestern flanks at depths from 262 - 656 ft. (80 - 200 m), where fine-grained sands and moderate currents predominate. Many southern species exist here at the northern limits of their range. Dominant fauna include amphipods, copepods, euphausiids, and starfish.

Common demersal fish species in Georges Bank are offshore hake, blackbelly rosefish, Gulf Stream flounder, silver hake, red hake, goosefish (monkfish), Atlantic cod, haddock, pollock, yellowtail flounder, windowpane flounder, winter flounder, winter skate, little skate, longhorn sculpin, white hake, American plaice, witch flounder, and thorny skate.

#### 5.3.1.3 Southern New England/Mid-Atlantic Bight

The Mid-Atlantic Bight includes the shelf and slope waters from Georges Bank south to Cape Hatteras, and east to the Gulf Stream. The northern portion of the Mid-Atlantic Bight is sometimes referred to as southern New England. It generally includes the area of the continental shelf south of Cape Cod from the Great South Channel to Hudson Canyon. The Mid-Atlantic Bight consists of the sandy, relatively flat, gently sloping continental shelf from southern New England to Cape Hatteras, North Carolina. The shelf slopes gently from shore out to 62 - 124 ft (100 - 200 km) offshore, where it transforms to the slope (328 - 656 ft. [100 - 200 m water depth]) at the shelf break. In both the Mid-Atlantic Bight and on Georges Bank, numerous canyons incise the slope, and some cut up onto the shelf itself (Stevenson, et al. 2004). Like the rest of the continental shelf, sea level fluctuations during past ice ages largely shaped the topography of the Mid-Atlantic Bight. Since that time, currents and waves have modified this basic structure.

At Cape Hatteras, the shelf extends seaward approximately 33 km, then widens gradually to 113 km off New Jersey and Rhode Island. 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 sediment type covering most of the shelf in the Mid-Atlantic Bight is sand, with some relatively small, localized areas of sand-shell and sand-gravel. Silty sand, silt, and clay predominate on the slope. Permanent sand ridges occur in groups with heights of about 33 ft. (10 m), lengths of 6 - 31 mi (10 - 50 km), and spacing of 1 mi (2 km). The sand ridges are usually oriented at a slight angle towards shore, running in length from northeast to southwest. Sand ridges are often covered with smaller similar forms such as sand waves, megaripples, and ripples. Sand waves are usually found in patches of 5 - 10 with heights of about 7 ft. (2 m), lengths of 164 - 328 ft. (50 - 100 m), and 0.6 - 1 mi (1 - 2 km) between patches. Sand waves are temporary features that form and re-form in different locations. They usually occur on the inner shelf, especially in areas like Nantucket Shoals where there are strong bottom currents. Because tidal currents southwest of Nantucket Shoals and southeast of Long Island and Rhode Island slow significantly, there is a large mud patch on the seafloor where silts and clays settle out.

Artificial reefs are another important Mid-Atlantic Bight habitat. Artificial reefs formed much more recently on the geologic time scale than other regional habitat types. These localized areas of hard structure have been formed by shipwrecks, lost cargoes, disposed solid materials, shoreline jetties and groins, submerged pipelines, cables, and other materials (Steimle & Zetlin 2000). In general, reefs are important for attachment sites, shelter, and food for many species. In addition, fish predators, such as tunas, may be drawn by prey aggregations or may be behaviorally attracted to the reef structure. Estuarine reefs, such as blue mussel beds or oyster reefs, are dominated by epibenthic organisms, as well as crabs, lobsters, and sea stars. These reefs are hosts to a multitude of fish, including gobies, spot, bass (black sea and striped), perch, toadfish, and croaker. Coastal reefs consist of exposed rock, wrecks, kelp, or other hard material. Boring mollusks, algae, sponges, anemones, hydroids, and coral generally dominate these coastal reefs. These reef types also host lobsters, crabs, sea stars, and urchins, as well as a multitude of fish, including; black sea bass, pinfish, scup, cunner, red hake, gray triggerfish, black grouper, smooth dogfish, and summer flounder. These epibenthic organisms and fish assemblages are similar to the reefs farther offshore, which generally consist of rocks and boulders, wrecks, and other types of artificial reefs. There is less information available for reefs on the outer shelf, but the fish species associated with these reefs include tilefish, white hake, and conger eel.

In terms of numbers, amphipod crustaceans and bivalve mollusks dominate the benthic inhabitants of this primarily sandy environment. Mollusks (70%) dominate the biomass (Stevenson, et al. 2004). Pratt (1973) identified three broad faunal zones related to water depth and sediment type:

1. The "sand fauna" zone is dominated by polychaetes and was defined for sandy sediments (≤1% silt) that are at least occasionally disturbed by waves, from shore out to a depth of about 164 ft. (50 m).
2. The "silty sand fauna" zone is dominated by amphipods and polychaetes and occurs immediately offshore from the sand fauna zone, in stable sands containing a small amount of silt and organic material.
3. Silts and clays become predominant at the shelf break and line the Hudson Shelf Valley supporting the "silt-clay fauna."

While substrate is the primary factor influencing demersal species distribution in the Gulf of Maine and Georges Bank, latitude and water depth are the primary influence in the Mid-Atlantic Bight area.

Colvocoresses and Musick (1984) identified the following assemblages in the Mid-Atlantic sub region during spring and fall.

- Northern (boreal) portions: hake (white, silver, red), goosefish (monkfish), longhorn sculpin, winter flounder, little skate, and spiny dogfish;
- Warm temperate portions: black sea bass, summer flounder, butterfish, scup, spotted hake, and northern sea robin;
- Water of the inner shelf: windowpane flounder;
- Water of the outer shelf: fourspot flounder; and
- Water of the continental slope: shortnose greeneye, offshore hake, blackbelly rosefish, and white hake.

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.

### 5.3.2 Essential fish habitat

Essential Fish Habitat (EFH) includes those waters and substrate necessary for spawning, breeding, feeding, and growth to maturity. The 1998 Omnibus Essential Fish Habitat Amendment 1 (NEFMC 1998; also as Amendment 11 to the Northeast Multispecies FMP) described and identified the essential fish habitat (EFH) for silver and red hake. 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 (NEFMC 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. It includes revised EFH designations for all the species managed by the Council, an assessment of fishing and non-fishing impacts for all the gears used in NEFMC-managed fisheries, and updated management measures to conserve EFH. The new EFH designations were approved by NMFS on January 3 2018. The new EFH maps for silver and red hake are based on state and NEFSC trawl survey data through 2005 and data for a number of inshore estuaries, with juvenile distributions used as a proxy for the egg and larval lifestages. Offshore hake EFH for eggs and larvae are based on egg and larval 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 covered by the trawl 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 Mapperhttp://www.habitat.noaa.gov/protection/efh/efhmapper/index.html. The mapper will be up-dated to reflect changes proposed in OHA2. 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[14]; Northeast Skate Complex; Atlantic Herring; Summer Flounder, Scup, and Black Sea Bass; Tilefish; Atlantic Mackerel, Squid, and Butterfish; Bluefish; Spiny Dogfish; and Atlantic Surfclam and Ocean Quahog Fishery Management Plans. EFH for many of 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, spiny dogfish, and clams.[15]

[14] 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.

[15] Summer Flounder, Scup, and Black Seabass Amendment 12 (MAFMC 1998a), Golden Tilefish Amendment 1 (MAFMC 2008), Atlantic Mackerel, Squid and Butterfish Amendment 11 (MAFMC 2011), Atlantic Surfclam and Ocean Quahog Amendment 12 (MAFMC 1998b), Spiny Dogfish Amendment 3 (MAFMC 2014); Bluefish Amendment 1 (MAFMC 1998c).

### 5.3.3 Gear impacts from the small-mesh multispecies fishery

The small-mesh multispecies fishery is primarily a trawl fishery. Omnibus EFH Amendment 2 and previous Council actions have found that bottom trawls can cause adverse, i.e. more than minimal 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 Omnibus EFH Amendment 2 (NEFMC 2017).

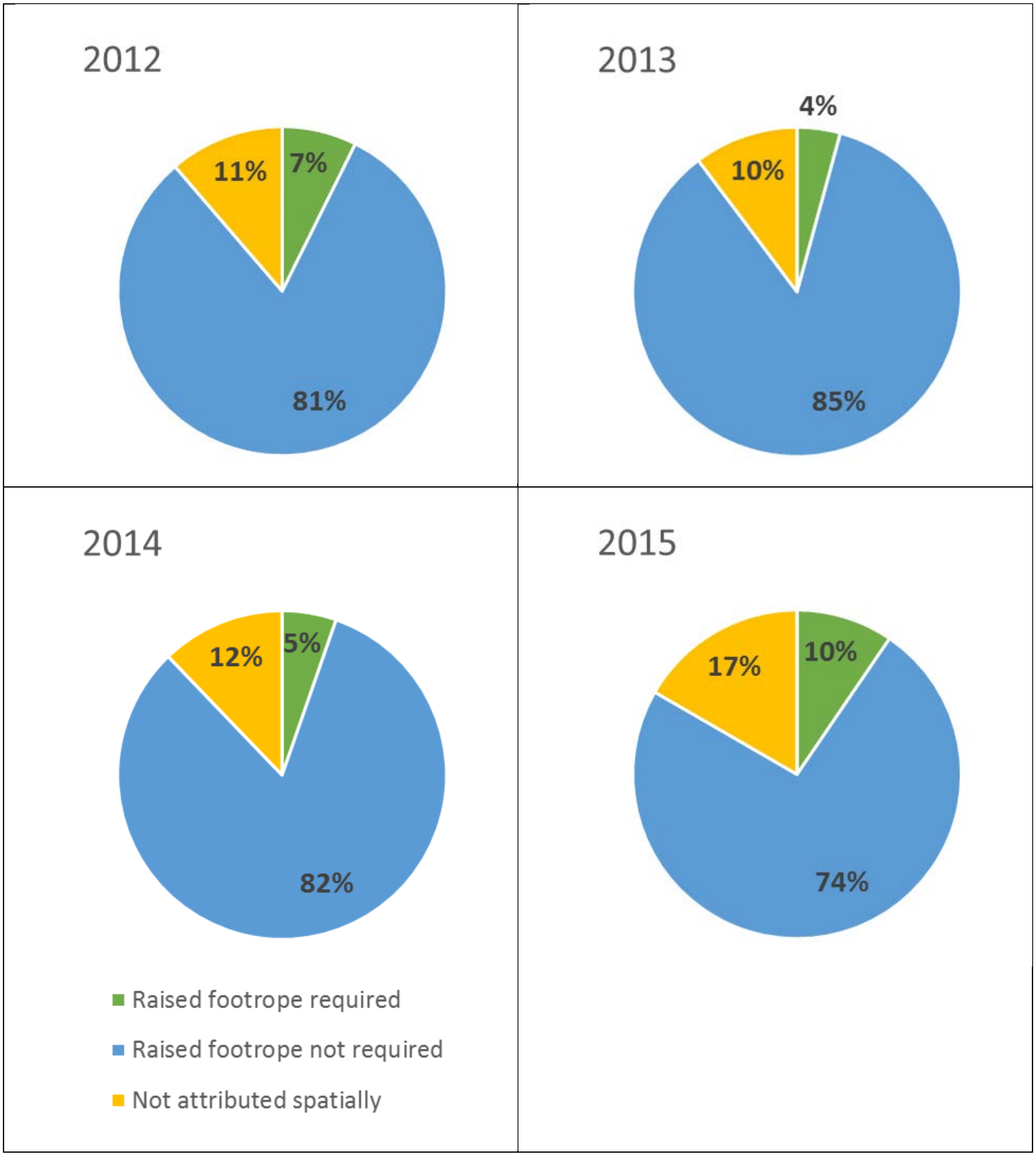
The Omnibus EFH Amendment 2 approach to evaluating adverse effects to EFH was based on two principles: (1) seabed habitat vulnerability to fishing effects varies spatially, due to variations in seabed substrates, energy regimes, living and non-living seabed structural features, etc., between areas and (2) the magnitude of habitat impacts is based on the amount of time that fishing gear spends in contact with the seabed. This seabed area swept (seabed contact time) is grossly related to the amount of time spent fishing, although it will of course vary depending on catch efficiency, gear type used, and other factors.

It is important to keep in mind that whiting fishing is spatially concentrated relative to some other fisheries, restricted by exemption area regulations and by availability of commercial concentrations of fish. It is likely that any changes in fishing effort will occur in the same general areas that are currently fished. While the intensity of fishing could change due to a limited entry program and any associated changes in possession limits and permit conditions, it is not likely that fishing will expand into new areas in the absence of other changes to the management program, specifically new or spatially expanded exemption areas.

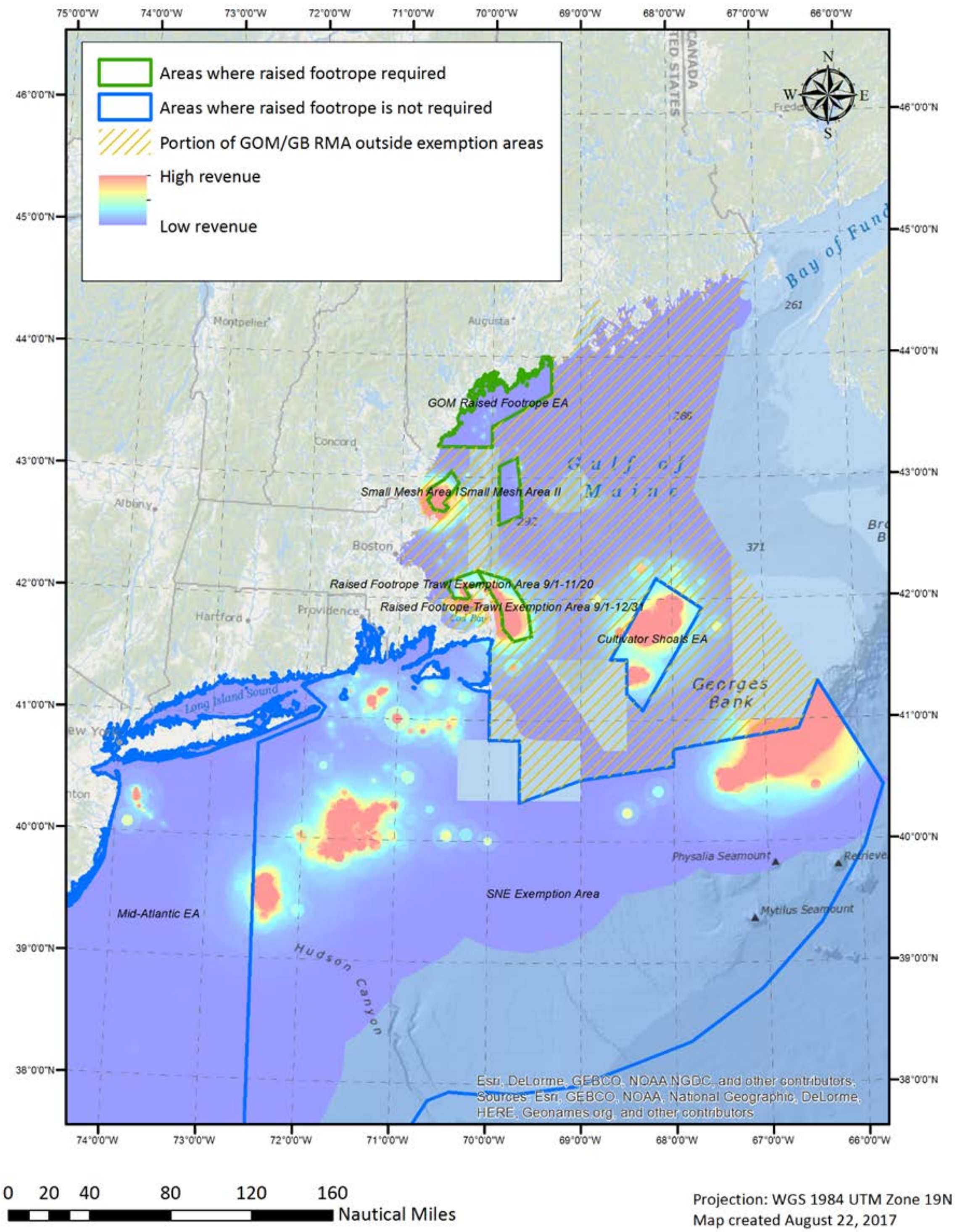
Use of small-mesh trawls to target whiting and red hake are restricted to specific exemption areas and seasons (see Map 1 and also Map 8 to Map 10), mostly to minimize the bycatch of regulated, large-mesh multispecies. Raised footropes are required on the bottom trawls used in the following exemption areas: GOM Grate Raised Footrope, Small Mesh Area 1, Small Mesh Area 2, and the two Raised Footrope Trawl Exempted Whiting Fishery Areas. Raised footropes are not required in the Cultivator Shoals Exemption Area, or in the Southern New England or Mid-Atlantic Regulated Mesh Areas. These raised footrope trawls minimize catches of flatfish (flounders, monkfish, and skates). As compared to bottom trawls outfitted with rollers or rockhoppers along the footrope, raised footrope trawls have less contact with the seabed along the sweep, and therefore have lower impacts to the seafloor. Even within the exemption areas, small-mesh multispecies fishing is usually confined to a specific area where whiting and red hake are most abundant, often over sand and muddy sand bottoms. Thus, gear impacts on EFH in the small-mesh multispecies fishery are likely to be considerably less problematic than for trawl fisheries operating in other areas to target groundfish, skates, and monkfish.

Most whiting revenues, and by extension, most whiting fishing effort and swept area, are from areas that do not require a raised footrope trawl (Figure 17). This conclusion was reached by summing fishery revenue within groups of exemption areas and regulated mesh areas using the Zonal Statistics by Table tool in the Spatial Analyst extension to ArcMap 10.5. Whiting revenues were attributed spatially according to a statistical model that combines vessel trip report positions with information about the spatial footprint of each trip, derived from at sea observer data (DePiper 2014). Vessel trip reports in the whiting fishery, as in other fisheries, report an average fishing location for each trip, and do not report fishing according to exemption area. Because these VTR positions are uncertain, and the statistical model is only an estimate, between 10-17% of annual revenues do not overlap any whiting exemption areas. Map 10 shows 2015 revenues relative to exemption areas as an example.

Figure 17. Whiting revenues from areas where raised footrope trawls are required (green), vs. not required (blue), calendar years 2012-2015. Some effort was not attributed to any exemption areas (yellow). See text for explanation of methods.



Map 7. Whiting revenue and small mesh exemption areas, calendar year 2015. Revenue approaches zero in the dark blue shaded areas. Exemption areas are color-coded by requirement for raised footrope trawl. Source: calendar year 2015 vessel trip report data.




Projection: WGS 1984 UTM Zone 19N
Map created August 22, 2017

## *5.4 Human Environment*

This Environmental Assessment 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 21).

Table 21. 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 |

### 5.4.2 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 22). 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 22. 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. 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 (Table 23).

Peak landings in the Northern Management Area also occurred in 1996, at 8.9 mil lbs., which earned about $5 mil in real revenue. The lowest silver hake landings in the Northern Area occurred in 2005 with 1.69 mil lbs., earning $1.0 mil in real revenue. In recent years, landings in the Northern Area have averaged around 5 mil lbs., earning real revenue $3.7 to $4.7 mil (Table 23). 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 lbs. to 25.9 mil pounds. Peak landings in the Southern area in 1997 were 25.9 mil lbs., 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 23. Silver hake landings (lbs.) 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.

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 lbs. until 2003, but declined during 2004-2013. The recent years, Northern Area landings have been around 5 mil lbs. compared to about 9 mil lbs. in 1996. In 2016, the Southern and Northern Areas have had similar silver hake landings and revenues.

Figure 18 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 18.  Silver hake landings (lbs.) by gear type, 1996-2016.

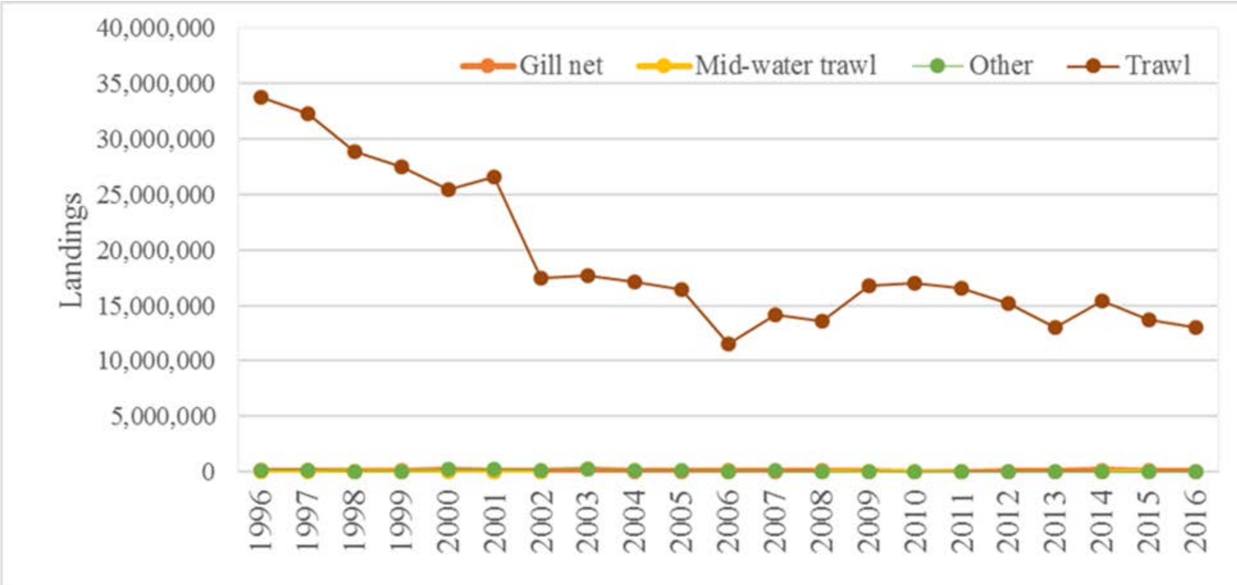
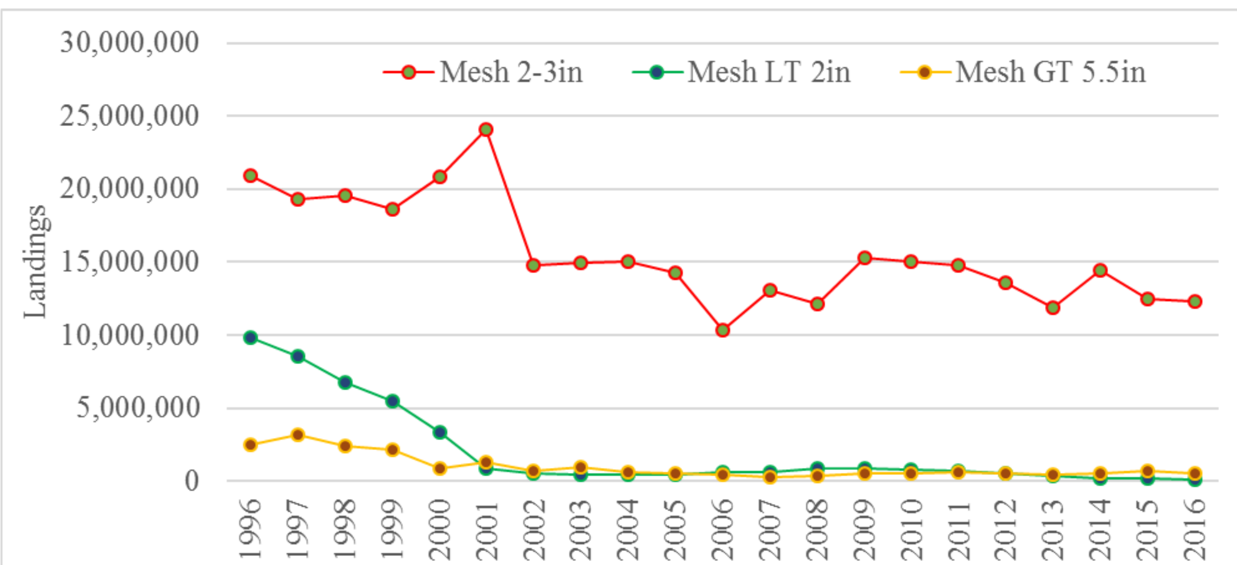



Figure 19 shows trends in silver hake landings for vessels fishing with trawls, by mesh size.  Most landings were made with mesh size between 2” and 3”.  Before 2001, mesh sizes of less than 2” and greater than 5.5” were used to land a good volume of silver hake, but the landings by these mesh sizes declined sharply since 2001.

Figure 19.  Silver hake landing (lbs.) by mesh sizes, 1996-2016




Red hake landings and revenue peaked at 4.18 mil lbs. and $2.675 mil in 2001 (Figure 20).  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 lbs. in 2016 to 3.17 mil lbs. in 2002.  Northern Area landings have ranged from 0.144 mil lbs. in 2014 to 1.375 mil lbs. in 1996.

Figure 20. Red hake landings (lbs.) by management area and total red hake revenue (in 2016$).

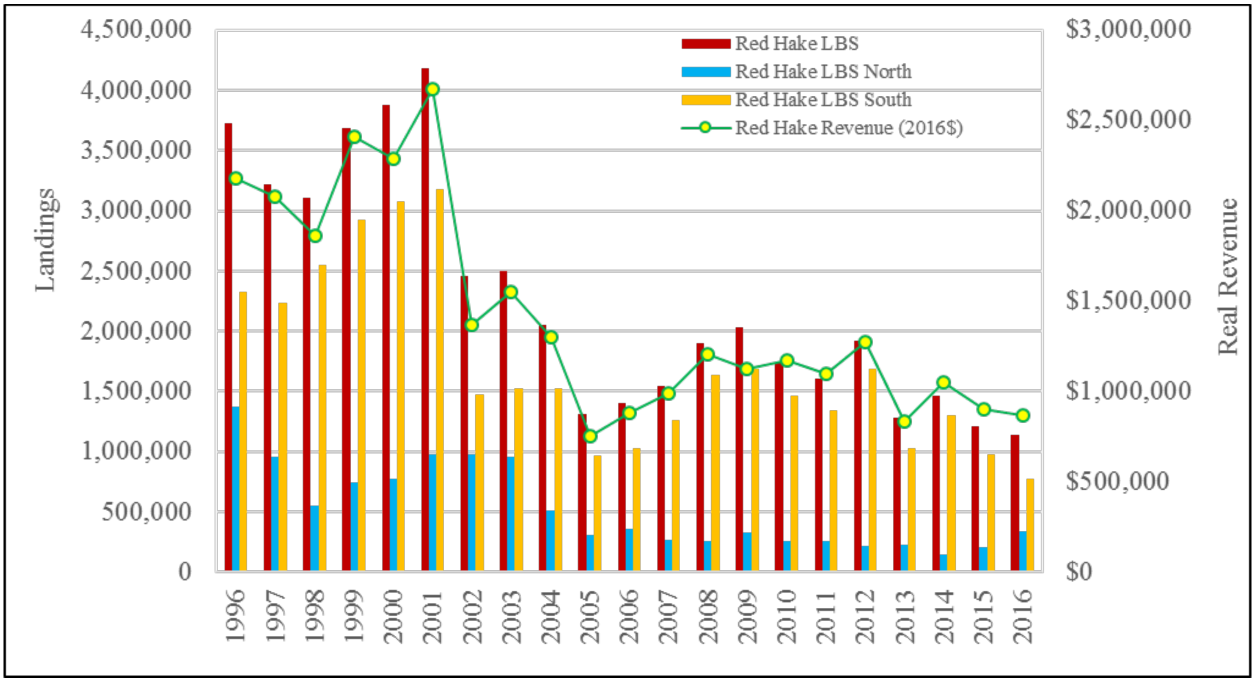



Figure 21. Red hake landing (lbs.) by gear type, 1996-2016.

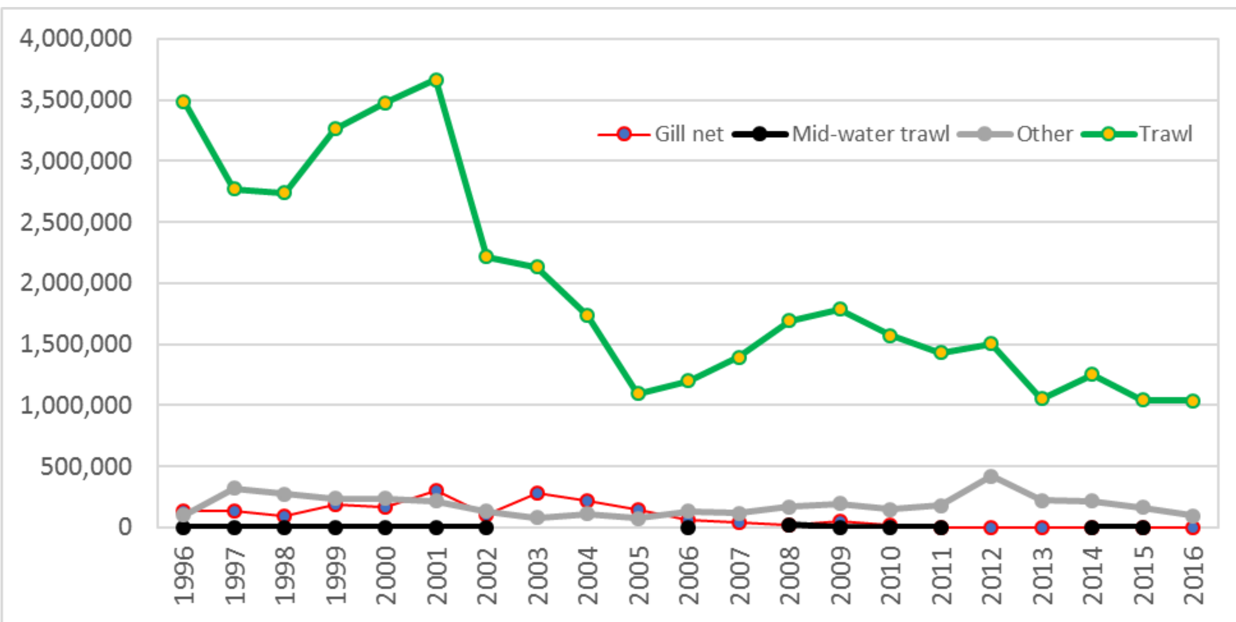



Figure 22 shows the trend in small-mesh multispecies landings from trips with 2,000 lbs. or more whiting. The number of trips with 2,000 lbs. or more have declined precipitously from about 3,100 trips in 1996 to around 800 trips in 2016 (Figure 22). Figure 23 presents small-mesh multispecies landings 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 24 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 25 and Figure 26 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 22. Annual silver hake and small-mesh multispecies landings (w/ trips ≥ 2,000 lbs whiting) and effort levels (no. of trips), 1996-2016.

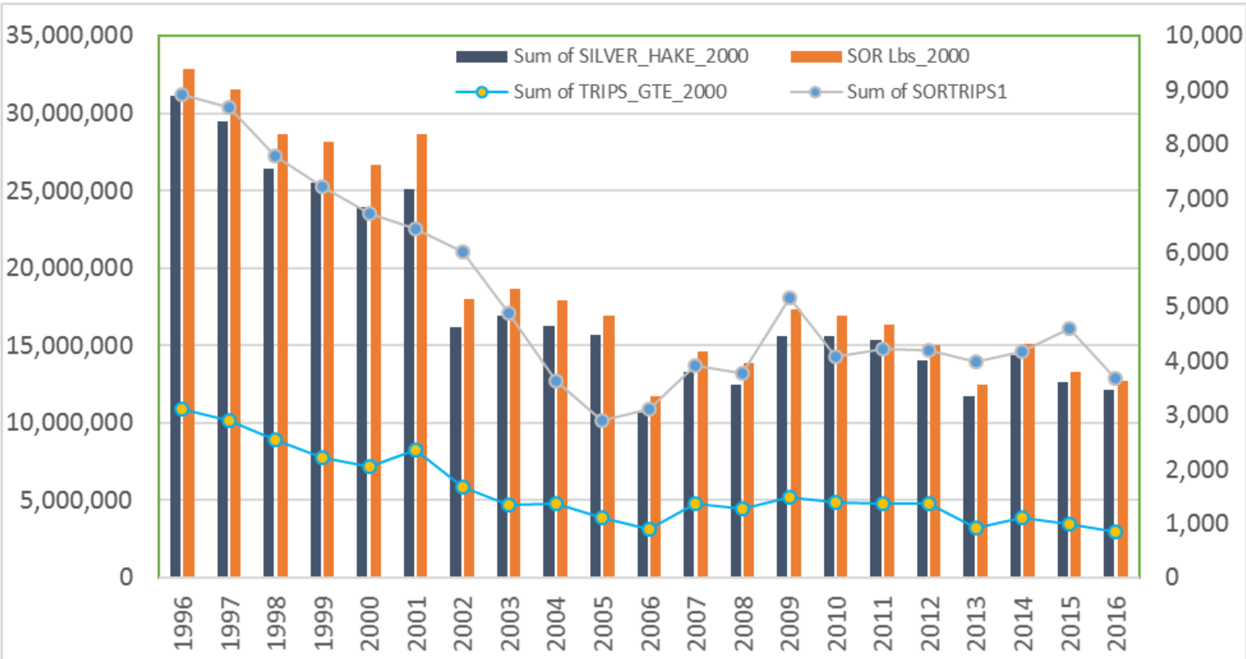



Figure 23. Small-mesh multispecies landings and effort levels by management area (w/ trips ≥ 2,000 lbs whiting), 1996-2016.

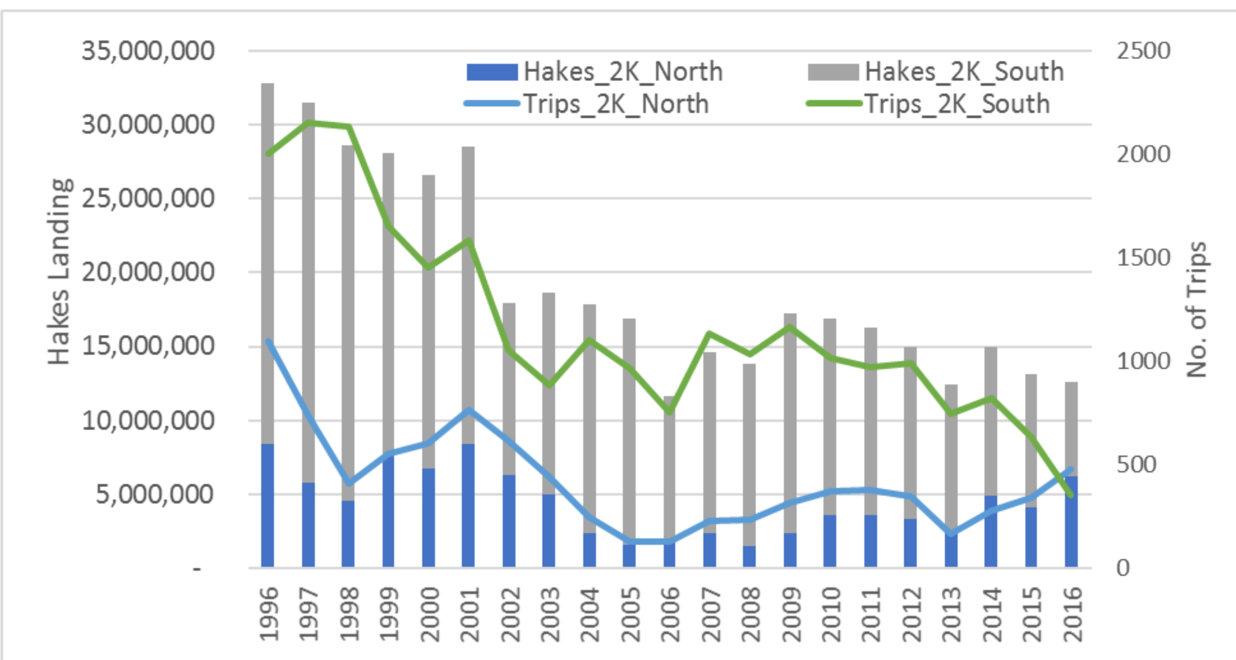


Figure 24. Small-mesh multispecies landings (lbs.) and CPUE levels (lbs./trip) by management area (w/ trips ≥ 2,000 lbs.), 1996-2016.

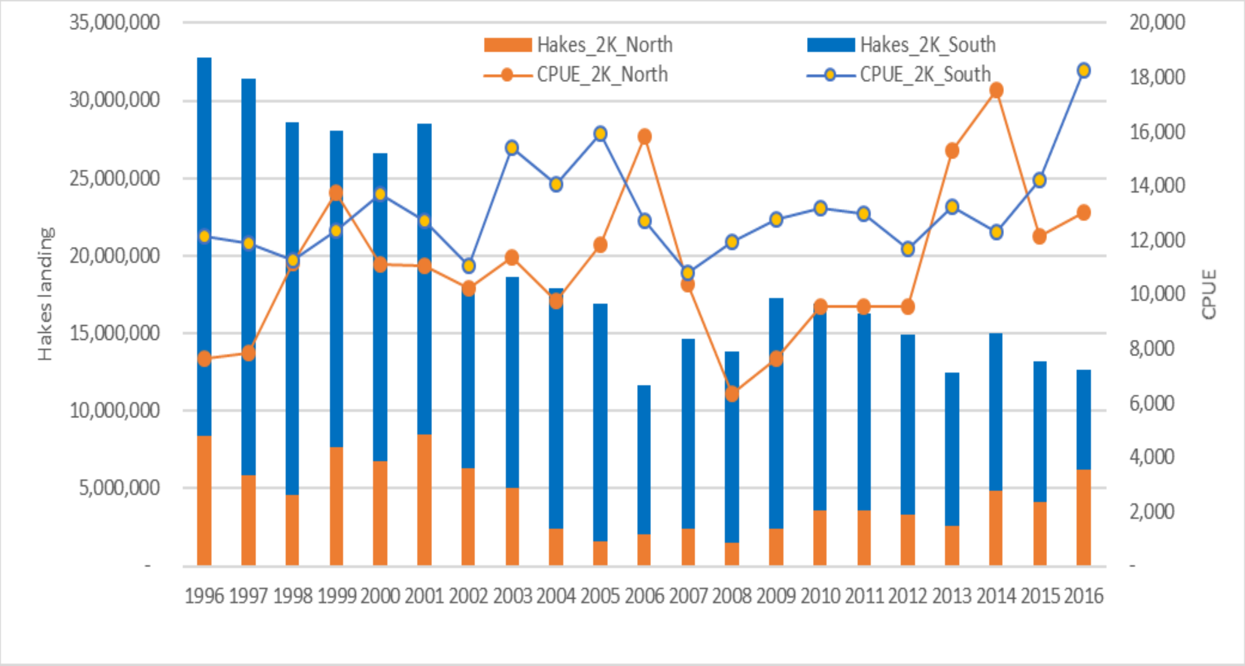



Figure 25. Silver hake landing (lbs.) and number of trips (w/ trips ≥ 2,000 lbs. whiting) by mesh size in the northern management area, 1996-2016.

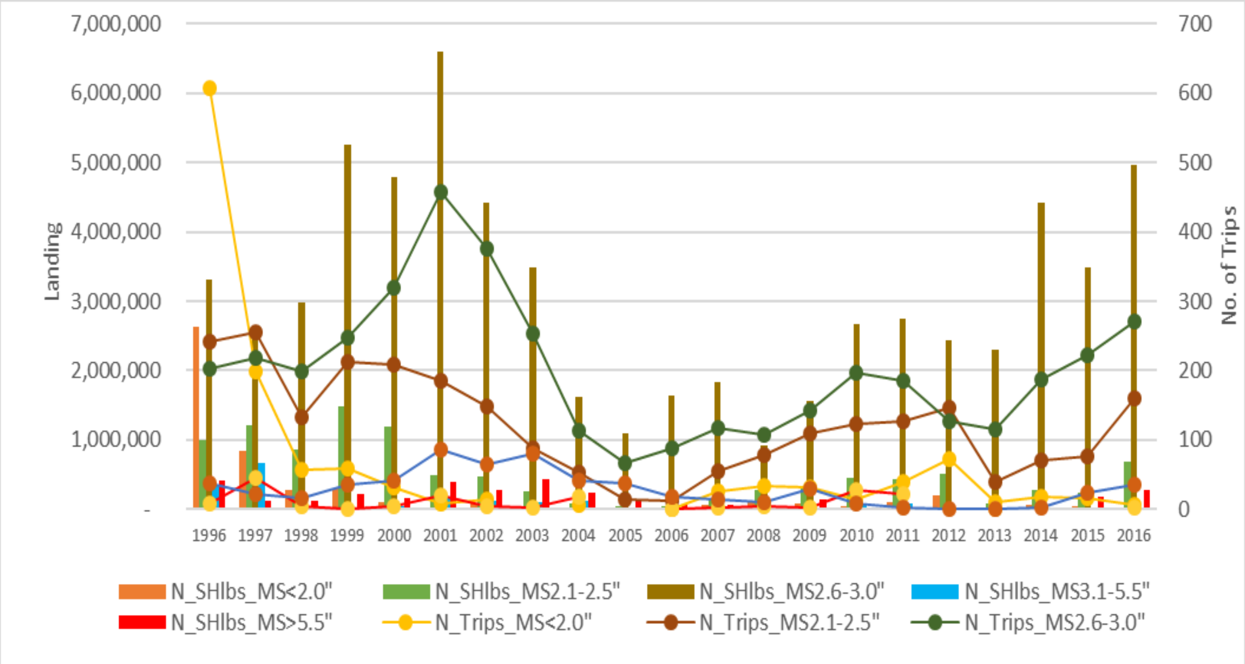
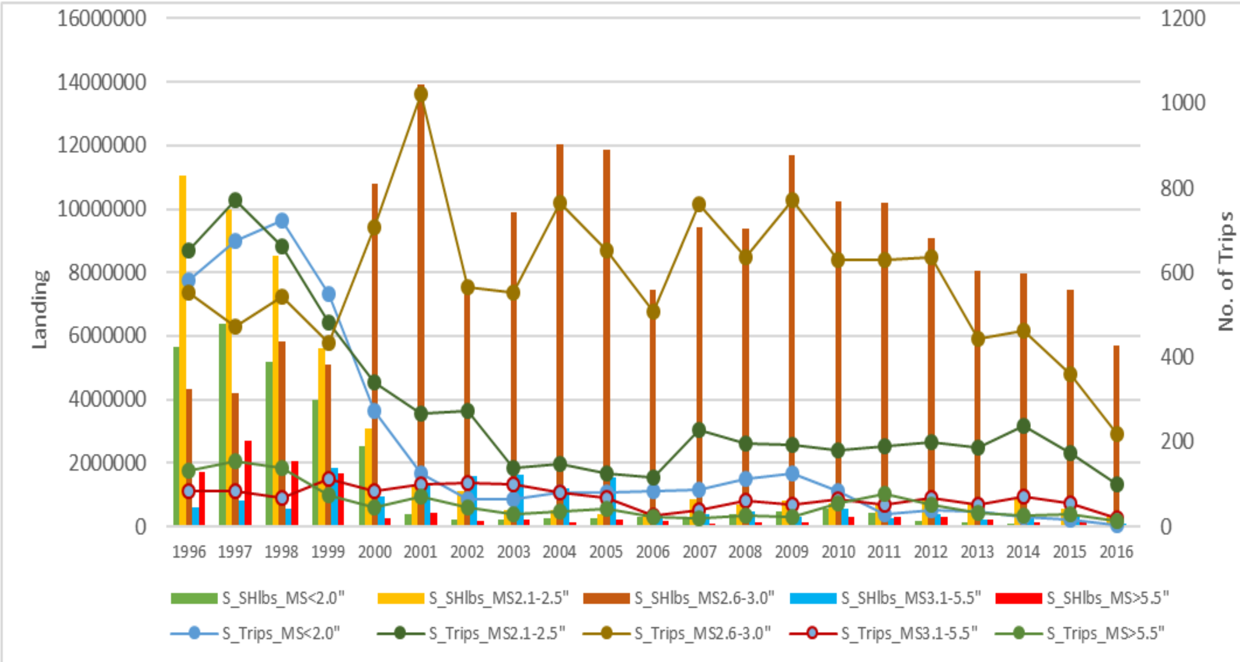


Figure 26. Silver hake landing (lbs.) and number of trips (with trips ≥ 2,000 lbs. whiting) by mesh sizes in the southern management area, 1996-2016.




Generally, silver hake prices are significantly higher than that of red hake. Both nominal (Figure 27) and real prices (Figure 28) 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 prices of silver and red hake were $0.76 and $0.48 per lb., respectively.

Figure 27. Nominal prices of silver and red hake, 1996-2016.

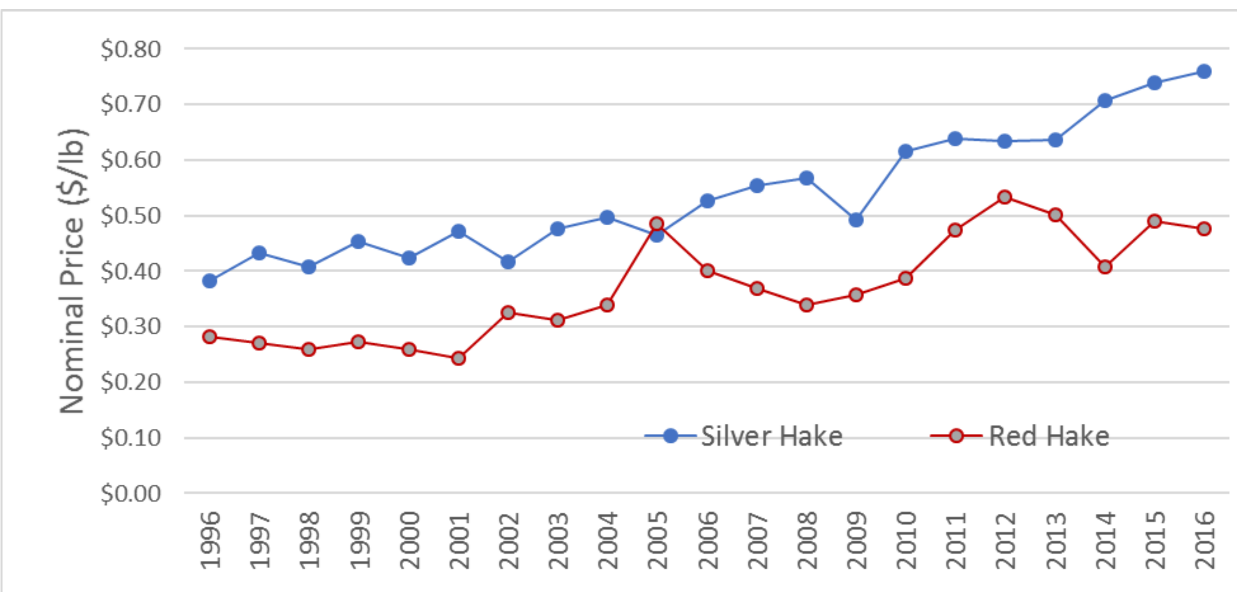
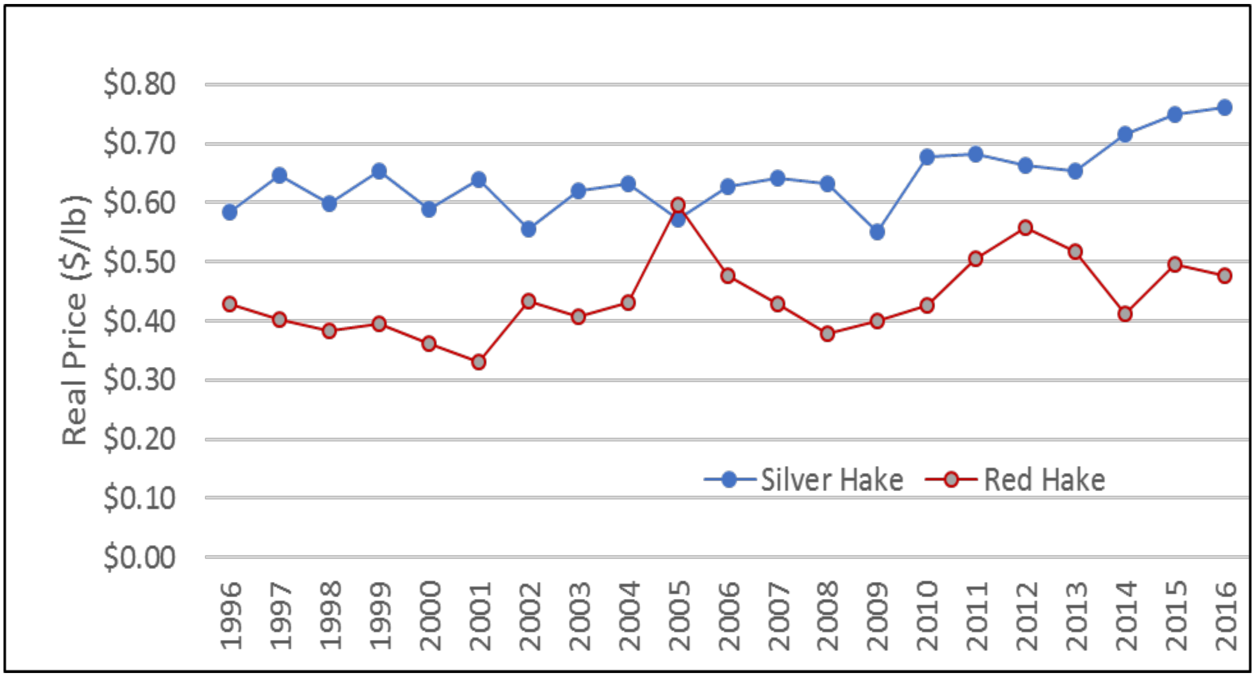
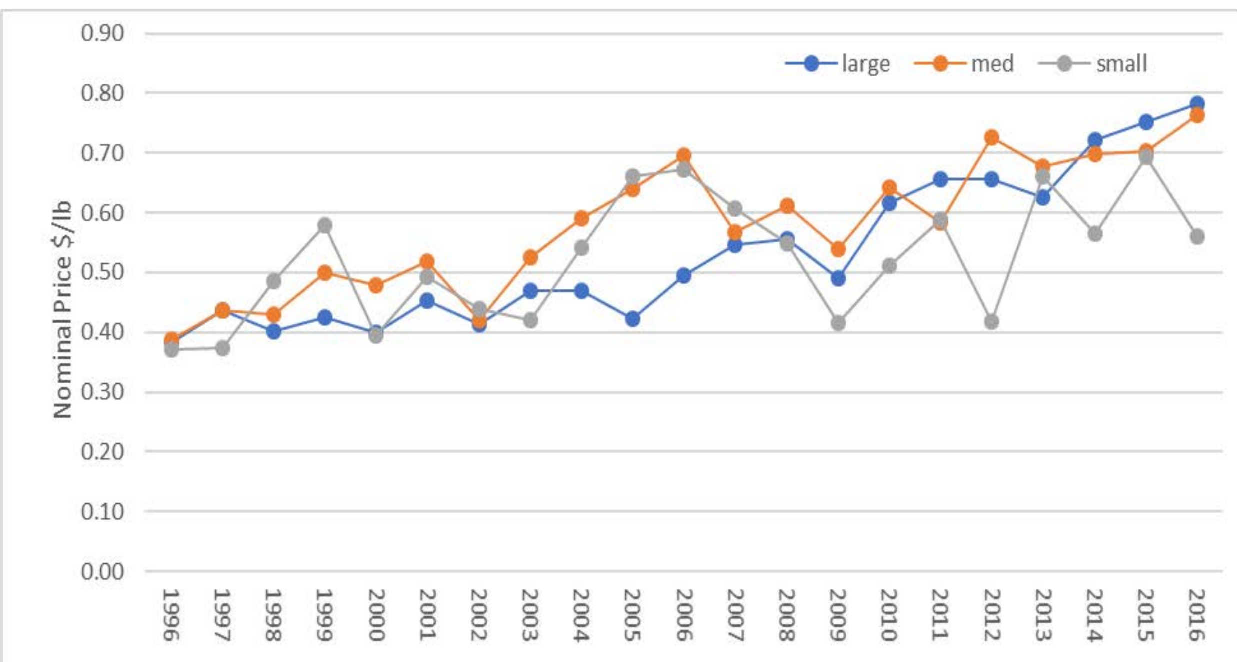


Figure 28.  Inflation adjusted real prices (in 2016$) of silver and red hake, 1996-2016.




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 the highest price (Figure 29).

Figure 29.  Nominal price ($/lb) of silver hake by vessel size classes, 1996-2016

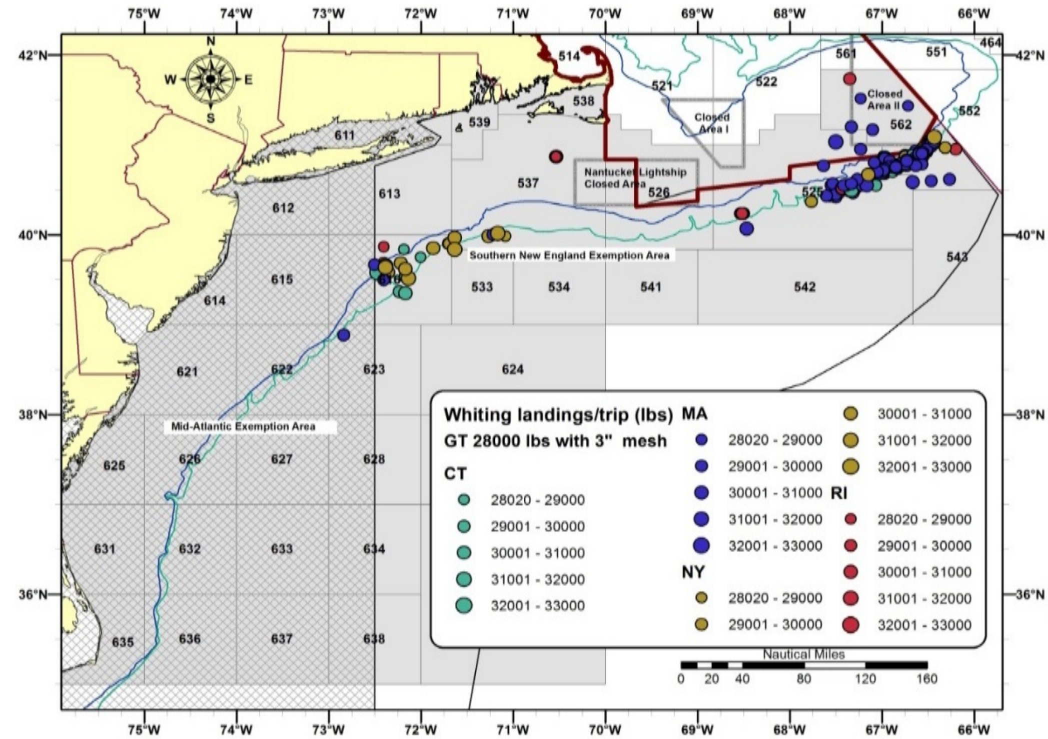


Whiting landings are regulated by possession limits that vary with the trawl mesh size and by stock area. These limits have helped maintain catches at or below sustainable levels since becoming effective in 2003. Since this amendment is considering increasing the Southern whiting possession limit, it 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.

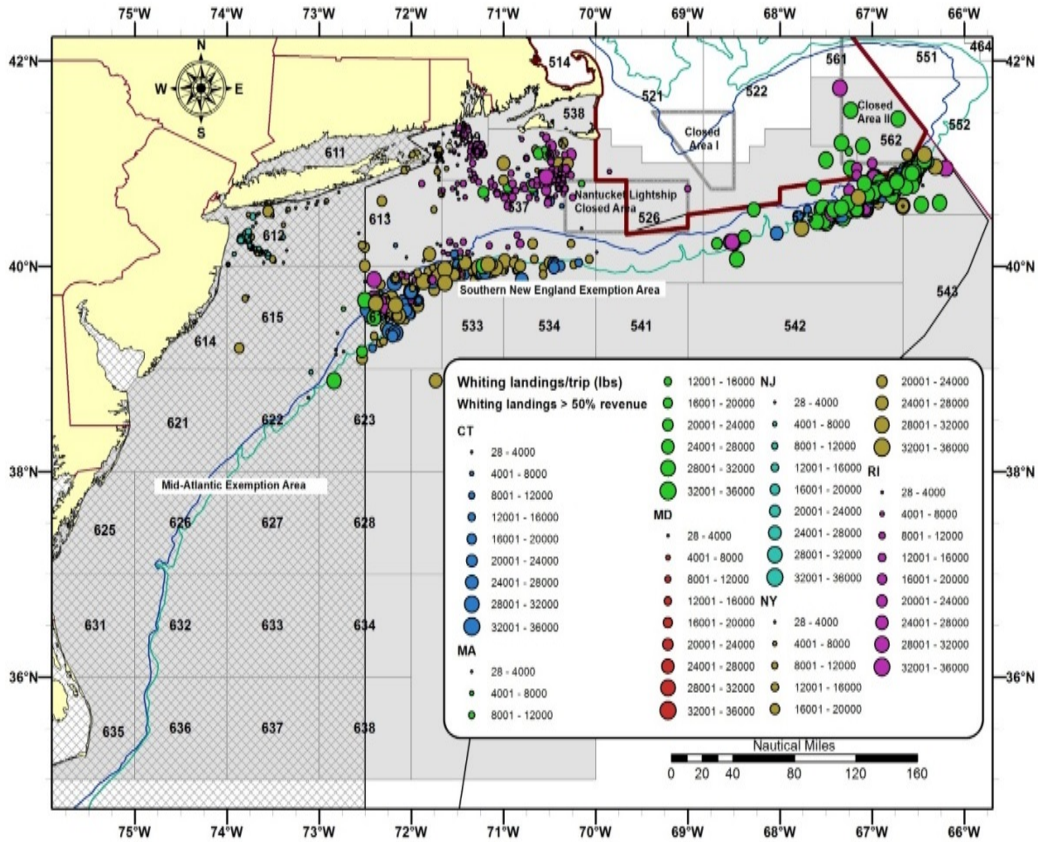
Vessels using 3 inch or larger mesh may possess and land up to 30,000 pounds of whiting in the northern management area and up to 40,000 lbs. of whiting in the southern management area. Nearly all of the high landings on trips targeting whiting are made by vessels fishing along the Mid-Atlantic continental shelf edge and along the Southern edge and eastern portion of Georges Bank (Map 8). 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). 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 8), 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 8. 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.



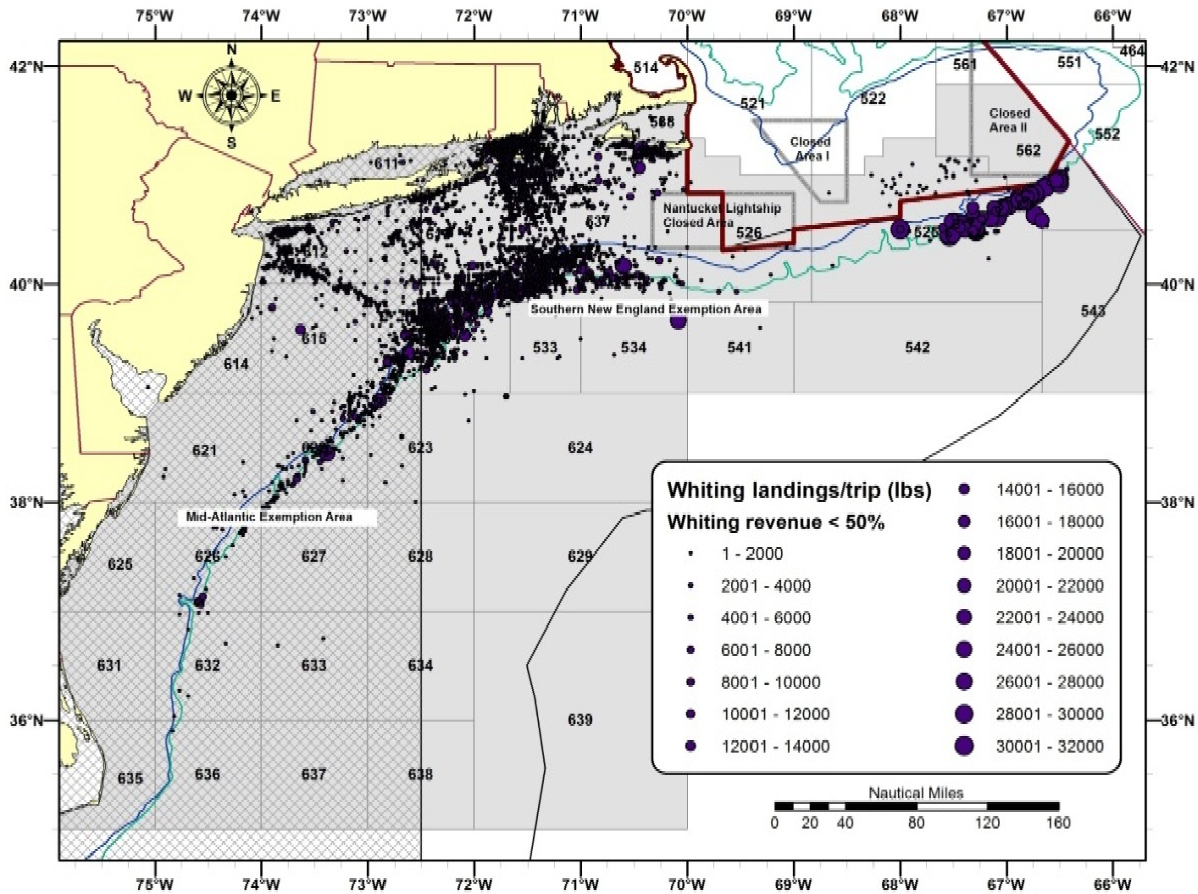

Trips targeting whiting but landing less than 28,000 pounds are more diversified, geographically (Map 9). In addition to the above trips, there are more trips spread out along the Southern New England shelf edge in statistical areas 537 and 616, some trips using 3-inch mesh and other trips using smaller 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 9. 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 10). 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 10. Reported fishing locations for 2009-2011 trips targeting species other than whiting while using trawls. Source: Dealer landings data matched to VTR data.

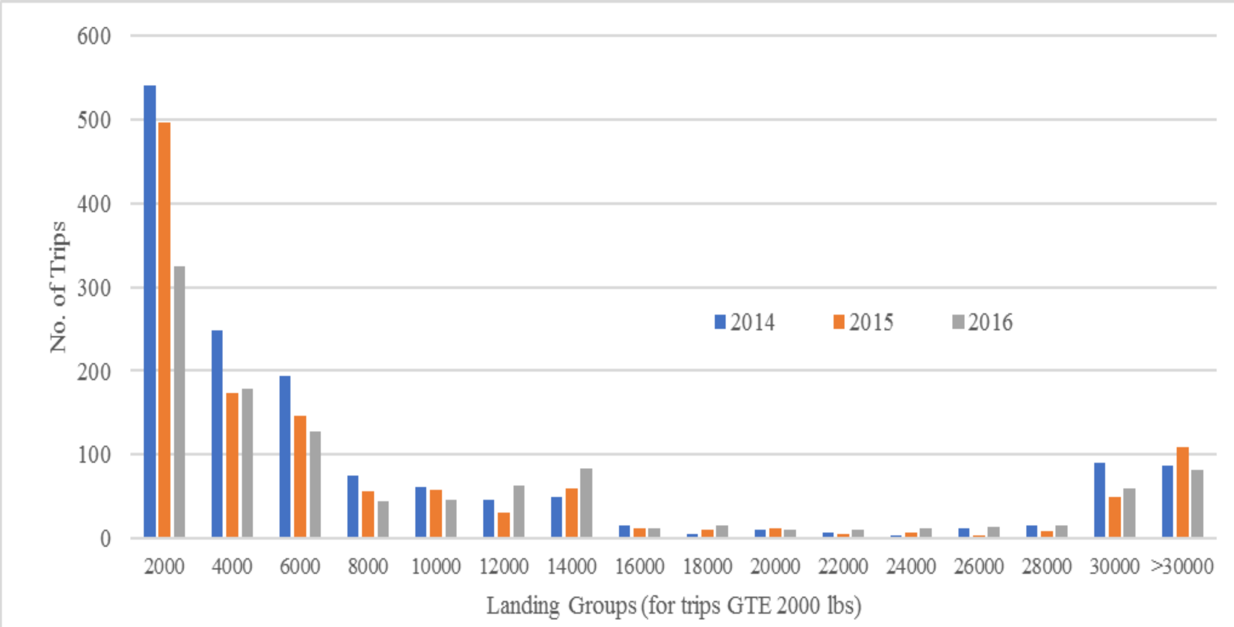



**Frequency of trips landing in 2014-2016**

For the trips that landed 2,000 or more pounds of whiting, 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.[16] Figure 30 presents the frequency of trips by landing volume in recent years and Figure 31 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.

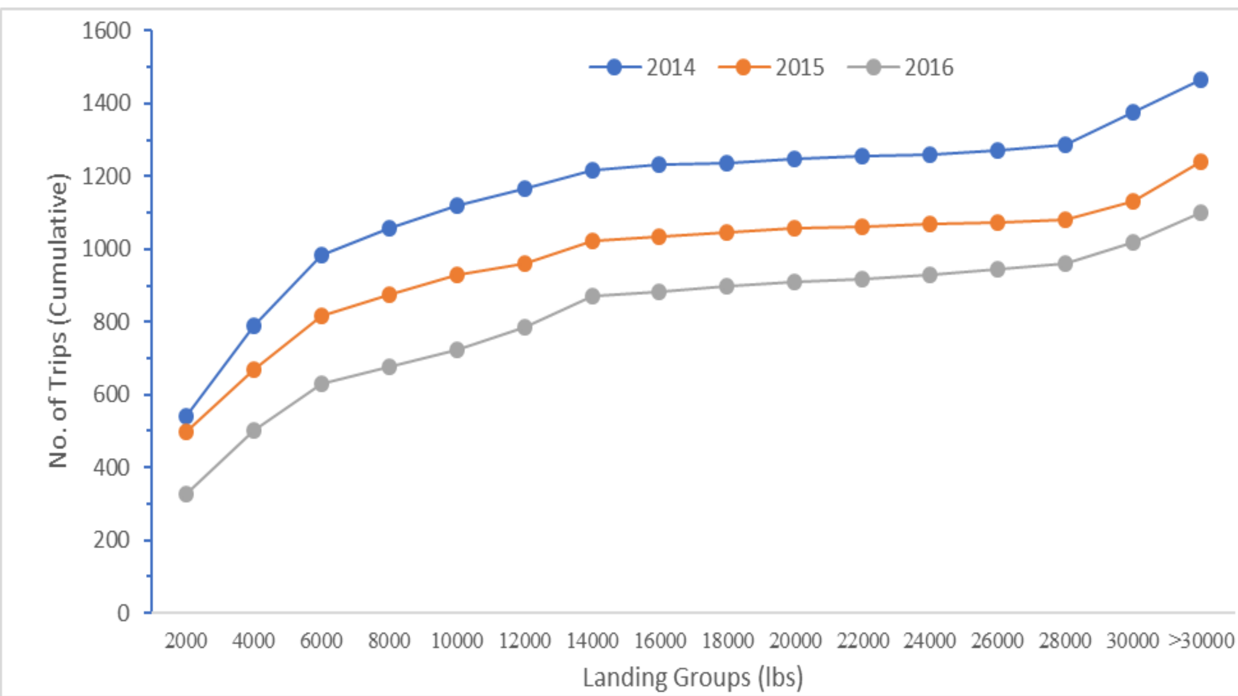
16 There are a few trips in this figure that appear to land more than 30,000 pounds of silver hake, more than the legal limit in the northern management area. This may reflect landings from different trips being reported as being landed in the same day for a permit or reporting mistakes by the dealer.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

Figure 30. 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 31. 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 million lbs. and real revenue (inflation adjusted in 2016 $) was also the greatest ($2.7 mil) in this year (Table 24). 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 25). 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 25). 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 32). 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 11,000 pounds (Figure 33).

Table 24. 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 25. Annual red hake landings (lbs.) 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 32. Frequency of red hake landings per trip, 2014-2016.

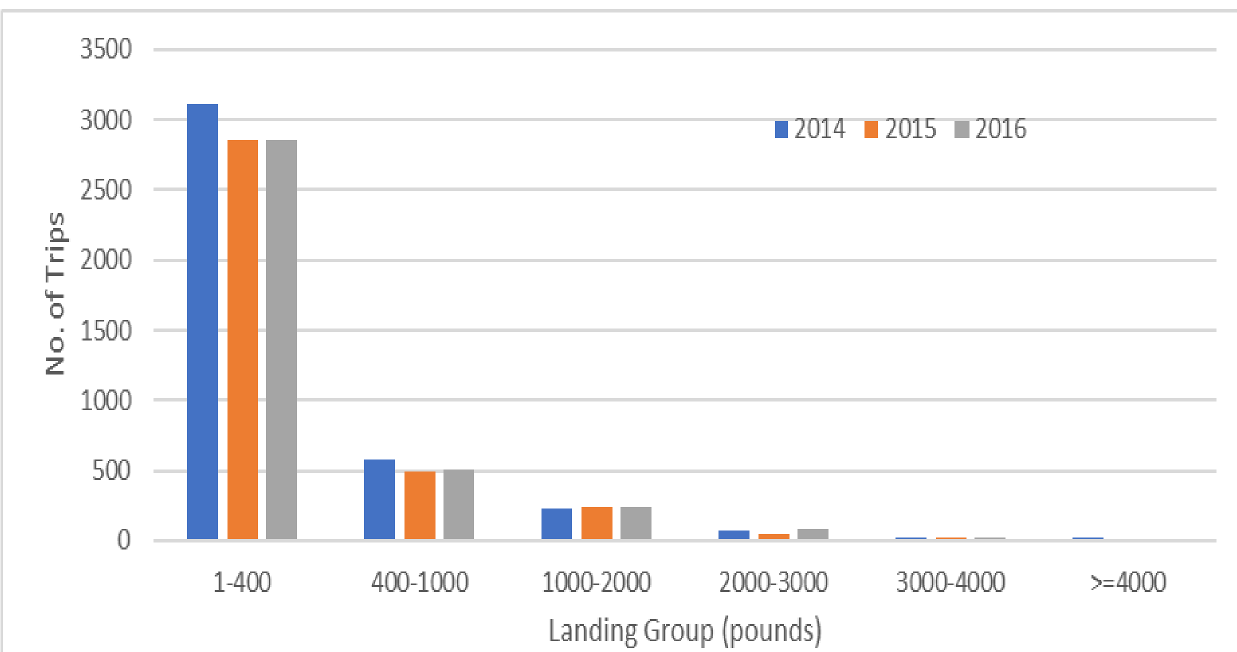
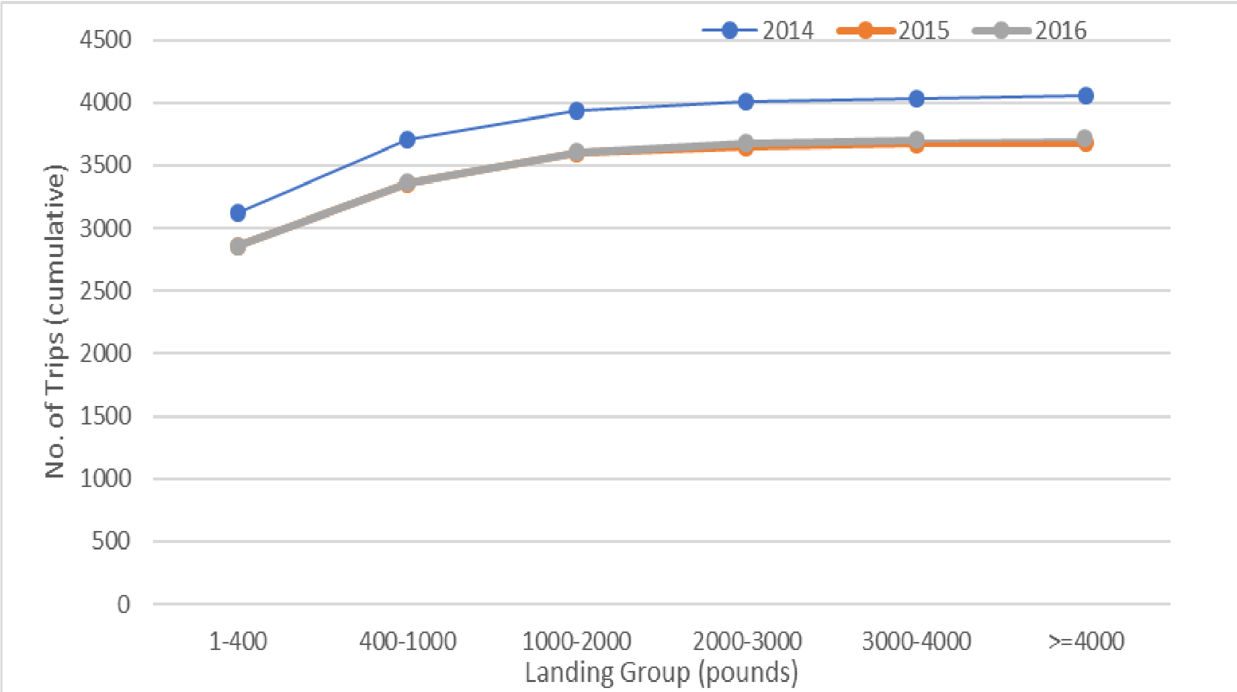


Figure 33. Cumulative frequency of red hake landings per trip, 2014-2016.




### 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 34 and Figure 35).

Figure 34. Price – Quantity relationship for red hake, 1996-2016.

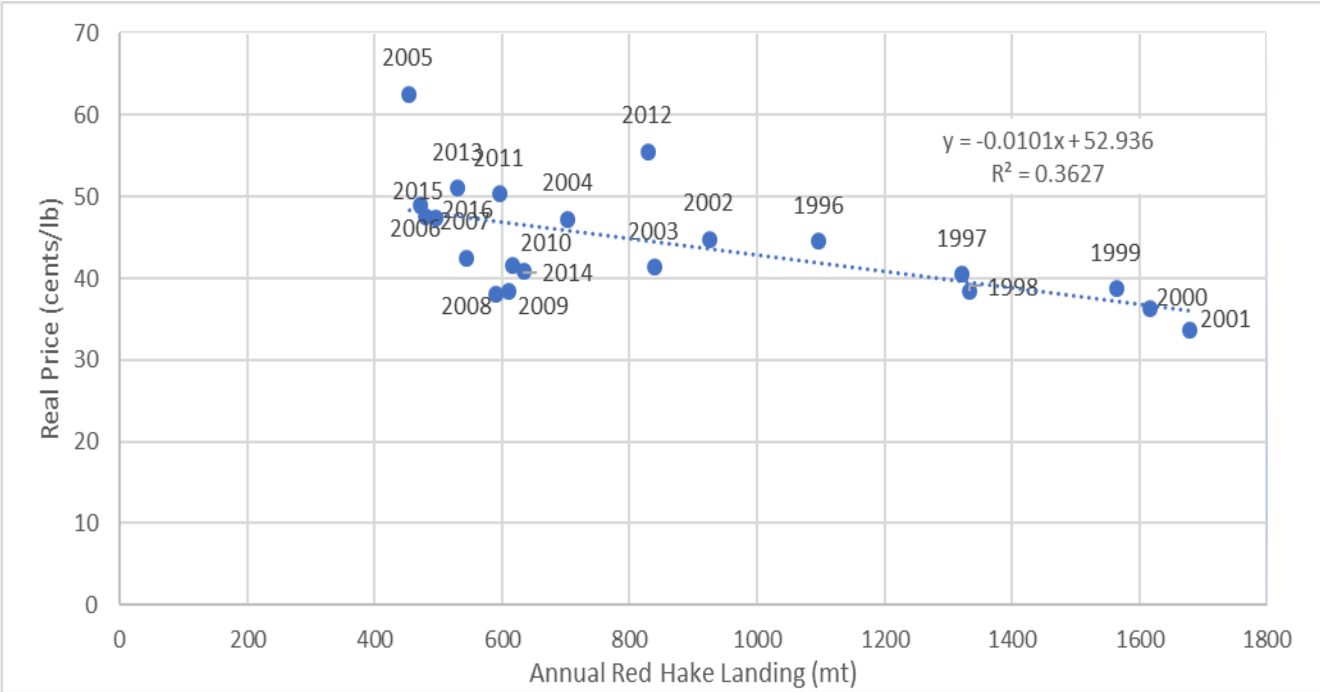
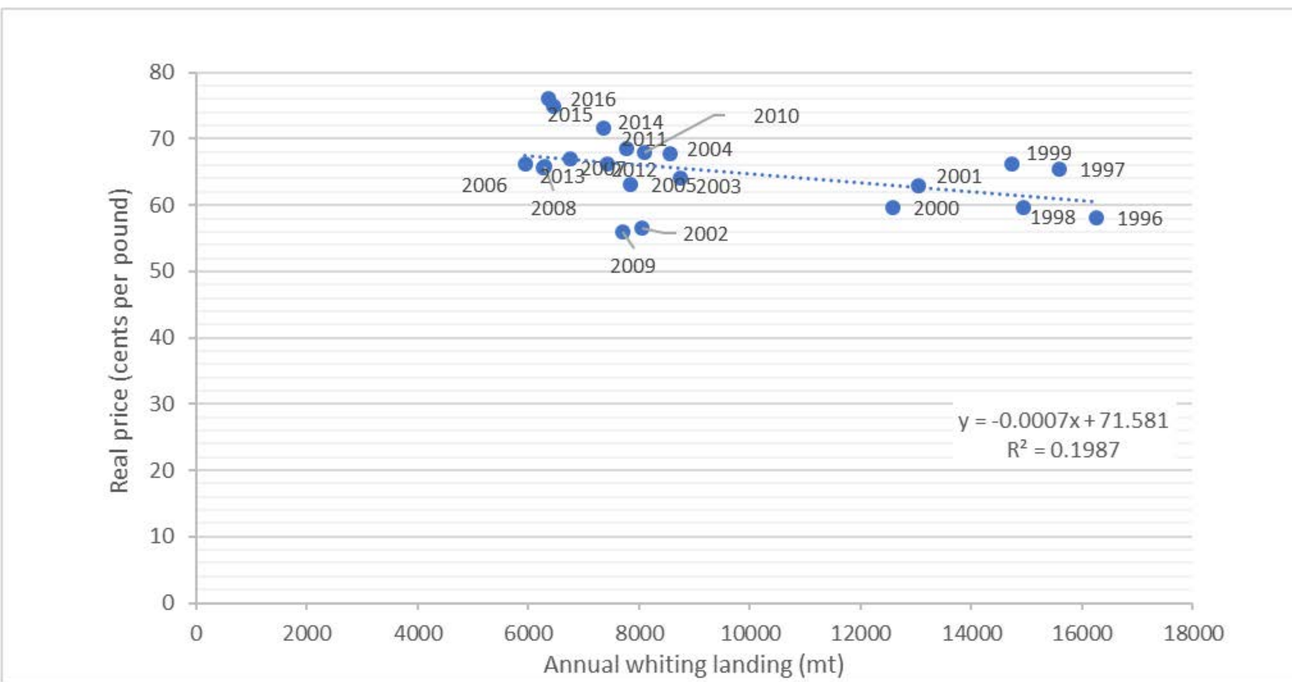



Figure 35. Price – Quantity relationship for whiting, 1996-2016.



## 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. 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 26):

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 26. *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 27 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 28 and Table 29 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 27. 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 28. Trips landing ≥ 2,000 pounds of small-mesh multispecies in Communities of Interest, 1996-2016.

| Landed Port | | 1996 trips | 1996 rank | 2016 trips | 2016 rank | Note |
|---|---|---|---|---|---|---|
| **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 29. 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 30 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 30. 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 31). 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 31). 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 31). 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 31). 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 31) – 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 31). 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 31). 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 31. 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 32 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 32. Annual red and silver hake landings by state as percentage of total state landings.

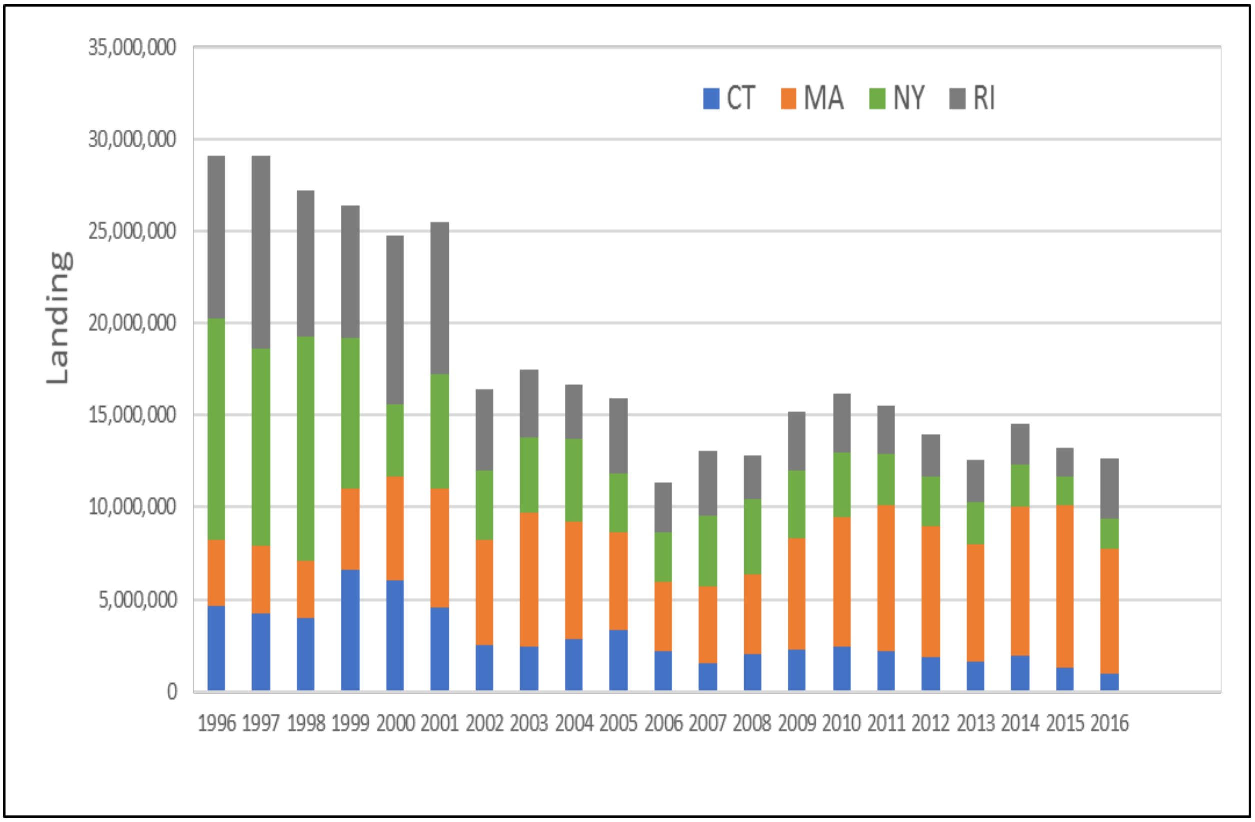
| State | Year | Landings (Live Pounds) | | | Percent of State Total | |
|---|---|---|---|---|---|---|
| | | Red Hake | Silver Hake | State Total Fish | Red Hake | Silver Hake |
| ME, NH, NJ | 1996 | 135,076 | 5,249,751 | 874,677,955 | 0.02% | 0.60% |
| | 1997 | 234,848 | 3,745,832 | 859,779,353 | 0.03% | 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 36 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 36. Annual silver hake landing (lbs.) for major states, 1996-2016.




Source: NEFSC VTR data

Table 33 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 33. 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 34 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 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 35). 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 34. 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 |
| | 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 |

| State | Year | Real Revenue$ (in 2016 $) | | | Percent of State Total | |
|---|---|---|---|---|---|---|
| | | Red Hake | Silver Hake | State Total Fish | Red Hake % | Silver Hake % |
| | 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 |
| | 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 |

| State | Year | Real Revenue$ (in 2016 $) | | | Percent of State Total | |
|---|---|---|---|---|---|---|
| | | Red Hake | Silver Hake | State Total Fish | Red Hake % | Silver Hake % |
| | 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 35. 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 | [redacted] | N/A | 53 | 862 | 265 | [redacted] | 1436 | [redacted] | [redacted] | [redacted] | 62 | 943 | 2310 | 2274 | 223 | N/A | N/A | 4010 | [redacted] |
| 1997 | [redacted] | [redacted] | 10 | 805 | 424 | [redacted] | 561 | [redacted] | 617 | [redacted] | 144 | 1653 | 1721 | 1792 | 269 | N/A | N/A | 4913 | [redacted] |
| 1998 | [redacted] | [redacted] | 28 | 836 | [redacted] | 0.28 | 75 | [redacted] | 418 | [redacted] | 75 | 1703 | 2232 | 2263 | 231 | N/A | N/A | 4417 | 237 |
| 1999 | [redacted] | [redacted] | 78 | 1004 | 759 | [redacted] | 63 | [redacted] | 239 | [redacted] | 24 | 1266 | 1187 | 1602 | 280 | [redacted] | N/A | 4172 | 163 |
| 2000 | [redacted] | [redacted] | 486 | 1081 | 633 | 0.58 | [redacted] | 89 | 223 | [redacted] | 8.86 | 1060 | 696 | 167 | 128 | N/A | N/A | 4296 | 381 |
| 2001 | [redacted] | [redacted] | 1182 | 619 | 711 | [redacted] | 13 | [redacted] | 297 | [redacted] | 33 | 2343 | 908 | 14 | 80 | N/A | [redacted] | 3609 | 577 |
| 2002 | [redacted] | [redacted] | 1196 | 489 | 564 | [redacted] | [redacted] | [redacted] | 289 | [redacted] | 7.46 | 1165 | 455 | 12 | 144 | N/A | [redacted] | 2149 | 156 |
| 2003 | [redacted] | [redacted] | 2417 | 232 | 71 | [redacted] | [redacted] | [redacted] | 32 | [redacted] | 1.98 | 1424 | 495 | 25 | 82 | N/A | N/A | 2372 | 249 |
| 2004 | [redacted] | [redacted] | 2536 | 227 | 22 | [redacted] | [redacted] | [redacted] | 57 | [redacted] | 5.14 | 1522 | 464 | [redacted] | 13 | 332.33 | 4.82 | 1724 | [redacted] |
| 2005 | [redacted] | [redacted] | 2267 | 453 | [redacted] | [redacted] | [redacted] | [redacted] | 94 | [redacted] | 1.62 | 1216 | 200 | [redacted] | N/A | 26.68 | 49.39 | 1814 | [redacted] |
| 2006 | [redacted] | [redacted] | 1875 | 126 | N/A | [redacted] | [redacted] | [redacted] | 45 | [redacted] | 4.69 | 736 | 212 | [redacted] | [redacted] | [redacted] | 94.74 | 1486 | 51 |
| 2007 | 254 | [redacted] | 1475 | 320 | 20 | [redacted] | 0.16 | [redacted] | 224 | [redacted] | 1.59 | 934 | 268 | 4.86 | [redacted] | [redacted] | 113.97 | 1937 | 49 |
| 2008 | 401 | 110 | 1142 | 123 | 134 | [redacted] | [redacted] | [redacted] | 162 | [redacted] | 10 | 1487 | 180 | 10 | [redacted] | [redacted] | 105.51 | 1418 | [redacted] |
| 2009 | 321 | [redacted] | 1872 | 313 | 217 | [redacted] | [redacted] | [redacted] | 358 | [redacted] | 21 | 1590 | 189 | [redacted] | [redacted] | [redacted] | 52.96 | 1634 | [redacted] |
| 2010 | 300 | 361 | 2542 | 293 | 240 | [redacted] | [redacted] | [redacted] | 181 | [redacted] | 6.80 | 1549 | 179 | 1.34 | [redacted] | [redacted] | 174.41 | 1530 | [redacted] |
| 2011 | 315 | 276 | 2980 | 442 | 264 | 49 | [redacted] | [redacted] | 194 | [redacted] | 14 | 980 | 163 | [redacted] | [redacted] | [redacted] | 210.57 | 1163 | [redacted] |
| 2012 | 513 | [redacted] | 2656 | 602 | 29 | [redacted] | [redacted] | [redacted] | 191 | [redacted] | 3.37 | 1044 | 111 | N/A | N/A | N/A | 99.07 | 1109 | [redacted] |
| 2013 | 610 | 113 | 2456 | 444 | 41 | [redacted] | [redacted] | [redacted] | 104 | [redacted] | [redacted] | 1032 | 36 | [redacted] | N/A | N/A | 12.91 | 1093 | 2.84 |
| 2014 | [redacted] | [redacted] | 3120 | 687 | [redacted] | [redacted] | [redacted] | [redacted] | 153 | 152 | [redacted] | 919 | 86 | [redacted] | N/A | [redacted] | 14.60 | 1003 | [redacted] |
| 2015 | 536 | [redacted] | 3000 | 863 | 142 | [redacted] | [redacted] | [redacted] | 57 | [redacted] | [redacted] | 614 | 43 | [redacted] | N/A | [redacted] | 13.87 | 752 | 0.35 |
| 2016 | 333 | 36 | 1719 | 1352 | [redacted] | [redacted] | [redacted] | [redacted] | 17 | 13 | 1.12 | 538 | 16 | N/A | N/A | [redacted] | [redacted] | 1665 | [redacted] |
| **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.

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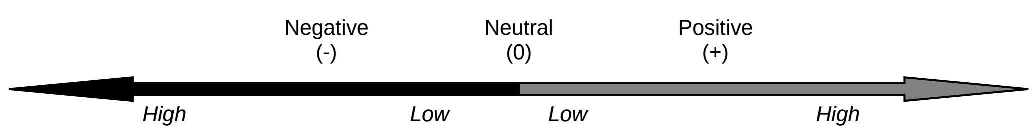
# 6.0 ANALYSIS OF IMPACTS ON VECS

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 36. 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 (Section 4.1.1; preferred)

Stock biomass has increased considerably since 2005 in the northern management area and has declined substantially since 2011 in the southern management area. In the northern area, strong year-classes have appeared and are now of commercial size. In the south, low recruitment in recent years and potentially unfavorable conditions (warmer temperatures) have probably contributed to declining stock biomass, while catches have remained relatively stable. Because of this, the 2016 catches in the southern area were sufficiently high to cause overfishing (NEFMC 2017).

The proposed 2018-2020 red hake specifications (Table 37) 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 estimates. 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 are expected to influence fishing behavior; therefore are effective in preventing future overfishing.

For the northern stock (stock areas shown in Map 1), 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 preferred 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 taking into account the factors described above, **the preferred 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 37**.** Differences between the proposed ACL 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 (Section 4.1.2)

For the northern red hake stock, the No Action specifications (Table 37) are 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** (to less than 1%) by setting a management target that would be more risk adverse than the preferred alternative would otherwise allow.

For the southern red hake stock, the No Action specifications (Table 37) 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. **As compared to the proposed updated specifications, the No Action specifications are expected to result in high negative (but not significant) 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 since 2005 in the northern management area and except for an uptick in 2016 biomass has been generally declining since 2011 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, low recruitment and potentially unfavorable conditions (warmer water temperatures) 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 5.1.4)

Fishing with small-mesh trawls is allowed via exemptions from large-mesh groundfish regulations, which restricts fishing to six specific areas and seasons (Table 38 and Map 1). Other factors also inhibit fishermen from targeting whiting and red hake with small-mesh trawls. 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 38**) 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 other factors. 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) as 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%[17].

Table 38**.** Differences between the proposed ACL 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% |

[17] 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 38). 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 38) 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 Updated specifications (Section 4.1.1; preferred)

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.

Although red and offshore hakes do not appear to be a primary prey item for many species, silver hake play a more central role and consumption by predators has been estimated to be greater than removals by the commercial fishery (NEFSC 2010). Thus, maintaining a healthy stock and higher abundance of juvenile silver hake has a positive effect on the ecosystem. The proposed ACL specifications are intended to prevent overfishing and maintain healthy stocks by limiting catch below sustainable levels. In fact, the scientific buffer for silver hake (P*=25%) is intentionally more conservative than normal because of this ecosystem role. In the south, No Action could cause overfishing if catches reach the annual catch limits. The ecosystem effects of the proposed ACL are expected to be positive, while the ecosystem effects of No Action are expected to be low negative.

**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.**

### 6.2.2 No Action (Section 4.1.2)

**No Action is expected to have a positive, but insignificant biological impact on species commonly caught in the small-mesh fishery (see Section 5.1.5), compared to baseline environmental conditions.** Catch limits coupled with exemption area boundaries and seasons and specific gear requirements such as the raised footrope trawl at acceptably low levels.

## *6.3 Protected Resources*

### 6.3.1 Updated specifications (Section 4.1.1; preferred)

The commercial whiting fishery is prosecuted primarily with small-mesh 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 37 and Table 38), 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.

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].

Small gadids, mostly comprised of small-mesh multispecies, are generally a low proportion of the estimated consumption by marine mammals in the NE US large marine ecosystem (Smith et. al. 2015; Section 5.1.3.4). Many marine mammals have a broad, general diet and primarily predate on zooplankton and squids. Dolphins and pinnipeds are more piscivorous, but also focus on a broad range of prey, often small pelagic fish (e.g. mackerels) and forage fish (e.g. herrings). Small gadid fish were estimated as the primary diet item for white-sided dolphin and harbor seal, but consumption of herrings was a close second.

Decreases in abundance caused by increases in catch limits of small-mesh multispecies the northern management area could therefore have a low negative to negligible indirect effect on marine mammals. On the other hand, reduced catch limits and a lower overfishing risk in the southern management area could have a low positive to negligible indirect effect on marine mammals.

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.

Based on this, the whiting fishery is likely to result in some level some level of negative impacts to ESA listed species. Taking into consideration fishing behavior/effort under Alternative 1, as well the fact that interaction risks with protected species are strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., soak time, tow time), and the presence of protected species in the same area and time as the gear (with vulnerability of an interaction increasing with increases in of any or all of these factors), we determined the level of negative impacts to ESA listed species to be low. Below, we provide support for this determination.

Alternative 1 proposes to increase ACLs by 27-45 percent in the northern management area and decrease ACLs by 35-38% in the southern management area, (Table 37 and Table 38). Relative to current operating conditions, these changes to the ACLs are not expected to significantly change total small-mesh multispecies fishing effort because the silver hake limits are well above catches since the 1990s and due to constraints caused by restrictive regulations and limited marked demand. As a result, fishing behavior and effort in the whiting fishery is expected to remain similar to what has been observed in the fishery over the last 5 or more years. Specifically, the number of small mesh bottom trawls, tow times, and area fished are not expected change significantly from current operating conditions. As noted above, interactions risks with protected species are strongly associated with the amount of gear in the water, the time the gear is in the water (e.g., tow time), and the presence of protected species in the same area and time as the gear. Continuation of fishing behavior/effort that is similar to the “status quo” is not expected to change any of these operating conditions and therefore, the impacts of the No Action alternative on ESA listed species is expected to be low negative.

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 neutral to 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. This potential minor shift in small-mesh multispecies fishing effort from south to north could be mitigated by increases in effort caused by more restrictive groundfish and herring regulations.**

### 6.3.2 No Action (Section 4.1.2)

The No Action alternative maintains existing specifications authorized under Amendment 19 (NEFMC 2013) and the 2015-2017 specifications (NEFMC 2015b). 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 6.3.1).

Lower catch limits in the northern management area than proposed could lead to higher abundance and biomass of small-mesh multispecies than would otherwise occur. But due to a broad diet, No Action could have a very low positive to negligible indirect impact on marine mammals. Higher catch limits in the southern management area for No Action could increase the risk of overfishing and gradual depletion of the small-mesh multispecies populations. Due to the broad diet and low reliance of marine mammals on small gadid fish, No Action could therefore have a low negative to negligible impact on marine mammals in the southern management area. It is likely that most marine mammals would simply substitute prey items, particularly if herrings are not also in low abundance.

**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.** Higher southern area catch limits under No Action would allow small-mesh multispecies landings to increase there, rather than potentially shifting effort northward where observed protected species interactions in the small-mesh multispecies fishery are generally less prevalent. No Action is unlikely to change the expectation about shifts in fishing effort into the small-mesh multispecies fishery due to more restrictive groundfish and herring regulations.

## *6.4 Physical Environment and Essential Fish Habitat*

### 6.4.1 Updated specifications (Section 4.1.1; preferred)

**The proposed specifications (described in Section 4.1.1; preferred) would have a neutral 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 37) to an increase of 27% for northern red hake (Table 38). In recent years, northern silver and red hake catches (landings plus discards) have been below the total allowable landings under the preferred alternative specifications. Similarly, southern whiting catches have been below the proposed limits. However, recent southern red hake catches exceed the reduced catch limits proposed in the action. Thus, the proposed specifications could theoretically cause shifts in effort from south to north,

However, even if southern red hake proves constraining, 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. Restrictive regulations and limited market demand are the most important factors in determining that impacts to EFH will not change substantially as a result of new specifications.

If lower southern red hake catch limits do cause vessels to shift their effort into the northern management area, these vessels could end up fishing in exemption areas where raised footrope trawls are required. Raised footrope trawls may have lower habitat impacts than small mesh bottom trawls without the raised footrope. However, since most of the effort in the fishery (~75-85% over 2012-2014 Figure 17) has tended to occur in areas where raised footrope trawls are not required, these shifts are unlikely to have a major bearing on the magnitude of impacts to EFH in the fishery.

Although large scale changes in effort under the preferred alternative are unlikely, there have 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 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.).

However, these increases in effort in Small Mesh Area I are not expected to increase impacts of the fishery on EFH. Most of this fishing activity occurs within relatively sandy habitats that have patchy areas of more vulnerable hard bottom. In Small Mesh Area I, these hard bottom areas are well known and vessels targeting whiting try to avoid them to prevent net damage. Also, the fishery targets deeper, sandy/mud bottoms, since silver and red hake are associated with these habitat types (NMFS 1999 and NMFS 2004; also NEFMC 2016; Volume 2 and Appendix B). Furthermore, vessels fishing for whiting in Small Mesh Area I are required to use raised footrope trawls, further minimizing concerns about increases in habitat impacts associated with shifts in effort.

### 6.4.2 No Action (Section 4.1.2)

**No Action (described in Section 4.1.2)**, maintaining the existing specifications, is not expected to change fishing effort or behavior, although recent trends in effort in Small Mesh Area I are likely to continue. Therefore No Action **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.

## *6.5 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 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 39 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[18] 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 39) 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 39), 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 40). 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 41), 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

[18] 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.

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.

Recreational fishing is a very minor component of total catch in the NE region, although it can be an important component for some local recreational fishing. A few party, charter, and recreational boats target silver hake, but often it is caught incidentally while targeting other species, like cod, haddock, or black sea bass. Red hake are sometimes targeted while fishing for black sea bass, particularly in the NJ/NY area.

The proposed specifications are expected to reduce the risk of overfish in the south and maintain healthy stocks of small-mesh multispecies. The proposed specifications would tend to produce bigger and more numerous fish for the recreational fishery, thus it would have a low positive impact on recreational fishing.

**Taking the above factors into consideration, the proposed specifications are 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.

### 6.5.2 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.

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. Use 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.

No Action would have a higher risk of overfishing in the southern management area than the proposed specifications would have. Although the proposed specifications are higher in the northern management area than they are for No Action, the proposed specifications are still consistent with a healthy resource, producing MSY, and are not expected to harm or substantially affect recreational fishing. Thus No Action is expected to have a low negative impact on recreational fishing in the southern management area and a neutral to low positive impact in the northern management area.

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 39. 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)[19] | 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 |

[19] 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 40. 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 41. 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
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 5.1.5). 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 2020 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 42 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 42. 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 groundfish bycatch. | **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 groundfish bycatch. | **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 | **Indirect Positive** Any increase in observer coverage affords more information on protected species bycatch that can then be used to better inform protected species management decisions | **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. | **Direct Positive to Direct Negative** May shift effort into the small-mesh multispecies fishery, but shifts in fishing effort 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 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 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 11). 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 11). | **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 Designation of Northeast Canyons and Seamounts Marine National Monument (2016) | Closes to fishing the shelf-slope region from Oceanographer to Lydonia Canyons and an area surrounding four deep-sea seamounts (Map 11). | **Neutral** Small-mesh multispecies fishing trips occur in the Canyons portion and would be 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] Potential changes to Northeast Canyons and Seamounts Marine National Monument | Authority over fishing activity in the Monument could potentially be turned back over to the FMCs. | **Neutral** Fishing trips that were displaced 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 11) 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] Small Mesh Multispecies 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 | **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] Small Mesh Multispecies – Action to address overfished condition of southern red hake | A framework action or amendment to rebuild southern red hake, possibly including seasonal or area restrictions, selective fishing gear or other measures. | **Direct Positive or Indirect Negative**<br>Measures would be chosen to reduce catches of southern red hake. They may increase fishing effort on northern stocks. | **Direct Positive or Negative**<br>Measures to reduce bycatch of southern red hake are likely to limit bycatch of other stocks, but higher catches for some stocks may also occur. | **Potentially Indirect Positive or Negative**<br>Measures to reduce catches of southern red hake could reduce effort overall or shift fishing to areas with more vulnerable habitat. | **Potentially Indirect Positive or Negative**<br>Measures to reduce catches of southern red hake could reduce effort in the southern management area but could increase effort in other fisheries with higher levels of protected species interactions. | **Direct Negative**<br>Measures to reduce catches of southern red hake could be costly to fishermen or reduce the ability to fish for other species. |
| [RFF] Multispecies FMP Framework 57 | Specifies 2018 Georges Bank yellowtail flounder and prohibits possession of Atlantic halibut | **Neutral**<br>Unlikely to change effort and fishing mortality on target species | **Potentially Direct Positive**<br>Limits mortality on overfished stocks. | **Neutral**<br>Unlikely to change the amount or distribution of small-mesh fishing | **Neutral**<br>Unlikely to change the amount or distribution of small-mesh fishing | **Potentially Indirect Negative**<br>Measures to reduce mortality on bycatch species could increase fishing cost. |

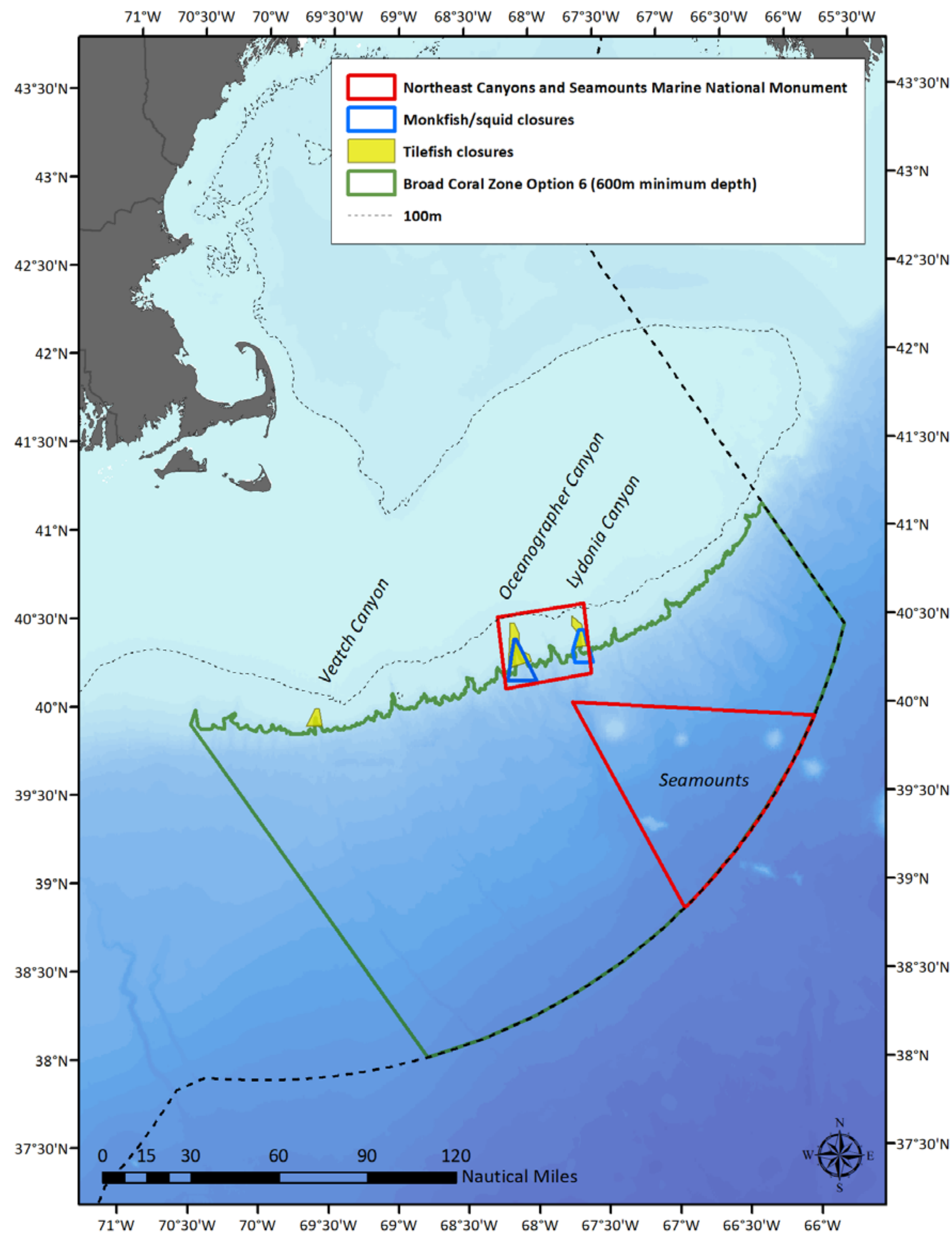
| Action | Description | Impacts on Red, Silver, and Offshore Hake Stocks | Impacts on Non-target Species and Bycatch | Impacts on the Physical Environment and EFH | Impacts on Protected Species | Impacts on Fishery-related Businesses and Communities |
|---|---|---|---|---|---|---|
| RFF Amendment 8 to the Atlantic Herring FMP. | Harvest control rule alternatives and measures to address potential for localized depletion of herring and conflicts between the herring fishery and other uses (predator fisheries and ecotourism).<br><br>Reducing herring ABCs and/or prohibiting the use of midwater trawl gear could increase fishing for herring and whiting using bottom trawls in small-mesh exemption areas. | **Neutral to Low Negative** Whiting and red hake catches by all gears are counted, but the measure could increase discards if the AMs trigger reduced whiting and red hake possession limits. More restrictive herring measures could cause effort shifts into the small-mesh multispecies fishery and higher catches whiting and red hake. | **Neutral to low negative** More fishing activity in exemption areas could increase bycatch, especially for species caught by bottom-tending trawls. Catches of non-target species could increase or decrease depending on whether non-target species catches are comparatively higher or lower in the herring and small-mesh multispecies fishery. | **Neutral to low negative** More fishing using bottom-tending trawls instead of purse seines or mid-water trawls could increase effects on bottom habitat. Whiting fishing generally occurs on less-vulnerable sand and muddy-sand bottom, so the changes in impacts on EFH are expected to be minor. | **Low negative to low positive** Amendment 8 could result in higher forage availability to some protected species (a low positive impact), but could also shift effort from herring mid-water trawls (Category II, NMFS 2018a) to small-mesh bottom trawls (Category II) in the small-mesh multispecies exemption areas (potentially a low negative impact). | **Negative to Low negative** If herring vessels are faced with large closures, they may shift effort to other fisheries such as whiting to capture some lost revenue. This could have negative impacts on price and current participants in the whiting fishery. |
| 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. |

| 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 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. | **Indirect Negative**<br>Squid effort in the summer (during Trimester 2) may be redirected to target southern whiting. | **Indirect Positive**<br>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**<br>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**<br>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**<br>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] NEFMC Deep-sea Coral Amendment | Considers closure of broad zones to bottom-tending gears to protect deep-sea corals and other species | **Neutral**<br>Analysis shows a very low impact on small-mesh multispecies fishing. | **Potentially Direct Negative**<br>Minor increase in bycatch. | **Direct Positive**<br>Coral zones (Map 11) will reduce or prevent future impacts to deep-sea corals and other vulnerable biogenic habitat types in the canyons, on the slope, and on the seamounts. | **Neutral**<br>Effects are uncertain. | **Neutral**<br>Analysis shows a very low impact on small-mesh multispecies fishing. |
| [P, Pr, RFF] Agricultural runoff | Nutrients applied to agricultural land are introduced into aquatic systems | **Indirect Negative**<br>Reduced habitat quality | **Indirect Negative**<br>Reduced habitat quality | **Direct Negative**<br>Reduced habitat quality | **Indirect Negative**<br>Reduced habitat quality | **Indirect Negative**<br>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**<br>Dependent on mitigation effects | **Uncertain – Likely Indirect Negative**<br>Dependent on mitigation effects | **Uncertain – Likely Direct Negative**<br>Dependent on mitigation effects | **Direct and Indirect Negative**<br>Potential interactions with protected species; reduced habitat quality/availability; dependent on mitigation efforts | **Uncertain – Likely Mixed**<br>Dependent on mitigation effects |

| 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 Beach nourishment | Offshore mining of sand for beaches; 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 | **Direct and Indirect Negative** Reduced habitat quality; dredge interactions; dependent on mitigation efforts | **Mixed** Positive for mining companies, possibly negative for fishing industry; Beachgoers like sand; positive for tourism |
| P, Pr, RFF Marine transportation including a potential major dredging project for Boston Harbor. | 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 | **Direct and Indirect Negative** Reduced habitat quality/availability; potential for interactions (ship strikes) with protected species | **Mixed** Positive for some interests, potential displacement for others |
| P, Pr, RFF Installation of pipelines, utility lines and cables, including the Atlantic Link cable bringing hydro-generated electricity from Canada into Plymouth, MA. | Transportation of oil, gas and electricity 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** Reduced habitat quality; 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 MA, RI, NY/NJ, DE, MD, 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 | **Direct and Indirect Negative** Reduced habitat quality; ship strikes; sound exposure (physical injury or behavioral harassment); dependent on mitigation efforts | **Uncertain – Likely Mixed** Dependent on mitigation effects |

Map 11. 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.

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

Results from the Northeast Fisheries Climate Vulnerability Assessment (Hare et al., 2016) indicate that climate change could have overall directional impacts on all VECs that range from negative to positive depending on the species, their climate vulnerability, potential for distribution change, and other factors. However, future mitigation and adaptation strategies to climate change may mitigate some of these impacts as more information becomes available to predict, evaluate, monitor, and categorize these changes.

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 fallen below the threshold and the stock has become overfished[20]. In response, the Council will initiate a management action 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% 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 also not be needed in the near future. 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

[20] In January 2018, NMFS notified the Council that southern red hake has become overfished based on the 2016 assessment update.

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 following section discusses the effects of these actions on each of the VECs. 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 42. 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 (Hare et al. 2016).

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

<table>
<tr><th>Action</th><th colspan="2">Past to the Present</th><th>Reasonably Foreseeable Future</th></tr>
<tr><td>Original FMP and subsequent Amendments and Frameworks to the FMP</td><td colspan="2">Direct Positive</td><td></td></tr>
<tr><td>Red, Silver, and Offshore Hakes Specifications</td><td colspan="2">Direct Positive</td><td></td></tr>
<tr><td>Developed, Apply, and Redo Standardized Bycatch Reporting Methodology</td><td colspan="3">Indirect Neutral</td></tr>
<tr><td>Amendment to address ACLs/AMs implemented</td><td colspan="3">Direct Positive</td></tr>
<tr><td>Agricultural runoff</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Port maintenance</td><td colspan="3">Uncertain – Likely Indirect Negative</td></tr>
<tr><td>Offshore disposal of dredged materials</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Beach nourishment</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Marine transportation</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Installation of pipelines, utility lines and cables</td><td colspan="3">Uncertain – Likely Indirect Negative</td></tr>
<tr><td>National Offshore Aquaculture Act of 2007</td><td colspan="3">Potentially Indirect Negative</td></tr>
<tr><td>Offshore Wind Energy Facilities (within 3 years)</td><td></td><td></td><td>Uncertain – Likely Indirect Negative</td></tr>
<tr><td>Liquefied Natural Gas (LNG) terminals (within 3 years)</td><td></td><td colspan="2">Uncertain – Likely Indirect Negative</td></tr>
<tr><td>Convening Gear Take Reduction Teams (within 3 years)</td><td></td><td></td><td>Indirect Positive</td></tr>
<tr><td>Summary of past, present, and future actions excluding those proposed in this specifications document</td><td colspan="3">Overall, actions have had, or will have, positive impacts on red, silver, and offshore hakes stocks</td></tr>
</table>

### 6.6.5.2 Non-target species

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 42. 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 44, 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 44. Summary of the effects of past, present, and reasonably foreseeable future actions on the non-target species.

| 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 | **Indirect Negative** | |
| Marine transportation | **Indirect Negative** | |
| Installation of pipelines, utility lines and cables | **Uncertain – Likely 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** |
| **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 42. 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 45, 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 45. 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 | **Direct Negative** | | |
| Marine transportation | **Direct Negative** | | |
| Installation of pipelines, utility lines and cables | **Uncertain – Likely 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** |
| **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 42. 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 ALWTRP and the development of strategies for sea turtle conservation described in Table 42, 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 46).

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 (http://www.nmfs.noaa.gov/pr/species/mammals/whales/north-atlantic-right-whale.html). 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.

Climate-induced environmental changes [warming water temperatures, increased precipitation and/or drought, decreasing pH, changes in stream flow or salinity, changes in seasonal distribution of spawners, prey mismatch, and/or increases in nutrient and toxic chemical concentrations (Murdoch et al. 2000)] have the potential to reduce the amount and quality of habitat for early life stages of Atlantic sturgeon and Atlantic salmon. Past, present, and future effects caused by agriculture, industrialization, urbanization, and the potential adaptations of human activity to respond to climate change through water extraction and power use could add to these stresses. Friedland (1998) found that juvenile salmon growth and habitat were affected by temperature regimes and flow conditions that are likely to be influenced by climate change. Adult sturgeon and salmon usually feed in estuarine and coastal marine habitats, consuming a variety of small crustaceans and small fish, which in turn rely on a diet including zooplankton. Crustaceans and zooplankton form their shells and skeletons from carbonate availability which is reduced by ocean acidification (Wood et. al. 2008). Spawning and rearing habitat could also be affected and restricted by the anticipated climate change effects, reducing productivity or survivability of Atlantic salmon and Atlantic sturgeon distinct population segments.

For additional information on potential climate change effects to Atlantic sturgeon and Atlantic salmon, please refer to the Endangered Species Act Section 7 Consultation for the Tappan Zee Bridge Replacement (NMFS 2017c). and the Worumbo Project (NMFS 2017d), respectively.

Table 46. 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 | **Neutral** | |
| Developed, Apply, and Redo Standardized Bycatch Reporting Methodology | **Indirect positive** | |
| Amendment to address ACLs/AMs implemented | **Potentially Indirect Positive** | |
| Agricultural runoff | **Indirect Negative** | |
| Port maintenance | **Direct and Indirect Negative** | |
| Offshore disposal of dredged materials | **Indirect Negative** | |
| Beach nourishment | **Direct and Indirect Negative** | |
| Marine transportation | **Direct and Indirect Negative** | |
| Installation of pipelines, utility lines and cables | **Potentially Direct Negative** | |
| Offshore Wind Energy Facilities (within 3 years) | | **Uncertain – Likely Indirect Negative** |
| Liquefied Natural Gas (LNG) terminals (within 3 years) | **Direct and Indirect Negative** | |
| Convening Gear Take Reduction Teams (within 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 42. 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 47, 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 47. 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** | | |
| 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** |
| **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 48).

Table 48. Magnitude and significance of the cumulative effects2015-2017 preferred alternatives, as well as past, present, and future actions., 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** |
| **Protected Resources** | Complex and variable (Section 6.3) | Indirect positive (Section6.6.5.4) | Neutral (Sections 6.3) | **None** |
| **Physical Environment and EFH** | Complex and variable (Section 6.4) | Indirect positive (Section6.6.5.3) | Low negative (Sections 6.3) | **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** |

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# 7.0 RELATIONSHIP TO APPLICABLE LAWS

## 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.

The data used for the assessment update are derived from a spring and fall bottom trawl survey conducted annually since 1967 (1963 for the fall survey) using standardized and peer reviewed methods. The fall survey abundance and biomass indicies were updated through the fall of 2016 and the spring of 2017. Catch data were updated through the end of calendar year 2016. Specifications are set for a fishing year that begins annually on May 1. State landings and bycatch (i.e. discards) are an important component of the specification procedure. Landings and catch data were updated through April 30, 2017.

The assessment update is carried out by experts in population dynamics, reviewed by other scientists at the NEFSC, and presented to the Council's Whiting Plan Development Team. The assessment and the PDT's recommendations for catch specifications are also presented to the Council's Scientific and Statistical Committee, a committee of experts in fishery management and science, who approve the final recommendations.

### 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[21]. 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;*

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

[21] 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.

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)

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

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

The proposed action establishes catch and landing limits in 2018 to 2020 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 and 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.

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.

Although the proposed measures include increased catch and landings limits for the northern management area, fishing effort is not expected to change substantially due to socioeconomic factors that have limited small-mesh multispecies landings in recent years.

Overall, revenues from small-mesh multispecies landings are expected to increase in the northern management area and decrease in the south, balancing out. The proposed action is not expected to result in increased interactions between fishing gear and protected species (Section 6.3) or between fishing gear and physical habitat (Section 6.4). The impacts of this action on all VECs are expected to be similar to the status quo measures, which do not currently have significant impacts on the VECs and are fully described in Section 6.0.

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

The propose action does not alter the way that 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.

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

Historic or cultural resources such as shipwrecks may be present in the area where the small-mesh multispecies fishery is prosecuted. 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. The exemption areas where the fleet fishes for small-mesh multispecies do not overlap the Stellwagen Bank National Marine Sanctuary and limited fishing had occurred in the newly formed Northeast Canyons and Seamounts Marine National Monument (which now prohibits commercial fishing with trawls and many other gears). Therefore, it is unlikely that the proposed action would result in substantial impacts to unique areas.

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

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.

*5) Are the proposed action's 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 effects of fishing are well studied and the impacts to managed species, non-target species, and protected resources will continue to be monitored by the NMFS and by the Council, who are responsible for managing a sustainable fishery and minimizing adverse impacts to the extent practicable. 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.

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

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. Specifications are routine adjustments and the adjustments undertaken herein are similar to those taken in the past. None of these specifications results in significant effects, nor do they represent a decision in principle about a future consideration. The impact of any future changes will be analyzed as to their significance in the process of developing and implementing them.

*7) Is the proposed action related to other actions that when considered together will have 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.

8) *Can the proposed action reasonably be expected to adversely affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources?*

The impacts of the proposed action on the human environment are described in Section 6.0. The proposed action is not expected to alter fishing practices. Although there are shipwrecks present in the area where fishing occurs, including some registered on the National Register of Historic Places, vessels using small-mesh trawls typically avoid fishing too close to wrecks due to possible loss or entanglement of fishing gear. Therefore, it is not likely that the proposed action would adversely affect the historic resources listed above.

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

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 6.3).

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."

As described in Section 6.3, the proposed action is not likely to adversely affect any critical habitat. The small-mesh multispecies fishery will not affect the essential physical and biological features of North Atlantic right whale or loggerhead (Northwest Atlantic DPS) critical habitat and, and therefore, will not result in the destruction or adverse modification of critical habitat (NMFS 2013; NMFS 2014a; NMFS 2015a,b).

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

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 7.9).

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

The proposed action is not expected to alter fishing methods or activities. The proposed action is not expected to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. Therefore, this action is not expected to adversely affect MMPA protected species (Section 6.3).

Vessels that target whiting and red hake stocks use almost exclusively small-mesh trawls to do so. Observed interactions with marine mammals (see Section ) have been relatively low and mainly with common dolphin, rather than rarer whales and other marine mammals. There is a low amount of recreational fishing that occurs, primarily with hook and line gear that have few interactions with marine mammals. For the reasons described in Section 6.3, status quo levels of fishing effort are expected to result in moderate negative to slight positive impacts for non-ESA listed marine mammals, depending on the species in question, and moderate negative impacts for ESA-listed marine mammals.

As described in Section 5.2, some marine mammal stocks/species are experiencing levels of interactions that have resulted in exceedance of their PBR levels. These stocks/populations are not at an optimum sustainable level and therefore, the continued existence of these stocks/species is at risk. As a result, any potential for an interaction is a detriment to the species/stocks ability to recover from this condition. As interactions with non-ESA listed marine mammals are possible under the proposed action, for these species/stocks, it could result in moderate some impacts to these non-listed marine mammal stocks/species.

Alternatively, there are also many non-ESA listed marine mammals that, even with continued fishery interactions, are maintaining an optimum sustainable level (i.e., PBR levels have not been exceeded) over the last several years. For these stocks/species, it appears that the fishery management measures that have been in place over this timeframe have resulted in levels of effort that equate to interaction levels that are not expected to impair the stocks/species ability to remain at an optimum sustainable level. These fishery management measures, therefore, have resulted in indirect slight positive impacts to these non-ESA listed marine mammal species/stocks. Should future fishery management actions maintain similar operating condition as they have over the past several years, it is expected that these slight positive impacts would remain. Thus, given that the proposed action is not expected to significantly change fishing effort relative to the status quo, the impacts on these non-ESA listed species of marine mammals are expected to be slight positive (i.e., continuation of current operating conditions is not expected to result in exceedance of any of these stocks/species PBR level).

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

The impacts of this action on managed fish species, including target and non-target species, are described in Sections 6.1 and 6.2. Responding to changes in stock biomass and discard rates, the proposed action is expected to increase yield in the northern management area where biomass has been increasing and substantially reduce the risk of overfishing of whiting and red hake in the southern management area. The most common bycatch on small-mesh multispecies trips (defined as trips landings at least 2000 lbs. whiting or 400 lbs. red hake) are haddock, spiny dogfish, and red hake in the northern management area and red hake, butterfish, and haddock in the southern management area. Haddock discards have increased recently due to exceptionally abundance of small haddock. Spiny dogfish is not currently overfished and the stock is not experiencing overfishing. Abundance and biomass of red hake (red hake are often caught incidentally while fishing for silver hake and other species, but is sometimes targeted for marketing as bait) has been increasing and is above $B_{msy}$ proxy levels. Red hake in the southern management area is often discarded by vessels using small-mesh trawls to target whiting and squid. As described in Section 6.1, given recent trends in landings in the commercial and the expectation that other management measures will remain unchanged, effort is not expected to increase substantially from current (2016) levels. The proposed action is not expected to have any significant adverse impacts on managed fish species.

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

The small-mesh multispecies fishery is conducted with bottom trawls (Section 5.1.4). The small-mesh exemption areas in the Gulf of Maine require the use of a raised footrope, which not only reduces the catch of flatfish (flounders, skates, monkfish), but it is also believed to have less impact on benthic organisms and substrates. Furthermore, vessels are targeting whiting and red hake, which are usually concentrated on sandy or sand/mud bottoms which are thought to be less vulnerable to fishing impacts. Nonetheless, bottom otter trawls can adversely impact bottom habitat and EFH.

The prosed action includes increased commercial catch limits in the northern management area compared to the status quo alternative; therefore, it has the potential to result in increased fishing effort and increased damage to physical habitat, including EFH, as it could lead to an increase in the amount of interactions between trawl gear and habitat. However, due to market constraints and stable levels of demand for whiting and red hake, the proposed action may not result in an increase in fishing effort or have more than marginal affects on the ocean, coastal habitats, and or EFH (see Section 6.4).

The commercial small-mesh multispecies fishery has been under-harvesting their catch allocations since 2012 (with the exception of northern red hake in some years) and this pattern is expected to continue into the near future under the proposed action. In the southern management area, the catch specifications would be considerably lower than the status quo, but decreases in fishing effort are generally not expected because the whiting limits are not constraining if catches and effort remain stable. The proposed red hake catch limits are somewhat less than 2016 levels but the limit (and potential in-season accountability measure) may not affect fishing much because red hake are not generally targeted and mostly discarded.

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

The proposed action is not expected to have significant impacts on the natural or physical environment, including vulnerable marine or coastal ecosystems. The proposed action is not expected to alter fishing methods or activities or to substantially increase fishing effort or the spatial and/or temporal distribution of current fishing effort. The main target stock, whiting, is most abundant over sand or sandy mud bottoms. Furthermore, the small-mesh exemption areas in the Gulf of Maine require the use of a raised footrope, which not only reduces the catch of flatfish (flounders, skates, monkfish), but it is also believed to have less impact on benthic organisms and substrates. For these reasons, the proposed action is not expected to adversely affect vulnerable marine or coastal ecosystems.

While some small-mesh multispecies fishing takes place near the continental slope/shelf break where deep sea corals may be found in and around the submarine canyons, much of this area in the Mid-Atlantic is now protected by a prohibition on bottom-tending gear in the Frank R. Lautenberg Deep Sea Coral Protection Area (81 FR 90246; December 14, 2016). The proposed action in this document is not expected to alter small-mesh multispecies fishing patterns relative to this protected area or in any other manner that would lead to adverse impacts on deep sea coral or other vulnerable marine or coastal ecosystems.

*15) 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.

The role of whiting and red hake in the ecosystem, serving as both an important prey item for larger fish and other species, and in the case of whiting, as an important predator on other species and small whiting. These effects are described in Section 5.1.3 and evaluated in Sections 6.1 and 6.2. Continued overfishing and further depletion of southern red hake might occur with No Action, but the ecosystem effects are expected to be minor because red hake are not a key species in the near coastal food web. Nonetheless the lower risk of overfishing of southern whiting and red hake could have a minor, but positive effect on the ecosystem. In the northern management area, both silver and red hakes biomass is above sustainable targets and the proposed higher catch limits is not expected to have a negative effect on biodiversity or ecosystem function.

*16) 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.

**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.

________________________________________ __________________
Michael Pentony
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 6.3.

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

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

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

## 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 11.0) 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](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 Impact Review*

### 7.9.1 Background

In compliance with Executive Order (E.O.) 12866, NMFS requires the preparation of a Regulatory Impact Review (RIR) for all regulatory actions or for significant policy changes that are of public interest. E.O. 12866 was signed on September 30, 1993, and established guidelines for Federal agencies promulgating new regulations and reviewing existing regulations.

An RIR is a required component of the process of preparing and reviewing fishery management plans (FMPs) or amendments and provides a comprehensive review of the economic impacts associated with the proposed regulatory action. An RIR addresses many of the concerns posed by the regulatory philosophy and principles of E.O. 12866. An RIR also serves as the basis for assessing whether or not any proposed regulation is a "significant regulatory action" under criteria specified in E.O. 12866. According to the "Guidelines for Economic Analyses of Fishery Management Actions," published by NMFS in August 2000, an RIR must include the following elements: (1) A description of the management objectives of the regulatory action; (2) a description of the fishery affected by the regulatory action; (3) a statement of the problem the regulatory action is intended to address; (4) a description of each selected alternative, including the "no action" alternative; and (5) an economic analysis of the expected effects of each selected alternative relative to the baseline.

### 7.9.2 Statement of the Problem and Management Objectives of the Regulatory Action

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 (NEFMC 2013) 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.

The problem being addressed is to adjust annual catch limits and specifications to account for changes in stock biomass and discarding rates. This is explained in more detail in Section 3.1 – Purpose and need of action.

### 7.9.3 Description of the Affected Fishery

See Section 5.4 - Human Environment (Description of the Fishery) and Section 7.9.7- Directly regulated small-mesh multispecies fishing entities.

### 7.9.4 Description of the Management Measure Alternatives

See Section 4.0 for a complete description of the proposed management measures and the alternatives that were considered by NMFS for this Amendment.

### 7.9.5 Expected Economic Effects of the Proposed Action

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. As described in Section 6.5, the proposed minor change should lead to low positive impacts to stakeholders, specifically people who fish for small-mesh multispecies and any businesses that support that activity. There should not be substantial distributional issues, and low positive 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 2018-2020 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.

### 7.9.6 Executive Order 12866 (Regulatory Planning and Review)

<u>Introduction</u>

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.

A regulatory program is “economically significant” if it is likely to result in the effects described above. The RIR is designed to provide information to determine whether the proposed regulation is likely to be “economically significant.”

Section 6.0 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.

Determination of Executive Order 12866 significance

The proposed specifications 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. 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 is 5,990 mt, with an estimated value of $8.6 million (Table 39), 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. Not accounting for a small potential for increases in effort and landings of northern silver hake, the expected change in revenue from red hake compared to 2016 is a minor reduction of $13,000. Increases in northern silver hake landings could potentially total $8.6 million, but due to the factors mentioned earlier, such a large increase is highly unlikely. With the updated specifications, landings of small-mesh multispecies could increase somewhat from more trips targeting northern silver hake, but a small decrease in landings is expected from a southern red hake in-season accountability measure. A more complete economic analysis of the expected effects is given in Section 6.5.1.

Nevertheless, the specification will not be “significant” since they will not have an annual effect on the economy of $100 million or more whether beneficially or adversely.

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.

### 7.9.7 Initial Regulatory Flexibility Act (IRFA)

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;
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**

Effective from July 1 2016 (80 FR 81194)[22] , NMFS' small business size standard for businesses, including their affiliates, whose primary industry is commercial fishing is $11 million in annual gross

[22] https://www.federalregister.gov/documents/2015/12/29/2015-32564/establish-a-single-small-business-size-standard-for-commercial-fishing-businesses

receipts. This standard applies to all businesses classified under North American Industry Classification System (NAICS) code 11411 for commercial fishing, including all businesses classified as commercial finfish fishing (NAICS 114111), commercial shellfish fishing (NAICS 114112), and other commercial marine fishing (NAICS 114119) businesses.

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 2014-2016 permits and contains gross sales associated with those permits for calendar years 2014 through 2016. The determination as to whether the entity is large or small is based on the average revenue from 2014 through 2016 with the benchmark threshold value of $11 million in sales revenue from commercial fisheries (80 FR 81194). Although not a requirement, but ownership entities are further categorized as finfish or shellfish based on which activity generated the greatest gross revenue (50% or more) during 2014 to 2016.

**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 (i.e., permit type A, C-F, K) 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 2014-2016 and so are considered to be small.

There were 853 distinct ownership entities based on business entities' participation during 2014-2016 permits that could potentially target small-mesh multispecies. Of these, 844 are small business entities and 9 are large per the SBA guidelines in support of NMFS' regulatory actions for commercial fishing businesses (see tables below).

Table 49. Description of directly regulated small-mesh multispecies fishing entities by business type and size (2014-2016)[23]

| Business Type | Major revenue source | No. of Entities | No. of Small Entities |
|---|---|---|---|
| Fishing | ▪ Finfish | 345 | 345 |
| | ▪ Shellfish | 442 | 433 |
| | *Sub-total* | *787* | *778* |
| For-hire | | 43 | 43 |
| Not classified (no revenue) | | 23 | 23 |
| | **Total** | **853** | **844** |

Table 50. Description of directly regulated (A, C, D, E, F, K permit holders) small-mesh multispecies fishing entities by gross sales (2014-2016 averages)[24].

| Business Class | Major revenue source | Sales category (US$ mil) | Mean gross sales | No. of entities | Mean permits per entity |
|---|---|---|---|---|---|
| Small | Finfish | <0.05 m | $13,860 | 100 | 10 |
| | | 0.05-0.1 m | $77,707 | 35 | 12 |
| | | 0.1-0.5 m | $259,590 | 126 | 13 |
| | | 0.5-1 m | $752,349 | 43 | 15 |
| | | 1-5.5 m | $2,035,051 | 41 | 14 |
| | | *Mean or Total (small finfish)* | ***$442,325*** | ***345*** | ***13*** |
| Small | Shellfish | <0.05 m | $23,165 | 53 | 9 |
| | | 0.05-0.1 m | $76,243 | 34 | 10 |
| | | 0.1-0.5 m | $233,526 | 167 | 10 |
| | | 0.5-1 m | $744,756 | 60 | 14 |
| | | 1-5.5 m | $1,903,899 | 109 | 15 |
| | | 5.5-11 m | $7,111,561 | 10 | 16 |
| | | *Mean or Total (small shellfish)* | ***$845,600*** | ***433*** | ***12*** |
| | | *Mean or Total (small business)* | ***$666,770*** | ***778*** | ***12*** |
| Large | Shellfish | >20.5 m | $22,820,573 | 3 | 16 |
| | | 11-20.5 m | $17,753,241 | 6 | 15 |
| | | *Mean or Total (large shellfish)* | ***$19,442,352*** | ***9*** | ***15*** |
| All Business | Fishing | *Mean or Total (All business)* | ***$881,484*** | ***787*** | ***12*** |

[23] Data filters (Permits (A, C, D, E, F, K) =1); All numbers are distinct counts of business entities that were in operation during 2014-16.
[24] Data Filters (Fishing=1; Permits (A, C, D, E, F, K) =1)

**Directly regulated, active small-mesh multispecies fishing entities impacted**

While 853 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 during 2014-16 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 407 potentially impacted, directly regulated commercial entities, 405 (99.5%) of which are classified as small entities. Only couple of large entities had very negligible value of revenues (i.e., about 0.5 percent) from incidental landings of small-mesh multispecies in recent years.

Table 51. Description of potentially impacted, directly regulated active small-mesh multispecies fishing, by business type and size (2014-2016).

| Business Type | Major revenue source | No. of entities | No. of small entities |
|---|---|---|---|
| Fishing | ▪ Finfish | 282 | 282 |
| | ▪ Shellfish | 124 | 122 |
| | ***Sub-total*** | ***406*** | ***404*** |
| For-hire | | 1 | 1 |
| **All** | | ***407*** | ***405*** |

Note: Data Filters (Revenues from small-mesh multispecies ≠ 0). All numbers are distinct counts of business entities.

Table 52. Description of directly impacted (with SMS landing >0 lbs.) small-mesh multispecies fishing entities by gross sales (2014-2016 averages)[25].

| Business Size | Major revenue source | Sales category (US$ mil) | Mean gross sales | No. of entities | Mean permits per entity |
|---|---|---|---|---|---|
| Small | Finfish | <0.05 m | $18,000 | 68 | 3 |
| | | 0.05-0.1 m | $75,405 | 43 | 7 |
| | | 0.1-0.5 m | $260,062 | 108 | 11 |
| | | 0.5-1 m | $736,627 | 31 | 13 |
| | | 1-5.5 m | $2,024,492 | 32 | 14 |
| | | *Mean & sub-total* | ***$426,143*** | ***282*** | ***9*** |
| | Shellfish | <0.05 m | $22,993 | 23 | 3 |
| | | 0.05-0.1 m | $72,238 | 15 | 3 |
| | | 0.1-0.5 m | $210,648 | 36 | 8 |
| | | 0.5-1 m | $704,909 | 23 | 15 |
| | | 1-5.5 m | $2,110,716 | 23 | 16 |
| | | 5.5-11 m | $7,306,913 | 2 | 15 |
| | | *Mean & sub-total* | ***$725,975*** | ***122*** | ***9*** |
| | | *Mean & sub-total (small)* | ***$516,686*** | ***404*** | ***9*** |
| Large | Shellfish | 11-20.5 m | $19,254,773 | 2 | 15 |
| | | *Mean & sub-total* | ***$19,254,773*** | ***2*** | ***15*** |
| All Business | Fishing | *Mean or total (all business)* | ***$608,992*** | ***406*** | ***9*** |

Table 53. Total number of potentially impacted, directly regulated entities landing small-mesh multispecies by business class (2014-2016)[26].

| Business size | Year | Whiting Value | Red Hake Value | No. of Entities |
|---|---|---|---|---|
| **Large** | 2014 | $3,553 | $16 | 2 |
| | 2015 | $39,925 | $0 | 2 |
| | 2016 | $54,113 | $463 | 2 |
| | | | ***2014-16 (large)*** | ***2*** |
| **Small** | 2014 | $11,389,148 | $557,637 | 314 |
| | 2015 | $10,419,860 | $499,264 | 300 |
| | 2016 | $10,596,071 | $515,185 | 309 |
| | | | ***2014-16 (small)*** | ***404*** |
| **All Business** | | | ***2014-16 (All business)*** | ***406*** |

[25] Data Filters (Fishing=1; Revenues from small-mesh multispecies ≠ 0). All numbers are distinct counts of business entities.
[26] Data Filters (Fishing=1; Revenues from small-mesh multispecies ≠ 0). All numbers are distinct counts of business entities.

**<u>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</u>**

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

**<u>Identification of all relevant Federal rules, which may duplicate, overlap or conflict with the proposed rule</u>**

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

**<u>Significance of economic impacts on small entities</u>**

### 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.

**<u>Description of impacts on small entities</u>**

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, 404 of 406 (787) of directly regulated commercial fishing 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 TALs and in-season accountability measures. All commercial entities harvesting red hake in both the northern and southern 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 whether southern or northern red hake. The same holds true for whiting. There are only two large commercial fishing entities that had incidental landing of red hake, but the value of landing was none to less than $500 during 2014-2016. A reduction in red hake or whiting possession limit in the southern management area will not have a disproportional impact on profitability of small entities since nearly all affected entities are small.

<u>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</u>. 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.

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

Table 54. 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% |

# 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 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).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** – 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, winter flounder, witch flounder, American plaice, 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, winter flounder, witch flounder, American plaice, 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  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.  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 EFH designations, biomass data, and some of the effort data have been classified or grouped for analysis.

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

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

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