UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
PROGRAM PLANNING AND INTEGRATION
Silver Spring, Maryland 20910

MAR 5 2012

To All Interested Government Agencies and Public Groups:

Under the National Environmental Policy Act, an environmental review has been performed on the following action.

TITLE: Secretarial Amendment to Establish Annual Catch Limits and Accountability Measures for the Small-Mesh Multispecies Fishery

LOCATION: Exclusive Economic Zone off the East Coast of the U.S.

SUMMARY: NMFS issues a Secretarial Amendment for the small-mesh multispecies fishery. The intent of this amendment is to implement annual catch limits and accountability measures for the small-mesh multispecies fishery. The amendment is not anticipated to result in any significant impacts on target and non-target fishery resources, protected resources, habitat, or affected human communities.

RESPONSIBLE
OFFICIAL: Daniel S. Morris
Acting Regional Administrator, Northeast Region
National Marine Fisheries Service, National Oceanic and Atmospheric Administration (NOAA)
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The environmental review process led us to conclude that this action will not have a significant impact on the environment. Therefore, an environmental impact statement was not prepared. A copy of the finding of no significant impact (FONSI), including the environmental assessment, is enclosed for your information.

Although NOAA is not soliciting comments on this completed EA/FONSI, we will consider any comments submitted that would assist us in preparing future NEPA documents. Please submit any written comments to the Responsible Official named above.

Sincerely,

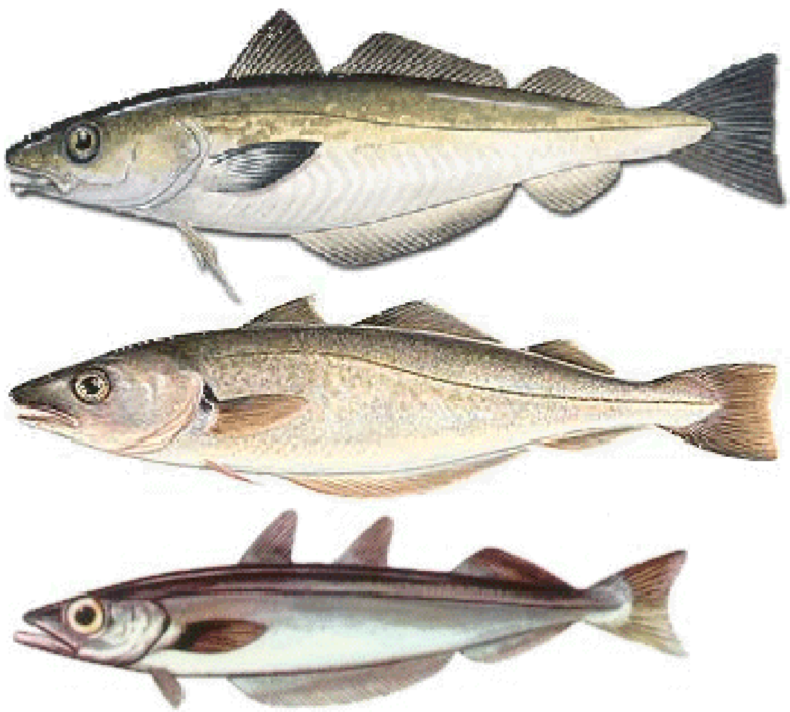
Patricia A. Montanio
NEPA Coordinator

Enclosure

Secretarial Amendment to Establish Annual Catch Limits and Accountability Measures for the Small-Mesh Multispecies Fishery

Environmental Assessment

Including a Regulatory Impact Review



Prepared by NOAA, National Marine Fisheries Service
55 Great Republic Drive
Gloucester, Massachusetts
February 29, 2012

Executive Summary

NOAA's National Marine Fisheries Service (NMFS) has prepared a Secretarial Amendment, under the authority of Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) section 304(c)1)(A), for the small-mesh multispecies component of the Northeast Multispecies Fishery Management Plan (FMP). The Secretarial Amendment is intended to establish a mechanism for specifying annual catch limits (ACLs) and accountability measures (AMs) for silver hake, red hake, and offshore hake, collectively known as "small-mesh multispecies." There are two stocks each of silver and red hake (northern and southern), and one stock of offshore hake. Offshore hake are primarily caught incidentally in the southern silver hake fishery and they are marketed together as "whiting."

The New England Fishery Management Council (Council) is responsible for managing the small-mesh multispecies fishery through the Northeast Multispecies FMP and initiated the development of an amendment in 2009 (Amendment 19) to that management plan to implement ACLs and AMs for the small-mesh multispecies. However, development of Amendment 19 was delayed in order to incorporate the results from a stock assessment of all three species that occurred in November 2010 (Stock Assessment Workshop (SAW) 51.) The Magnuson-Stevens Act requires the establishment of the ACL and AM framework by 2011. NMFS is developing this action to meet that deadline and bring the small-mesh multispecies fishery into compliance with the Magnuson-Stevens Act. While the Secretarial Amendment does not have an expiration date, and would be in effect until Amendment 19, if approved, replaces it, NMFS intends for this amendment to act as a bridge for the small-mesh multispecies fishery and does not address the full suite of measures that the Council is developing for Amendment 19. In order to minimize confusion and ease the transition between the two amendments, NMFS chose as the preferred alternatives the most general and flexible from the Council's preliminary list of alternatives for Amendment 19. The Secretarial Amendment also proposes the same ACL framework mechanism that the Council is analyzing for Amendment 19, which is based on recommendations from the Council's Scientific and Statistical Committee (SCC).

Proposed Measures

NMFS is proposing the following measures for the ACL and AM framework and other management measures necessary to effectively implement that framework.

1. Overfishing limit (OFL) and acceptable biological catch (ABC) control rules (**Section 3.1**)

The OFL control rules are based on recommendations from the November 2010 stock assessment (SAW 51). The ABC control rules are based on the OFLs and take into account the amount of scientific uncertainty in the OFL estimates. The ABCs are based on the probability distribution of the OFL calculation, and the Council's SSC has made recommendations on the appropriate percentile from this distribution to use as the ABC. An OFL calculation for offshore hake was not possible given the limited survey and fishery-dependent data. In order to account for offshore hake catches, the Stock Assessment Review Committee (SARC) and the SSC both recommended incorporating an estimate of offshore hake catch into the southern silver hake catch limits. As such, the southern silver hake ABC is increased by 4 percent, which is the average estimated amount of offshore hake in a typical "whiting" trip. This combined ABC is referred to as the "Southern Whiting" ABC, as is the corresponding ACL and total allowable landing (TAL) limit. The SSC has recommended the 40th percentile of the OFL distribution for red hake, and the 25th percentile for silver hake or silver and offshore hake combined.

Table 1 Proposed OFLs and ABCs for Small-Mesh Multispecies

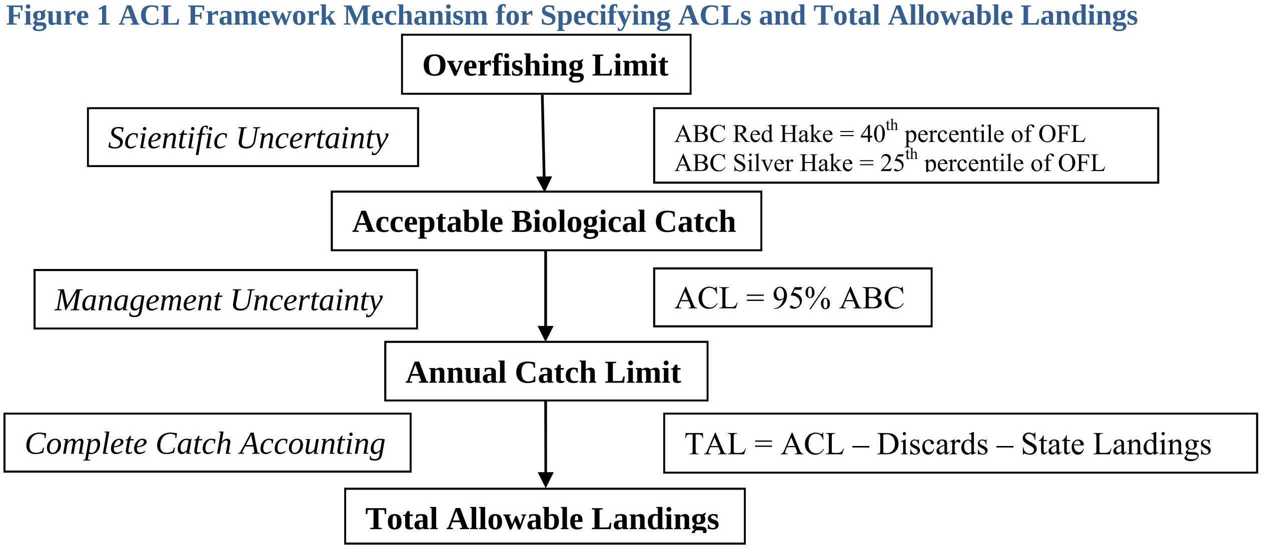
	Northern Red Hake	Northern Silver Hake	Southern Red Hake	Southern Whiting
OFL	314 mt	24,840 mt	3,448 mt	62,301 mt
ABC	280 mt	13,177 mt	3,259 mt	33,940 mt*

*Southern Whiting ABC = Silver Hake 25th percentile of OFL (32,635 mt) + 4% (1,305 mt) to account for Offshore Hake

2. Stock area annual catch limits and total allowable landings (TALs) limits (**Section 3.2**)

A stock area ACL framework (Figure 1), with corresponding TALs, is proposed for the small-mesh multispecies fishery. This framework builds on the OFL and ABC control rules and is also based on preliminary decisions that the Council has made for Amendment 19. The Council has recommended a 5-percent buffer between the ABC and its corresponding ACL to account for management uncertainty. In order to get from the ACL to the TAL, the Council has recommended using a three-year moving average estimate of discards and a 3-percent allowance for state landings.

Figure 1 ACL Framework Mechanism for Specifying ACLs and Total Allowable Landings



Using the OFLs and ABCs described in Table 1, the ACLs and TALs are proposed as follows:

Table 2 Proposed ACLs and TALs for Small-Mesh Multispecies

	Northern Red Hake	Northern Silver Hake	Southern Red Hake	Southern Whiting
ACL	266 mt	12,518 mt	3,096 mt	32,295 mt
Federal TAL[1]	90.3 mt	8,973 mt	1,336 mt	27,255 mt

3. A combination of reactive and proactive accountability measures (**Section 3.3**)

    a. A reactive pound-for-pound payback of any ACL overage

In order to ensure accountability for the above described catch limits, a reactive AM is proposed. This measure would deduct from a subsequent year the exact amount of pounds by which an ACL was exceeded. A pound-for-pound payback of any ACL overage would work in conjunction with the proposed in-season AM to provide incentive for vessel owners not to exceed the ACL as well as sufficiently protect the stocks from the harm excessive fishing can cause.

    b. A proactive reduction to an incidental trip limit when 90 percent of a TAL is projected to be harvested

The in-season AM that is proposed for the Secretarial Amendment is a reduction in the possession limit to an incidental limit when a "trigger" point is projected to be harvested. The Council's Small-Mesh Multispecies Oversight Committee has recommended a range of incidental limits for inclusion in Amendment 19, and has also recommended that the trigger for all four TALs be 90 percent. NMFS also analyzed the current level of incidental (i.e., minimal or below the trip limit) landings of northern red hake, as reported in the vessel trip report database. Northern red hake was used as it is the only TAL for which the trigger is expected to be reached in the near future. Using this data, NMFS selected the following incidental possession limits:

Table 3 Proposed Incidental Possession Limits

	Trigger	Incidental Possession Limit
Red Hake	90%	400 lb
Silver Hake	90%	1,000 lb

Summary of the Impacts of the Proposed Measures

As detailed in Section 5.0, Environmental Consequences, the impact of the proposed action is, in nearly all cases, expected to have a neutral or positive impact on the human environment. The only exceptions are those potentially negative economic impacts if the reactive accountability measure is triggered. These adverse impacts, however, are not likely to be substantial.

[1] Between the publication and public notice of the Draft Secretarial Amendment, the New England Fishery Management Council's Small-Mesh Multispecies Plan Development Team discovered that they had made a calculation error in the discard rates used until that point. Because NMFS intends to maintain consistency with the Council's Amendment 19 measures, those corrections are included here and further described in Section 3.2 of this document.

The adoption of ACLs, TALs, and AMs will contribute to ensuring that overfishing of small-mesh multispecies does not occur, and if it does, future overfishing will be prevented. These controls will not only have a positive effect on the small-mesh multispecies resources, but may also have a long-term positive effect on non-target species, protected species, habitat, and communities as a result of the improved controls on fishing effort and the resulting long-term sustainability of the fishery. If triggered, the pound-for-pound payback provision may have short-term, but minimal, negative impacts on fishing communities; however, this provision is necessary to provide long-term assurance in a sustainable small-mesh multispecies fishery.

Table 4 Summary of the Impacts of the Preferred Alternatives

	ABCs, ACLs, TALs	Pound-for-Pound Payback	Incidental Possession Limit at Trigger
Target Species	**Positive** This alternative would set catch and landings limits that are based on the best available science.	**Positive** This alternative would provide assurance that landings would stay within the limits that are based on the best available science.	**Neutral** Allows trips fishing to continue, without causing large amounts of discards.
Non-Target/By-Catch Species	**Neutral** Potential redirected effort would be limited by the ACL frameworks in place for the other species that may be targeted.	**Neutral** This would likely lead to either no change in fishing, or a reduction in fishing effort, that would be accounted for under the analysis of the other species ACL framework.	**Neutral** Trips for other species would continue at the same incidental level of small-mesh multispecies that are currently landed.
EFH	**Neutral to Low Positive** It is likely that catch, and by extension, fishing effort, would not change due to the implementation of this action. However, if the catch limit for a stock (likely Northern Red Hake) is harvested and AMs are implemented, fishing effort may be reduced, leading to a positive impact.		
Protected Resources	**Neutral** It is likely that catch, and by extension, fishing effort, would not change due to the implementation of this action.		
Human Communities	**Neutral to Positive** This alternative would likely result in no change to current fishing operations; however, the sustainable harvesting of the small-mesh multispecies stocks would lead to positive long-term benefits.	**Negative** If invoked, this alternative would result in short-term negative economic impacts by reducing the amount of a particular stock that could be landed in a given year.	**Low Negative** This alternative is expected to impact a low number of trips and result in a minor amount of revenue lost across the fleet.

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List of Acronyms

ABC	Acceptable Biological Catch
ACL	Annual Catch Limit
AIM	An Index Method of Analysis
AM	Accountability Measure(s)
ANPR	Advanced Notice of Proposed Rulemaking
AP	Advisory Panel
B_{MSY}	Biomass at Maximum Sustainable Yield
BiOp, BO	Biological Opinion
CEQ	Council on Environmental Quality
CPUE	Catch per Unit Effort
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
ESA	Endangered Species Act
EFH	Essential Fish Habitat
FMP	Fishery Management Plan
FR	*Federal Register*
FEIS	Final Environmental Impact Statement
F_{MSY}	Fishing Mortality at Maximum Sustainable Yield
GOM	Gulf of Maine
LPUE	Landings per unit effort
IRFA	Initial Regulatory Flexibility Analysis
IVR	Interactive Voice Reporting
M	Natural Mortality
MFMT	Maximum Fishing Mortality Target
MSST	Maximum Sustainable Stock Threshold
MSY	Maximum Sustainable Yield
NEFSC	Northeast Fisheries Science Center
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanographic Atmospheric Administration
OFL	Overfishing Limit
OY	Optimum Yield
RIR	Regulatory Impact Review
RFT	Raised Footrope Trawl
SARC	Stock Assessment Review Committee
SAW	Stock Assessment Workshop
SBNMS	Stellwagen Bank National Marine Sanctuary
SBRM	Standardized bycatch reporting methodology
SNE	Southern New England
SSC	Science and Statistical Committee
TAC	Total Allowable Catch.
TAL	Total Allowable Landings
PDT	Plan Development Team
USGS	United States Geological Survey
VEC	Valued Ecosystem Component
VMS	Vessel Monitoring System
VTR	Vessel Trip Reports

Section 1.0 Introduction and 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. A summary of the biological information from the most recent stock assessment (SAW 51) can be found in Section 4.1.

The small-mesh multispecies fishery is managed as a series of exemptions from the Northeast Multispecies Fishery Management Plan (FMP), which is managed by the New England Fishery Management Council (Council). In 2007, the reauthorized Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) required all managed species to have annual catch limits (ACLs) and measures to ensure accountability (accountability measures, or "AMs"). The Magnuson-Stevens Act required ACLs and AMs by 2010 for stocks that were experiencing overfishing, and by 2011 for all other stocks. The Council has developed, and NOAA's National Marine Fisheries Service (NMFS) has implemented, ACLs and AMs for every species for which it is responsible, except silver, red, and offshore hake. The Council is developing an amendment for the small-mesh multispecies fishery to establish ACLs and AMs, but it (Amendment 19 to the Northeast Multispecies FMP) will not be effective in time to meet the statutory deadline. NMFS is developing this Secretarial Amendment to bring the small-mesh multispecies fishery into compliance with the Magnuson-Stevens Act.

Section 1.1 History of the fishery[2]

The commercial silver hake fishery in the United States may have begun as early as the mid-1800s (Anderson et al, 1980). Prior to the early 1920s, landings of silver hake totaled less than seven million pounds annually, and most fishermen considered whiting a nuisance fish because its soft flesh tended to spoil quickly without refrigeration. Technological advances in handling, freezing, processing, and transportation aided in expanding this market as well as creating new opportunities to capitalize on whiting. Until this time, the fishery operated primarily inshore using pound nets. As the demand for whiting increased, operations began to extend offshore, and vessels started using otter trawls to catch more whiting. By 1950, U.S. commercial silver hake landings had increased to more than 45,000 metric tons. Floating traps, gillnets, purse seines, and longline trawls were also employed (almost all of the U.S. commercial silver hake catch is currently taken with otter trawls).

Prior to 1960, the commercial exploitation of silver hake in the Northwest Atlantic was exclusively by U.S. fleets. Distant water fleets had already reached the banks of the Scotian Shelf by the late 1950s, and by 1961, scouting/research vessels from the USSR were fishing on Georges Bank. By 1962, factory freezer fleets (ranging from 500 to 1,000 GRT) intensively exploited the whiting and red hake stocks on the Scotian Shelf and on Georges Bank. Led by the USSR, the distant water fleet landed an increasingly larger share of the silver hake

[2] Excerpted from Amendment 12 to NE Multispecies FMP

catch from the Gulf of Maine, Georges Bank, and northern Mid-Atlantic waters. In 1962, the distant water fleet landed 41,900 metric tons of silver hake (43% of the total silver hake landings), but that number had increased to 299,200 metric tons (85% of the total silver hake landings) in 1965. That year marked the year of the highest total commercial silver hake landings, 351,000 metric tons. Recreational landings of silver hake in the southern New England and Mid-Atlantic areas were also at record levels between 1955 and 1965, averaging about 1,360 metric tons. Unable to sustain such high rates of fishing, the abundance of silver hake off the U.S. Atlantic coast began to decline. As a result, total commercial catches decreased significantly after 1965 and reached a 20-year low of 55,000 metric tons in 1970. U.S. recreational landings also dropped after 1965 to about half the levels of previous years.

After 1970, catches of silver hake by the distant water fleet in U.S. waters increased again, especially in southern New England and the Mid-Atlantic. Between 1971 and 1977, distant water fleet landings from the southern stock averaged 75,000 tons annually and accounted for 90% of the total harvest from the southern stock. The size and efficiency of distant water fleet factory ships also increased, many ranging between 1,000 and 3,000 GRT. In 1973, the International Commission for the Northwest Atlantic Fisheries established temporal and spatial restrictions that reduced the distant water fleet to small “windows” of opportunity to fish for U.S. silver hake. These windows restricted the distant water fleet to the continental slope of Georges Bank and the Mid-Atlantic. As effort control regulations increased, foreign fleets gradually left most areas of Georges Bank.

Although foreign fishing had ceased on Georges Bank by about 1980 and in the Mid-Atlantic by about 1986, the U.S. groundfish fleet’s technologies and fishing practices began to advance, and between 1976 and 1986, fishing effort (number of days) increased by nearly 100% in the Gulf of Maine, 57% on Georges Bank, and 82% in southern New England (Anthony, 1990). Such increases in effort, although directed primarily towards principal groundfish species (cod, haddock, yellowtail flounder), were accompanied by a 72% decline in silver hake biomass. In turn, U.S. East Coast landings of silver hake began to decline, dropping to 16,100 metric tons in 1981. Since that time, landings have remained relatively stable, but at much lower levels in comparison to earlier years. U.S. East Coast silver hake catches are taken almost exclusively by otter trawls, either as bycatch from other fisheries or through directed fisheries targeting a variety of sizes of silver hake.

Section 1.2 Current Management Measures

Collectively, the small-mesh multispecies fishery is managed under a series of exemptions from the Northeast Multispecies FMP. 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 (Figure 2), there are six exemption areas, which are open seasonally (Table 5).

Table 5 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="6">June 15 – October 31</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 RFT[†]</td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td colspan="3">Sept 1 – Nov 20</td><td></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td><td rowspan="2"></td></tr>
<tr><td colspan="4">September 1 – December 31</td></tr>
</table>

[*] 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 (Table 6) for all the areas with that requirement are:

Table 6 Mesh Size Dependent Possession Limits

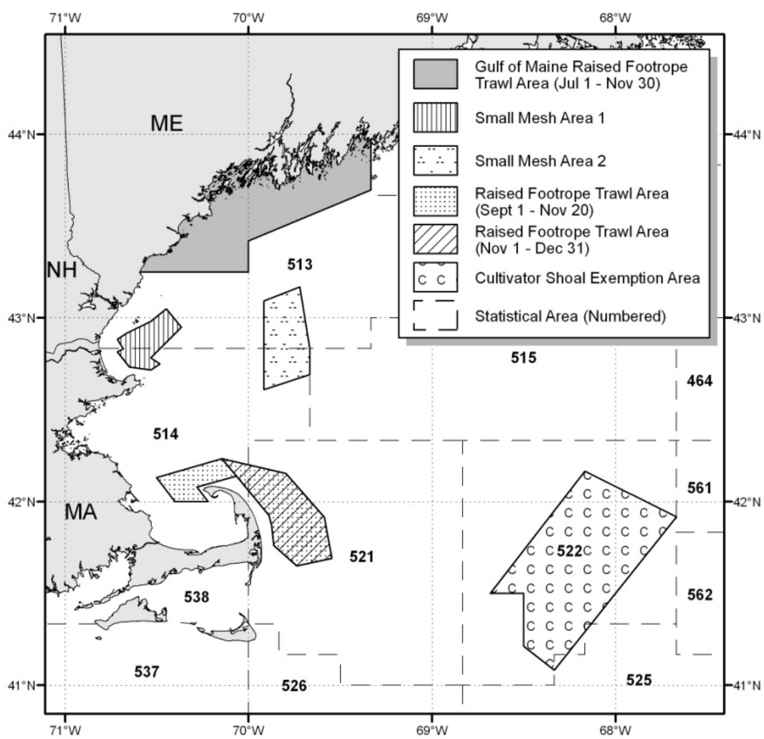
Codend Mesh Size	Silver and offshore hake, combined, possession limit
Smaller than 2.5”	3,500 lb
Larger than 2.5”, but smaller than 3.0”	7,500 lb
Equal to or greater than 3.0”	30,000 lb

The exemption areas 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[3] 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

[3] 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.”

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.

Figure 2 Small-Mesh Exemption Areas in the Gulf of Maine and Georges Bank



Vessels participating in any of the exemption areas must have a Northeast Multispecies limited access or open access category K permit and must have a letter of authorization from the Regional Administrator to fish in Cultivator Shoal and the Cape Cod Raised Footrope areas. None of the exemption areas have a possession limit for red hake. Most of the areas (Small Mesh Areas I and II, the Cape Cod Raised Footrope areas, Southern New England Exemption Area, and the Mid-Atlantic Exemption Area) have mesh size dependent possession limits for silver and offshore hake, combined (Table 6). 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.

Section 2.0 Purpose and Need for the Action

The purpose of this action is to establish the mechanism for implementing ACLs and AMs for the small-mesh multispecies fishery within the Northeast Multispecies FMP. In addition, this action will establish the specifications for the small-mesh multispecies fishery for the next three years. This action is needed to reduce the risk of overfishing, by taking into account scientific uncertainty in estimating the overfishing limit and management uncertainty.

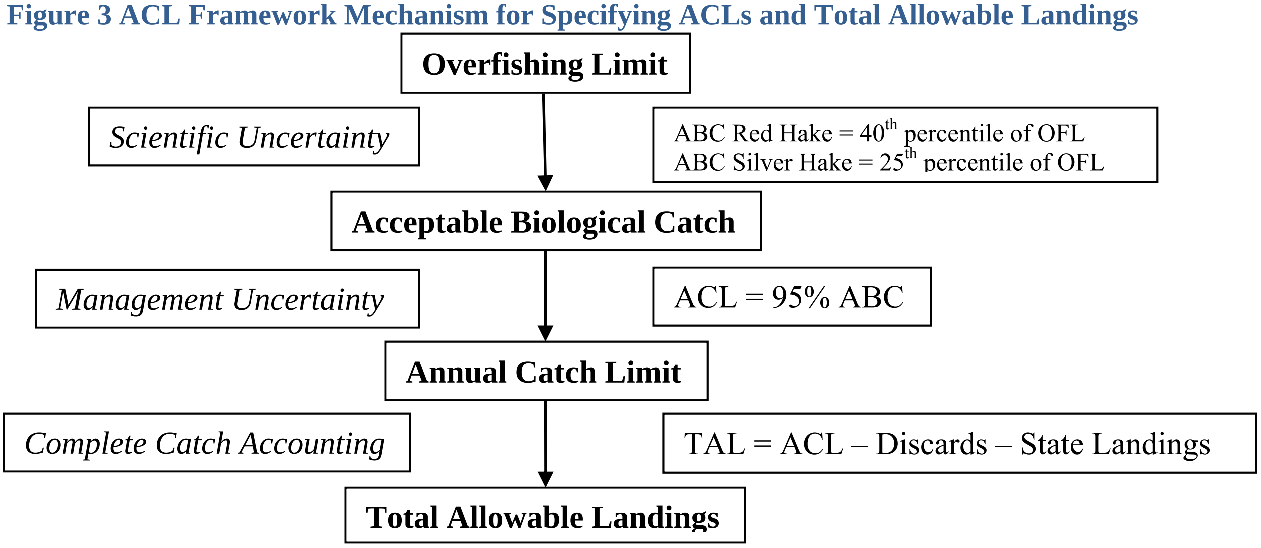
NMFS is implementing this action as a Secretarial Amendment, as provided for under Section 304(c)(1)(A) of the Magnuson-Stevens Act, because the Council has "failed to develop and submit to the Secretary, after a reasonable period of time" an amendment to implement the mechanism for specifying ACLs and AMs for the five small-mesh stocks. The Council is preparing an amendment to the Northeast Multispecies FMP to implement ACLs and AMs for the small-mesh multispecies fishery; however, Amendment 19 will not be completed in time to meet the statutory deadline in the Magnuson-Stevens Act.

In choosing the preferred alternatives for the Secretarial Amendment, NMFS intended to meet the requirements of the law, while preserving the Council's flexibility for implementing measures in Amendment 19. In doing so, NMFS considered but rejected for this amendment one of the Council's alternatives for a more complicated, sub-divided quota system in the northern area (See Section 3.5.1). This is not intended to preclude the Council from choosing this alternative in Amendment 19.

Section 3.0 Specifying ACLs and AMs and Associated Reference Points

The Council has recommended the following framework mechanism for specifying ACLs and total allowable landings (TALs) and associated reference points, which incorporates scientific and management determinations. NMFS is proposing the same framework mechanism in the Secretarial Amendment to maintain consistency with the Council's expected approach (Figure 3). The Council has recommended a 5-percent buffer between the ABCs and the ACLs to account for management uncertainty.

Figure 3 ACL Framework Mechanism for Specifying ACLs and Total Allowable Landings



The following section describes the alternatives under consideration for the Secretarial Amendment in three parts. The first part describes the alternatives associated with the establishment of overfishing limits and an acceptable biological catch (ABC) control rule for the five stocks as the basis for specifying ACLs and TALs as outlined above. The second part

(Management Measure Alternatives) describes the management alternatives that would specify catch limits or targets for the small-mesh multispecies fishery. The Council has made some preliminary decisions on the structure of the ACL mechanism, as described above. In order to minimize confusion between the two amendments, the Secretarial Amendment uses those decisions as the basis for the preferred alternatives and does not include a discussion on the other potential alternatives, except for the status quo/no action alternative. The OFL and ABC control rules described in Section 3.1, are based on the scientific advice of both the Stock Assessment Review Committee and the Council's Scientific and Statistical Committee (SSC). There are no other viable alternatives to the structure discussed, as that would violate the requirement in the Magnuson-Stevens Act that the Council use the SSC's recommendation of ABC as the basis for ACLs. Only the preferred and status quo/no action alternatives are included for the ACL framework measure as well. This is because, in preparing this amendment, NMFS determined that implementing a complex, sub-divided quota system, without a final decision by the Council to do the same, would cause unnecessary confusion among the industry during the transition period between the two sets of rules. The more complicated alternative (a sub-divided quota) was considered but rejected for this amendment, as discussed in Section 3.4. The Council is expected to implement a three-year specification cycle for the small-mesh multispecies fishery, so the Secretarial Amendment would implement the same (see Section 3.2).

The third part describes the accountability measures associated with those catch limits. There are two types of accountability measures discussed—proactive, or in-season, and reactive, or post-season. Because the Council has not yet fully developed a set of alternatives for post-season AMs for analysis in Amendment 19, NMFS determined it would be appropriate to use only the most common reactive AM, a pound-for-pound payback of an ACL overage (Section 3.3.1), and the status quo/no action alternative. The Council did have a range of alternatives for in-season AMs, so the Secretarial Amendment discusses several alternatives in addition to the status quo/no action alternative.

Section 3.1 Management Reference Point Alternatives

Section 3.1.1 Overfishing Limit and Acceptable Biological Catch Control Rules (Preferred Alternative)

Overfishing Limit Control Rules

The overfishing limit (OFL) is the amount of catch above which overfishing is deemed to be occurring, that is, it is a status determination criterion for overfishing. It is an annual limit derived as the product of current exploitable biomass and the current rate of fishing, after taking into account the variance of each factor. To calculate this, the Council's Small-Mesh Multispecies Plan Development Team (PDT) derived a distribution of the OFL, and the OFL is equal to the 50th percentile of that distribution. (See Appendix B.) The three-year moving average biomass estimate for silver hake is estimated using the fall trawl survey; and the three-year moving average biomass estimate for red hake is estimated using the spring trawl survey, based on guidance from the SARC. No reliable estimates for offshore hake are available.

OFL values are currently calculated to be **24,840 mt** for the northern stock of silver hake and **62,301 mt** for the southern stock of silver hake, using the 50th percentile of the OFL distribution (Figure 5.)

OFL values are currently calculated to be **314 mt** for the northern stock of red hake and **3,448 mt** for the southern stock of red hake, using the 50th percentile of the OFL distribution (Figure 4.)

ABC Control Rules

ABC is the level of catch that accounts for scientific uncertainty in the estimate of the OFL and any other scientific uncertainty. The National Standard 1 guidelines prescribe that "the determination of ABC should be based, when possible, on the probability that an actual catch equal to the stock's ABC would result in overfishing."

Based on guidance from the Council's Scientific and Statistical Committee (SSC), ABCs for small-mesh multispecies would be set for the individual stocks of northern red hake, northern silver hake, and southern red hake, and a combined ABC for southern silver hake and offshore hake would be implemented. The SSC recommended a combined "southern whiting" ABC because offshore hake are caught most often with southern silver hake and the two species are not separated for the market. To account for offshore hake, the SSC recommended that the ABC for southern silver hake be augmented by 4 percent—the estimated average amount of offshore hake in a southern silver hake trip. Based on analysis produced by the PDT (See APPENDIX A), the SSC endorsed the approach of setting ABC based on an appropriate percentile from the distribution of the OFLs for each stock. The OFL represents the 50th percentile and is, therefore, the maximum level that ABC could be set. The SSC recommended a range of ABC control rule alternatives to the Council, based on the distribution of OFLs. The Council chose the 40th percentile of OFL as the ABC control rule for both red hake stocks, and the 25th percentile of OFL as the ABC control rule for both of the silver hake stocks (Table 7).

The ABC control rule for northern silver hake could be expressed as:

$$ABC_{\text{Northern Silver Hake}} = 25^{th}\text{percentile } OFL_{\text{Northern Silver Hake}} \text{ distribution}$$

The ABC control rule for southern whiting could be expressed as:

$$ABC_{\text{Southern Whiting}} = 25^{th}\text{percentile } OFL_{\text{Southern Silver Hake}} \text{ distribution} + 4\%$$

The ABC control rule for red hake (both northern and southern) could be expressed as:

$$ABC_{\text{Red Hake}} = 40^{th}\text{percentile } OFL_{\text{Red Hake}} \text{ distribution}$$

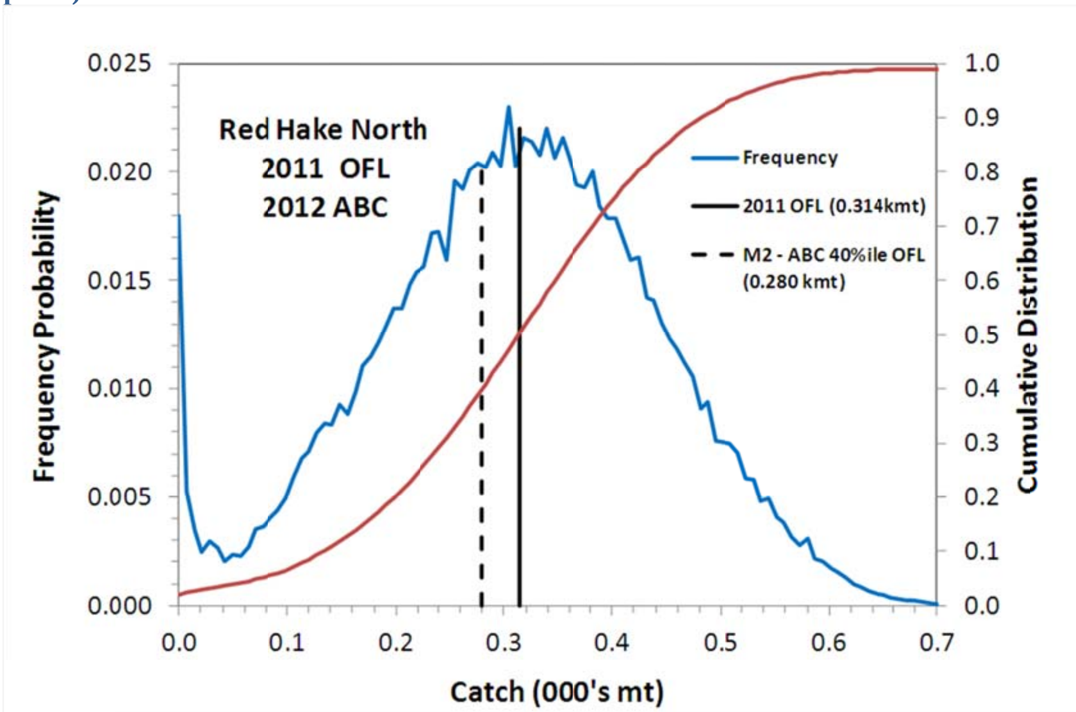
To calculate ABC, the Small-Mesh Multispecies PDT produced a probability distribution for each calculation of OFL. The uncertainty in the red hake OFL estimates were estimated as the joint probability distribution of F_{MSY} and the 3-year spring survey moving average of biomass. The probability distribution of the proxy F_{MSY} was obtained from the AIM (An Index Method assessment model or analysis) bootstrap distribution of relative F (Figure 4). The probability distribution of the spring survey three-year (2009-2011) moving average of biomass was estimated from a normal distribution of the mean and variance. For silver hake, the probability distribution of the proxy F_{MSY} was obtained from the lognormal distribution of the mean and variance of the exploitation ratios from 1973-1982 (Figure 5). Similarly, the probability distribution of the fall survey three-year (2008-2010) moving average of biomass was estimated from a normal distribution of the mean and variance. (See APPENDIX B).

Table 7 Council Recommended OFLs and ABCs

	Northern Red Hake	Northern Silver Hake	Southern Red Hake	Southern Whiting
OFL	314 mt	24,840 mt	3,448 mt	62,301 mt
ABC	280 mt	13,177 mt	3,259 mt	33,940 mt*

* Southern Whiting ABC = Silver Hake 25th percentile of OFL (32,635 mt) + 4% (1,305 mt) to account for Offshore Hake

Figure 4 Frequency Distribution and Cumulative Probability of 2011 OFL and the Proposed 2012 ABC (40th percentile of OFL) for Northern Red hake (top panel) and Southern Red Hake (bottom panel).



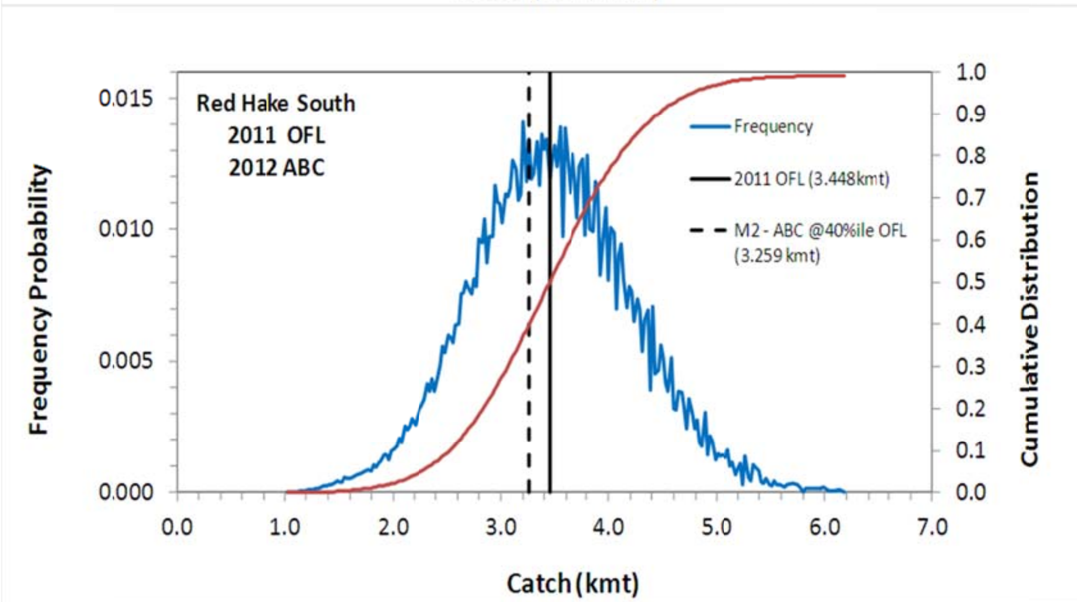
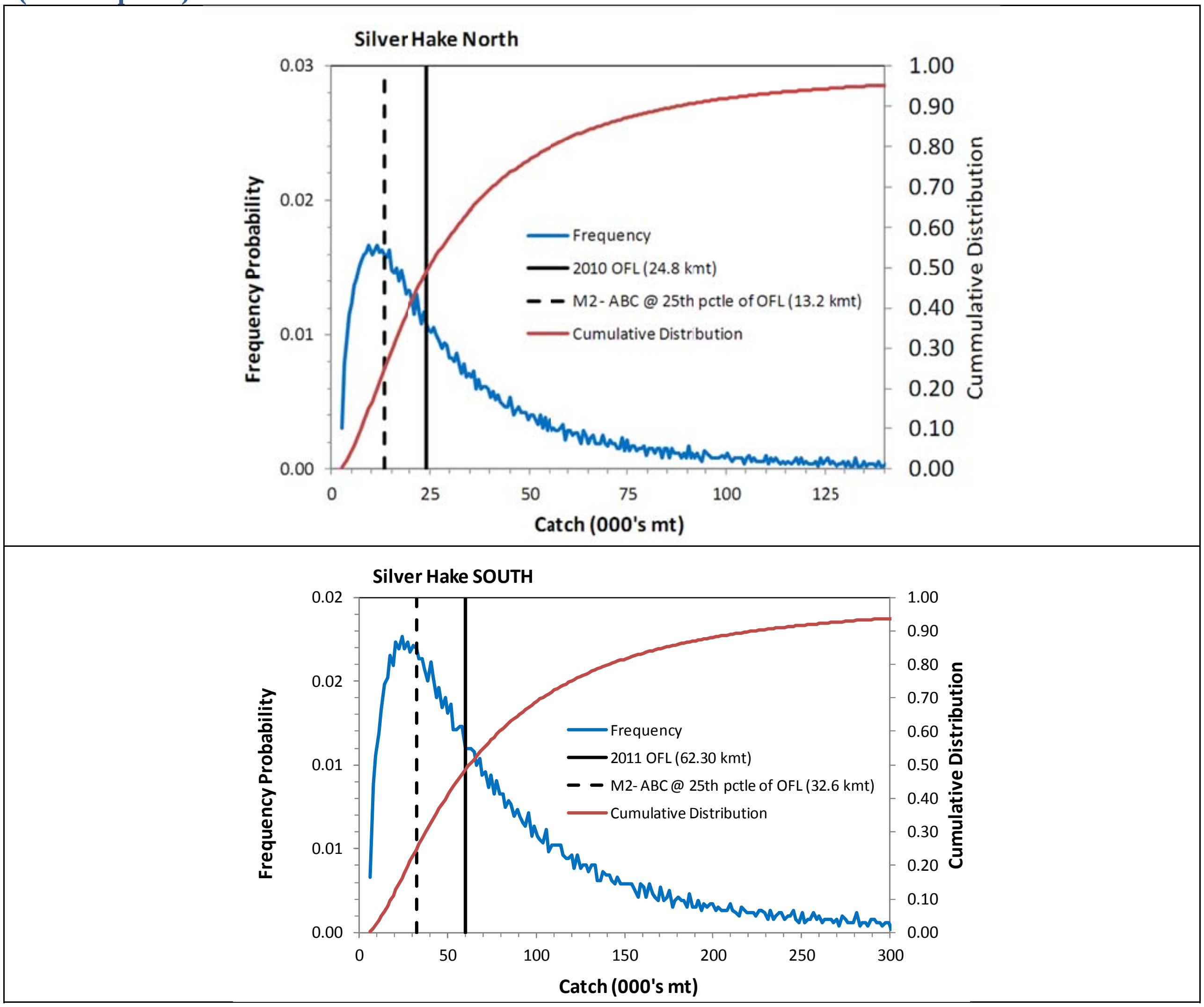


Figure 5 Frequency Distribution and Cumulative Probability of 2011 OFL and the Proposed 2012 ABC (25th percentile of OFL) for Northern Silver Hake (top panel) and Southern Silver Hake (bottom panel).



Section 3.1.2 Status Quo/No Action Alternative

The status quo/no action alternative would mean that no OFLs or ABCs would be implemented for any of the small-mesh multispecies stocks. This alternative would be inconsistent with the Magnuson-Stevens Act because it would not be based on the best available science, as required by National Standard 2.

Section 3.2 Alternatives for Specifying ACLs

Section 3.2.1 Stock Area ACL Framework and Specifications Process Alternative (Preferred Alternative)

ACL/TAL Framework

This alternative would implement a framework of ACLs, AMs, and TALs on a stock area basis, with southern silver and offshore hake combined, as described in Table 7 and Table 8. This alternative would result in four ACLs that relate directly to the ABCs recommended by the SSC and the Council: Northern Silver Hake, Northern Red Hake, Southern Whiting, and Southern Red Hake. Complementary AMs would be implemented under this alternative for each ACL. The Council has recommended setting all four ACLs equal to 95-percent of the corresponding ABC. Under this alternative, discards and a state landings estimate would be deducted from the ACLs, and stock area TALs would be used as the management limit. To fully account for all catch, the ACL framework must make allowances for state landings and discards. At its September 2011 meeting, the Council recommended a 3-percent allowance for state landings. The Council also recommended using a discard estimate based on the average discards from 2008 – 2010, for all species.

Table 8 ACL/TAL Framework, including State Landings and Discards

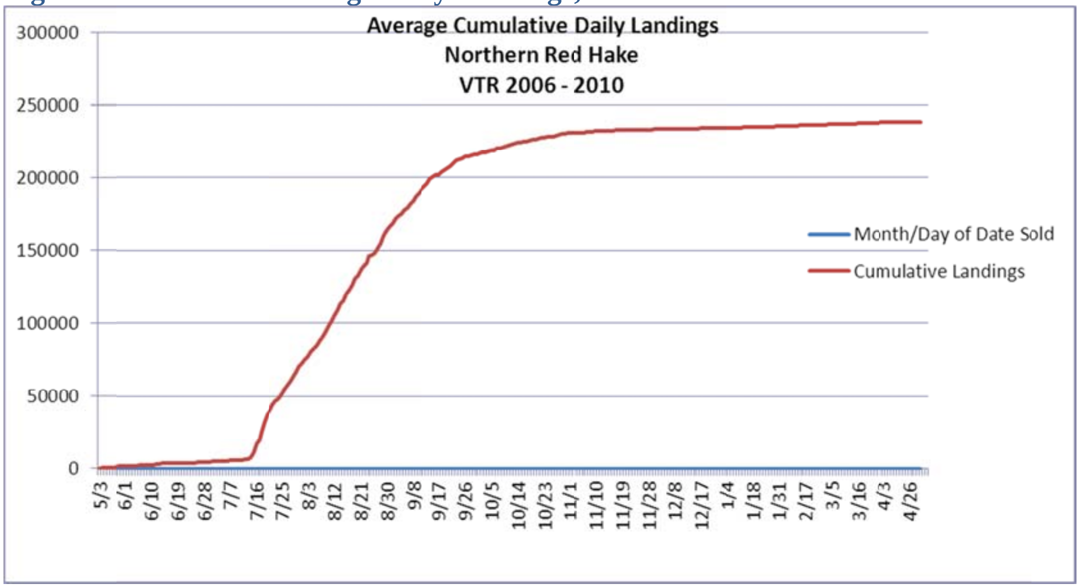
	Northern Red Hake	Northern Silver Hake	Southern Red Hake	Southern Whiting
ABC	280 mt	13,177 mt	3,259 mt	33,940 mt*
ACL (95% of ABC)	266 mt	12,518 mt	3,096 mt	32,295 mt
Discard Percentage 2008-2010	65%	26%	56%	13%
Discards	173 mt	3,267 mt	1,718 mt	4,198 mt
State Landings (3% of Landings)	2.8 mt	278 mt	42 mt	842 mt
Total Federal TAL	90.3 mt	8,973 mt	1,336 mt	27,255 mt

* Southern Whiting ABC = Silver Hake 25th percentile of OFL (32,635 mt) + 4% (1,305 mt)

During the development of the Secretarial Amendment, NMFS received comments (Section 7.1.3) concerned that by using a stock area TAL, some of the seasonal exemption areas (Table 5) in the northern stock area would not be given the opportunity to open because the TAL could be fully harvested earlier in the season. NMFS is proposing the stock area TAL because it is the least complex of the Council's approved list of alternatives. In addition, the landings in the northern area peak with the inshore exemption area openings (Figure 6). This suggests that the red hake fishery is of less importance to the Cultivator Shoal Exemption Area Program, and landings do not start to peak until after both the inshore Gulf of Maine and Small Mesh Area I Exemption Area Programs open.

Note: During the development of Amendment 19, but after the publication of the proposed rule for the Secretarial Amendment, the Council's Small-Mesh Multispecies PDT determined that an error had been made in the calculation of the TALs described above. NMFS had been using the same values as had been presented to the Whiting Oversight Committee in order to maintain consistency between the two rules. The PDT had inadvertently used the 2007-2009 discard rate information, but had presented it as the 2008-2010 discard information. The Whiting Oversight Committee and the Council have both since agreed to the PDT's revisions. In order to maintain consistency with Amendment 19, the Secretarial Amendment has been updated to reflect the corrected data.

Figure 6 Cumulative Average Daily Landings; Northern Red Hake



Specifications Process

Specifications (ACLs, TALs) would be set on a three-year cycle, starting with the first year of implementation of the Secretarial Amendment. This process would update the OFLs, ABCs, ACLs, and TALs based on the most recent available information using the framework mechanisms described in Sections 3.1.1 and 3.2.1. Data that should be available for the specifications setting process will include, but is not limited to, new survey biomass indices, reported landings, estimated discards, and estimates of state-waters landings. The specifications process would work as follows:

- The Council, the Small-Mesh Multispecies Plan Development Team (PDT), and the Small-Mesh Multispecies Oversight Committee will monitor the status of the small-mesh multispecies fishery and resource.
- The Small-Mesh Multispecies PDT will meet to review the status of the stocks and the fishery. Based on this review, the PDT will provide a report to the Council on any changes or new information about the small-mesh multispecies stocks and/or fishery, and it should recommend whether the specifications for the upcoming year(s) need to be modified.
- If necessary, the Small-Mesh Multispecies PDT will provide advice and recommendations to the Small-Mesh Multispecies Oversight Committee and the Council regarding the need to adjust measures for the small-mesh multispecies fishery to better achieve the FMP's objectives.
- The PDT's recommendations will include the following information:
    - OFL estimates for the next three fishing years, based on the control rules described in Section 3.1.1;
    - ABC estimates for the next three fishing years, based on the control rules described in Section 3.1.1;
    - ACLs that are set equal to 95 percent of the corresponding ABC;

    - TALs that are calculated using an estimate of discards based on the most recent three-year moving average for which data are available and an appropriate estimate of state-waters landings;
    - An evaluation of catches compared to the ABCs in recent years; and
    - Any other measures that the PDT determines are necessary to successfully implement the ACL framework, including, but not limited to, adjustments to the management uncertainty buffer between ABC and ACL.
- The PDT will provide these recommendations to the SSC for review. The SSC will either approve the PDT's recommendations or provide alternative recommendations to the Council.
- The Council will then consider the SSC's and PDT's recommendations and make a decision on the specifications for the next three fishing years. The Council must establish ACLs that equal to or lower than the SSC's recommended ABCs.
- Once the Council has approved ACLs, they will be submitted to NMFS for approval and implementation.
- After receipt of the Council's ACLs, NMFS will review the recommendations and will implement the ACLs in a manner consistent with the Administrative Procedure Act, if it is determined that the ACLs are consistent with applicable laws. If the ACLs are determined to be inconsistent with applicable law, NMFS may publish alternative specifications that are consistent with the SSC's recommendation and applicable law.
- If new ACLs are not implemented for the start of the new specifications cycle, the old ACLs will remain in effect until they are replaced.

Section 3.2.2 Status Quo/No Action Alternative

The no action/status quo alternative would maintain the current management measures for the small-mesh multispecies fishery. That is, the series of exempted areas and their associated requirements would remain with no catch limits or targets. This would mean that there would be no ACLs or AMs implemented for the small-mesh fishery. The status quo/no action alternative would be out of compliance with the Magnuson-Stevens Act, which requires ACLs for all managed stocks by 2011.

Section 3.3 Alternatives for Accountability Measures

In general, AMs are management controls implemented for stocks so that exceeding an ACL is prevented, and, if an ACL is exceeded, correction or mitigation occurs. There are two types of accountability measures proposed for the Secretarial Amendment—reactive, or post-season, and proactive, or in-season. Reactive AMs are designed to be applied after the fishing year ends to address the operational issue that caused the overage and/or address any biological harm to the stock. NMFS determined that a pound-for-pound payback of any ACL overage was the most reasonable alternative to implement for the small-mesh multispecies fishery in the Secretarial Amendment, and only analyzed that alternative and the status quo/no action alternative. This is not intended to preclude the Council from selecting different reactive AMs in Amendment 19, but is intended to meet the requirements of the Magnuson-Stevens Act with minimal confusion to industry during the transition between the two sets of rules.

Proactive AMs are designed to be implemented in-season to prevent the ACL from being exceeded in the first place. The Council has several options that may be included in Amendment 19, and NMFS chose the Council's most likely preferred alternative, which is also the most flexible and general of the current alternatives. Several of the Council's other alternatives are discussed below, in addition to the status quo/no action alternative.

Section 3.3.1 Reactive (Post-season) Accountability Measure Alternatives

Section 3.3.1.1 Pound-for-Pound Payback of an ACL Overage (Preferred Alternative)

This alternative would authorize NMFS, through the Northeast Regional Administrator, to deduct from a subsequent year's ACL any overage of a stock's ACL in a given year. In the Northeast Region, there have been two approaches to this alternative. In some fisheries, such as groundfish, an overage in year 1 is deducted from the ACL in year 2. In other fisheries, such as skates, an overage in year 1 is deducted from the ACL in year 3.

For the small-mesh multispecies fishery, NMFS is proposing the latter option. ACL overages that occur in one year would be deducted from the ACL in the second year after the overage occurred (i.e., year 3). The advantage to this approach for the small-mesh multispecies fishery is that this would ensure that an in-season adjustment to an ACL would not prevent some exemption areas from opening in a given year, but allow others to open. This also allows vessel owners the opportunity to prepare for the reduction with ample time to adjust their business plans.

Section 3.3.1.2 Status Quo/No Action

The Status Quo/No Action alternative would leave in place the existing management measures for the small-mesh multispecies fishery and would not implement a reactive, or post-season, accountability measure. The status quo/no action alternative is out of compliance with the Magnuson-Stevens Act, which requires AMs for all managed stocks by 2011.

Section 3.3.2 Proactive (In-season) Accountability Measure Alternatives

Section 3.3.2.1 Zero Possession at 100% of TAL

This alternative would prohibit the possession and landing of a particular small-mesh multispecies stock if 100% of that stock's TAL is projected to be reached prior to the end of the fishing year. NMFS would monitor the in-season landings of small-mesh multispecies against that year's TAL using dealer-reported data, as is done with most quota-managed FMPs. NMFS would notify the public in a manner consistent with the Administrative Procedure Act.

Section 3.3.2.2 Incidental Possession Limit Trigger Alternative

This alternative would reduce the possession of a particular stock to an incidental level when the trigger limit for that stock's TAL is projected to be reached. Under this approach, even if the TAL is exceeded, the possession limit would remain at the incidental level until the end of the fishing year. NMFS determined that when choosing a preferred alternative that it would be the least confusing to choose the most general and most flexible of the Council's alternatives.

Based on what vessels are currently landing as an incidental limit, NMFS is proposing the following incidental limits (Table 9). These incidental limits are also included in recent decisions by the Council's Small-Mesh Multispecies Oversight Committee for discussion in Amendment 19.

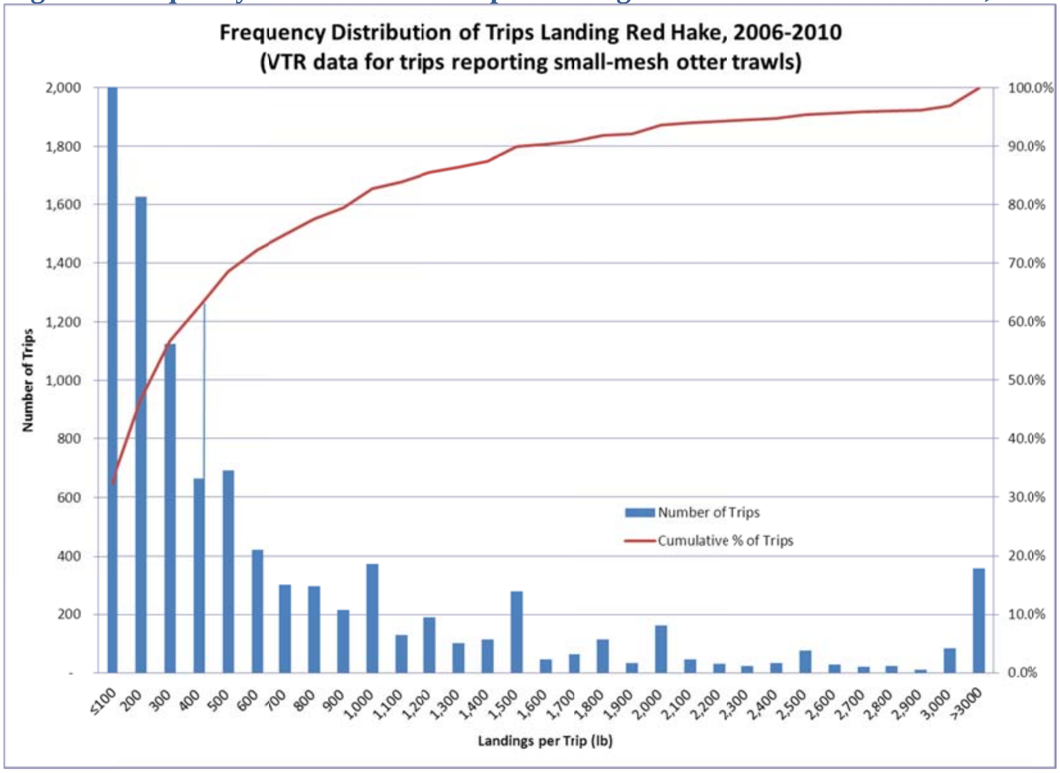
Table 9 Potential Incidental Possession Limits and Triggers

	% of TAL	Incidental Limit
Red Hake	90	400 lb
Silver Hake	90	1,000 lb

To determine the appropriate incidental possession limit, vessel trip reports from 2006 – 2010 were queried. For red hake, 62.5 percent of trips that landed at least one pound of red hake with a small-mesh otter trawl landed 400 lb or less (Figure 7). The landing level for 45-percent of all trips landing at least one pound of red, silver, or offshore hake with a small-mesh otter trawl was less than 400 lb of red hake; 1,000 lb of red hake represents nearly two-thirds of all trips. For all gears from 2006 -2010, 100 lb or less was landed by 51 percent of vessels landing at least one pound of red hake; 78 percent landed 500 lb or less; and, 88 percent of vessels landing at least one pound of red hake landed less than 1,000 lb.

This suggests that 400 – 1,000 lb is roughly the current level of small-mesh multispecies that vessels land on a small-mesh trip, and that 100 – 400 lb is approximately the current incidental limit for all gear types. That is, this is already the incidental level that vessels are landing, without a possession limit dictating that level.

Figure 7 Frequency Distribution of Trips Landing Red Hake with Small-Mesh, 2006-2010



Section 3.3.2.3 Incidental Possession Limit Trigger and Zero Possession at 100% of TAL

This alternative would combine alternatives 3.3.2.1 and 3.3.2.2. This alternative would reduce the possession of a particular stock to the incidental limit at a trigger level *and* would prohibit possession of that stock when 100% of the TAL is projected to be reached prior to the end of the fishing year.

Section 3.3.2.4 Status Quo/No Action

The Status Quo/No Action alternative would leave in place the existing management measures for the small-mesh multispecies fishery and would not implement a proactive, or in-season, accountability measure.

Section 3.4 Considered, But Rejected Alternative

Section 3.4.1 Exemption Area ACL Framework Alternative (Northern Area Only)

This alternative, based on recommendations from the Council's Whiting Oversight Committee and Advisory Panel, would have implemented ACLs and AMs in the southern area by stock area (as in Section 3.2.1), but in the northern area would have subdivided those TALs. This alternative would have resulted in four ACLs, corresponding to two southern area TALs and six northern area TALs. The northern area TALs would have been divided based on the historic proportional landings recommended by the Council (2004-2010) of the Cultivator Shoal Exemption Area, the Other Small-Mesh Exemption Areas, and Incidental Landings.

This alternative was considered, but rejected, in order to maintain the Council's flexibility in determining which alternatives in Amendment 19 would be preferable. NMFS prefers the broadest of the Council's alternatives (stock area TALs; Section 3.2.1). This allows the Council to determine if it is appropriate to refine the TALs further and to implement more precise management alternatives, such as a sub-divided TAL in the northern area.

NMFS received comments during the public comment period of the Advanced Notice of Proposed Rulemaking (Section 7.1.3) that preferred this alternative because of the concern that a stock area TAL would be harvested prior to one or more of the small-mesh exemption areas being opened for the season. NMFS is proposing the stock area TAL because the landings in the northern area peak with exemption area openings (Figure 6). NMFS suggests that the data show no indication that the Cultivator Shoal Exemption Area Program would land red hake in such a way to prevent the inshore Gulf of Maine exemption area programs from operating as they have recently. Further, Figure 20 (see section 5.5.3.2 of this document) demonstrates the potential impact of the 400 lb incidental possession limit for northern red hake, and relatively few trips would be affected, if the trigger is implemented.

Section 4.0 Affected Environment

Section 4.1 Target Species (Silver, Red, Offshore Hake)

Section 4.1.1 Life History

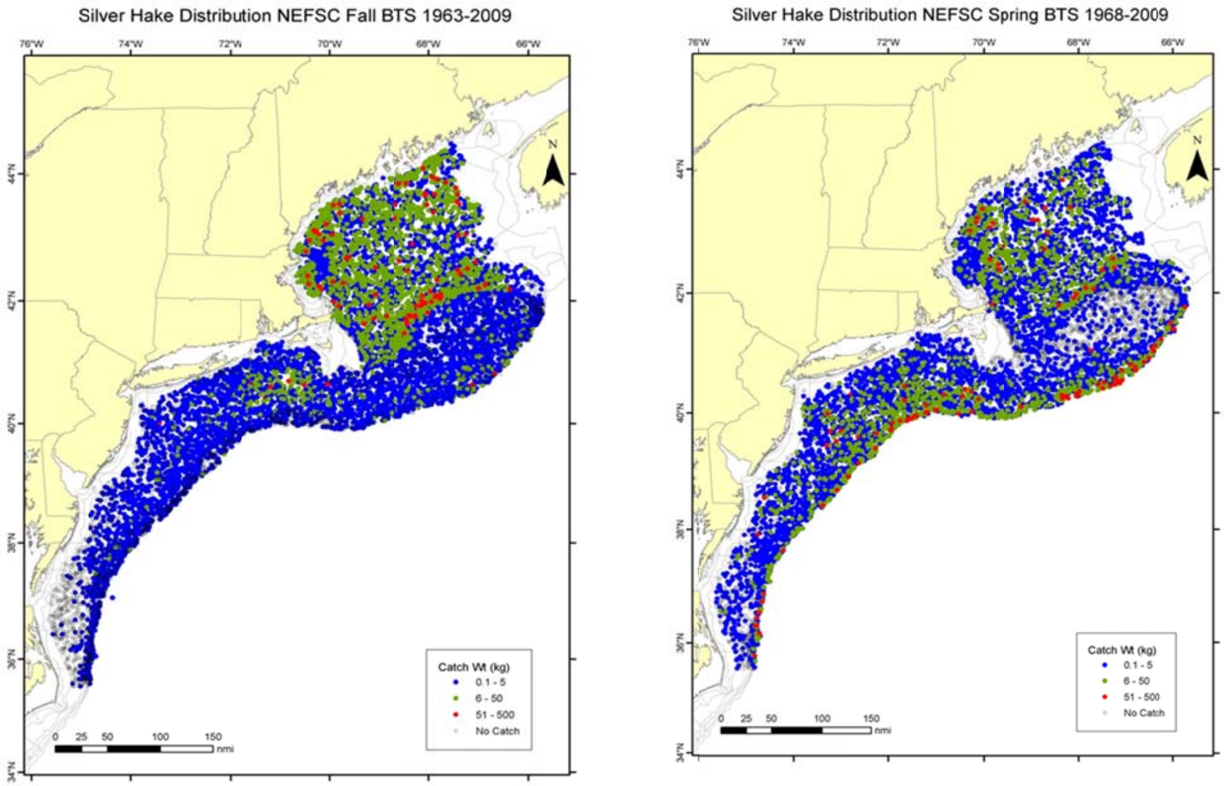
Section 4.1.1.1 Silver Hake

Silver hake, *Merluccius bilinearis*, also known as whiting, range from the Grand Banks of Southern Newfoundland to South Carolina (Brodziak, 2001, Lock and Packer 2004). In U.S. waters, two subpopulations of silver hake are assumed to exist within the EEZ based on numerous methods, primarily morphometric differences and otolith micro-constituent differences (Conover et al. 1967, Almeida 1987, Bolles and Begg 2000). The northern silver hake stock inhabits the Gulf of Maine to Northern Georges Bank waters, while the southern silver hake stock inhabits Southern Georges Bank to the Mid Atlantic Bight waters (Figure 11). 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 8). Silver hake migrate in response to seasonal changes in water temperatures, moving toward shallow, warmer waters in the spring, spawning 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 other 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 8 Fall (left) and Spring (right) Survey Distribution of Silver Hake from the NEFSC Bottom Trawl Surveys, 1963-2009



Section 4.1.1.2 Red Hake Life History

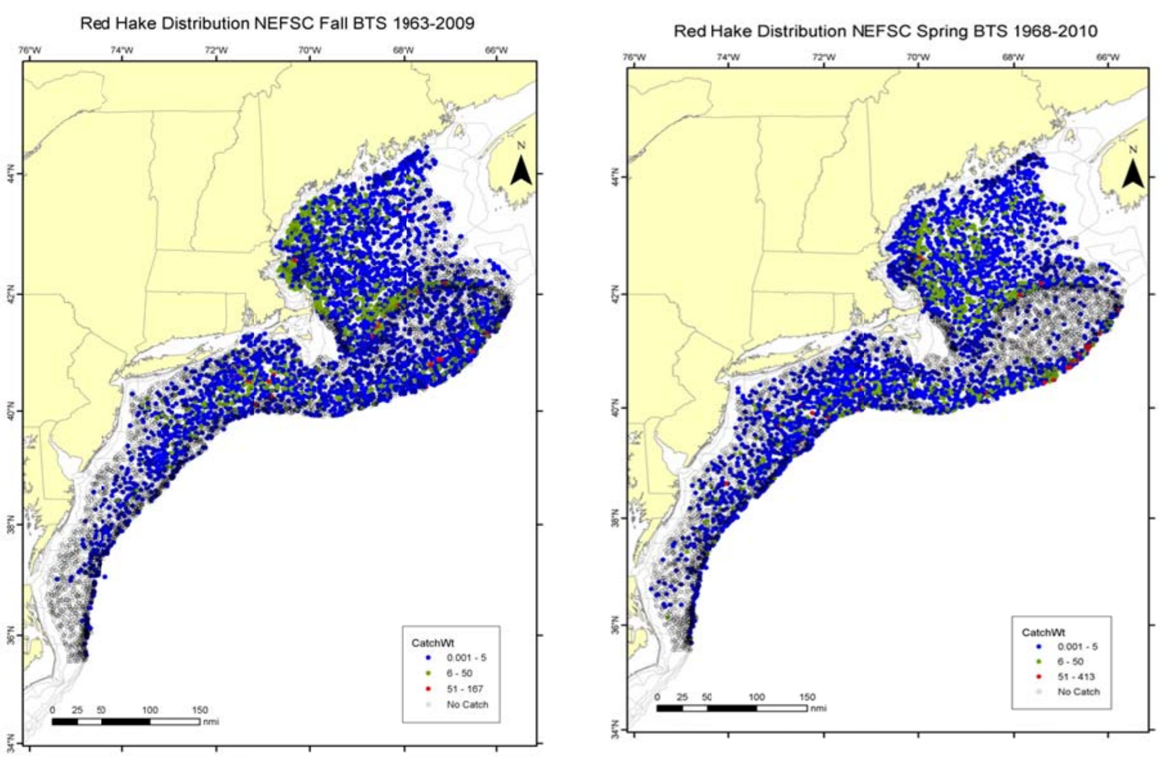
Red hake, *Urophycis chuss*, is a demersal gadoid species distributed from the Gulf of St. Lawrence to North Carolina, and are most abundant from the western Gulf of Maine through Southern New England waters. Red hake are separated into northern and southern stocks for management purposes. The northern 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 11). 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 9).

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

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

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

Figure 9 Fall (left) and Spring (right) Survey Distribution of Red Hake from the NEFSC Bottom Trawl Surveys, 1963-2009



Section 4.1.1.3 Offshore Hake Life History

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^{o}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 10).

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

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

Offshore hake appear to be sexually dimorphic with females slightly larger than males. Females mature at a larger length than males, similar to 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 10 Fall (left), Spring (middle) and Winter (right) Survey Distribution of Offshore Hake from the NEFSC Bottom Trawl Surveys, 1967-2009

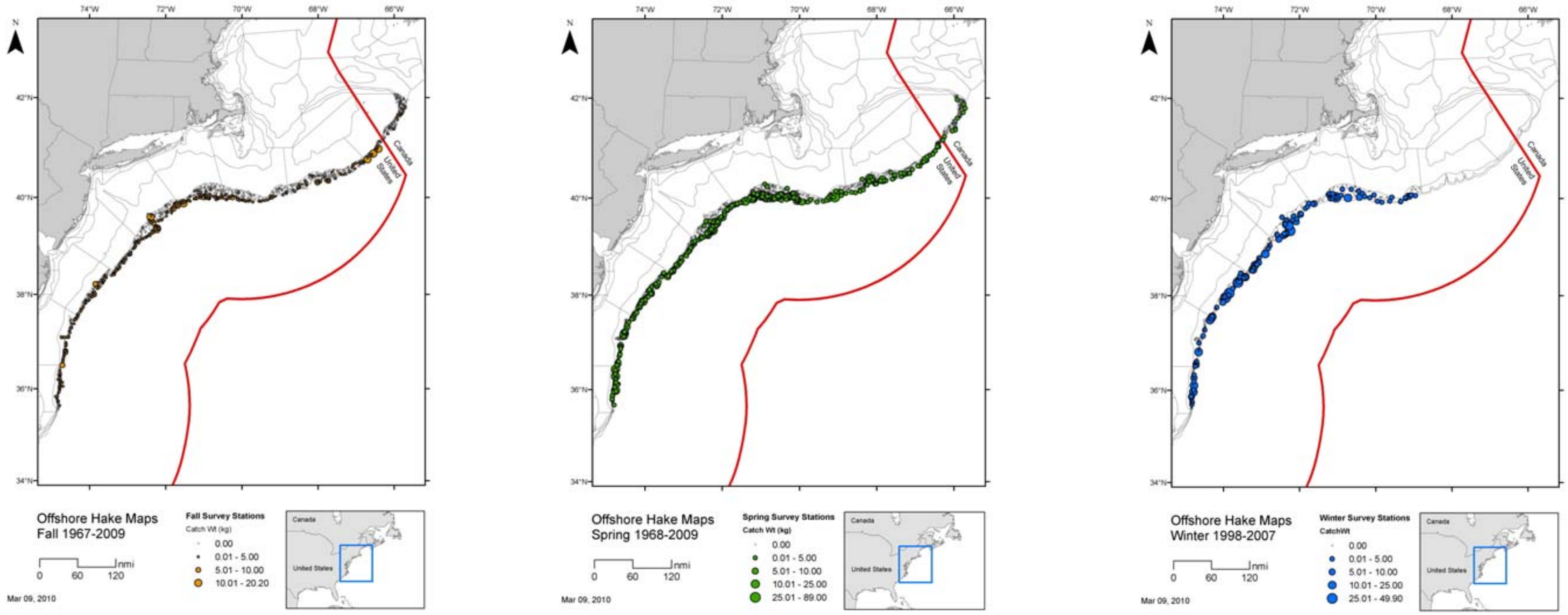
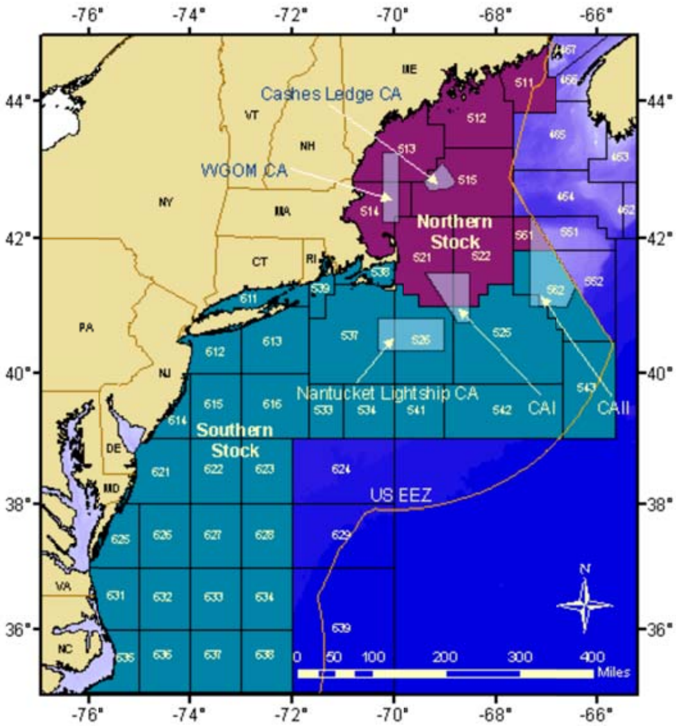


Figure 11 Statistical Area Used to Define Red and Silver hake in the Northern and Southern Management Areas. Offshore Hake Statistical Areas are Restricted to the Southern Management Region only.



Section 4.1.2 Stock Status

The Stock Assessment Review Committee (SARC) of the 51st Stock Assessment Workshop (SAW 51) met from November 19 through December 3, 2010, at the Northeast Fisheries Science Center, in Woods Hole, MA to review the benchmark assessments of silver hake *(Merluccius bilinearis*), red hake (*Urophycis chuss*), and offshore hake (*Merluccius albidus*). Despite several attempts to produce an analytical assessment for the hake stocks, the benchmark could not ultimately resolve different signals coming from low catches (especially compared with those in the early part of the time series), increasing stock biomass, and an increasingly truncated age structure in survey catches (i.e., increasing absence of older fish, particularly silver hake). Nonetheless, the benchmark assessment made some progress on resolving stock structure, species identification in the survey and commercial catches, and in estimating consumption. Despite the inclusion of predatory consumption estimates, which were almost an order of magnitude greater than catch, the analytical models still did not perform well. Instead, the SAW accepted an index based assessment for both red and silver hake status determination, similar to previous assessments, with updated reference points. For offshore hake, there was no reliable information about catch or trends in abundance and biomass to guide management of offshore hake.

Section 4.1.2.1 Silver hake

The 2010 silver hake assessment 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 2009. Since then, the Council's Small-Mesh Multispecies Planning Development Team (PDT) have updated the assessment results to include both the 2010 fall survey biomass and commercial catch data and will be the basis for this report (Table 11 and Table 12).

In the absence of an analytical assessment for silver hake, the biological reference points for both the northern and southern silver hake stocks are as follows (Table 10):

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.

Table 10 Proposed Overfishing Definition Reference Points for Silver Hake

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

Overfishing threshold estimates are based on annual exploitation ratios (catch divided by arithmetic fall survey biomass) averaged from 1973-1982. Catch per tow is in "Albatross" units (Table 11 and Table 12).

Table 11 Northern Silver Hake Stock - Summary of catch and survey indices in Albatross units for northern silver hake, 1955-2010 (*continues onto next page*)

Year	Northern Fall Survey arithmetic kg/tow	Northern Fall Survey 3-year average	Northern Landings (000'smt)	Northern Discards (000's mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 year avg)
1955			53.36		53.36		
1956			42.15		42.15		
1957			62.75		62.75		
1958			49.90		49.90		
1959			50.61		50.61		
1960			45.54		45.54		
1961			39.69		39.69		
1962			79.00		79.00		
1963	23.10		73.92		73.92	3.20	
1964	4.34		94.46		94.46	21.77	
1965	7.06	11.50	45.28		45.28	6.41	10.46
1966	4.19	5.20	47.81		47.81	11.41	13.20
1967	2.27	4.51	33.37		33.37	14.70	10.84
1968	2.28	2.91	41.38		41.38	18.15	14.75
1969	2.41	2.32	24.06		24.06	9.98	14.28
1970	3.03	2.57	27.53		27.53	9.09	12.41
1971	2.67	2.70	36.40		36.40	13.63	10.90
1972	5.78	3.83	25.22		25.22	4.36	9.03
1973	4.12	4.19	32.09		32.09	7.79	8.60
1974	3.45	4.45	20.68		20.68	5.99	6.05
1975	8.09	5.22	39.87		39.87	4.93	6.24
1976	11.25	7.60	13.63		13.63	1.21	4.05
1977	6.72	8.69	12.46		12.46	1.85	2.66
1978	6.32	8.10	12.61		12.61	2.00	1.69
1979	6.18	6.41	3.42		3.42	0.55	1.47
1980	7.23	6.58	4.73		4.73	0.65	1.07
1981	4.52	5.98	4.42	2.64	7.05	1.56	0.92
1982	6.28	6.01	4.66	2.91	7.57	1.21	1.14
1983	8.76	6.52	5.31	2.64	7.95	0.91	1.22
1984	3.36	6.13	8.29	2.59	10.88	3.24	1.78
1985	8.28	6.80	8.30	2.56	10.86	1.31	1.82
1986	13.04	8.23	8.50	2.35	10.86	0.83	1.79
1987	9.79	10.37	5.66	2.11	7.77	0.79	0.98
1988	6.05	9.63	6.79	1.79	8.57	1.42	1.01
1989	10.53	8.79	4.65	2.32	6.96	0.66	0.96
1990	15.61	10.73	6.38	1.96	8.34	0.53	0.87

Year	Northern Fall Survey arithmetic kg/tow	Northern Fall Survey 3-year average	Northern Landings (000'smt)	Northern Discards (000's mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 year avg)
1991	10.52	13.07	6.06	1.26	7.31	0.69	0.60
1992	10.25	15.61	5.31	1.42	6.73	0.66	0.53
1993	7.50	9.42	4.36	0.69	5.05	0.67	0.67
1994	6.84	8.20	3.90	0.24	4.14	0.61	0.65
1995	12.89	9.08	2.59	0.63	3.22	0.25	0.51
1996	7.57	9.10	3.62	0.82	4.44	0.59	0.48
1997	5.66	8.71	2.80	0.24	3.05	0.54	0.46
1998	18.91	10.71	2.05	0.69	2.74	0.14	0.42
1999	11.15	11.91	3.45	0.74	4.19	0.38	0.35
2000	13.51	14.52	2.59	0.36	2.95	0.22	0.25
2001	8.33	10.28	3.39	0.48	3.87	0.46	0.47
2002	7.99	10.09	2.59	0.51	3.11	0.39	0.47
2003	8.29	8.20	1.81	0.20	2.01	0.24	0.37
2004	3.28	6.52	1.05	0.12	1.16	0.35	0.33
2005	1.72	4.43	0.83	0.06	0.89	0.52	0.37
2006	3.69	2.90	0.90	0.04	0.94	0.26	0.38
2007	6.44	3.95	1.01	0.75	1.76	0.27	0.35
2008	5.27	5.13	0.62	0.17	0.79	0.15	0.23
2009	6.89	6.20	1.04	0.19	1.2320	0.18	0.20
2010	13.35	8.50	1.69	0.79	2.4784	0.19	0.17

Table 12 Southern Silver Hake Stock– Summary of catch and survey indices in Albatross units for northern silver hake, 1955-2010 (*continues onto next page*)

Year	Southern Fall Survey arithmetic kg/tow	Southern Fall Survey 3-year average	Southern Landings (000'smt)	Southern Discards (000's mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1955			13.255		13.255		
1956			14.241		14.241		
1957			16.426		16.426		
1958			12.902		12.902		
1959			16.387		16.387		
1960			8.816		8.816		
1961			12.649		12.649		
1962			17.939		17.939		
1963	4.660		89.425		89.425	19.190	
1964	4.060		147.048		147.048	36.219	
1965	5.280	4.667	294.117		294.117	55.704	37.038
1966	2.640	3.993	202.318		202.318	76.636	56.186
1967	2.440	3.453	87.383		87.383	35.813	56.051
1968	2.730	2.603	58.157		58.157	21.303	44.584
1969	1.260	2.143	74.891		74.891	59.437	38.851
1970	1.350	1.780	26.832		26.832	19.876	33.539
1971	2.210	1.607	70.506		70.506	31.903	37.072
1972	2.130	1.897	88.179		88.179	41.399	31.059
1973	1.700	2.013	102.078		102.078	60.046	44.449
1974	0.850	1.560	102.396		102.396	120.466	73.970
1975	1.790	1.447	72.164		72.164	40.315	73.609
1976	1.990	1.543	64.608		64.608	32.466	64.416
1977	1.680	1.820	57.160		57.160	34.024	35.602
1978	2.500	2.057	25.834		25.834	10.334	25.608
1979	1.680	1.953	16.398		16.398	9.761	18.039
1980	1.630	1.937	11.684		11.684	7.168	9.087
1981	1.120	1.477	13.429	3.502	16.931	15.117	10.682
1982	1.560	1.437	14.152	4.654	18.806	12.055	11.447
1983	2.570	1.750	11.860	4.814	16.674	6.488	11.220
1984	1.40	1.84	12.96	4.88	17.84	12.74	10.43
1985	3.55	2.51	12.82	3.87	16.69	4.70	7.98
1986	1.45	2.13	9.70	4.33	14.03	9.68	9.04
1987	1.95	2.32	9.55	4.25	13.80	7.08	7.15
1988	1.78	1.73	8.95	4.50	13.45	7.55	8.10
1989	1.87	1.87	13.00	6.57	19.57	10.46	8.37
1990	1.52	1.72	13.02	5.97	18.99	12.49	10.17

Year	Southern Fall Survey arithmetic kg/tow	Southern Fall Survey 3-year average	Southern Landings (000'smt)	Southern Discards (000's mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1991	0.850	1.413	9.740	3.081	12.821	15.084	12.681
1992	0.990	1.120	10.531	3.446	13.977	14.118	13.899
1993	1.280	1.040	12.487	5.166	17.653	13.791	14.331
1994	0.790	1.020	12.181	5.936	18.117	22.933	16.947
1995	1.590	1.220	11.992	1.402	13.394	8.424	15.049
1996	0.450	0.943	12.134	0.479	12.613	28.029	19.795
1997	0.830	0.957	12.548	0.624	13.172	15.870	17.441
1998	0.570	0.617	12.558	0.526	13.084	22.954	22.284
1999	0.820	0.740	10.417	3.549	13.966	17.032	18.619
2000	0.720	0.703	9.472	0.329	9.801	13.613	17.866
2001	2.040	1.193	8.884	0.188	9.072	4.447	11.697
2002	1.180	1.313	4.888	0.410	5.298	4.490	7.516
2003	1.420	1.547	6.281	0.604	6.885	4.849	4.595
2004	1.240	1.280	6.965	1.203	8.168	6.587	5.309
2005	0.940	1.200	6.395	1.576	7.971	8.480	6.638
2006	1.420	1.200	4.583	0.161	4.744	3.341	6.136
2007	0.870	1.077	5.067	0.146	5.213	5.992	5.938
2008	1.360	1.217	5.582	1.033	6.615	4.864	4.732
2009	1.100	1.110	6.595	0.839	7.434	6.758	5.871
2010	2.818	1.759	6.330	0.780	7.110	2.523	4.715

In the northern management area, the three year average arithmetic mean biomass based on the NEFSC fall bottom trawl survey for data 2008-2010 (8.50 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 2008-2010 (0.17 kt/kg) was below the overfishing threshold (2.78 kt/kg; Figure 12). In the southern management area, the three year arithmetic also based on the NEFSC fall bottom trawl survey data for 2008-2010 (1.76 kg/tow) was above the biomass threshold (0.83 kg/tow) and above the target (1.65 kg/tow). The three year average exploitation index (total catch divided by biomass index) for 2008-2010 (4.72 kt/kg) was below the overfishing threshold (34.19 kt/kg; Figure 13). Therefore, based on the accepted SAW 51 reference points, the northern and southern stocks of silver are <u>NOT</u> overfished and overfishing is <u>NOT</u> occurring.

Figure 12 Northern Silver Hake Fall Survey Biomass in kg/tow (top) and Relative Exploitation Ratios (bottom) of the Total Catch (kt) to the Fall Survey Index with their Calculated 3-yr Running Averages (red lines). The solid lines represent the overfishing thresholds.

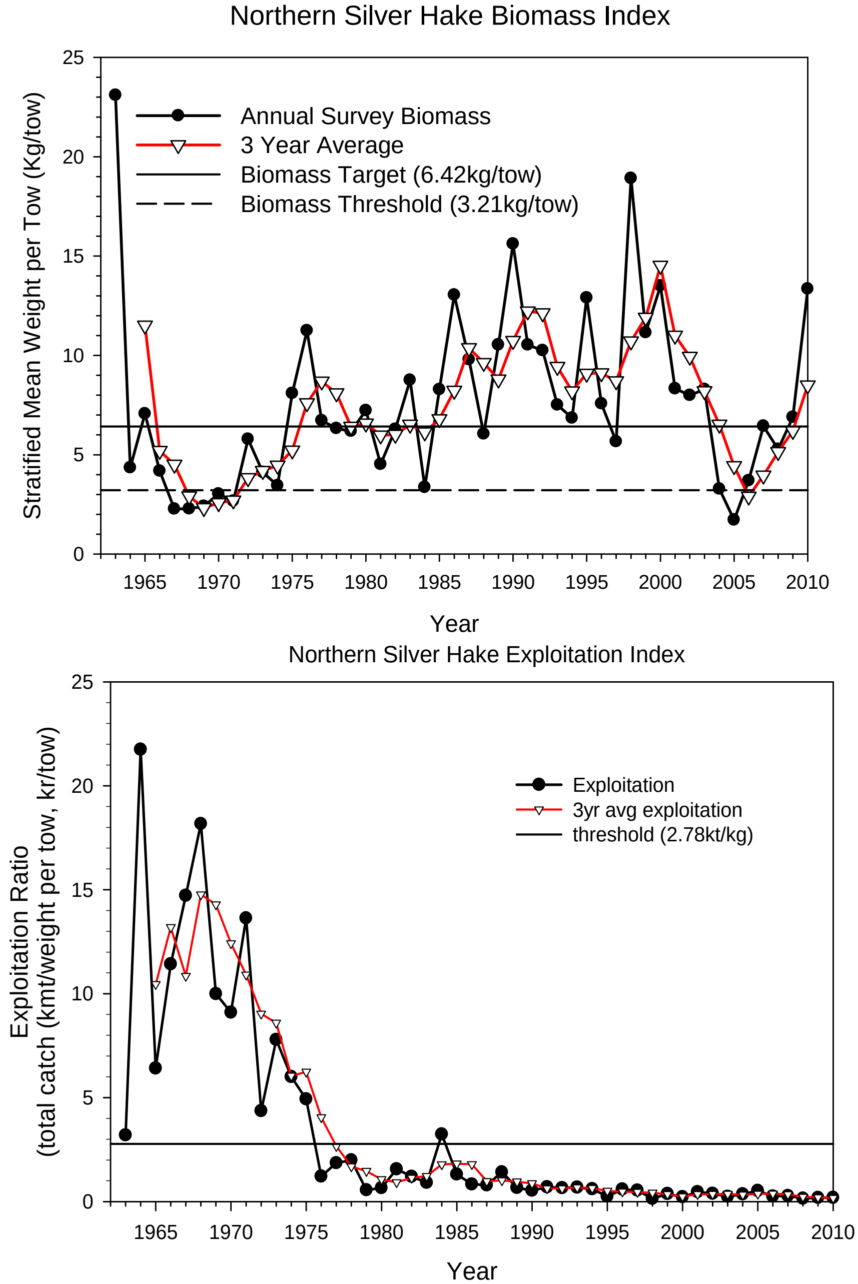
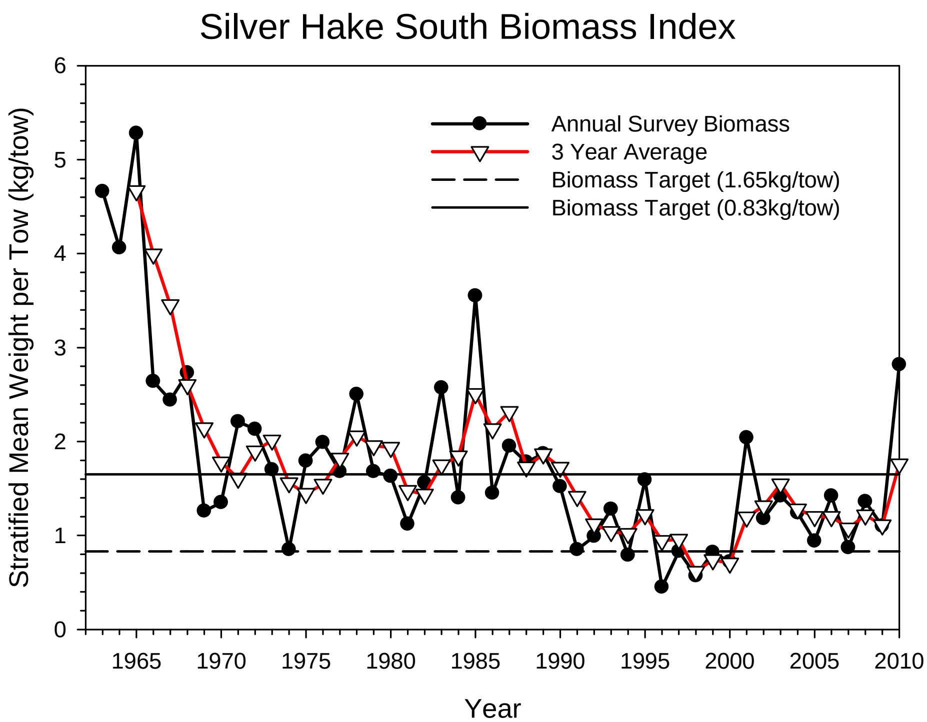
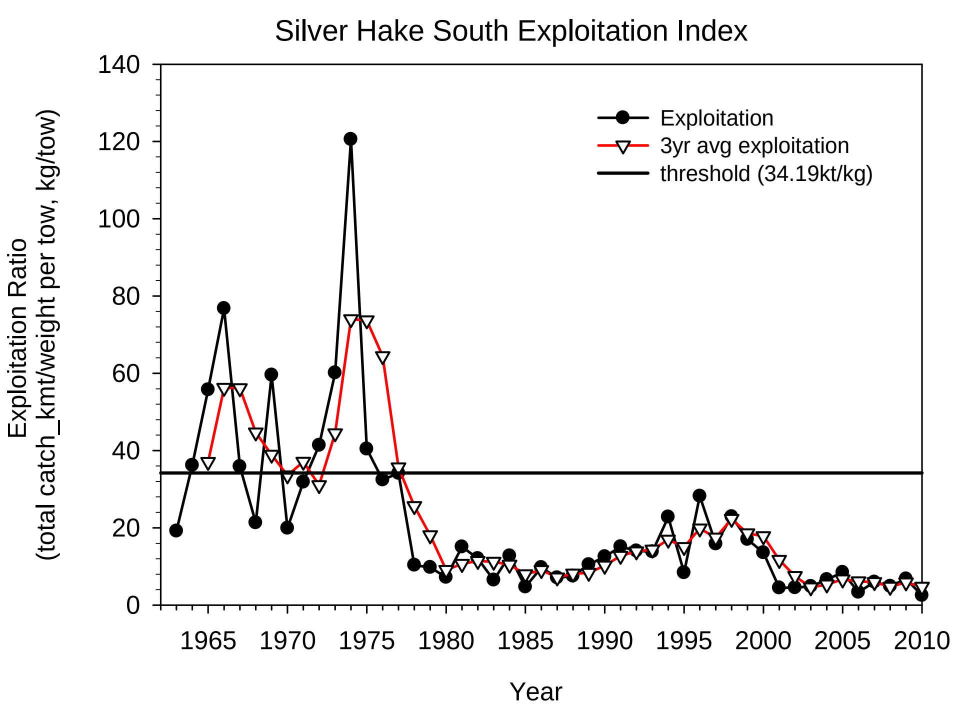


Figure 13 Southern Silver Hake Fall Survey Biomass in kg/tow (top) and Relative Exploitation Ratios (bottom) of the Total Catch (kt) to the Fall Survey Index with their Calculated 3-yr Running Averages (red lines). The solid lines represent the overfishing thresholds.





The range of years (1973-1982) adopted during the benchmark assessments for deriving the overfishing definition reference points are considered to be uncertain because it does not incorporate estimates of current stock productivity. The transition from the 1970's to the 1980's highlight a period of high and low productivity with respect to the stock dynamics. Recognizing the potential for non-stationary productivity in the stock dynamics and the implications on estimates of the OFL, options for ABCs were explored to account for scientific uncertainty. Other sources of uncertainty in the assessment include: truncation in the age structure, estimates of predatory consumption, and catch estimates relative to mixed landings in the fishery (NEFSC, 2011).

Section 4.1.2.2 Red hake

The 2010 red hake assessment included survey data from the NEFSC spring bottom trawl survey through 2010, commercial fishing data from vessel trip reports, dealer landings, and on-board fishery observer data through 2009. Since the last assessment, the Council's Small-Mesh Multispecies PDT have updated the assessment results (to include both the 2011 spring survey biomass and the 2010 commercial catch data and will be reflected in this report. In the absence of a an analytical assessment for red hake, the biological reference points for both the northern and southern silver stocks are as follows (Table 13):

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

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

Table 13 Current Overfishing Definition Reference Points for Red Hake

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

Table 14 Northern Red Hake Stock - Summary of catch and survey indices in Albatross units for northern silver hake, 1962-2010 (*continues onto next page*)

Year	Northern Fall Survey arithmetic kg/tow	Northern Fall Survey 3-year average	Northern Landings (000'smt)	Northern Discards (000's mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 year avg)
1962			1.918	1.600	3.518		
1963			3.285	1.600	4.885		
1964			1.410	1.701	3.111		
1965			2.774	1.624	4.398		
1966			5.578	1.603	7.181		
1967			1.865	1.404	3.269		
1968	1.138		2.629	1.301	3.930	3.454	
1969	0.639		2.022	1.117	3.138	4.909	
1970	0.541	0.773	1.033	1.098	2.130	3.939	4.101
1971	0.648	0.609	4.806	1.162	5.969	9.211	6.020
1972	1.560	0.916	15.028	0.963	15.991	10.248	7.800
1973	4.311	2.173	15.289	0.909	16.199	3.757	7.739
1974	2.431	2.768	7.226	0.815	8.041	3.308	5.771
1975	4.254	3.665	8.703	1.199	9.902	2.328	3.131
1976	3.371	3.352	6.339	0.925	7.264	2.155	2.597
1977	2.656	3.427	0.894	1.081	1.976	0.744	1.742
1978	2.571	2.866	1.227	1.117	2.345	0.912	1.270
1979	2.041	2.422	1.529	1.223	2.751	1.348	1.001
1980	3.883	2.831	1.033	1.366	2.399	0.618	0.959
1981	6.353	4.092	1.277	1.324	2.601	0.409	0.792
1982	2.127	4.121	1.213	1.460	2.673	1.257	0.761
1983	3.698	4.059	0.895	1.353	2.248	0.608	0.758
1984	2.982	2.936	1.060	1.327	2.388	0.801	0.888
1985	3.913	3.531	0.992	1.270	2.262	0.578	0.662
1986	3.260	3.385	1.458	1.189	2.646	0.812	0.730
1987	2.941	3.371	1.013	1.052	2.066	0.702	0.697
1988	1.996	2.732	0.866	0.897	1.763	0.883	0.799
1989	1.651	2.196	0.777	1.447	2.224	1.347	0.977
1990	1.331	1.660	0.830	0.595	1.425	1.070	1.100

Year	Northern Fall Survey arithmetic kg/tow	Northern Fall Survey 3-year average	Northern Landings (000'smt)	Northern Discards (000's mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 year avg)
1991	1.621	1.621	0.745	0.818	1.563	0.964	0.964
1992	2.501	2.061	0.918	0.726	1.645	0.658	0.811
1993	2.824	2.315	0.769	0.083	0.853	0.302	0.641
1994	1.590	2.305	0.729	0.077	0.806	0.507	0.489
1995	1.973	2.129	0.187	0.063	0.250	0.127	0.312
1996	1.792	1.785	0.414	0.656	1.070	0.597	0.410
1997	1.811	1.859	0.339	0.125	0.464	0.256	0.327
1998	2.519	2.041	0.187	0.130	0.317	0.126	0.326
1999	2.322	2.217	0.220	0.468	0.687	0.296	0.226
2000	3.186	2.676	0.197	0.055	0.252	0.079	0.167
2001	3.579	3.029	0.223	0.135	0.358	0.100	0.158
2002	4.460	3.742	0.275	0.101	0.376	0.084	0.088
2003	0.996	3.012	0.210	0.088	0.297	0.298	0.161
2004	1.772	2.409	0.103	0.057	0.160	0.090	0.158
2005	1.097	1.288	0.096	0.057	0.153	0.140	0.176
2006	0.912	1.260	0.096	0.181	0.277	0.303	0.178
2007	2.056	1.355	0.069	0.127	0.197	0.096	0.180
2008	3.488	2.152	0.052	0.059	0.112	0.032	0.144
2009	1.748	2.431	0.085	0.095	0.180	0.103	0.077
2010	2.020	2.419	0.067	0.244	0.311	0.154	0.096
2011	**2.178**	1.982					

Table 15 Southern Red Hake Stock - Summary of catch and survey indices in Albatross units for northern silver hake, 1962-2010 (*continues onto next page*)

Year	Southern Fall Survey arithmetic kg/tow	Southern Fall Survey 3-year average	Southern Landings (000'smt)	Southern Discards (000's mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1962			12.757	4.000	16.757		
1963			32.671	4.000	36.671		
1964			44.221	3.758	47.979		
1965			93.624	4.292	97.916		
1966			108.016	3.773	111.789		
1967			58.948	3.660	62.608		
1968	1.285		18.713	3.715	22.428	17.450	
1969	1.082		53.417	3.623	57.040	52.707	
1970	1.723	1.364	11.864	3.141	15.005	8.708	26.288
1971	3.488	2.098	35.421	2.313	37.734	10.817	24.077
1972	3.590	2.934	61.371	2.098	63.469	17.680	12.402
1973	3.992	3.690	51.679	2.240	53.919	13.506	14.001
1974	2.838	3.473	26.834	2.158	28.992	10.217	13.801
1975	3.179	3.336	20.028	1.763	21.791	6.855	10.193
1976	5.314	3.777	23.110	1.827	24.937	4.693	7.255
1977	2.300	3.598	7.812	1.818	9.630	4.186	5.245
1978	7.648	5.087	6.434	2.436	8.870	1.160	3.346
1979	1.514	3.821	7.837	2.665	10.502	6.938	4.095
1980	2.380	3.847	4.226	2.702	6.928	2.911	3.670
1981	4.613	2.835	2.496	2.715	5.211	1.130	3.660
1982	3.342	3.445	3.199	3.776	6.975	2.087	2.043
1983	2.207	3.387	1.576	3.889	5.465	2.476	1.898
1984	1.331	2.293	1.819	3.910	5.729	4.305	2.956
1985	1.392	1.643	0.932	2.968	3.901	2.802	3.194
1986	1.734	1.486	0.899	3.389	4.288	2.473	3.193
1987	0.878	1.335	1.415	3.313	4.728	5.389	3.554
1988	1.006	1.206	1.122	3.462	4.584	4.557	4.139
1989	0.487	0.790	1.367	5.006	6.372	13.077	7.674
1990	0.707	0.733	1.312	4.748	6.060	8.573	8.735

Year	Southern Fall Survey arithmetic kg/tow	Southern Fall Survey 3-year average	Southern Landings (000'smt)	Southern Discards (000's mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1991	0.611	0.602	1.210	2.612	3.822	6.257	9.302
1992	0.465	0.594	1.439	6.343	7.782	16.743	10.524
1993	0.424	0.500	1.014	5.308	6.321	14.926	12.642
1994	0.675	0.521	1.052	1.720	2.772	4.108	11.926
1995	0.516	0.538	1.473	1.329	2.801	5.433	8.156
1996	0.453	0.548	0.719	0.380	1.099	2.426	3.989
1997	1.161	0.710	1.172	2.422	3.595	3.097	3.652
1998	0.214	0.609	1.207	0.740	1.948	9.118	4.880
1999	0.455	0.610	1.404	1.060	2.465	5.420	5.878
2000	0.423	0.364	1.462	0.250	1.712	4.047	6.195
2001	0.642	0.507	1.492	0.138	1.630	2.540	4.002
2002	0.542	0.536	0.673	0.327	1.000	1.846	2.811
2003	0.206	0.463	0.641	0.345	0.986	4.794	3.060
2004	0.154	0.301	0.599	0.616	1.214	7.865	4.835
2005	0.376	0.245	0.411	1.007	1.418	3.772	5.477
2006	0.380	0.304	0.429	0.674	1.103	2.902	4.846
2007	0.857	0.538	0.489	1.545	2.035	2.373	3.015
2008	0.473	0.570	0.653	0.814	1.467	3.099	2.791
2009	1.342	0.891	0.674	0.869	1.543	1.150	2.207
2010	1.045	0.954	0.616	0.737	1.352	1.294	1.848
2011	**1.098**	**1.162**					

In the north, the three year arithmetic mean biomass index, based on the NEFSC spring bottom trawl survey for 2009-2011 (1.98 kg/tow) was above the management threshold (1.27 kg/tow) and below the target (2.54 kg/tow). The exploitation index (catch divided by biomass index for 2010 (0.15 kt/kg) was below the threshold (0.16 kt/kg; Figure 14). In the south, the three year arithmetic mean biomass index, based on the NEFSC spring bottom trawl survey for 2009-2011 (1.16 kg/tow) was above the management threshold (0.51 kg/tow) and above the target (1.02 kg/tow; Figure 15). The exploitation index (catch divided by biomass index for 2010 (1.29 kt/kg) was below the threshold (3.04 kt/kg; Figure 15). Therefore, based on the accepted SARC 51 reference points, the northern and southern red hake stocks are NOT overfished and overfishing is NOT occurring.

Figure 14 Northern Red Hake Spring Survey Biomass in kg/tow (top) and Relative Exploitation Ratios (bottom) of the Total Catch (kt) to the Fall Survey Index with their Calculated 3-yr Running Averages (red lines). The solid lines represent the overfishing thresholds.

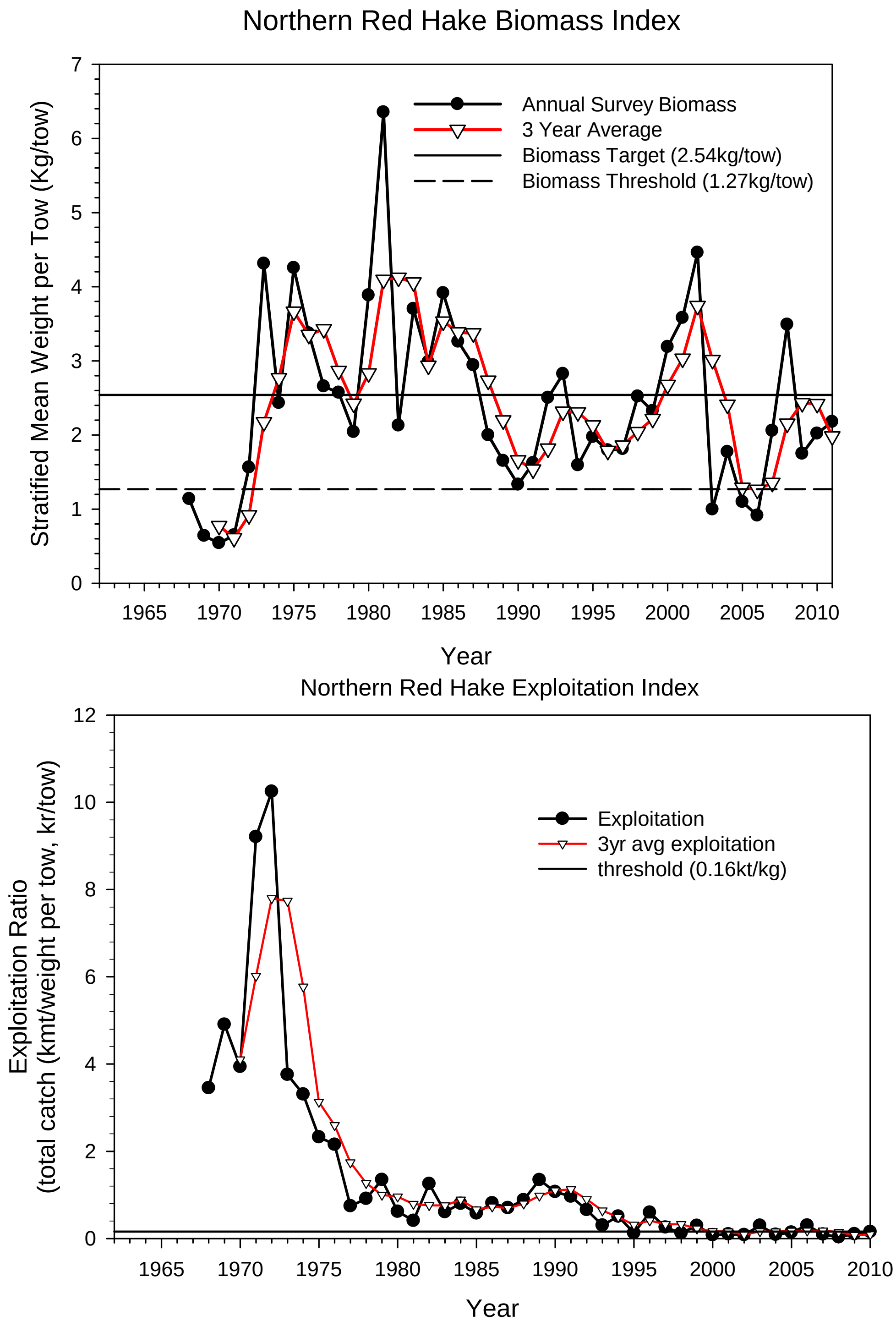
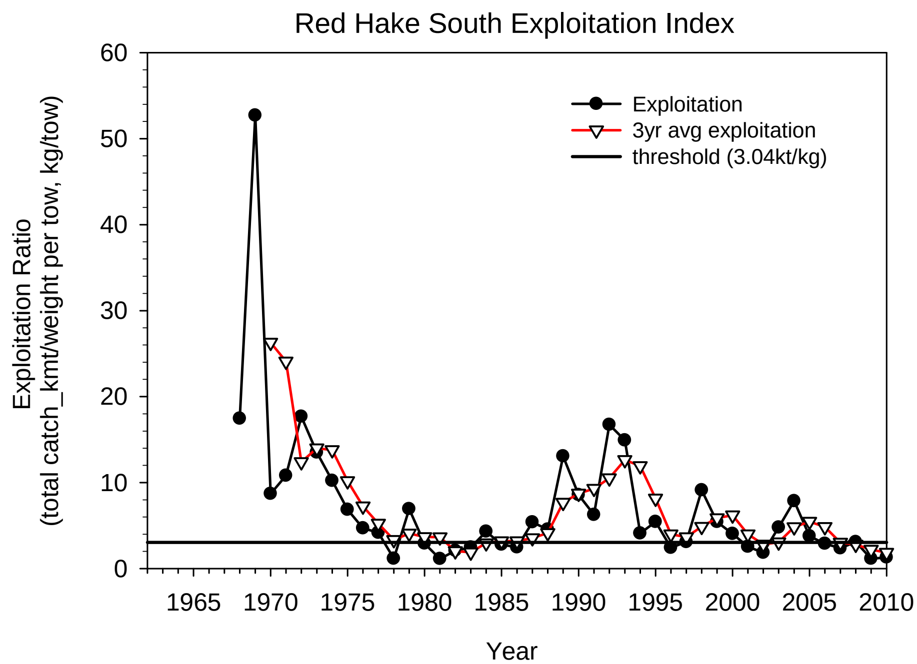
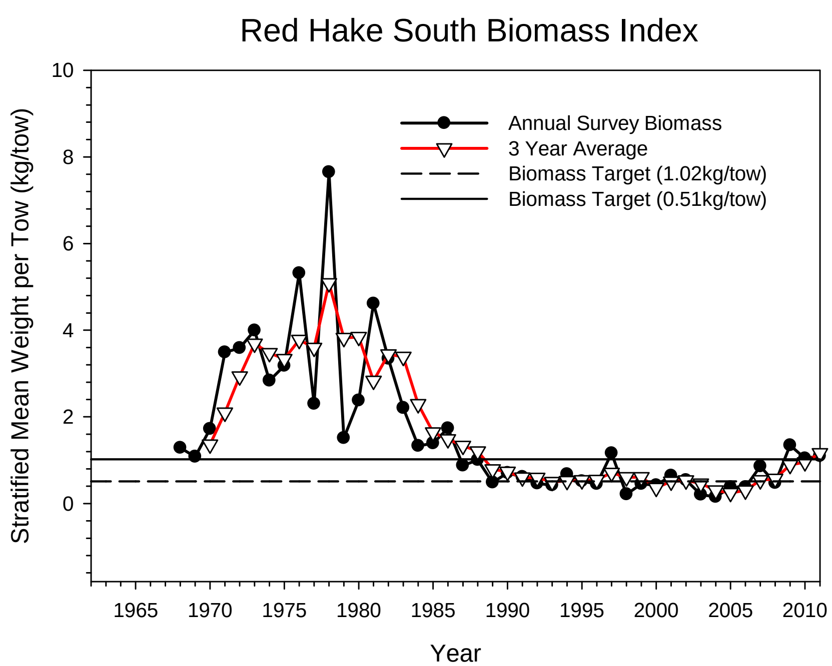


Figure 15 Southern Red Hake Spring Survey Biomass in kg/tow (top) and Relative Exploitation Ratios (bottom) of the Total Catch (kt) to the Fall Survey Index with their Calculated 3-yr Running Averages (red lines). The solid lines represent the overfishing thresholds.





Section 4.1.2.3 Offshore hake

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

Section 4.2 Non-Target Species

Information about the absolute level of bycatch species in the directed small-mesh multispecies fishery could not be determined due to difficulties of determining an appropriate trip definition for the hake fishery. Several factors were explored in attempt to define an observed hake trip, including regulated mesh size and possession limits for years 2000-2004. However, these factors were not sufficient to define "directed" small-mesh multispecies trips. This insufficiency likely resulted in trips that did target small-mesh multispecies being excluded, with potentially significant impacts. For the purpose of this exercise, bycatch species were determined using a broad definition of all trips (directed and non-directed) that caught small-mesh multispecies in the trawl fishery by mesh-size groups. Mesh size was grouped into three categories in an attempt to crudely disaggregate which trips are believed to most likely target small-mesh multispecies based on mesh regulations for the exempted area programs. The mesh groups include: <2.5-inch mesh (often trips targeting other species like herring, shrimp, and squid), 2.5-4.5-inch mesh (often trips targeting small-mesh multispecies), and > 4.5-inch mesh (often trips targeting other species like regulated groundfish, black sea bass, and summer flounder). In the southern area, trips that caught offshore hake were included with silver hake trips to account for mixed landings of whiting in the southern management area. In the analysis, mesh-size group 2.5-4.5-inches was used as a proxy for trips that were most likely to "target" small-mesh multispecies. However, it was also recognized that there are some overlaps with other targeted fisheries (i.e., the squid, mackerel, and butterfish fishery) within this category.

Table 16 – Table 31 provide a list of the most frequent discarded species or species group that comprised <1% or more of the discards on observed trips that caught either silver hake or red hake during 2004 -2010 by management area based on data from the NEFSC Observer Program. Note the small-mesh multispecies resources are included in the list (grayed out in Table 16-Table 31). Across both stock areas, the discard list includes the skate complex (*Raja eglanteria, Luecoraja erinacea, Leucoraja garmani, Malacoraja senta, Ambiraja radiate, Leucoraja ocellata*), dogfish (*Squalus acanthias*), fluke (*Paralicthys dentatus*), windowpane flounder (*Scophthalmus aquosus*), yellowtail flounder (*Limanada ferriginea*), American plaice (*Hippoglossoides platessoides*), witch flounder (*Glyptocephalus cynoglossus*), red hake (*Urophycis chuss*), silver hake (*Merluccidae billinearis*), scup (*Stenotomus chrysops*), black sea bass (*Centropristis striata*), monkfish (*Lophius americanus*), cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), red crab (*Chaceon quinquedens*), scallops (*Placopecten magellanicus*), squid (*Loligo pealeii, Illex illecebrosus*), butterfish (*Peprilus triacanthus*), mackerel (*Scomber scombrus*), and redfish (*Sebastes fasciatus*).

The proportion of observed catches that were discarded by total weight on trips that were likely to target either red or silver hake were fairly similar regardless of stock area, but lower for other mesh-size groupings, with the exception of large the mesh fishery (>4.5 inches) in the southern region. In the northern area, for 2004-2010, 38% of observed catches were discarded on trips that were likely to target silver hake (Table 18), and 40% of total catches were discarded on trips that were likely directed towards red hake (Table 19). During the same time period, discards of all species caught in the trips that likely targeted silver hake or red hake in the southern area represented 31% and 36% of the observed catch for these fisheries, respectively. For trips that likely targeted small-mesh multispecies, the majority of discards consisted of the small-mesh groundfish species complex (silver hake, offshore hake, and red hake). In the northern area, approximately 21-22% of the small-mesh multispecies catches were discarded (Table 18-Table 19) and in the southern area, 23-27% (Table 26-Table 27) of small-mesh multispecies were discarded. Other frequently discarded species on trips that caught small-mesh multispecies (i.e., trips with trawl mesh size < 2.5 inches or > 4.5 inches, as well as other gear types) include dogfish in the northern stock area, the squid, mackerel, and butterfish complex in the southern stock area, and skates in both the northern and southern stock areas (Table 16-Table 31). Because we are unable to definitively identify "targeted" small-mesh multispecies trips, it is difficult to assign discards to particular fisheries. For example, skates and dogfish catch would be uninformative, as those species are also often caught incidentally (and with a relatively high trip limit) to trips directing on higher value, lower trip limit species. If we were to say a trip is a directed skate trip because of a relatively high proportion of its landings are skates, it is likely not accurate because the trip could have been targeting a lower landing limit of cod (a higher value species). Because of this, it would be difficult to tease out of the data that the lower landing limit, higher value species is, in fact, the target.

In the following tables (Table 16-Table 31), "Pct Discard (Overall)" represents the discard weight (lb) of that species divided by the total discard weight across all species. "Pct Discard (Sp)" represents the percentage of the catch (Kept + Discards) of a species that was discarded from trips that caught silver hake.

Table 16 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught silver hake in the northern management area for mesh size < 2.5 inches, from the NEFSC Program database (2004 -2010).

Northern Silver Hake (Mesh < 2.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Dogfish	29,973	103,177	133,150	77%	32%
Groundfish, Small-Mesh	272,919	39,646	312,566	13%	12%
Groundfish, Large-Mesh	2,581	22,893	25,474	90%	7%
Silver Hake	217,275	19,996	237,271	8%	6%
Red Hake	55,588	19,650	75,238	26%	6%
Skate	-	19,086	19,086	100%	6%
Herring	64,237	17,542	81,779	21%	5%
Squid, Mackerel, Butterfish	8,899	11,873	20,773	57%	4%
General *Alosa*	4,160	9,194	13,354	69%	3%
Winter Flounder	-	7,233	7,233	100%	2%
American Plaice	-	6,759	6,759	100%	2%
River Herring	774	5,399	6,173	87%	2%
Mackerel	855	4,838	5,693	85%	1%
Yellowtail Flounder	10	4,651	4,661	100%	1%
Butterfish	4,104	4,499	8,603	52%	1%

Alewife	170	3,442	3,612	95%	1%
Unknown Herring	3,124	3,398	6,522	52%	1%
Illex	915	2,004	2,918	69%	1%
Blueback Herring	604	1,957	2,561	76%	1%
Other Species	5,569	8,011	13,580	59%	3%
Total	671,757	315,248	987,005	32%	NA

Table 17 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught <u>red hake in the northern management area</u> for mesh size <2.5 inches, from the NEFSC Program database (2004 -2010).

Northern Red Hake (Mesh < 2.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Dogfish	24,983	96,355	121,338	79%	31%
Groundfish, Small-Mesh	266,406	39,301	305,708	13%	13%
Groundfish, Large-Mesh	1,524	22,055	23,579	94%	7%
Silver Hake	210,762	19,651	230,413	9%	6%
Red Hake	55,588	19,650	75,238	26%	6%
Skate	-	18,290	18,290	100%	6%
Herring	63,386	17,412	80,798	22%	6%
Squid, Mackerel, Butterfish	8,062	11,629	19,691	59%	4%
General *Alosa*	4,110	9,013	13,123	69%	3%
Winter Flounder	-	6,824	6,824	100%	2%
American Plaice	-	6,560	6,560	100%	2%
River Herring	771	5,284	6,054	87%	2%
Mackerel	855	4,838	5,693	85%	2%
Yellowtail Flounder	10	4,618	4,628	100%	1%
Butterfish	4,042	4,331	8,373	52%	1%
Unknown Herring	3,077	3,348	6,425	52%	1%
Alewife	167	3,327	3,494	95%	1%
Illex	915	1,975	2,889	68%	1%
Blueback Herring	604	1,957	2,561	76%	1%
Other Species	3,726	7,693	11,419	67%	3%
Total	648,985	304,112	953,096	32%	NA

Table 18 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught <u>silver hake in the northern management area</u> for mesh size range between 2.5 and 4.5 inches, from the NEFSC Program database (2004 -2010).

Northern Silver Hake (2.5-4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Groundfish, Small-Mesh	545,261	198,314	743,574	27%	21%
Skate	8,121	164,917	173,038	95%	18%

Silver Hake	495,773	147,747	643,520	23%	16%
Dogfish	10,422	73,823	84,245	88%	8%
Groundfish, Large-Mesh	77,593	60,668	138,261	44%	7%
Herring	38,062	60,559	98,621	61%	7%
Red Hake	49,160	50,542	99,701	51%	5%
Squid, Mackerel, Butterfish	15,388	22,333	37,721	59%	2%
Winter Flounder	557	21,604	22,161	97%	2%
Yellowtail Flounder	524	13,397	13,921	96%	1%
American Plaice	15,623	12,854	28,477	45%	1%
Butterfish	8,112	11,304	19,416	58%	1%
Fluke, Scup, Black Sea Bass	486	9,532	10,018	95%	1%
Fluke	479	9,527	10,006	95%	1%
Illex	376	7,749	8,125	95%	1%
Monkfish	115,323	7,654	122,976	6%	1%
Haddock	6,096	4,890	10,986	45%	1%
Other Species	62,906	25,083	87,989	29%	3%
Total	1,450,259	902,496	2,352,755	38%	NA

Table 19 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught red hake in the northern management area for mesh size range between 2.5 and 4.5 inches, from the NEFSC Program database (2004 -2010).

Northern Red Hake (2.5-4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Groundfish, Small-Mesh	527,119	197,298	724,416	27%	22%
Skate	1,713	163,293	165,006	99%	18%
Silver Hake	477,631	146,731	624,362	24%	16%
Dogfish	8,846	61,855	70,701	87%	7%
Herring	37,917	60,461	98,378	61%	7%
Groundfish, Large-Mesh	43,206	56,137	99,343	57%	6%
Red Hake	49,160	50,542	99,701	51%	6%
Squid, Mackerel, Butterfish	14,991	22,070	37,060	60%	2%
Winter Flounder	98	20,978	21,076	100%	2%
Yellowtail Flounder	3	12,957	12,960	100%	1%
Butterfish	8,067	11,169	19,236	58%	1%
American Plaice	7,890	10,559	18,449	57%	1%
Fluke, Scup, Black Sea Bass	486	9,385	9,871	95%	1%
Fluke	479	9,380	9,859	95%	1%
Illex	330	7,659	7,989	96%	1%
Monkfish	69,172	6,819	75,991	9%	1%
Haddock	1,207	4,870	6,077	80%	1%
Other Species	41,745	23,146	64,891	36%	3%
Total	1,290,057	875,307	2,165,364	40%	NA

Table 20 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught silver hake in the northern management area for mesh size greater than 4.5 inches, from the NEFSC Program database (2004 -2010).

Northern Silver Hake (Mesh > 4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	5,319,058	15,531,636	20,850,694	74%	63%
Groundfish, Large-Mesh	23,700,480	2,399,490	26,099,970	9%	10%
Dogfish	67,352	1,823,470	1,890,821	96%	7%
Cod	4,028,453	705,852	4,734,305	15%	3%
Monkfish	6,513,241	466,669	6,979,910	7%	2%
Haddock	5,801,800	384,633	6,186,433	6%	2%
American Plaice	1,870,113	358,488	2,228,601	16%	1%
Fluke, Scup, Black Sea Bass	35,887	279,791	315,678	89%	1%
Fluke	35,853	279,594	315,447	89%	1%
Yellowtail Flounder	652,492	216,669	869,161	25%	1%
Redfish	1,477,410	188,120	1,665,530	11%	1%
Windowpane	11,887	160,987	172,875	93%	1%
Groundfish, Small-Mesh	21,638	157,841	179,479	88%	1%
Witch Flounder	1,740,960	148,353	1,889,313	8%	1%
Silver Hake	14,557	93,318	107,874	87%	0%
Red Hake	7,017	62,853	69,870	90%	0%
Other Species	8,345,849	690,582	9,036,431	8%	3%
Total	59,622,473	23,792,175	83,414,648	29%	NA

Table 21 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught red hake in the northern management area for mesh size greater than 4.5 inches, from the NEFSC Program database (2004 -2010).

Northern Red Hake (Mesh > 4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	3,612,312	10,695,964	14,308,276	75%	65%
Groundfish, Large-Mesh	14,923,343	1,564,081	16,487,424	9%	9%
Dogfish	36,008	1,166,609	1,202,617	97%	7%
Cod	2,560,364	431,717	2,992,081	14%	3%
Monkfish	3,924,702	285,250	4,209,953	7%	2%
Haddock	3,982,135	267,611	4,249,746	6%	2%
American Plaice	1,111,375	248,059	1,359,434	18%	1%
Fluke, Scup, Black Sea Bass	24,573	177,719	202,292	88%	1%
Fluke	24,545	177,554	202,099	88%	1%
Groundfish, Small-Mesh	16,063	133,136	149,199	89%	1%
Redfish	1,038,866	132,809	1,171,675	11%	1%

Yellowtail Flounder	444,145	127,356	571,501	22%	1%
Windowpane	8,602	105,638	114,240	92%	1%
Witch Flounder	1,109,369	97,112	1,206,481	8%	1%
Silver Hake	8,777	68,442	77,218	89%	0%
Red Hake	7,222	63,168	70,390	90%	0%
Other Species	4,832,168	480,529	5,312,697	9%	3%
Total	37,648,570	16,091,143	53,739,714	30%	NA

Table 22 Species comprising <1% (in red font) or more of all observed discards, aggregated across other gear groups (shrimp trawl, gillnet, and scallop dredge) for trips (directed and non-directed) that caught silver hake in the northern management area, from the NEFSC Program database (2004 -2010).

Northern Silver Hake Other Gears (All Mesh Categories)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Dogfish	516,059	1,288,709	1,804,768	71%	47%
Scallops	5,583,406	437,184	6,020,591	7%	16%
Skate	70,495	397,593	468,088	85%	15%
Groundfish, Large-Mesh	2,685,099	145,624	2,830,723	5%	5%
Monkfish	168,584	82,004	250,588	33%	3%
Cod	798,816	41,282	840,099	5%	2%
Pollock	1,421,239	34,524	1,455,763	2%	1%
Winter Flounder	14,907	25,398	40,305	63%	1%
Groundfish, Small-Mesh	8,624	17,894	26,518	67%	1%
Silver Hake	7,326	12,528	19,854	63%	0%
Red Hake	1,174	5,284	6,458	82%	0%
Other Species	484,431	124,485	608,916	20%	5%
Total	11,751,661	2,594,697	14,346,357	18%	NA

Table 23 Species comprising <1% (in red font) or more of all observed discards, aggregated across other gear groups (shrimp trawl, gillnet, and scallop dredge) for trips (directed and non-directed) that caught red hake in the northern management area, from the NEFSC Program database (2004 - 2010).

Northern Red Hake Other Gears (All Mesh Categories)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Dogfish	158,019	452,750	610,768	74%	31%
Scallops	4,367,243	356,307	4,723,550	8%	25%
Skate	21,980	313,594	335,573	93%	22%
Monkfish	68,713	77,356	146,069	53%	5%
Groundfish, Large-Mesh	928,149	67,877	996,027	7%	5%
Winter Flounder	6,142	19,899	26,041	76%	1%

Pollock	510,270	14,539	524,809	3%	1%
Groundfish Small Mesh	4,155	12,439	16,594	75%	1%
Yellowtail Flounder	1,977	8,807	10,784	82%	1%
Silver Hake	2,780	6,696	9,475	71%	0%
Red Hake	1,279	5,661	6,940	82%	0%
Other Species	193,666	60,724	254,390	24%	4%
Total	6,488,628	1,391,312	7,879,939	18%	NA

Table 24 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught silver hake in the southern management area for mesh size < 2.5 inches, from the NEFSC Program database (2004 -2010).

Southern Silver Hake (Mesh < 2.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Squid, Mackerel, Butterfish	15,448,841	1,381,682	16,830,523	8%	21%
Groundfish, Small-Mesh	949,017	831,921	1,780,937	47%	12%
Dogfish	35,614	582,134	617,748	94%	9%
Butterfish	82,100	554,129	636,229	87%	8%
Silver Hake	902,473	507,996	1,410,468	36%	8%
Illex	9,800,687	495,727	10,296,414	5%	7%
Red Hake	44,770	323,125	367,896	88%	5%
Skate	4,209	285,960	290,169	99%	4%
Fluke, Scup, Black Sea Bass	204,634	274,259	478,893	57%	4%
Loligo	5,458,945	166,864	5,625,809	3%	3%
Scup	78,505	159,069	237,574	67%	2%
Mackerel	88,760	158,918	247,679	64%	2%
Groundfish, Large-Mesh	9,400	104,846	114,246	92%	2%
Fluke	114,409	93,918	208,327	45%	1%
General *Alosa*	32,314	92,494	124,808	74%	1%
Herring	793,439	66,675	860,113	8%	1%
Unknown Herring	4,186	56,757	60,943	93%	1%
Monkfish	54,492	47,496	101,988	47%	1%
Winter Flounder	580	37,621	38,201	98%	1%
Scallops	10,220	35,213	45,433	78%	1%
Other Species	130,689	200,201	330,890	61%	3%
Total	34,248,283	6,457,004	40,705,288	16%	NA

Table 25 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught red hake in the southern management area for mesh size <2.5 inches, from the NEFSC Program database (2004 -2010).

Species	Kept (lb)	Discard (lb)	Grand Total (lb)	Pct Discard (Sp)	Pct Discard (Overall)
Squid, Mackerel, Butterfish	9,198,927	858,313	10,057,240	9%	19%
Groundfish, Small-Mesh	827,473	701,198	1,528,671	46%	16%
Silver Hake	780,885	376,637	1,157,523	33%	8%
Butterfish	45,585	369,776	415,361	89%	8%
Dogfish	22,978	345,752	368,730	94%	8%
Red Hake	44,823	323,779	368,602	88%	7%
Illex	5,969,498	285,418	6,254,916	5%	6%
Skate	1,822	192,553	194,376	99%	4%
Fluke, Scup, Black Sea Bass	127,286	146,845	274,131	54%	3%
Mackerel	24,238	106,597	130,834	81%	2%
Loligo	3,143,807	88,837	3,232,645	3%	2%
Groundfish, Large-Mesh	3,796	69,957	73,754	95%	2%
Scup	41,346	68,250	109,596	62%	2%
Fluke	76,387	62,538	138,925	45%	1%
Herring	203,092	40,420	243,512	17%	1%
Monkfish	41,461	34,001	75,462	45%	1%
General *Alosa*	12,488	32,967	45,455	73%	1%
Scallops	6,351	26,759	33,110	81%	1%
Other Species	64,252	155,644	219,896	71%	4%
Total	20,636,496	4,286,241	24,922,737	17%	NA

Table 26 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught silver hake in the southern management area for mesh size range between 2.5 and 4.5 inches, from the NEFSC Program database (2004 -2010).

Southern Silver Hake (2..5-4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Groundfish, Small-Mesh	1,313,028	476,629	1,789,657	27%	23%
Red Hake	65,831	285,951	351,782	81%	14%
Dogfish	19,098	245,006	264,105	93%	12%
Skate	4,920	202,153	207,073	98%	10%
Silver Hake	1,238,245	190,657	1,428,901	13%	9%
Fluke, Scup, Black Sea Bass	129,944	92,556	222,500	42%	5%
Squid, Mackerel, Butterfish	743,079	92,158	835,237	11%	4%
Groundfish, Large-Mesh	20,499	71,348	91,847	78%	3%
Scup	66,986	59,021	126,006	47%	3%
Illex	2,389	52,490	54,879	96%	3%
Butterfish	14,841	26,860	41,700	64%	1%

Fluke	27,922	24,072	51,993	46%	1%
Haddock	2,191	24,041	26,232	92%	1%
Monkfish	23,169	22,113	45,282	49%	1%
Witch Flounder	133	12,509	12,642	99%	1%
Redfish	243	10,512	10,755	98%	1%
General *Alosa*	1,232	10,326	11,558	89%	1%
Other Species	772,536	77,756	850,292	9%	4%
Total	4,446,285	1,976,156	6,422,441	31%	NA

Table 27 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught red hake in the southern management area for mesh size range between 2.5 and 4.5 inches, from the NEFSC Program database (2004 -2010).

Southern Red Hake (2.5-4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Groundfish, Small-Mesh	1,175,650	448,353	1,624,003	28%	27%
Red Hake	65,831	285,951	351,782	81%	17%
Skate	3,555	170,425	173,980	98%	10%
Silver Hake	1,100,867	162,380	1,263,247	13%	10%
Dogfish	14,276	122,322	136,598	90%	7%
Squid, Mackerel, Butterfish	171,009	78,516	249,525	31%	5%
Groundfish, Large-Mesh	19,961	64,704	84,665	76%	4%
Illex	1,010	49,063	50,073	98%	3%
Fluke, Scup, Black Sea Bass	42,927	31,262	74,189	42%	2%
Haddock	2,191	23,886	26,077	92%	1%
Butterfish	11,543	20,369	31,912	64%	1%
Scup	22,397	17,243	39,640	43%	1%
Monkfish	19,562	16,675	36,237	46%	1%
Fluke	17,107	12,636	29,743	42%	1%
General *Alosa*	1,189	9,840	11,028	89%	1%
Redfish	143	9,656	9,799	99%	1%
Witch Flounder	125	8,890	9,015	99%	1%
Winter Flounder	518	8,546	9,064	94%	1%
Other Species	165,553	47,704	213,257	22%	3%
Total	2,835,412	1,588,420	4,423,832	36%	NA

Table 28 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught silver hake in the southern management area for mesh size greater than 4.5 inches, from the NEFSC Program database (2004 -2010).

Southern Silver Hake (Mesh > 4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	5,119,903	12,453,871	17,573,775	71%	63%
Groundfish, Large-Mesh	7,741,493	1,360,094	9,101,586	15%	7%
Dogfish	45,081	1,100,000	1,145,080	96%	6%
Fluke, Scup, Black Sea bass	1,997,872	957,238	2,955,110	32%	5%
Fluke	1,176,211	752,772	1,928,983	39%	4%
Windowpane	45,058	478,569	523,626	91%	2%
Yellowtail Flounder	3,361,626	415,506	3,777,132	11%	2%
Haddock	2,578,497	217,090	2,795,587	8%	1%
Monkfish	2,373,639	216,973	2,590,612	8%	1%
Red Crab	2,759	211,318	214,077	99%	1%
Groundfish, Small-Mesh	88,089	198,943	287,032	69%	1%
Scup	725,804	169,613	895,417	19%	1%
Scallops	419,208	162,783	581,991	28%	1%
Red Hake	6,595	127,581	134,176	95%	1%
Silver Hake	81,358	70,838	152,196	47%	0%
Other Species	2,129,145	488,804	2,617,949	19%	3%
Total	27,810,979	19,311,155	47,122,133	41%	NA

Table 29 Species comprising <1% (in red font) or more of all observed trawl discards from trips (directed and non-directed) that caught red hake in the southern management area for mesh size greater than 4.5 inches, from the NEFSC Program database (2004 -2010).

Southern Red Hake (Mesh > 4.5 Inches)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	3,348,780	9,578,227	12,927,007	74%	66%
Groundfish, Large-Mesh	5,905,964	1,010,393	6,916,356	15%	7%
Fluke, Scup, Black Sea Bass	694,675	613,152	1,307,827	47%	4%
Fluke	410,784	543,993	954,777	57%	4%
Dogfish	27,147	485,902	513,049	95%	3%
Windowpane	30,233	363,897	394,129	92%	3%
Yellowtail Flounder	2,771,142	312,216	3,083,358	10%	2%
Groundfish, Small-Mesh	78,556	186,415	264,971	70%	1%
Haddock	1,806,250	169,791	1,976,040	9%	1%
Monkfish	1,576,626	165,144	1,741,770	9%	1%
Red Hake	6,613	127,753	134,366	95%	1%
Silver Hake	71,825.06	58,328.72	130,153.78	45%	0%
Scallops	343,693	117,346	461,039	25%	1%

Red Crab	-	92,235	92,235	100%	1%
Other Species	1,688,125	361,823	2,049,948	18%	3%
Total	18,688,588	14,128,284	32,816,872	43%	NA

Table 30 Species comprising <1% (in red font) or more of all observed discards, aggregated across other gear groups (shrimp trawl, gillnet, and scallop dredge) for trips (directed and non-directed) that caught silver hake in the southern management area, from the NEFSC Program database (2004 -2010).

Southern Silver Hake Other Gears (All Mesh Categories)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	54,359	3,324,512	3,378,872	98%	38%
Scallops	59,736,048	3,238,524	62,974,572	5%	37%
Monkfish	615,961	918,620	1,534,581	60%	10%
Groundfish, Large-Mesh	9,564	239,731	249,295	96%	3%
Fluke, Scup, Black Sea Bass	4,949	198,391	203,340	98%	2%
Fluke	4,522	195,354	199,876	98%	2%
Yellowtail Flounder	3,932	124,150	128,082	97%	1%
Dogfish	260	84,309	84,569	100%	1%
Groundfish, Small-Mesh	7,598	55,466	63,064	88%	1%
Red Hake	28	40,545	40,573	100%	0%
Silver Hake	3,405	13,274	16,679	80%	0%
Other Species	64,703	202,748	267,452	76%	2%
Total	60,501,895	8,581,806	69,083,701	12%	NA

Table 31 Species comprising <1% (in red font) or more of all observed discards, aggregated across other gear groups (shrimp trawl, gillnet, and scallop dredge) for trips (directed and non-directed) that caught red hake in the southern management area, from the NEFSC Program database (2004 -2010).

Southern Red Hake Other Gears (All Mesh Categories)					
Species	**Kept (lb)**	**Discard (lb)**	**Grand Total (lb)**	**Pct Discard (Sp)**	**Pct Discard (Overall)**
Skate	1,449	2,392,311	2,393,760	100%	38%
Scallops	43,412,689	2,192,236	45,604,925	5%	35%
Monkfish	426,774	715,972	1,142,747	63%	11%
Groundfish, Large-Mesh	9,127	187,173	196,300	95%	3%
Fluke, Scup, Black Sea Bass	2,398	134,815	137,212	98%	2%
Fluke	2,088	132,773	134,861	98%	2%
Yellowtail Flounder	3,744	98,872	102,616	96%	2%
Groundfish, Small-Mesh	7,460	53,289	60,749	88%	1%
Dogfish	-	52,649	52,649	100%	1%
Red Hake	29	41,347	41,376	100%	1%
Silver Hake	3,265	10,302	13,567	76%	0%

Other Species	35,986	127,264	163,250	78%	2%
Total	43,901,744	6,128,701	50,030,445	12%	NA

Section 4.3 Physical Environment and EFH

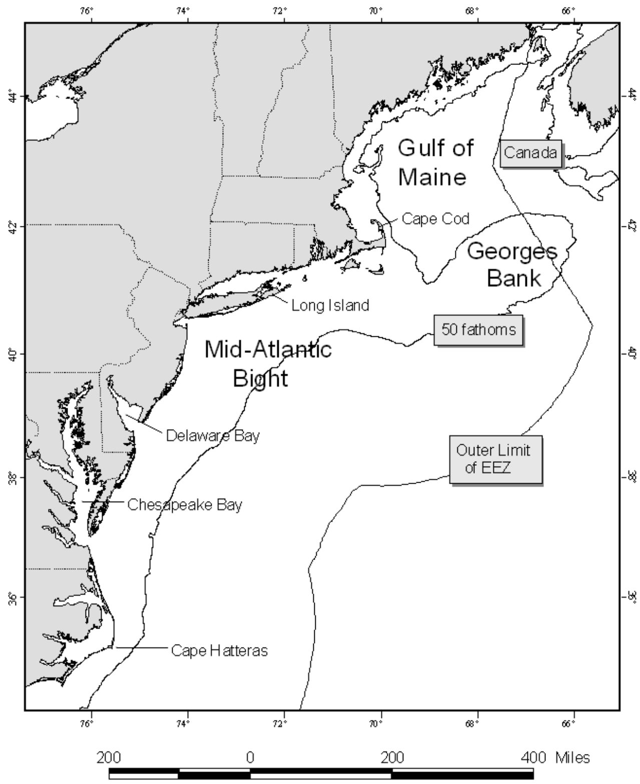
Section 4.3.1 Description of the Physical Environment and EFH of the Small-Mesh Multispecies Fishery

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 (Figure 16**,** 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. The small-mesh multispecies fishery occurs throughout the Mid-Atlantic Bight, the Gulf of Maine, and Georges Bank. (Figure 11)

The first Essential Fish Habitat Amendment (Amendment 11 to the Northeast Multispecies FMP) in 1998 initially described and identified the essential fish habitat for silver and red hake. The EFH amendment addressed all elements required by the EFH provisions of the Sustainable Fisheries Act. This includes the description and identification of silver and red hake EFH, the threats to EFH from fishing and non-fishing activities, and the conservation and enhancement measures to protect EFH for silver and red hake, which were updated in Amendment 13 to the Northeast Multispecies FMP. EFH for offshore hake was first described and identified in Amendment 12 to the Northeast Multispecies FMP in 2000. The Council is developing a second EFH Omnibus Amendment in two phases. The initial phase reviewed the existing EFH designations and recommends modifications to the current descriptions of EFH for the three small-mesh multispecies. However, the new designations will not be incorporated into the FMP until the completion of Phase II, which is intended to evaluate management measures to address adverse impacts to EFH from fishing. Summaries of EFH descriptions and maps for Northeast region species can be accessed at http://www.nero.noaa.gov/hcd/webintro.html.

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; Northeast Skate Complex; Atlantic Herring; Summer Flounder, Scup, and Black Sea Bass; Tilefish; Squid, Atlantic Mackerel, and Butterfish; Atlantic Surfclam and Ocean Quahog Fishery Management Plans. EFH for the species managed under these FMPs includes a wide variety of benthic habitats in state and federal waters throughout the Northeast U.S. Shelf Ecosystem. For more information on the geographic area, depth, and EFH description for each applicable life stage of these species, the reader is referred to Table 46 of Northeast Multispecies Amendment 16 EIS.

Figure 16 Northeast U.S. Shelf Ecosystem



Section 4.3.2 Habitat Description

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 6.1 the FSEIS for Amendment 16 to the Northeast Multispecies FMP. Section 6.1 of Amendment 16 also contains detailed information about the Mid-Atlantic region to Cape Hatteras and the reader is directed there for more information.

Section 4.3.3 Weather

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

Section 4.3.4 Gear Impacts from the Small-Mesh Multispecies Fishery

The small-mesh multispecies fishery is primarily a trawl fishery (Table 32), with most of the exemption areas in the northern stock area (Gulf of Maine Grate Raised Footrope Exemption Area, Small Mesh Areas I and II, and the Raised Footrope Trawl Exemption Area near Cape Cod) requiring the use of a raised footrope trawl.

Table 32 Landings of Small-Mesh Multispecies by Gear (2008-2010)

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

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

Amendment 13 (NEFMC 2003) describes the general effects of bottom trawls and dredges on benthic marine habitats and is hereby incorporated by reference. The primary source document used for this analysis was an advisory report prepared for the International Council for the Exploration of the Seas (ICES 2000) that identified a number of possible effects of beam trawls and bottom otter trawls on benthic habitats. This report is based on scientific findings summarized in Lindeboom and de Groot (1998), which were peer-reviewed by an ICES working group. The focus of the report is the Irish Sea and North Sea, but it also includes assessments of effects in other areas. Two general conclusions were: 1) low-energy environments are more affected by bottom trawling; and 2) bottom trawling can affect the potential for habitat recovery (*i.e.*, after trawling ceases, benthic communities and habitats may not always return to their original pre-impacted state). With regards to the direct habitat effects of trawling, the report also concluded that:

- Loss or dispersal of physical features such as peat banks or boulder reefs: <u>changes are always permanent</u> and lead to an overall change in habitat diversity, which can in turn lead to the local loss of species and species assemblages dependent on such features;
- Loss of structure-forming organisms such as bryozoans, tube-dwelling polychaetes, hydroids, seapens, sponges, mussel beds, and oyster beds: <u>changes may be permanent</u> and can lead to an overall change in habitat diversity which can in turn lead to the local loss of species and species assemblages dependant on such biogenic features;
- Reduction in complexity caused by redistributing and mixing of surface sediments and the degradation of habitat and biogenic features, leading to a decrease in the physical patchiness of the sea floor: <u>changes are not likely to be permanent</u>;
- Alteration of the detailed physical features of the sea floor by reshaping seabed features such as sand ripples and damaging burrows and associated structures which provide important habitats for smaller animals and can be used by fish to reduce their energy requirements: <u>changes are not likely to be permanent</u>.

A more recent evaluation of the habitat effects of trawling and dredging was prepared by the Committee on Ecosystem Effects of Fishing for the National Research Council's Ocean Studies Board (NRC 2002). Trawl gear evaluated by the Committee included bottom otter trawls and beam trawls. Dredge gear included hydraulic clam dredges, non-hydraulic oyster, conch, and crab dredges, and scallop dredges with and without teeth. This report identified four general conclusions regarding the types of habitat modifications caused by trawls and dredges.

- Trawling and dredging reduce habitat complexity
- Repeated trawling and dredging result in discernable changes in benthic communities
- Bottom trawling reduces the productivity of benthic habitats

- Fauna that live in low natural disturbance regimes are generally more vulnerable to fishing gear disturbance

A description of the raised footrope trawl, required in all of the inshore Gulf of Maine Exemption Areas (Gulf of Maine Grate Raised Footrope Trawl, Small Mesh Areas I and II and the Raised Footrope Trawl Area near Cape Cod), was included in the Council's on-going second EFH Omnibus Amendment's Swept Area Seabed Impact Model document (NEFMC 2011), as well as in Amendment 13 to the Northeast Multispecies FMP. The raised footrope trawl was "designed capture small-mesh species (silver hake, red hake, and dogfish). Raised-footrope trawls can be rigged with or without a chain sweep. If no sweep is used, drop chains must be hung at defined intervals along the footrope. In trawls with a sweep, chains connect the sweep to the footrope. Both configurations are designed to make the trawl fish about 0.45 - 0.6 m (1.5 - 2 ft) above the bottom (Carr and Milliken 1998). Although the doors of the trawl still ride on the bottom, underwater video and observations in flume tanks have confirmed that the sweep in the raised footrope trawl has much less contact with the sea floor than does the traditional cookie sweep that it replaces (Carr and Milliken 1998)."

Section 4.4 Protected Resources

There are numerous species that inhabit the environment within the Northeast Multispecies FMP management unit, and that therefore potentially occur in the operations area of the groundfish fishery, that are afforded protection under the Endangered Species Act of 1973 (ESA; i.e., for those designated as threatened or endangered) and/or the Marine Mammal Protection Act of 1972 (MMPA), and are under NMFS' jurisdiction. Seventeen species are classified as endangered or threatened under the ESA, three others are candidate species under the ESA, while the remainder are protected by the provisions of the MMPA.

Section 4.4.1 Species Present in the Area

Table 33 lists the species, protected either by the ESA, the MMPA, or both, that may be found in the environment that would be utilized by the fishery. Table 33 also includes three candidate fish species as identified under the ESA. Candidate species are those petitioned species that are actively being considered for listing as endangered or threatened under the ESA, as well as those species for which NMFS has initiated an ESA status review that it has announced in the Federal Register.

Table 33 Species, and Their Status, Protected under the Endangered Species Act and Marine Mammal Protection Act that May Occur in the Operations Area for the Small-Mesh Multispecies Fishery[a]

Species	Status
Cetaceans	
North Atlantic right whale (*Eubalaena glacialis*)	Endangered
Humpback whale (*Megaptera novaeangliae*)	Endangered
Fin whale (*Balaenoptera physalus*)	Endangered
Sei whale (*Balaenoptera borealis*)	Endangered
Blue whale (*Balaenoptera musculus*)	Endangered
Sperm whale (*Physeter macrocephalus*	Endangered
Minke whale (*Balaenoptera acutorostrata*)	Protected
Pilot whale (*Globicephala spp*.)	Protected
Risso's dolphin (*Grampus griseus*)	Protected
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)	Protected
Common dolphin (*Delphinus delphis*)	Protected
Spotted dolphin (*Stenella frontalis*)	Protected
Bottlenose dolphin (*Tursiops truncatus*)[b]	Protected
Harbor porpoise (*Phocoena phocoena*)	Protected
Sea Turtles	
Leatherback sea turtle (*Dermochelys coriacea*)	Endangered
Kemp's ridley sea turtle (*Lepidochelys kempii*)	Endangered
Green sea turtle (*Chelonia mydas*)	Endangered[c]
Loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic DPS	Threatened
Hawksbill sea turtle (*Eretmochelys imbricate*)	Endangered
Fish	
Shortnose sturgeon (*Acipenser brevirostrum*)	Endangered
Atlantic salmon (*Salmo salar*)	Endangered
Atlantic sturgeon *(Acipenser oxyrinchus)*	
Gulf of Maine DPS	Threatened
New York Bight DPS	Endangered
Chesapeake Bay DPS	Endangered
Carolina DPS	Endangered
South Atlantic DPS	Endangered
Cusk *(Brosme brosme)*	Candidate
Alewife (*Alosa pseudo harengus*)	Candidate
Blueback herring (*Alosa aestivalis*)	Candidate
Pinnipeds	
Harbor seal (*Phoca vitulina*)	Protected
Gray seal (*Halichoerus grypus*)	Protected
Harp seal (*Phoca groenlandicus*)	Protected
Hooded seal (*Cystophora cristata*)	Protected

Notes:

a MMPA-listed species occurring on this list are only those species that have a history of interaction with similar gear types within the action area of the Northeast Multispecies Fishery, as defined in the 2012 List of Fisheries.

b Bottlenose dolphin (*Tursiops truncatus*), Western North Atlantic coastal stock is listed as depleted.

c Green turtles in U.S. waters are listed as threatened except for the Florida breeding population which is listed as endangered. Due to the inability to distinguish between these populations away from the nesting beach, green turtles are considered endangered wherever they occur in U.S. waters.

A status review for Atlantic sturgeon was completed in 2007 which indicated that five distinct population segments (DPS) of Atlantic sturgeon exist in the United States (ASSRT 2007). On October 6, 2010, NMFS proposed listing these five DPSs of Atlantic sturgeon along the U.S. East Coast as either threatened or endangered species (75 FR 61872 and 75 FR 61904). A final listing was published on February 6, 2012 (77 FR 5880 and 75 FR 5914). The GOM DPS of Atlantic sturgeon has been listed as threatened, and the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon have been listed as endangered. Atlantic sturgeon from any of the five DPSs could occur in areas where the multispecies fishery operates. Atlantic sturgeon have been captured in small mesh otter trawl gear, albeit less often than in large mesh otter trawl gear (Stein et al. 2004a, ASMFC 2007).

Candidate species receive no substantive or procedural protection under the ESA; however, NMFS recommends that project proponents consider implementing conservation actions to limit the potential for adverse effects on candidate species from any proposed project. NMFS has initiated review of recent stock assessments, bycatch information, and other information for these candidate and proposed species. The results of those efforts are needed to accurately characterize recent interactions between fisheries and the candidate/proposed species in the context of stock sizes. Any conservation measures deemed appropriate for these species will follow the information reviews. Please note that once a species is proposed for listing the conference provisions of the ESA apply (see 50 CFR 402.10).

Section 4.4.2 Species Potentially Affected by Small-Mesh Multispecies Fishery

The small-mesh multispecies fishery has the potential to affect the sea turtle, cetacean, pinniped, and fish species discussed below. A number of documents contain background information on the range-wide status of sea turtle and marine mammal species that occur in the area and are known or suspected of interacting with fishing gear (demersal gear including trawls, gillnets, and bottom longlines). These documents include:

- Sea turtle status reviews and biological reports (NMFS and USFWS 1995; Turtle Expert Working Group 1998, 2000, 2007, 2009; NMFS and USFWS 2007a, 2007b, recovery plans for ESA-listed cetaceans and sea turtles (NMFS 1991, 2005; NMFS and USFWS 1991a, 1991b; NMFS and USFWS 1992),
- The marine mammal stock assessment reports (e.g., Waring et al. 1995---2011), and
- Other publications (e.g., Clapham et al. 1999, Perry et al. 1999, Best et al. 2001, Perrin et al. 2002).

Section 4.4.2.1 Sea Turtles

Loggerhead, leatherback, Kemp's ridley, and green sea turtles occur seasonally in southern New England and Mid-Atlantic continental shelf waters north of Cape Hatteras, North Carolina. Turtles generally move up the coast from southern wintering areas as water temperatures warm in the spring (James et al. 2005, Morreale and Standora 2005, Braun-McNeill and Epperly 2004, Morreale and Standora 1998, Musick and Limpus 1997, Shoop and Kenney 1992, Keinath et al. 1987). A reversal of this trend occurs in the fall when water temperatures cool. Turtles pass Cape Hatteras by December and return to more southern waters for the winter (James et al. 2005, Morreale and Standora 2005, Braun-McNeill and Epperly 2004, Morreale and Standora 1998, Musick and Limpus 1997, Shoop and Kenney 1992, Keinath et al. 1987). Hard-shelled species typically occur as far north as Cape Cod whereas the more cold-tolerant leatherbacks occur in more northern Gulf of Maine waters in the summer and fall (Shoop and Kenney 1992, STSSN database http://www.sefsc.noaa.gov/seaturtleSTSSN.jsp).

On March 16, 2010, NMFS and USFWS published a proposed rule (75 FR 12598) to divide the worldwide population of loggerhead sea turtles into nine DPSs, as described in the 2009 Status Review. Two of the DPSs were proposed to be listed as threatened and seven of the DPSs, including the Northwest Atlantic Ocean DPS, were proposed to be listed as endangered. NMFS and the USFWS accepted comments on the proposed rule through September 13, 2010 (June 2, 2010, 75 FR 30769). On March 22, 2011, NMFS and USFWS extended the date (76 FR 15932) by which a final determination on the listing action will be made to no later than September 16, 2011. This action was taken to address the interpretation of the existing data on status and trends and its relevance to the assessment of risk of extinction for the Northwest Atlantic Ocean DPS, as well as the magnitude and immediacy of the fisheries bycatch threat and measures to reduce this threat. New information or analyses to help clarify these issues were requested by April 11, 2011.

On September 22, 2011, NMFS and USFWS issued a final rule (76 FR 58868), determining that the loggerhead sea turtle is composed of nine DPSs (as defined in Conant et al., 2009) that constitute species that may be listed as threatened or endangered under the ESA. Five DPSs were listed as endangered (North Pacific Ocean, South Pacific Ocean, North Indian Ocean, Northeast Atlantic Ocean, and Mediterranean Sea), and four DPSs were listed as threatened (Northwest Atlantic Ocean, South Atlantic Ocean, Southeast Indo-Pacific Ocean, and Southwest Indian Ocean). Note that the Northwest Atlantic Ocean (NWA) DPS and the Southeast Indo-Pacific Ocean DPS were original proposed as endangered. The NWA DPS was determined to be threatened based on review of nesting data available after the proposed rule was published, information provided in public comments on the proposed rule, and further discussions within the agencies. The two primary factors considered were population abundance and population trend. NMFS and USFWS found that an endangered status for the NWA DPS was not warranted given the large size of the nesting population, the overall nesting population remains widespread, the trend for the nesting population appears to be stabilizing, and substantial conservation efforts are underway to address threats.

The September 2011 final rule also noted that critical habitat for the two DPSs occurring within the U.S. (NWA DPS and North Pacific DPS) will be designated in a future rulemaking. Information from the public related to the identification of critical habitat, essential physical or biological features for this species, and other relevant impacts of a critical habitat designation was solicited.

This proposed action only occurs in the Atlantic Ocean. As noted in Conant et al. (2009), the range of the four DPSs occurring in the Atlantic Ocean are as follows: NWA DPS – north of the equator, south of 60° N latitude, and west of 40° W longitude; Northeast Atlantic Ocean (NEA) DPS – north of the equator, south of 60° N latitude, east of 40° W longitude, and west of 5° 36’ W longitude; South Atlantic DPS – south of the equator, north of 60° S latitude, west of 20° E longitude, and east of 60° W longitude; Mediterranean DPS – the Mediterranean Sea east of 5°

36’ W longitude. These boundaries were determined based on oceanographic features, loggerhead sightings, thermal tolerance, fishery bycatch data, and information on loggerhead distribution from satellite telemetry and flipper tagging studies. Sea turtles from the NEA DPS are not expected to be present over the North American continental shelf in U.S. coastal waters, where the proposed action occurs (P. Dutton, NMFS, personal communication, 2011). Previous literature (Bowen et al. 2004) has suggested that there is the potential, albeit small, for some juveniles from the Mediterranean DPS to be present in U.S. Atlantic coastal foraging grounds. These data should be interpreted with caution however, as they may be representing a shared common haplotype and lack of representative sampling at Eastern Atlantic rookeries. Given that updated, more refined analyses are ongoing and the occurrence of Mediterranean DPS juveniles in U.S. coastal waters is rare and uncertain, if even occurring at all, for the purposes of this assessment we are making the determination that the Mediterranean DPS is not likely to be present in the action area. Sea turtles of the South Atlantic DPS do not inhabit the action area of this subject fishery (Conant et al. 2009). As such, the remainder of this assessment will only focus on the NWA DPS of loggerhead sea turtles, listed as threatened.

In general, sea turtles are a long-lived species and reach sexual maturity relatively late (NMFS SEFSC 2001; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Sea turtles are injured and killed by numerous human activities (NRC 1990; NMFS and USFWS 2007a, 2007b, 2007c, 2007d). Nest count data are a valuable source of information for each turtle species since the number of nests laid reflects the reproductive output of the nesting group each year. A decline in the annual nest counts has been measured or suggested for four of five western Atlantic loggerhead nesting groups through 2004 (NMFS and USFWS 2007a), however, data collected since 2004 suggests nest counts have stabilized or increased (TEWG 2009). Nest counts for Kemp’s ridley sea turtles as well as leatherback and green sea turtles in the Atlantic demonstrate increased nesting by these species (NMFS and USFWS 2007b, 2007c, 2007d).

Section 4.4.2.2 Large Cetaceans

The most recent Marine Mammal Stock Assessment Report (SAR) (Waring et al. 2010) reviewed the current population trend for each of these cetacean species within U.S. Economic Exclusion Zone (EEZ) waters. The SAR also estimated annual human-caused mortality and serious injury. Finally, it described the commercial fisheries that interact with each stock in the U.S. Atlantic. The following paragraphs summarize information from the SAR.

The western North Atlantic baleen whale species (North Atlantic right, humpback, fin, sei, and minke whales) follow a general annual pattern of migration. They migrate from high latitude summer foraging grounds, including the Gulf of Maine and Georges Bank, to and latitude winter calving grounds (Perry et al. 1999, Kenney 2002). However, this is a simplification of species movements as the complete winter distribution of most species is unclear (Perry et al. 1999, Waring et al. 2011). Studies of some of the large baleen whales (right, humpback, and fin) have demonstrated the presence of each species in higher latitude waters even in the winter (Swingle et al. 1993, Wiley et al. 1995, Perry et al. 1999, Brown et al. 2002). Blue whales are most often sighted along the east coast of Canada, particularly in the Gulf of St. Lawrence. They occur only infrequently within the U.S. EEZ (Waring et al. 2002).

Available information suggests that the North Atlantic right whale population increased at a rate of 1.8 percent per year between 1990 and 2005. The total number of North Atlantic right whales is estimated to be at least 361 animals in 2005 (Waring et al. 2011). The minimum rate of annual human-caused mortality and serious injury to right whales averaged 2.8 mortality or serious injury incidents per year during 2004 to 2008 (Waring et al. 2011). Of these, fishery interactions resulted in an average of 0.8 mortality or serious injury incidents per year.

The North Atlantic population of humpback whales is conservatively estimated to be 7,698 (Waring et al. 2011). The best estimate for the GOM stock of humpback whale population is 847 whales (Waring et al. 2011). Based on data available for selected areas and time periods, the minimum population estimates for other western North Atlantic whale stocks are 3,269 fin whales, 208 sei whales (Nova Scotia stock), 3,539 sperm whales, and 6,909 minke whales (Waring et al. 2009). Current data suggest that the GOM humpback whale stock is steadily increasing in size (Waring 2011). Insufficient information exist to determine trends for these other large whale species.

Recent revisions to the Atlantic Large Whale Take Reduction Plan (ALWTRP) (72 FR 57104, October 5, 2007) continue to address entanglement risk of large whales (right, humpback, and fin whales, and acknowledge benefits to minke whales) in commercial fishing gear. The revisions seek to reduce the risk of death and serious injury from entanglements that do occur.

Section 4.4.2.3 Small Cetaceans

There is anthropogenic mortality of numerous small cetacean species (dolphins, pilot whales, and harbor porpoise) in Northeast multispecies fishing gear. Seasonal abundance and distribution of each species off the coast of the Northeast U.S. varies with respect to life history characteristics. Some species such as white-sided dolphin and harbor porpoise primarily occupy continental shelf waters. Other species such as the Risso's dolphin occur primarily in continental shelf edge and slope waters. Still other species like the common dolphin and the spotted dolphin occupy all three habitats. Waring et al. (2009) summarizes information on the western North Atlantic stocks of each species.

Section 4.4.2.4 Pinnipeds

Harbor seals have the most extensive distribution of the four species of seal expected to occur in the area. Harbor seals sighting have occurred far south as 30° N (Katona et al. 1993, Waring et al. 2009). Gray seals are the second most common seal species in U.S. EEZ waters. They occur primarily in waters off of New England (Katona et al. 1993; Waring et al. 2009). Pupping for both species occurs in both U.S. and Canadian waters of the western North Atlantic. Although there are at least three gray seal pupping colonies in U.S., the majority of harbor seal pupping likely occurs in U.S. waters and the majority of gray seal pupping likely occurs in Canadian waters. Observations of harp and hooded seals are less common in U.S. EEZ waters. Both species form aggregations for pupping and breeding off eastern Canada in the late winter/early spring. They then travel to more northern latitudes for molting and summer feeding (Waring et al. 2006). Both species have a seasonal presence in U.S. waters from Maine to New Jersey, based on sightings, stranding, and fishery bycatch information (Waring et al. 2009).

Section 4.4.2.5 Atlantic Sturgeon DPSs

Atlantic sturgeon is an anadromous species that spawns in relatively low salinity, river environments, but spends most of its life in the marine and estuarine environments from Labrador, Canada to the Saint Johns River, Florida (Holland and Yelverton 1973, Dovel and Berggen 1983, Waldman et al. 1996, Kynard and Horgan 2002, Dadswell 2006, ASSRT 2007). Tracking and tagging studies have shown that subadult and adult Atlantic sturgeon that originate from different rivers mix within the marine environment, utilizing ocean and estuarine waters for life functions such as foraging and overwintering (Stein et al. 2004a, Dadswell 2006, ASSRT 2007, Laney et al. 2007, Dunton et al. 2010). Fishery-dependent data as well as fishery-independent data demonstrate that Atlantic sturgeon use relatively shallow inshore areas of the continental shelf; primarily waters less than 50 m (Stein et al. 2004b, ASMFC 2007, Dunton et al. 2010). The data also suggest regional differences in Atlantic sturgeon depth distribution with sturgeon observed in waters primarily less than 20 m in the Mid-Atlantic Bight and in deeper waters in the Gulf of Maine (Stein et al. 2004b, ASMFC 2007, Dunton et al. 2010). Information on population sizes for each Atlantic sturgeon DPS is very limited. Based on the best available information, NMFS has concluded that bycatch, vessel strikes, water quality and water availability, dams, lack of regulatory mechanisms for protecting the fish, and dredging are the most significant threats to Atlantic sturgeon.

Comprehensive information on current abundance of Atlantic sturgeon is lacking for all of the spawning rivers (ASSRT 2007). Based on data through 1998, an estimate of 863 spawning adults per year was developed for the Hudson River (Kahnle et al. 2007), and an estimate of 343 spawning adults per year is available for the Altamaha River, GA, based on data collected in 2004-2005 (Schueller and Peterson 2006). Data collected from the Hudson River and Altamaha River studies cannot be used to estimate the total number of adults in either subpopulation, since mature Atlantic sturgeon may not spawn every year, and it is unclear to what extent mature fish in a non-spawning condition occur on the spawning grounds. Nevertheless, since the Hudson and Altamaha Rivers are presumed to have the healthiest Atlantic sturgeon subpopulations within the United States, other U.S. subpopulations are predicted to have fewer spawning adults than either the Hudson or the Altamaha (ASSRT 2007). It is also important to note that the estimates above represent only a fraction of the total population size as spawning adults comprise only a portion of the total population (e.g., this estimate does not include subadults and early life stages).

Section 4.4.3 Species Not Likely to be Affected

NMFS has determined that the action being considered in this EA is not likely to adversely affect shortnose sturgeon, the Gulf of Maine distinct population segment (DPS) of Atlantic salmon, hawksbill sea turtles, blue whales, or sperm whales, all of which are listed as endangered species under the ESA. Further, the action considered in this EA is not likely to adversely affect North Atlantic right whale (discussed in Section 4.4.2.2) critical habitat. The following discussion provides the rationale for these determinations.

Shortnose sturgeon are benthic fish that mainly occupy the deep channel sections of large rivers. They occupy rivers along the western Atlantic coast from St. Johns River in Florida, to the Saint

John River in New Brunswick, Canada. Although, the species is possibly extirpated from the Saint Johns River system. The species is anadromous in the southern portion of its range (i.e., south of Chesapeake Bay), while some northern populations are amphidromous (NMFS 1998). Since sectors would not operate in or near the rivers where concentrations of shortnose sturgeon are most likely found, it is highly unlikely that sectors would affect shortnose sturgeon.

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. Juvenile salmon in New England rivers typically migrate to sea in spring after a one- to three-year period of development in freshwater streams. They remain at sea for two winters before returning to their U.S. natal rivers to spawn (Kocik and Sheehan 2006). Results from a 2001-2003 post-smolt trawl survey in the nearshore waters of the Gulf of Maine indicate that Atlantic salmon post-smolts are prevalent in the upper water column throughout this area in mid to late May (Lacroix, Knox, and Stokesbury 2005). Therefore, commercial fisheries deploying small-mesh active gear (pelagic trawls and purse seines within 10 m of the surface) in nearshore waters of the Gulf of Maine may have the potential to incidentally take smolts. However, it is highly unlikely that the action being considered will affect the Gulf of Maine DPS of Atlantic salmon given that operation of the multispecies fishery does not occur in or near the rivers where concentrations of Atlantic salmon are likely to be found. Additionally, multispecies gear operates in the ocean at or near the bottom rather than near the surface where Atlantic salmon are likely to occur. Thus, this species will not be considered further in this EA.

North Atlantic right whales occur in coastal and shelf waters in the western North Atlantic (NMFS 2005). Section 4.4.2.2 discusses potential fishery entanglement and mortality interactions with North Atlantic right whale individuals. The western North Atlantic population in the U.S. primarily ranges from winter calving and nursery areas in coastal waters off the southeastern U.S. to summer feeding grounds in New England waters (NMFS 2005). North Atlantic Right Whales use five well-known habitats annually, including multiple in northern waters. These northern areas include the Great South Channel (east of Cape Cod); Cape Cod and Massachusetts Bays; the Bay of Fundy; and Browns and Baccaro Banks, south of Nova Scotia. NMFS designated the Great South Channel and Cape Cod and Massachusetts Bays as Northern Atlantic right whale critical habitat in June 1994 (59 FR 28793). NMFS has designated additional critical habitat in the southeastern U.S. Multispecies gear operates in the ocean at or near the bottom rather than near the surface. It is not known whether the bottom-trawl, or any other type of fishing gear, has an impact on the habitat of the Northern right whale (59 FR 28793). As discussed in the FY 2010 and FY 2011 sector EAs and further in Section 5.0, sectors would result in a negligible effect on physical habitat. Therefore, FY 2012 sector operations would not result in a significant impact on Northern right whale critical habitat. Further, mesh sizes used in the multispecies fishery do not significantly impact the Northern right whale's planktonic food supply (59 FR 28793). Therefore, Northern right whale food sources in areas designated as critical habitat would not be adversely affected by sectors. For these reasons, Northern right whale critical habitat will not be considered further in this EA.

The hawksbill turtle is uncommon in the waters of the continental U.S. Hawksbills prefer coral reefs, such as those found in the Caribbean and Central America. Hawksbills feed primarily on a wide variety of sponges, but also consume bryozoans, coelenterates, and mollusks. The Culebra Archipelago of Puerto Rico contains especially important foraging habitat for hawksbills. Nesting areas in the western North Atlantic include Puerto Rico and the Virgin Islands. There are accounts of hawksbills in south Florida and individuals have been sighted along the east coast as far north as Massachusetts; however, east coast sightings north of Florida are rare (NMFS 2009a). Operations in the NE multispecies fishery would not occur in waters that are typically used by hawksbill sea turtles. Therefore, it is highly unlikely that fishery operations would affect this turtle species.

Blue whales do not regularly occur in waters of the U.S. EEZ (Waring et al. 2002). In the North Atlantic region, blue whales are most frequently sighted from April to January (Sears 2002). No blue whales were observed during the Cetacean and Turtle Assessment Program surveys of the mid- and North Atlantic areas of the outer continental shelf (Cetacean and Turtle Assessment Program 1982). Calving for the species occurs in low latitude waters outside of the area where the sectors would operate. Blue whales feed on euphausiids (krill) that are too small to be captured in fishing gear. There were no observed fishery-related mortalities or serious injuries to blue whales between 1996 and 2000 (Waring et al. 2002). The species is unlikely to occur in areas where the sectors would operate, and sector operations would not affect the availability of blue whale prey or areas where calving and nursing of young occurs. Therefore, the Proposed Action would not be likely to adversely affect blue whales.

Unlike blue whales, sperm whales do regularly occur in waters of the U.S. EEZ. However, the distribution of the sperm whales in the U.S. EEZ occurs on the continental shelf edge, over the continental slope, and into mid-ocean regions (Waring et al. 2007). Sperm whale distribution is typically concentrated east-northeast of Cape Hatteras in winter and shifts northward in spring when whales are found throughout the MA Bight (Waring et al. 2006). Distribution extends further northward to areas north of GB and the Northeast Channel region in summer and then south of New England in fall, back to the MA Bight (Waring et al. 1999). In contrast, the sectors would operate in continental shelf waters. The average depth over which sperm whale sightings occurred during the Cetacean and Turtle Assessment Program surveys was 5,879 ft (1,792 m) (Cetacean and Turtle Assessment Program 1982). Female sperm whales and young males almost always inhabit open ocean, deep water habitat with bottom depths greater than 3,280 ft (1,000 m) and at latitudes less than 40° N (Whitehead 2002). Sperm whales feed on large squid and fish that inhabit the deeper ocean regions (Perrin et al. 2002). There were no observed fishery-related mortalities or serious injuries to sperm whales between 2001 and 2005 (Waring et al. 2007). Sperm whales are unlikely to occur in water depths where the sectors would operate, sector operations would not affect the availability of sperm whale prey or areas where calving and nursing of young occurs. Therefore, the Proposed Action would not be likely to adversely affect sperm whales.

Although marine turtles and large whales could be potentially affected through interactions with fishing gear, NMFS has determined that the continued authorization of the multispecies fishery, and therefore the FY 2011 sectors, would not have any adverse effects on the availability of prey for these species. Sea turtles feed on a variety of plants and animals, depending on the species. However, none of the turtle species are known to feed upon groundfish. Right whales and sei whales feed on copepods (Horwood 2002, Kenney 2002). The multispecies fishery will not affect the availability of copepods for foraging right and sei whales because copepods are very small organisms that will pass through multispecies fishing gear rather than being captured in it. Humpback whales and fin whales also feed on krill as well as small schooling fish such as sand lance, herring and mackerel (Aguilar 2002, Clapham 2002). Multispecies fishing gear operates on or very near the bottom. Fish species caught in multispecies gear are species that live in benthic habitat (on or very near the bottom) such as flounders. As a result, this gear does not typically catch schooling fish such as herring and mackerel that occur within the water column. Therefore, the continued authorization of the small-mesh multispecies fishery or the approval of the proposed measures in the Secretarial Amendment for the small-mesh multispecies fishery will not affect the availability of prey for foraging humpback or fin whales.

Section 4.4.4 Interactions Between Gear and Protected Resources

NMFS categorizes commercial fisheries based on a two-tiered, stock-specific fishery classification system that addresses both the total impact of all fisheries on each marine mammal stock as well as the impact of individual fisheries on each marine mammal stock. NMFS bases the system on the numbers of animals per year that incur incidental mortality or serious injury due to commercial fishing operations relative to a marine mammal stock's Potential Biological Removal (PBR) level.[4] Tier 1 takes into account the cumulative mortality and serious injury to marine mammals caused by commercial fisheries. Tier 2 considers marine mammal mortality and serious injury caused by the individual fisheries. This EA uses Tier 2 classifications to indicate how each type of gear proposed for use in the Proposed Action may affect marine mammals (NMFS 2009b). Table 34 identifies the classifications used in the final List of Fisheries (for FY 2010 (75 FR 68468; November 8, 2010; NMFS 2010b), which are broken down into Tier 2 Categories I, II, and III. A proposed List of Fisheries for fishing year 2012 was published on June 28, 2011 (76 FR 37716), but the List of Fisheries for fishing year 2012 has not yet been adopted and is not discussed further in this document.

[4] PBR is the maximum number of animals, not including natural mortalities, which may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population.

Table 34. Descriptions of the Tier 2 Fishery Classification Categories

Category	Category Description
Category I	A commercial fishery that has frequent incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is, by itself, responsible for the annual removal of 50 percent or more of any stock's PBR level.
Category II	A commercial fishery that has occasional incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that, collectively with other fisheries, is responsible for the annual removal of more than 10 percent of any marine mammal stock's PBR level and that is by itself responsible for the annual removal of between 1 percent and 50 percent, exclusive of any stock's PBR.
Category III	A commercial fishery that has a remote likelihood of, or no known incidental mortality and serious injury of marine mammals. This classification indicates that a commercial fishery is one that collectively with other fisheries is responsible for the annual removal of: a. Less than 50 percent of any marine mammal stock's PBR level, or b. More than 1 percent of any marine mammal stock's PBR level, yet that fishery by itself is responsible for the annual removal of 1 percent or less of that stock's PBR level. In the absence of reliable information indicating the frequency of incidental mortality and serious injury of marine mammals by a commercial fishery, the Assistant Administrator would determine whether the incidental serious injury or mortality is "remote" by evaluating other factors such as fishing techniques, gear used, methods used to deter marine mammals, target species, seasons and areas fished, qualitative data from logbooks or fisher reports, stranding data, and the species and distribution of marine mammals in the area or at the discretion of the Assistant Administrator.

Interactions between gear and a given species occur when fishing gear overlaps both spatially and trophically with the species' niche. Spatial interactions are more "passive" and involve inadvertent interactions with fishing gear when the fishermen deploy gear in areas used by protected resources. Trophic interactions are more "active" and occur when protected species attempt to consume prey caught in fishing gear and become entangled in the process. Spatial and trophic interactions can occur with various types of fishing gear used by the multispecies fishery through the year. Many large and small cetaceans and sea turtles are more prevalent within the operations area during the spring and summer. However they are also relatively abundant during the fall and would have a higher potential for interaction with sector activities that occur during these seasons. Although harbor seals may be more likely to occur in the operations area between fall and spring, harbor and gray seals are year-round residents. Therefore, interactions could occur year-round. The uncommon occurrences of hooded and harp seals in the operations area are more likely to occur during the winter and spring, allowing for an increased potential for interactions during these seasons.

Although interactions between protected species and gear deployed by the Northeast multispecies fishery would vary, interactions generally include:

- Becoming caught on hooks (bottom longlines)
- Entanglement in mesh (gillnets and trawls)
- Entanglement in the float line (gillnets and trawls)
- Entanglement in the groundline (gillnets, trawls, and bottom longlines)
- Entanglement in anchor lines (gillnets and bottom longlines), or

- Entanglement in the vertical lines that connect gear to the surface and surface systems (gillnets, traps/pots, and bottom longlines).

NMFS assumes the potential for entanglements to occur is higher in areas where more gear is set and in areas with higher concentrations of protected species.

Table 35 lists the marine mammals known to have had interactions with gear used by the Northeast multispecies fishery. This gear includes sink gillnets, traps/pots, bottom trawls, and bottom longlines within the Northeast multispecies region, as excerpted from the List of Fisheries for Fishing Year 2011 ([75 FR 68468; November 8, 2010], also see Waring et al. 2009). Sink gillnets have the greatest potential for interaction with protected resources, followed by bottom trawls. There are no observed reports of interactions between longline gear and marine mammals in fishing year 2009 and fishing year 2010. However, interactions between the pelagic longline fishery and both pilot whales and Risso's dolphins led to the development of the Pelagic Longline Take Reduction Plan.

Table 35. Marine Mammals Impacts Based on Groundfishing Gear and Northeast Multispecies Fishing Areas (Based on 2010 List of Fisheries)

Fishery		Estimated Number of Vessels/Persons	Marine Mammal Species and Stocks Incidentally Killed or Injured
Category	**Type**		
Category I	MA gillnet	5,495	Bottlenose dolphin, Northern Migratory coastal [a] Bottlenose dolphin, Southern Migratory coastal [a] Bottlenose dolphin, Northern NC estuarine system [a] Bottlenose dolphin, Southern NC estuarine system [a] Bottlenose dolphin, WNA offshore Common dolphin, WNA Gray seal, WNA Harbor porpoise, GOM/Bay of Fundy Harbor seal, WNA Harp seal, WNA Humpback whale, Gulf of Maine Long-finned pilot whale, WNA Minke whale, Canadian east coast Risso's dolphin, WNA Short-finned pilot whale, WNA White-sided dolphin, WNA
	Northeast sink gillnet	7,712	Bottlenose dolphin, WNA, offshore Common dolphin, WNA Fin whale, WNA Gray seal, WNA Harbor porpoise, GOM/Bay of Fundy Harbor seal, WNA Harp seal, WNA Hooded seal, WNA Humpback whale, GOM Minke whale, Canadian east coast North Atlantic right whale, WNA Risso's dolphin, WNA White-sided dolphin, WNA
Category II	MA bottom trawl	1,182	Bottlenose dolphin, WNA offshore Common dolphin, WNA [a] Long-finned pilot whale, WNA [a] Short-finned pilot whale, WNA [a] White-sided dolphin, WNA

	Northeast bottom trawl	1,635	Common dolphin, WNA Harbor porpoise, GOM/ Bay of Fundy Harbor seal, WNA Harp seal, WNA Long-finned pilot whale, WNA Short-finned pilot whale, WNA White-sided dolphin, WNA [a]
	Atlantic mixed species trap/pot [c]	1,912	Fin whale, WNA Humpback whale, GOM
Category III	Northeast/MA bottom longline/hook-and-line	1,183	None documented in recent years
Notes: [a] Fishery classified based on serious injuries and mortalities of this stock, which are greater than 50 percent (Category I) or greater than 1 percent and less than 50 percent (Category II) of the stock's PBR. [b] Although not included in the 2010 List of Fisheries, Waring et al. (2009) indicates that nine gray seal mortalities in 2007 were attributed to incidental capture in the northeast bottom trawl. [c] This fishery is classified by analogy.			

Marine mammals are taken in gillnets, trawls, and trap/pot gear used in the Northeast multispecies area. Documented protected species interactions in Northeast sink gillnet fisheries include harbor porpoise, white-sided dolphin, harbor seal, gray seal, harp seal, hooded seal, long-finned pilot whale, offshore bottlenose dolphin, Risso's dolphin, and common dolphin. Not mentioned here are possible interactions with sea turtles and sea birds. Multispecies fishing vessels would be required to adhere to measures in the Atlantic Large Whale Take Reduction Plan to minimize potential impacts to certain cetaceans. Atlantic Large Whale Take Reduction Plan was developed to address entanglement risk to right, humpback, and fin whales, and to acknowledge benefits to minke whales in specific Category I or II commercial fishing efforts that utilize traps/pots and gillnets. The Atlantic Large Whale Take Reduction Plan calls for the use of gear markings, area restrictions, weak links, and sinking groundline. Fishing vessels would be required to comply with the Atlantic Large Whale Take Reduction Plan in all areas where gillnets were used. Fishing vessels would also need to comply with the Bottlenose Dolphin Take Reduction Plan and Harbor Porpoise Take Reduction Plan within the Northeast multispecies area. The Bottlenose Dolphin Take Reduction Plan restricts night time use of gillnets in the MA gillnet region. The Harbor Porpoise Take Reduction Plan aims to reduce interactions between the harbor porpoise and gillnets in the Gulf of Maine. The Harbor Porpoise Take Reduction Plan implements seasonal area closures and the seasonal use of pingers (acoustic devices that emit a sound) to deter harbor porpoises from approaching the nets.

Data from sector trips in fishing year 2010 and fishing year 2009 indicate no overall significant increase in take of protected resources or sea turtles. There may be a decrease in annual take in sink gillnet gear, and the data suggest an overall decrease in the winter take, and in the fall for turtles. However, this decrease in take corresponds well to the decrease in ACL. Within individual stat areas there does appear to be some trends in take of protected resources (includes all species).

Sea turtles have been caught and injured or killed in multiple types of fishing gear, including gillnets, trawls, and hook and line gear. However, impact due to inadvertent interaction with trawl gear is almost twice as likely to occur when compared with other gear types (NMFS

2009c). Interaction with trawl gear is more detrimental to sea turtles as they can be caught within the trawl itself and will drown after extended periods underwater. A study conducted in the MA region showed that bottom trawling accounts for an average annual take of 616 loggerhead sea turtles, although Kemp's ridleys and leatherbacks were also caught during the study period (Murray 2006). Sea turtles generally occur in more temperate waters than those in the Northeast multispecies area. Gillnets are considered more detrimental to marine mammals such as pilot whales, dolphins, porpoises, and seals, as well as large marine whales; however, protection for marine mammals would be provided through various Take Reduction Plans outlined above.

Atlantic sturgeon are known to be captured in sink gillnet, drift gillnet, and otter trawl gear (Stein et al. 2004a, ASMFC TC 2007). Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon (ASMFC TC 2007). Sturgeon deaths were rarely reported in the otter trawl observer dataset (ASMFC TC 2007). However, the level of mortality after release from the gear is unknown (Stein et al. 2004a). In a review of the Northeast Fishery Observer Program (NEFOP) database for the years 2001-2006, observed bycatch of Atlantic sturgeon was used to calculate bycatch rates that were then applied to commercial fishing effort to estimate overall bycatch of Atlantic sturgeon in commercial fisheries. This review indicated sturgeon bycatch occurred in statistical areas abutting the coast from Massachusetts (statistical area 514) to North Carolina (statistical area 635) (ASMFC TC 2007). Based on the available data, participants in an ASMFC bycatch workshop concluded that sturgeon encounters tended to occur in waters less than 50 m throughout the year, although seasonal patterns exist (ASMFC TC 2007). The ASMFC analysis determined that an average of 650 Atlantic sturgeon mortalities occurred per year (during the 2001 to 2006 timeframe) in sink gillnet fisheries. Stein et al. (2004a), based on a review of the NMFS Observer Database from 1989-2000, found clinal variation in the bycatch rate of sturgeon in sink gillnet gear with lowest rates occurring off of Maine and highest rates off of North Carolina for all months of the year.

In an updated, preliminary analysis, the Northeast Fisheries Science Center (NEFSC) was able to use data from the NEFOP database to provide updated estimates for the 2006 to 2010 timeframe. Data were limited by observer coverage to waters outside the coastal boundary (fzone>0) and north of Cape Hatteras, NC. Sturgeon included in the data set were those identified by federal observers as Atlantic sturgeon, as well as those categorized as unknown sturgeon. At this time, data were limited to information collected by the NEFOP; limited data collected in the At-Sea Monitoring Program were not included, although preliminary views suggest the incidence of sturgeon encounters was low.

The preliminary analysis apportioned the estimated weight of all sturgeon takes to specific fishery management plans. The analysis estimates that between 2006 and 2010, a total of 15,587 lb of Atlantic sturgeon were captured and discarded in bottom otter trawl (7,740 lb) and sink gillnet (7,848 lb) gear. The analysis results indicate that 1.1% (85 lb) of the weight of sturgeon discards in bottom otter trawl gear could be attributed to the small-mesh bottom trawl fisheries if a correlation of FMP species landings (by weight) was used as a proxy for fishing effort.

Additionally, the analysis results indicate that 0.7% (55 lb) of the weight of sturgeon discards in sink gillnet gear could be attributed to the small mesh gillnet fisheries if a correlation of FMP species landings (by weight) was used as a proxy for fishing effort.

These additional data support the conclusion from the earlier bycatch estimates that the small-mesh multispecies fishery may interact with Atlantic sturgeon. Since the Atlantic sturgeon DPSs have been listed as endangered and threatened under the ESA, the ESA Section 7 consultation for the multispecies fishery will be reinitiated, and additional evaluation will be included in the resulting Biological Opinion to describe any impacts of the fisheries on Atlantic sturgeon and define any measures needed to mitigate those impacts, if necessary. It is anticipated that any measures, terms and conditions included in an updated Biological Opinion will further reduce impacts to the species. The Biological Opinion is expected to be completed prior to the 2012 Northeast multispecies fishing year (May 1).

Section 4.5 Human Communities (Economic and Social Trends)

Section 4.5.1 Silver and Offshore Hake Landings and Revenue

Silver and offshore hake landings and revenue were highest at the start of the time series, in 1996 (Table 36). In 2006, the smallest amount of silver hake were landed, 5,000mt, coinciding with the lowest revenue earned from silver hake landings. Since then, silver hake landings and revenues have been generally increasing. It appears that while current landings are lower than landings in the 1990's, there is an increasing trend in both landings and revenue in recent years (Figure 17). Peak landings in the Northern management area also occurred in 1996, at 3,619mt, which earned $3 million in revenue. The lowest silver hake landings in the Northern area occurred in 2008 with 618mt, earning $832,000 in revenue. In recent years, landings in the Northern area have been greater than 1,000mt, earning revenue $1.2 million - $2.3 million (Table 37). Landings in the Southern area account for two-thirds to nearly all of the total landings (Table 37). Landings range from 4,629mt – 13,441mt. Peak landings in the Southern area in 2009 were 13,000mt, earning $15 million in revenue. This was also the year with peak revenue from silver hake. The lowest landings occurred in 2006 and were 4,629 mt, earning approximately $6 million. The lowest revenue from silver hake was in 2002 at $5million in the Southern stock area (Table 37).

Table 36 Silver Hake and Offshore Hake Landings and Revenue (1996-2010)

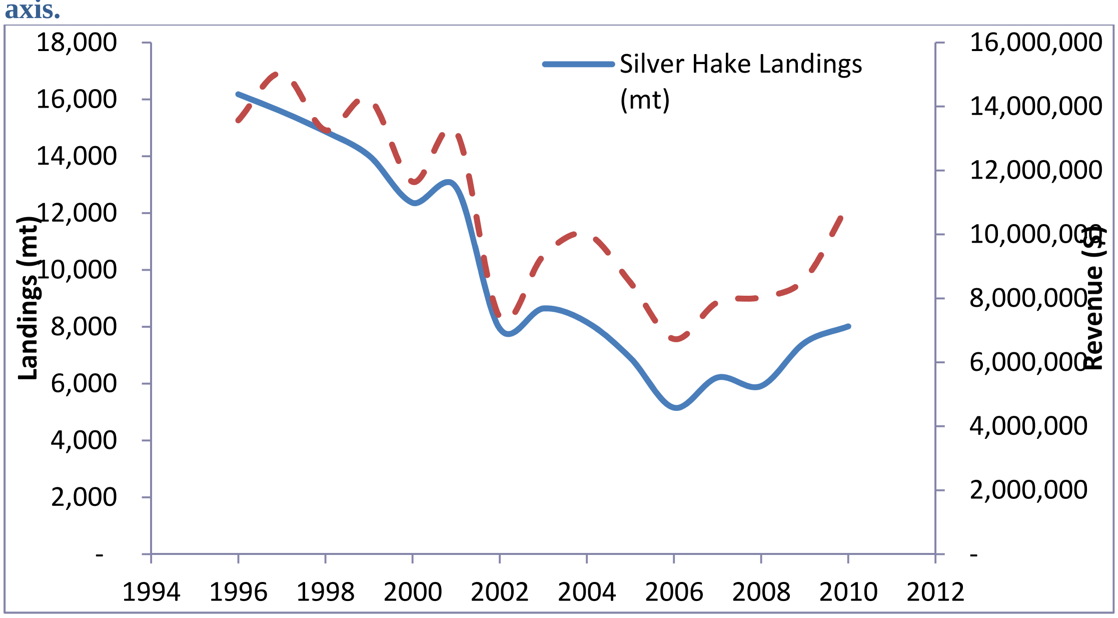
Year	Silver hake landings (mt)	Silver hake revenue ($)	Offshore hake landings (mt)	Offshore hake revenue ($)
1996	16,181	13,567,329	67	60,663
1997	15,565	15,045,264	23	16,005
1998	14,867	13,259,078	5	5,807
1999	14,020	14,243,589	12	19,673
2000	12,362	11,644,431	5	7,035
2001	12,908	13,211,153	2	2,013
2002	7,938	7,410,730	6	4,055
2003	8,643	9,326,001	11	18,150
2004	8,163	10,006,343	27	31,429

2005	6,902	8,493,180	14	15,265
2006	5,153	6,727,695	37	45,001
2007	6,217	7,880,472	12	10,806
2008	5,915	8,035,894	21	24,152
2009	7,441	8,602,262	20	31,371
2010	8,014	10,951,987	10	16,348

Table 37 Silver Hake Landings and Revenue by Stock Area

	Northern Stock		Southern Stock	
Year	**Landings (mt)**	**Revenue($)**	**Landings (mt)**	**Revenue($)**
1996	3,619	3,034,584	12,560	10,531,566
1997	2,802	2,708,077	12,761	12,335,466
1998	2,045	1,824,252	12,828	11,440,726
1999	3,444	3,498,658	10,577	10,746,305
2000	2,591	2,440,854	9,734	9,169,144
2001	3,391	3,470,530	9,379	9,598,879
2002	2,593	2,420,618	5,343	4,988,009
2003	1,808	1,950,450	6,833	7,373,296
2004	1,012	1,240,949	7,436	9,115,907
2005	853	1,049,283	6,671	8,208,849
2006	879	1,147,976	4,629	6,043,655
2007	1,017	1,288,530	5,345	6,774,279
2008	613	832,397	5,645	7,669,565
2009	1,038	1,199,934	13,441	15,539,587
2010	1,693	2,313,869	6,386	8,726,243

Figure 17 Silver Hake Landings and Revenue (1996-2010). Revenue is plotted on the secondary axis.



Section 4.5.2 Red Hake Landings and Revenue

Landings of red hake peaked in 2001 at 1,600mt and revenue was also the greatest ($912,000) in this year (Table 38). The lowest red hake landings occurred in 2005; while in 2006, there was the least amount of revenue earned from red hake ($393,000). Peak landings in the Northern management area were 394mt in 1996, which earned $252,000 in revenue (Table 39). The lowest red hake landings in the Northern area occurred in 2008 with 9mt, earning $7,865 in revenue. In recent years, landings in the Northern area have been less than 100mt, earning revenue $300,000 -$400,000 (Table 39).

Landings of red hake in the Southern area also account for two-thirds to nearly all of the total red hake landings (Table 39). Peak landings in the Southern area were in 2001 and were 1,464mt, earning approximately $800,000 in revenue. In 2000, there was $808,000 earned revenue from red hake landings. The lowest landings occurred in 2005 and were 356mt, earning approximately $400,000. The lowest revenue from red hake was in 2006 at $326,000 in the Southern stock area (Table 39).

Table 38 Red Hake Landings and Revenue (1996-2010)

Year	Landings (mt)	Revenue ($)
1996	1,097	703,343
1997	1,322	790,556
1998	1,327	762,793
1999	1,557	920,320
2000	1,589	907,560
2001	1,672	912,883
2002	908	668,312
2003	808	557,278
2004	674	547,812
2005	427	478,070
2006	453	393,581
2007	512	415,368
2008	587	495,332
2009	613	463,879
2010	603	497,934

Table 39 Red Hake Landings and Revenue by Stock Area

	Northern Stock		Southern Stock	
Year	**Landings (mt)**	**Revenue($)**	**Landings (mt)**	**Revenue($)**
1996	394	252,760	700	448,738
1997	322	192,493	999	597,230
1998	173	99,212	1,154	663,553
1999	206	121,645	1,351	798,600
2000	172	98,106	1,415	808,329
2001	204	111,146	1,465	799,548

2002	245	180,070	663	488,059
2003	185	127,810	623	429,362
2004	82	66,906	588	477,880
2005	73	82,122	356	398,446
2006	77	67,183	375	326,416
2007	42	34,243	470	381,118
2008	9	7,685	579	488,910
2009	39	29,404	574	
2010	51	41,932	553	456,129

Section 4.5.3 Small-Mesh Multispecies Landings by State

Table 40 displays silver hake and red hake landings for each state in New England and the Mid-Atlantic (1996-2010) and the percentage of those landings compared to the state's entire landings. For the most part, silver hake comprises a small percentage of each state's landings. Connecticut, Rhode Island and New York are among the states with the largest proportion of silver hake landings when compared to the state's total landings. Silver hake landings in Connecticut have consistently been 15-32% of the state's total landings. The silver hake landings in both New York and Rhode Island have been 8-26% of the state's total landings (Table 40).

The proportion of silver hake landings to total landings in Maine has consistently been low; however, in recent years, this proportion has been nearly zero. The landings in total and of silver hake have decreased from 1996-2010; however, the proportion of silver hake landings to total landings has been about equal for 1997-2010. In New Hampshire, the proportion of silver hake landings has been about 2%, while the red hake proportion is very minor, nearly 0%. The magnitude of silver hake landings is less in recent years than it had been in the late 1990s; however, the proportion of silver hake landings to total landings is nearly equal throughout the time period (Table 40).

The proportion of silver hake landings to total landings has fluctuated between 1-3%, while the reliance on red hake landings is very minor. Interestingly, while the magnitude of both silver hake and total landings has increased, the proportion of silver hake and red hake landings has not fluctuated much. Rhode Island has the second greatest magnitude of silver hake landings among the studied states, but the silver hake landings make up less than ten percent of total state landings. The reliance on silver hake has fluctuated between 3-10%, while red hake constituted less than one percent of total state landings (Table 40).

In Connecticut, up to one-third of state landings are silver hake. The proportion of silver hake to total landings has fluctuated from 15% (2003) – 36% (1999). While landings in the last ten years have been some of the lowest amount of silver hake landings, this is apparent across all fisheries. The proportion of silver hake to total landings has remained approximately equal over this same time period. Red hake is not relied upon as much in Connecticut—less than five percent of state landings are red hake (Table 40).

New York has the highest magnitude of silver hake landings of any other state in New England or the Mid-Atlantic. Silver hake comprised 8-26% of total landings; however, there has been an increasing reliance of silver hake from 2005-2010. Red hake comprise less than three percent of total state landings. Silver hake represent a minor proportion of New Jersey's state landings (1.25% to less than one percent) and red hake comprise an even smaller proportion of the state's landings (less than one percent). See Table 40.

Table 40 Silver and Red Hake Landings by State as Percentage of Total State Landings

		Landings (mt)			*Proportion of total landings (%)*	
State	**Year**	**Silver hake**	**Red hake**	**Total**	**Silver hake**	**Red hake**
Maine	1996	1,454.5	0.386	115,426	1.26	0.00
	1997	564.3	0.015	120,346	0.08	0.00
	1998	73.6	0.24	93,643	0.06	0.00
	1999	64.4	0.025	113,323		0.00
	2000	9.8	0.03	116,759	0.01	0.00
	2001	15.2	0.77	116,248	0.01	0.00
	2002	19.2	0.07	94,678	0.02	0.00
	2003	1.0	0.01	102,293	0.00	0.00
	2004	6.4	0.00	107,893	0.01	0.00
	2005	1.1	.	99,530	0.00	.
	2006	1.6	.	97,147	0.00	.
	2007	0.2	0.03	86,159	0.00	0.00
	2008	0.5	0.04	92,305	0.00	0.00
	2009	0.3	0.02	89,981	0.00	0.00
	2010	3.7	.	77,882	0.00	.
New Hampshire	1996	111.1	.	4,623	2.40	.
	1997	148.5	0.003	4,549	3.26	0.00
	1998	49.0	.	4,284	1.14	.
	1999	110.6	0.648	4,767	2.32	0.01
	2000	162.5	.	7,648	2.13	.
	2001	135.7	0.30	7,902	1.72	0.00
	2002	79.0	0.07	10,056	0.79	0.00
	2003	83.7	0.04	12,014	0.70	0.00
	2004	57.3	0.17	9,475	0.60	0.00
	2005	45.8	0.01	9,289	0.49	0.00
	2006	41.3	0.01	4,734	0.87	0.00
	2007	95.1	.	3,905	2.44	.
	2008	81.2	.	4,494	1.81	.
	2009	139.3	0.04	5,997	2.32	0.00
	2010	99.5	.	5,103	1.95	.
Massachusetts	1996	1,233.0	392.95	93,547	1.32	0.42
	1997	1,293.0	314.07	92,105	1.40	0.34
	1998	1,191.6	143.42	102,736	1.16	0.14
	1999	1,921.9	184.35	78,676	2.44	0.23
	2000	2,260.0	179.74	75,578	2.99	0.24
	2001	2,489.3	169.42	97,561	2.55	0.17
	2002	2,158.7	211.89	98,833	2.18	0.21
	2003	2,722.8	194.57	120,967	2.25	0.16
	2004	2,139.5	136.28	139,344	1.54	0.10
	2005	1,862.4	73.84	140,060	1.33	0.05
	2006	1,255.6	105.30	148,246	0.85	0.07
	2007	1,438.0	80.91	125,846	1.14	0.06

	2008	1,308.2	39.00	135,897	0.96	0.03
	2009	2,303.5	99.27	150,613	1.53	0.07
	2010	3,041.8	106.09	118,202	2.57	0.09
Rhode Island	1996	4,231.5	337.54	60,867	6.95	0.55
	1997	5,246.2	435.34	61,513	8.53	0.71
	1998	4,670.4	553.85	58,326	8.01	0.95
	1999	4,381.6	652.51	55,038	7.96	1.19
	2000	4,766.3	683.56	52,588	9.06	1.30
	2001	4,185.8	728.47	51,101	8.19	1.43
	2002	2,305.6	290.45	45,425	5.08	0.64
	2003	2,6210	283.15	41,865	6.26	0.68
	2004	2,175.6	216.29	49,871	4.36	0.43
	2005	1,888.2	105.02	42,848	4.41	0.25
	2006	1,542.4	182.54	49,694	3.10	0.37
	2007	2,010.5	179.95	33,435	6.01	0.54
	2008	1,468.3	278.73	31,406	4.68	0.89
	2009	1,652.1	197.05	36,941	4.47	0.53
	2010	1,557.6	226.32	33,404	4.66	0.68
Connecticut	1996	2,559.9	105.29	8,662	29.55	1.22
	1997	1,888.8	174.77	8,062	23.43	2.17
	1998	1,761.6	119.83	7, 409	23.78	1.62
	1999	2,943.8	163.99	8,034	36.64	2.04
	2000	2,813.1	172.86	8,396	33.51	2.06
	2001	2,363.6	155.23	8,158	28.97	1.90
	2002	1,149.0	151.32	7,055	16.29	2.14
	2003	1,113.0	189.53	7,156	15.55	2.65
	2004	1,331.8	190.00	7,975	16.70	2.38
	2005	1,496.7	172.53	6,084	24.60	2.84
	2006	1,065.0	119.66	5,219	20.41	2.29
	2007	709.8	120.75	4,452	15.94	2.71
	2008	930.1	128.91	3,073	30.27	4.20
	2009	919.2	143.16	3,051	30.13	4.69
	2010	759.5	64.84	2,363	32.14	2.74
New York	1996	5,769.9	196.42	26,740	21.58	0.73
	1997	5,434.5	285.07	26,351	20.62	1.08
	1998	6,413.5	393.61	24,381	26.31	1.61
	1999	4,259.9	439.88	21,596	19.73	2.04
	2000	2,048.2	398.41	19,660	10.42	2.03
	2001	3,352.6	461.05	18,698	17.93	2.47
	2002	1,799.1	191.47	16,928	10.63	1.13
	2003	2,031.6	126.31	17,286	11.75	0.73
	2004	2,348.0	112.79	15,263	15.38	0.74
	2005	1,517.1	55.21	16,954	8.95	0.33
	2006	1,159.8	23.47	14,480	8.01	0.16
	2007	1,508.9	76.56	14,384	10.49	0.53
	2008	1,708.1	90.30	13,605	12.55	0.66
	2009	1,782.6	92.07	14,849	12.00	0.62
	2010	2,267.8	132.64	12,058	18.81	1.10
New Jersey	1996	815.6	60.88	81,290	1.00	0.07
	1997	986.3	106.51	77,475	1.27	0.14
	1998	701.1	111.50	87,427	0.80	0.13
	1999	335.7	112.54	75,376	0.45	0.15
	2000	299.0	153.75	77,077	0.39	0.20

	2001	358.7	144.74	75,292	0.48	0.19
	2002	421.1	60.95	72,598	0.58	0.08
	2003	65.0	14.27	76,163	0.09	0.02
	2004	102.6	17.87	84,157	0.12	0.02
	2005	90.7	20.60	69,273	0.13	0.03
	2006	84.3	19.51	68,535	0.12	0.03
	2007	452.3	52.60	69,082	0.65	0.08
	2008	308.9	47.27	72,675	0.43	0.07
	2009	640.4	80.81	85,266	0.75	0.09
	2010	281.5	72.44	62,438	0.45	0.12

Table 41 displays the revenue from silver hake and red hake, as well as total revenue per state. The proportion of total revenue that is made of silver hake and red hake is also displayed. In Maine there was $117-1.1 million in revenue from silver hake. These revenues comprised <0.0001-0.463% of total state revenues. In 1996, silver hake landings made up approximately 0.5% of total state revenue. Following 1996, there has been a steady decline in revenue from silver hake landings; the same trend is true for red hake landings. Revenue from red hake landings make up less than 0.001% of total state revenue. In New Hampshire, during the period 1996-2010, revenue from silver hake was $41,000-139,000, comprising less than 0.24-2.4% of total state fishing revenue. Revenue from red hake landings were $0-300, comprising less than 0.0001% of total state fishing revenues. The greatest proportion of New Hampshire's revenue from silver hake was in 2004, at 2.4%. In 2010, the largest revenue from silver hake landings was $139,000, representing approximately 2% of total state fishing revenues. Revenue from red hake landings are very minor, approximately $300 and less than 0.0001% of total state fishing revenues.

Revenue from silver hake landings in Massachusetts was $930,000-3,000,000 in 1996-2010; this was less than 3% of total state fishing revenues over the same time period. Revenue from red hake landings was $100,000-284,000, but this was less 0.1% of total Massachusetts fishing revenue. The largest revenue from silver hake on record in Massachusetts occurred in 2010; while, the greatest revenue from red hake landings occurred in 1996. Revenue from silver hake was $1.4-4.5 million from 1996-2010 in Rhode Island; while revenue from red hake landings was $100,000-284,000 during this same time period. Revenue from silver hake was 2-6% of total state fishing revenue; while revenue from red hake was 0.1-1.0% of total Rhode Island revenue for 1996-2010. In 1997, landings of silver hake were the most profitable in this time period, $4.5 million, representing about 6% of total state fishing revenues. It is interesting to note that in 2007, lower revenues achieved this same proportion of dependence on silver hake.

One-third of Connecticut's total landings comprised silver hake; the same is true in terms of revenue. Revenue from silver hake landings in Connecticut were $700,000-3 million, approximately 4.2-32% of total state fishing revenue. Revenue from red hake was less than 5% of total state fishing revenue. Revenue from silver hake landings in New York were $1.2 million – 6.3 million for 1996-2010, representing approximately 4-18% of total state fishing revenue. Revenue from red hake landings were $23,000-336,000, approximately less than one percent of New York's fishing revenue. In New Jersey, during the period 1996-2010, revenue from silver hake was $84,000-906,000, comprising less than one percent of total state fishing revenue. Revenue from red hake landings were $16,000-116,000 comprising less than 0.12% of total state fishing revenues.

Table 41 Silver and Red Hake Revenue by State as Percentage of Total State Revenue

		Revenue (000$)			Proportion of total revenue (%)	
State	**Year**	**Silver Hake**	**Red Hake**	**Total**	**Silver hake**	**Red hake**
Maine	1996	1,174.93	0.34	253,284.77	0.4639	0.0001
	1997	319.28	0.02	274,754.74	0.1162	0.0000
	1998	47.74	0.05	277,453.16	0.0172	0.0000
	1999	49.76	0.01	323,837.18	0.0154	0.0000
	2000	13.35	0.04	348,053.64	0.0038	0.0000
	2001	12.00	0.41	299,618.65	0.0040	0.0001
	2002	10.37	0.14	307,266.99	0.0034	0.0000
	2003	1.06	0.01	315,268.02	0.0003	0.0000
	2004	6.02	0.00	407,557.58	0.0015	0.0000
	2005	0.46	.	415,636.14	0.0001	.
	2006	1.60	.	97,146.62	0.0017	.
	2007	0.17	0.03	86,158.93	0.0002	0.0000
	2008	0.47	0.04	92,304.93	0.0005	0.0001
	2009	0.30	0.02	89,980.57	0.0003	0.0000
	2010	3.72	.	77,881.67	0.0048	.
New Hampshire	1996	97.70	.	13,586.20	0.7191	.
	1997	112.69	0.01	12,586.58	0.8953	0.0001
	1998	41.20	.	11,186.35	0.3683	.
	1999	107.62	0.10	12,539.96	0.8582	0.0008
	2000	130.34	.	16,197.60	0.8047	.
	2001	121.46	0.12	17,909.77	0.6782	0.0007
	2002	84.91	0.04	16,736.87	0.5073	0.0003
	2003	86.03	0.02	15,315.41	0.5617	0.0001
	2004	58.00	0.30	8,035.83	0.7218	0.0037
	2005	54.17	0.02	22,232.42	0.2436	0.0001
	2006	41.32	0.01	4,733.59	0.8730	0.0002
	2007	95.14	.	3,904.85	2.4364	.
	2008	81.22	.	4,493.95	1.8073	.
	2009	139.26	0.04	5,996.71	2.3223	0.0007
	2010	99.47	.	5,102.81	1.9493	.
Massachusetts	1996	930.43	191.28	231,940.75	0.4012	0.0825
	1997	1,141.81	147.53	224,571.30	0.5084	0.0657
	1998	1,327.28	93.10	205,896.76	0.6446	0.0452
	1999	2,612.27	134.13	260,381.27	1.0033	0.0515
	2000	2,200.84	98.26	291,247.50	0.7557	0.0337
	2001	2,620.59	117.22	280,652.37	0.9338	0.0418
	2002	1,902.25	131.10	297,047.51	0.6404	0.0441
	2003	2,583.16	129.41	293,229.06	0.8809	0.0441
	2004	2,233.55	109.03	326,385.65	0.6843	0.0334
	2005	1,807.35	65.55	426,834.02	0.4234	0.0154
	2006	1,255.62	105.30	148,246.45	0.8470	0.0710
	2007	1,438.00	80.91	125,845.95	1.1427	0.0643
	2008	1,308.16	39.00	135,897.01	0.9626	0.0287
	2009	2,303.46	99.27	150,613.14	1.5294	0.0659
	2010	3,041.78	106.09	118,201.65	2.5734	0.0898
Rhode Island	1996	3,219.82	189.58	70,431.52	4.5716	0.2692
	1997	4,483.86	234.77	78,088.83	5.7420	0.3007
	1998	3,486.90	219.29	71,990.70	4.8435	0.3046
	1999	3,477.22	284.07	86,041.62	4.0413	0.3302
	2000	3,639.55	268.48	80,965.36	4.4952	0.3316

	2001	3,607.02	263.27	68,657.28	5.2537	0.3835
	2002	1,702.50	163.36	64,717.93	2.6307	0.2524
	2003	2,036.80	152.80	66,088.02	3.0819	0.2312
	2004	2,130.31	111.55	77,385.01	2.7529	0.1442
	2005	1,855.90	100.42	91,410.98	2.0303	0.1099
	2006	1,542.37	182.54	49,693.85	3.1037	0.3673
	2007	2,010.46	179.95	33,434.79	6.0131	0.5382
	2008	1,468.25	278.73	31,405.57	4.6751	0.8875
	2009	1,652.07	197.05	36,941.04	4.4722	0.5334
	2010	1,557.57	226.32	33,404.40	4.6628	0.6775
Connecticut	1996	1,943.38	76.25	48,417.25	4.0138	0.1575
	1997	1,739.98	96.24	33,081.97	5.2596	0.2909
	1998	1,448.61	67.97	34,359.38	4.2161	0.1978
	1999	3,119.07	81.30	38,090.42	8.1886	0.2135
	2000	2,754.70	101.00	31,245.53	8.8163	0.3233
	2001	2,219.40	92.47	31,194.44	7.1147	0.2964
	2002	1,166.55	130.04	27,779.08	4.1994	0.4681
	2003	1,460.25	139.10	29,825.50	4.8960	0.4664
	2004	2,028.11	192.52	33,399.34	6.0723	0.5764
	2005	2,183.02	209.72	37,570.31	5.8105	0.5582
	2006	1,065.02	119.66	5,219.07	20.4064	2.2928
	2007	709.77	120.75	4,452.08	15.9425	2.7122
	2008	930.07	128.91	3,072.57	30.2702	4.1955
	2009	919.21	143.16	3,050.65	30.1317	4.6929
	2010	759.52	64.84	2,363.04	32.1417	2.7438
New York	1996	5,578.85	189.82	86,670.00	6.4369	0.2190
	1997	6,337.49	232.52	89,614.78	7.0719	0.2595
	1998	6,273.31	299.20	81,828.13	7.6664	0.3657
	1999	4,571.00	338.91	74,787.60	6.1120	0.4532
	2000	2,589.67	322.50	61,121.40	4.2369	0.5276
	2001	4,218.39	336.14	55,072.52	7.6597	0.6104
	2002	2,127.89	188.51	51,264.53	4.1508	0.3677
	2003	3,055.45	119.55	51,603.26	5.9210	0.2317
	2004	3,448.59	110.69	46,877.09	7.3567	0.2361
	2005	2,480.61	72.23	56,436.68	4.3954	0.1280
	2006	1,159.80	23.47	14,479.63	8.0098	0.1621
	2007	1,508.92	76.56	14,383.96	10.4903	0.5322
	2008	1,708.09	90.30	13,605.46	12.5545	0.6637
	2009	1,782.58	92.07	14,849.02	12.0047	0.6201
	2010	2,267.75	132.64	12,057.75	18.8074	1.1000
New Jersey	1996	617.49	54.30	94,677.33	0.6522	0.0574
	1997	906.78	76.44	99,628.31	0.9102	0.0767
	1998	630.30	80.68	97,235.08	0.6482	0.0830
	1999	305.21	80.51	97,856.85	0.3119	0.0823
	2000	311.19	116.87	107,162.56	0.2904	0.1091
	2001	400.53	90.51	110,246.35	0.3633	0.0821
	2002	402.48	54.39	112,706.04	0.3571	0.0483
	2003	90.94	16.12	120,670.28	0.0754	0.0134
	2004	100.09	23.28	145,214.84	0.0689	0.0160
	2005	111.66	30.04	156,428.96	0.0714	0.0192
	2006	84.33	19.51	68,534.91	0.1231	0.0285
	2007	452.30	52.60	69,082.30	0.6547	0.0761
	2008	308.91	47.27	72,674.64	0.4251	0.0650

	2009	640.41	80.81	85,265.86	0.7511	0.0948
	2010	281.49	72.44	62,438.45	0.4508	0.1160

Section 4.5.4 Small-Mesh Multispecies Landings by Port

Table 42-Table 45 display the rankings of ports that landed the most silver hake from 2000-2010.

Point Judith, RI leads all other ports in New England and the Mid-Atlantic in silver hake landings for the years 2000-2008. In 2009, Point Judith, RI drops to the second highest port in silver hake landings, and in 2010, drops to number 3 (Table 45). Stonington, CT has the second highest silver hake landings in 2000 and third in 2001, but drops to number 11 in 2002 (Table 42). Stonington drops to the 10th position in 2009, but slightly rebounds to the seventh positing in 2010 (Table 45). Hampton/Seabrook, NH was 13th in terms of silver hake landings in 2000 (Table 42), but dropped out of the top 20 in 2003 (Table 43). Tiverton, RI was 15th in 2000 and 18th in 2002 (Table 42), but eventually dropped out of the top 20 in 2003 (Table 43). Hampton Bays, NY dropped from the fifth position in 2008 (Table 44) to the ninth position in 2010 (Table 45).

Other ports began to gain prominence in silver hake landings. Cape May, NJ and Portland, ME entered the top 20 silver hake landing ports in 2006 (Table 44). New Bedford, MA had the eighth highest silver hake landings in 2000 (Table 42), but eventually rose to the leading port in 2009 (Table 45). Gloucester, MA moved from 10th in 2008 (Table 44) to the fifth in 2009 (Table 45). Provincetown, MA moved from the seventh position in 2000 (Table 42) to the fourth position in 2010 (Table 45).

Table 42 Ranking of Silver Hake Landings and Revenue for the Top Ports based on Quantity of Silver Hake Landed, 2000-2002

	2000			2001				2002			
Port	Rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)
Point Judith, RI	1	4,298.1	3,300.1	1	-	3,610.3	3,186.1	1	-	2,154.7	1,607.3
Stonington, CT	2	1,510.8	1,552.9	3	↓	1,209.7	1,113.5	11	↓	135.4	128.6
New London, CT	3	1,302.5	1,202.0	4	↓	1,153.9	1,105.9	4	-	1,013.6	038.0
Gloucester, MA	4	1,082.1	1,212.7	8	↓	619.3	726.4	6	↑	489.0	572.4
Montauk, NY	5	1,057.6	1,384.9	2	↑	2,342.6	3,031.0	2	-	1,164.4	1,473.4
Hampton Bays, NY	6	695.6	862.1	6	-	908.1	1,048.9	7	↓	455.3	477.0
Provincetown, MA	7	633.3	518.1	7	-	711.5	899.6	5	↑	563.6	449.1
New Bedford, MA	8	452.4	381.0	5	↑	1,080.1	896.3	3	↑	1,083.6	845.5
Newport, RI	9	381.2	290.2	9	-	576.7	421.9	9	-	155.9	97.7
Point Pleasant, NJ	10	223.3	229.0	10	-	296.6	345.1	8	↑	288.8	283.2
Greenport, NY	11	166.5	166.4	16	↓	14.0	15.6	13	↑	11.7	7.7
Freeport, NY	12	128.2	176.0	12	-	79.8	114.3	10	↑	143.7	145.8
Hampton Seabrook, NH	13	88.9	78.6	11	↑	109.2	105.4	15	↓	4.0	4.4
Chatham, MA	14	76.7	76.4	13	↑	72.3	93.1	14	↓	10.3	18.9
Tiverton, RI	15	74.6	48.4	.	↓			18	↑	0.1	0.0
Belford, NJ	16	65.4	74.2	14	↑	19.9	27.7	12	↑	124.8	116.7
Portsmouth, NH	17	58.0	40.1	15	↑	17.7	12.0	16	↓	2.7	3.4
Rye, NH	18	15.4	11.6	17	↑	8.7	4.0	17	-	2.4	3.0
Cape May, NJ					-				-		
Portland, ME					-				-		

Table 43 Silver Landings and Revenue for the Top Silver Hake Ports based on Quantity Landed, 2003-2005

	2003				2004				2005			
Port	Rank	Change in rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)
Point Judith, RI	1	-	2,372.5	1,857.3	1	-	2,030.6	2,021.7	1	-	1,814.2	1,786.3
Stonington, CT	8	↑	99.0	106.6	8	-	85.3	111.9	7	↑	59.5	85.7
New London, CT	4	-	1,014.0	1,353.6	4	-	1,246.4	1,916.2	2	↑	1,437.2	2,097.3
Gloucester, MA	7	↓	231.7	339.9	6	↑	224.1	314.0	5	↑	451.0	503.8
Montauk, NY	3	↑	1,423.4	2,178.8	3	-	1,537.9	2,303.9	4	↓	1,216.4	2,035.6
Hampton Bays, NY	5	↑	495.3	752.2	5	-	465.0	611.1	6	↓	199.7	284.6
Provincetown, MA	10	↓	71.0	75.8	11	↓	25.7	27.2	15	↓	0.0	0.0
New Bedford, MA	2	↑	2,329.1	2,063.4	2	-	1,868.9	1,876.3	3	↓	1,413.4	1,305.2
Newport, RI	6	↑	248.8	179.7	7	↓	143.4	105.6	9	↓	43.9	42.5
Point Pleasant, NJ	12	↓	31.7	41.4	9	↑	56.7	51.6	10	↓	39.0	51.5
Greenport, NY	14	↓	24.7	24.7	14	-	7.0	13.4	11	↑	7.8	22.7
Freeport, NY	9	↑	82.0	89.9	13	↓	13.1	12.0		↓	.	.
Hampton Seabrook, NH		↓				-				-		
Chatham, MA	11	↑	49.4	62.8	12	↓	16.6	9.8	13	↓	0.4	0.4
Tiverton, RI		↓				-				-		
Belford, NJ	13	↓	31.1	47.8	10	↑	44.7	61.5	8	↑	50.0	58.1
Portsmouth, NH	15	↑	2.5	4.2	15	-	1.9	3.6	12	↑	1.3	1.4
Rye, NH	16	↑	0.4	0.5	16	-	0.5	0.6	14	↑	0.1	0.1
Cape May, NJ		-				-				-		
Portland, ME						-				-		

Table 44 Silver Landings and Revenue for the Top Silver Hake Ports based on Quantity Landed, 2006-2008

	2006				2007				2008			
Port	Rank	Change in rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)	Rank	Change in rank	Landings (mt)	Revenue (000$)
Point Judith, RI	1	-	1,488.2	1,653.5	1	-	1,936.7	2,076.3	1	-	1,417.6	1,790.5
Stonington, CT	7	-	107.8	156.6	9	↓	69.5	108.2	9	-	110.3	169.0
New London, CT	3	↓	957.2	1,358.1	4	↓	640.3	1,007.2	4	-	338.0	429.6
Gloucester, MA	6	↓	122.0	217.7	5	↑	312.4	472.1	10	↓	100.7	129.6
Montauk, NY	4	-	742.6	1,263.2	3	↑	906.3	1,435.7	2	↑	1,376.0	2,135.8
Hampton Bays, NY	5	↑	215.2	286.7	6	↓	267.7	331.6	5	↑	180.2	218.9
Provincetown, MA		-			11	↑	19.6	28.8	8	↑	134.0	206.0
New Bedford, MA	2	↑	1,127.8	1,252.2	2	-	1,069.4	1,183.9	3	↓	1,041.6	1,253.2
Newport, RI	8	↑	51.5	42.7	10	↓	48.6	45.3	11	↓	28.5	32.6
Point Pleasant, NJ	9	↑	45.5	59.5	8	↑	223.9	213.5	6	↑	161.8	173.0
Greenport, NY	12	↓	3.5	5.0	13	↓	4.9	8.2	12	↑	10.4	15.4
Freeport, NY	15	↑	0.1	0.3	18	↓	0.0	0.1	17	↑	0.1	0.1
Hampton/Seabrook, NH		-				-				-		
Chatham, MA	16	↓	0.1	0.1	15	↑	0.2	0.3	14	↑	1.6	2.4
Tiverton, RI		-				-				-		
Belford, NJ	10	↓	34.2	56.2	7	↑	226.5	279.1	7	-	137.2	185.5
Portsmouth, NH	13	↓	3.3	4.5	12	↑	7.0	8.1	18	↓	0.0	0.1
Rye, NH	17	↓	0.1	0.2	16	↑	0.2	0.3	16	-	0.4	0.6
Cape May, NJ	11	↑	4.7	2.8	14	↓	1.6	1.7	13	↑	9.8	5.2
Portland, ME	14	↑	1.6	2.1	17	↓	0.2	0.1	15	↑	0.5	0.7

Table 45 Silver Landings and Revenue for the Top Silver Hake Ports based on Quantity Landed, 2009-2010

	2009				2010			
Port	**Rank**	**Change in rank**	**Landings (mt)**	**Revenue (000$)**	**Rank**	**Change in rank**	**Landings (mt)**	**Revenue (000$)**
Point Judith, RI	2	↓	1,633.9	1,529.4	3	↓	1,529.7	1,921.6
Stonington, CT	10	↓	148.1	237.2	7	↑	183.2	244.7
New London, CT	6	↓	281.2	324.7	6	-	246.0	377.6
Gloucester, MA	5	↑	308.9	352.5	5	-	246.9	340.9
Montauk, NY	3	↓	1,488.1	2,140.6	2	↑	1,620.2	2,513.8
Hampton Bays, NY	9	↓	192.0	245.2	9	-	179.1	216.3
Provincetown, MA	8	-	217.3	316.1	4	↑	253.1	494.9
New Bedford, MA	1	↑	1,745.6	1,933.3	1	-	2,420.0	3,019.3
Newport, RI	13	↓	18.0	20.2	11	↓	7.2	6.3
Point Pleasant, NJ	4	↑	358.0	283.8	8	↓	181.4	179.5
Greenport, NY	17	↓	0.1	0.2	15	↑	1.4	1.6
Freeport, NY	18	↓	0.0	0.0	14	↑	1.7	3.0
Hampton/Seabrook, NH		-				-		
Chatham, MA	14	-	0.6	0.6	16	↓	1.2	1.9
Tiverton, RI		-				-		
Belford, NJ	7	-	261.8	304.2	10	↓	93.8	105.1
Portsmouth, NH	15	↑	0.2	0.3	18	↑	0.2	0.2
Rye, NH	11	↑	27.6	19.3	13	↓	4.5	4.1
Cape May, NJ	12	↑	20.6	12.0	12	-	6.4	3.6
Portland, ME	16	↓	0.2	0.2	17	↓	0.6	1.0

Section 4.5.5 Small-Mesh Multispecies Permits by Port

Table 46 displays the number of unique permits that landed silver hake, offshore hake or red hake in the listed port. These data were obtained from the Vessel Trip Reports.

From 2000-2010, there was a 78% decrease in the number of permits that recorded landings of silver hake, offshore hake, or red hake in the state of Maine. Portland, ME saw the majority of this decrease, with an 81% decline in the number of permits recording landings of the small-mesh multispecies over that decade. Other ports in Maine had relatively few permits landing small-mesh multispecies; in fact, most of these ports had less than three vessel permits reporting landings of the hake species. There was a 50% decrease in the number of permits reporting landings of silver hake, offshore hake, or red hake in New Hampshire for 2000-2010. The ports of Hampton, Seabrook, Rye, and Portsmouth, NH saw a decrease of 50-72% of permits landing hakes (Table 46). The number of unique permits reporting landings of silver hake, red hake or offshore hake decreased by 52% in the Commonwealth of Massachusetts of that decade. The principal fishing ports of Provincetown, Newburyport, Chatham, and Gloucester all saw declines of more than 50% of permits landing these hake species (Table 46).

There was a 42% decline in the number of permits reporting landings of small-mesh multispecies in the state of Rhode Island for 2000-2010. The number of permits landing in Point Judith, RI declined by about a quarter for 2000-2010; while there was an 81% decline in the number of permits reporting landings of these species in Newport, RI over that time period. There was an 18% decline in the number permits reporting landings of small-mesh multispecies in the state of Connecticut for 2000-2010 (Table 46). There was a 12.5% decline in the port of Stonington, CT.

There were declines in permitted vessels reporting hake landings in the mid-Atlantic. There was a decline of 24% of the number of permits reporting landings of small-mesh multispecies in the state of New York for 2000-2010. The ports of Montauk and Shinnecock experienced declines of 11% and 47%, respectively. There was a 150% increase in the number of permits reporting small-mesh multispecies landings in ports that could not be named due to confidentiality issues, indicating an increase in landings in incidental ports (Table 46). There was a 21% decline in the number of permits reporting landings of silver hake, offshore hake or red hake in the state of New Jersey for 2000-2010. There were declines in permits landing small-mesh multispecies in Belford (55%), Belmar (50%), Briele (20%), Cape May (22%) and Highlands (60%). However, there were increases in the number of permitted vessels reporting silver hake, offshore hake or red hake landings in Barnegat (18%) and Point Pleasant (19%). See Table 46.

Table 47 displays the number of unique permits that landed silver hake, offshore hake, or red hake in the listed ports for the years 2000-2010 in ports that are slightly farther south of the stock areas. Overall, during this time period the number of unique permits landing small-mesh multispecies in Virginia increased by 21%; the same trend is true for the port of Chinconteague. However, there was a 25% decrease in the Hampton port (Table 47). Although, there was fluctuation over this time period, the number of unique permits landing silver hake, offshore hake, or red hake remained the same in Ocean City, MD and North Carolina (Table 47).

Table 46 Number of Unique Permits Landing Silver Hake, Offshore Hake or Red Hake in Each Port

Port	State	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Boothbay Harbor	ME	3	3	3	*	*	*	*	*	*	*	*
Cape Porpoise	ME	3	*	*	*	*		*	*	3	*	*
Cundys Harbor	ME	3	*	4	*		*	*	*	*	*	
Five Islands	ME	3	3	*	*	*						
Kittery	ME	3	*	*							*	
New Harbor	ME		3	*	*	*						*
Ogunquit	ME	3	3	*	*	*	*	*	*	3	*	*
Port Clyde	ME	3	4	5	*	3	*			*		*
Portland	ME	57	49	37	23	21	21	12	7	8	10	11
Saco	ME	6	*	*	*		*	*	3	*	*	*
South Bristol	ME	4	3	*								
West Point	ME	*	4	*	*	*	*	*			*	*
York	ME	4	3	4	*	3	*		*		*	
*No. Confidential Permits	ME	19	21	26	26	17	14	14	13	15	19	14
TOTAL	*ME*	*111*	*96*	*79*	*49*	*44*	*35*	*26*	*23*	*29*	*29*	*25*
Hampton	NH	6	11	5	8	5	5	4	3	3	3	3
Portsmouth	NH	25	31	23	15	15	8	8	12	6	9	7
Rye	NH	10	10	8	6	7	5	5	7	8	7	6
Seabrook	NH	17	15	13	14	13	17	12	10	12	16	11
*No. Confidential Permits	NH		*	*	*				*	*	*	*
TOTAL	*NH*	*58*	*68*	*50*	*44*	*40*	*35*	*29*	*33*	*30*	*36*	*29*
Barnstable	MA		*	3	*	4	*	*			3	3
Beverly	MA	3	3	*	3		*	*	*	*	*	
Boston	MA	7	6	7	6	4	6	7	7	9	10	5
Chatham	MA	22	20	17	25	16	10	7	9	15	10	9
Gloucester	MA	101	102	98	83	69	52	34	46	56	60	44
Harwichport	MA	4	*			*	3	*	*	*		
Marblehead	MA	4	*	*	*	*				*	*	*
Marshfield	MA	*	*	*	4	*	3	*			*	*
New Bedford	MA	42	50	36	39	38	34	30	29	31	34	27
Newburyport	MA	10	10	9	11	9	4	*	*	3	4	5
Plymouth	MA	7	7	5	7	5	4	*	5	3	3	*
Provincetown	MA	21	21	24	15	15	5	4	5	9	8	8
Rockport	MA	7	6	6	5	6	3	*	4	3	4	3
Salisbury	MA	5	3	4	*	*	*	*		*	*	*

Scituate	MA	8	7	11	8	4	3	6	4	8	9	9
*No. Confidential Permits	MA	15	12	11	14	8	6	15	8	7	11	10
TOTAL	*MA*	*256*	*247*	*231*	*220*	*178*	*133*	*103*	*117*	*144*	*156*	*123*
Little Compton	RI	4	*	*	*	4		*	3	*	*	
New Shoreham	RI	4	4	5	5	*		*	3	5		*
Newport	RI	26	30	19	17	12	11	12	10	7	8	5
North Kingstown	RI	3	*	*					*	*	*	*
Point Judith	RI	95	93	99	79	73	73	81	77	83	81	70
*No. Confidential Permits	RI	3	5	5	3	*	*	7	*	3	3	3
TOTAL	*RI*	*135*	*132*	*128*	*104*	*91*	*85*	*100*	*95*	*98*	*92*	*78*
New London	CT	4	5	6	3	4	5	5	4	*	*	3
Stonington	CT	16	18	13	9	10	11	13	10	14	13	14
*No. Confidential Permits	CT	*	3	*	4	*	*	*	*	3	3	*
TOTAL	*CT*	*22*	*26*	*21*	*16*	*15*	*17*	*19*	*15*	*17*	*16*	*18*
Babylon (Captree)	NY						*	*	*	4	3	5
Brooklyn	NY	5	7	7	4	4	*	3	4	7	9	6
East Hampton	NY	*		*	3		4	*	3	*	*	
Freeport	NY	5	8	7	4	3	6	5	3	3	8	7
Greenport	NY	9	4	*	6	4	4	*	*	*	*	*
Hampton Bay	NY	6	6	6	6	7	5	6	6	7	3	5
Island Park	NY	3		*	*	*	*	4	4	5	4	4
Islip	NY	*	*	*	*	*	*	*	*	3	3	*
Mattituck	NY	4	6	3	*	4	*	6	*			
Montauk	NY	53	43	48	39	55	31	37	40	44	42	47
New York City	NY	3	3	3	*		*					*
Oceanside	NY	*		*				*		*	3	*
Other Nassau	NY	6	4	3		4					*	*
Other Suffolk	NY	5	*			10				*		
Pt. Lookout	NY	8	7	7	5	5	5	6	7	9	10	9
Shinnecock	NY	49	49	44	27	26	20	29	28	25	28	26
*No. Confidential Permits	NY	6	4	13	14	4	13	15	7	6	10	15
TOTAL	*NY*	*162*	*141*	*141*	*108*	*126*	*88*	*111*	*102*	*113*	*123*	*124*
Atlantic City	NJ	4	4	*	*	*	*	*	5	*	*	
Barnegat	NJ	4	8	3						4	8	11
Belford	NJ	20	20	18	12	12	13	16	14	12	13	9
Belmar	NJ	10	10	5	5	4	*	5	4	4	4	5
Briele	NJ	5	7	9	7	4	3	4	5	4	4	4
Cape May	NJ	23	36	19	17	19	18	17	15	30	25	18

Highlands	NJ	10	8	6	*	4	*	*	*	3	5	4
Long Beach	NJ	16	12	3	7	9	6	8	10	15	3	*
Ocean City	NJ	*	*		*	*	*	*	3	*	*	*
Pt. Pleasant	NJ	37	44	27	30	30	31	36	29	47	40	44
Sea Isle City	NJ	*	4	3	*		*	*	*	4	4	5
Shark River	NJ	5	3	3	*	4	*	3	*	*	4	*
Wildwood	NJ	5	*	*	*	*	*	3	*	6	*	3
*No. Confidential Permits	NJ	11	11	10	18	13	14	7	12	15	15	16
TOTAL	NJ	150	167	106	96	99	85	99	97	144	125	119

*Any port that has less than three permits is not listed for confidentiality reasons.

Table 47 Number of Unique Permits Landing Silver Hake, Offshore Hake or Red Hake in 'Non-Traditional' Ports

Port	State	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
CHINCOTEAGUE	VA	3	4	4	*	4	*	*	*	5	3	6
HAMPTON	VA	4	5	*		*	*	3	*	*	3	3
NEWPORT NEWS	VA	*	*						*	*	3	
VIRGINIA BEACH	VA	*	*	9	3	5	*	3	4	4	6	6
*No. Confidential Permits	VA	7	7	*	4	6	6	3	7	6	2	2
TOTAL	VA	14	16	15	7	15	6	9	11	15	17	17
ENGELHARD	NC	3				*		*		9	*	*
HATTERAS	NC	3	5	*	*	*	*			*		*
WANCHESE	NC	3	*	3	*	*	*	5	4	9	5	7
*No. Confidential Permits	NC	4	6	4	7	8	*	3	*	*	3	6
TOTAL	NC	13	11	7	7	8	*	8	5	19	8	13
OCEAN CITY	MD	13	11	10	10	11	7	11	14	14	10	13
TOTAL	FL, GA, SC, DE	3	*	*	*	5	7	10	5	13	11	12

*Any port that has less than three permits is not listed for confidentiality reasons.

Section 5.0 Environmental Consequences

Section 5.1 Impacts to Silver, Red, Offshore Hake

Section 5.1.1 ABC, ACL, and TAL Alternatives

These alternatives would implement an ABC, an ACL, and a TAL framework, including the specifications process, for each of the following stocks/stock group: Northern red hake, northern silver hake, southern red hake, and southern whiting (southern silver hake and offshore hake combined).

Section 5.1.1.1 Stock Area ABCs, ACLs, and TALs (Preferred Alternative)

Biological and management reference points and associated control rules are the foundation of the management program. Such reference points provide a framework under which to determine stock status and manage the fishery based upon the best available science. Thus, adopting biomass reference points and associated catch and landing limits are more likely to provide for sustainable management than the no action alternative, leading to positive biological effects over the long-term.

By definition, ABC and ACL frameworks reduce the risk of overfishing, by taking into account scientific uncertainty in estimating the overfishing limit and management uncertainty. The TAL is used to provide an additional tool that managers can use to keep the fishery from exceeding the ACL by holding the landings to a certain level. Discards and state landings estimates are based on the best available information to represent the current fishery behaviors.

These alternatives, described in Sections 3.1.1 and 3.2.1, are mostly administrative and may not have a direct biological impact. However, by making the process explicit and incorporating the SSC into the specification process, the alternatives serve to positively impact the small-mesh multispecies resources by presenting an opportunity to better prevent overfishing.

Section 5.1.1.2 Status Quo/No Action

The status quo/no action alternatives would result in no ABCs, ACLs, or TALs being adopted and no change to the existing specifications process for small-mesh multispecies. Therefore, these alternatives do not set allowable catch limits recommended by the SSC, which may result in a greater risk of overfishing than the preferred alternative. These status quo/no action alternatives could have potentially negative impacts on the small-mesh multispecies stocks, if catch were to exceed the recommended levels.

Section 5.1.2 Post-Season Accountability Measure Alternatives

The reactive, or post-season, accountability measure alternative would implement a pound-for-pound payback of any ACL overage in a subsequent year.

Section 5.1.2.1 Pound-for-Pound Payback of an ACL Overage (Preferred Alternative)

A reactive AM could have a positive impact on the small-mesh multispecies stocks because it would ensure that catch over the long-term does not exceed an acceptable level. This type of AM may also provide positive impact for a stock as an incentive for participants to fish within the given landings limit. By having a measure that could potentially reduce landings in a following year, fishery participants may be more likely to fish within the landing limits to ensure long-term access to a particular resource and assist in long-term business planning.

Section 5.1.2.2 Status Quo/No Action

Not implementing a reactive AM could have a negative impact on the small-mesh multispecies stocks because it would not ensure that catch over the long-term does not exceed an acceptable level which may result in a greater risk of overfishing than the preferred alternative. If an ACL is exceeded in a given year, the reactive AM would ensure that, over the long-term, catch does not exceed the recommended level compared to this alternative.

Section 5.1.3 In-Season Accountability Measure Alternatives

In-season AMs grant the Northeast Regional Administrator the authority to implement a management measure, such as reducing the trip limit or closing the fishery, when landings are projected to reach a pre-determined level.

Section 5.1.3.1 Zero Possession at 100% of TAL

This alternative would prohibit retention of a particular stock when 100 percent of that stock's TAL is projected to be harvested. This alternative would have a potentially positive impact on the small-mesh multispecies stocks because it would ensure that the landings in a given year would stay within the recommended limit.

Section 5.1.3.2 Incidental Possession Limit Trigger (Preferred Alternative)

This alternative would reduce possession to an incidental limit when a trigger level is projected to be reached. Under this alternative, the incidental possession limit would remain in effect, even if the TAL is projected to be exceeded. This is intended to work in conjunction with the post-season accountability measure which would be invoked if the overage of the TAL causes the catch for that year to exceed the ACL. This alternative would have neutral impacts because it would allow trips to continue, without causing large amounts of additional small-mesh multispecies discards.

Section 5.1.3.3 Incidental Possession Limit Trigger and Zero Possession at 100% of TAL

This alternative would reduce possession to an incidental limit when a trigger level is projected to be reached and would prohibit retention of a particular stock when 100 percent of the TAL is projected to be harvested. This alternative would have a potentially positive impact on the small-mesh multispecies stocks because it would allow for trips to continue, without causing large amounts of additional small-mesh multispecies discards, and it would ensure that the landings in a given year would stay within the recommended limit.

Section 5.1.3.4 Status Quo/No Action

This alternative would result in no proactive, or in-season, AMs being implemented. This would have a potentially negative impact on the small-mesh multispecies stocks because it would not guarantee that catch and landings would stay within the limits recommended by the SSC and may result in a greater risk of overfishing than the preferred alternative.

Section 5.2 Impacts to Non-Target Species

As discussed in Section 4.2, the following species are likely impacted by the small-mesh multispecies fishery:

Table 48 Other Species that May be Impacted by the Small-Mesh Multispecies Fishery

Northeast Skate Complex
Spiny Dogfish
Summer Flounder
Windowpane Flounder
Yellowtail Flounder
American Plaice
Witch Flounder
Scup
Black Sea Bass
Monkfish
Atlantic Cod
Haddock
Red Crab
Atlantic Sea Scallop
Loligo squid
Illex squid
Butterfish
Mackerel
Redfish

Section 5.2.1 ABC, ACL, and TAL Alternatives

Section 5.2.1.1 Stock Area ABCs, ACLs, and TALs, including a Specifications Process (Preferred Alternative)

All of the species likely to be impacted by the small-mesh multispecies fishery (Table 48) are currently managed by either the New England or Mid-Atlantic Fishery Management Council under ACL frameworks that would sufficiently limit the amount of redirected effort. Therefore, even though limiting catch on the small-mesh multispecies could result in a redirection of effort on to other species (e.g., skates or dogfish), the impact on non-target species, and their level of catch, are being managed by ABCs, ACLs, and AMs as well; thus, there would be neutral impacts on the non-target stocks from the small-mesh multispecies fishery.

Section 5.2.1.2 Status Quo/No Action

The status quo/no action would result in no ABCs, ACLs, or TALs being implemented and no change to the existing specifications process for the small-mesh multispecies fishery. This would likely result in no change to current fishing operations. There are currently management measures in place to protect other non-target/bycatch species, including catch limits and catch targets. The impacts of the status quo/no action alternatives are, therefore, expected to be neutral on non-target species.

Section 5.2.2 Post-Season Accountability Measure Alternatives

Section 5.2.2.1 Pound-for-Pound Payback of an ACL Overage (Preferred Alternative)

A reactive AM is designed to respond to exceeding the ACL, and, if invoked, would prevent catches from exceeding the OFL in the future. This would likely lead to either no change in fishing (if the AM is not invoked), or a reduction in fishing effort (if the AM reduces the allowable landings) on small-mesh multispecies. The existence of such controls on small-mesh multispecies fishing effort will likely have neutral impacts for non-target species. As discussed above (Section 5.2.1.1), although a reduction in the amount of small-mesh multispecies that may be landed in a given year due to the implementation of a payback may result in redirected fishing into other fisheries (e.g., skates or dogfish), the programs that are in place for those other species should sufficiently manage that impact that a small increase in effort may have.

Section 5.2.2.2 Status Quo/No Action

The status quo/no action would result in no AMs being implemented for the small-mesh multispecies fishery. This would likely result in no change to current fishing operations, especially because most of the non-target species described in Table 48 are currently managed under a system to protect those species, including catch limits and catch targets. Therefore, this alternative would have neutral impacts on non-target species.

Section 5.2.3 In-Season Accountability Measure Alternatives

Section 5.2.3.1 Zero Possession at 100% of TAL

This alternative would prohibit retention of a particular stock when 100 percent of that stock's TAL is projected to be harvested. This alternative could have a negative impact on non-target stocks if vessels increase fishing on other species when they are prohibited from landing small-mesh multispecies stocks. However, all of the other species likely to be targeted are currently managed under an ACL framework of their own. This suggests that the impacts on non-target stocks as a result of this alternative would be neutral.

Section 5.2.3.2 Incidental Possession Limit Trigger (Preferred Alternative)

This alternative would reduce possession to an incidental limit when a trigger level is projected to be reached. Under this alternative, the incidental possession limit would remain in effect, even if the TAL is projected to be exceeded. This is intended to work in conjunction with the post-season accountability measure which would be invoked if the overage of the TAL causes the catch for that year to exceed the ACL. This alternative would have a neutral impact on non-target species because it would allow trips for other species to continue at approximately the same incidental level of small-mesh multispecies that are currently landed.

Section 5.2.3.3 Incidental Possession Limit Trigger and Zero Possession at 100% of TAL

This alternative would reduce possession to an incidental limit when a trigger level is projected to be reached and would prohibit retention of a particular stock when 100 percent of the TAL is projected to be harvested. This alternative could have a negative impact on non-target stocks if vessels increase fishing on other species when they are prohibited from landing small-mesh multispecies stocks. However, all of the other species likely to be targeted are currently managed under an ACL framework of their own. This suggests that the impacts on non-target stocks as a result of this alternative would be neutral.

Section 5.2.3.4 Status Quo/No Action

This alternative would result in no proactive, or in-season, AMs being implemented. This alternative would have neutral impacts on non-target species because it would allow trips for other species to continue at the same incidental level of small-mesh multispecies that are currently landed.

Section 5.3 Impacts to the Physical Environment and EFH

The overall effect of the fishery on EFH was analyzed and mitigated for in Amendment 13 to the Northeast Multispecies FMP. The small-mesh multispecies fishery is primarily a trawl fishery, with minor landings coming from sink gillnets and other gears (Section 4.3; Table 32). In the northern stock areas, a raised footrope trawl is required in several of the exempted fishing programs (the Gulf of Maine Raised Footrope Trawl, Small Mesh Areas I and II, and the Raised Footrope Exemption Areas near Cape Cod). The raised footrope trawl has less impact on habitat than a traditional otter trawl (see Section 4.3.3 for more information). Small-mesh multispecies fishing effort will continue to occur in areas that are open to mobile bottom-tending gears or by gears that have been determined to not adversely impact EFH in a manner that is more than minimal and less than temporary in nature.

The alternatives under consideration in this action will not increase small-mesh multispecies fishing effort in either stock area, since they are administrative in nature, or otherwise do not affect the magnitude or distribution of fishing effort. Specifically, the alternatives under consideration which are not likely to affect small-mesh multispecies fishing effort, and by extension would not likely impact EFH, include:

- Establishment of ABCs, ACLs, and TALs,

- Post-season accountability measures; and
- In-season accountability measures

The small-mesh multispecies fishery is moving from a system with no catch limits, to a system with catch limits. While the catch limits are, in most cases, substantially higher than recent catch, there was previously no limit. Therefore, it is likely that catch, and by extension, fishing effort, would not change due to the implementation of these measures. The only stock where recent (2010) catch is higher than the proposed ACL is northern red hake. In this case, the preferred alternatives may have a slightly positive impact on the physical environment and EFH, if there is less fishing in a given fishing year, as compared to 2010 (Table 49).

Table 49 Percent Difference between Proposed ACLs and 2010 Catch

	Northern Red Hake	Northern Silver Hake	Southern Red Hake	Southern Whiting
Proposed ACL	266 mt	12,518 mt	3,096 mt	32,243 mt
2010 Catch	311 mt	2,478 mt	1,352 mt	7,110 mt
% Difference	-15%	405%	129%	354%

In summary, the actions proposed in this amendment would have neutral impacts on EFH for any federally managed species in the region.

Section 5.4 Impacts to Protected Species

As described in Section 4.4, the following protected species may be impacted by the small-mesh multispecies fishery (Table 50):

Table 50 Protected Species that May be Impacted by the Small-Mesh Multispecies Fishery

Cetaceans
North Atlantic right whale (*Eubalaena glacialis*)
Humpback whale (*Megaptera novaeangliae*)
Fin whale (*Balaenoptera physalus*)
Sei whale (*Balaenoptera borealis*)
Pilot whale (*Globicephala spp.*)
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
Bottlenose dolphin (*Tursiops truncatus*)[b]
Sea Turtles
Leatherback sea turtle (*Dermochelys coriacea*)
Kemp's ridley sea turtle (*Lepidochelys kempii*)
Green sea turtle (*Chelonia mydas*)
Loggerhead sea turtle (*Caretta caretta*) Northwest Atlantic DPS
Fish
Atlantic sturgeon *(Acipenser oxyrinchus)*
Pinnipeds
Harbor seal (*Phoca vitulina*)
Harp seal (*Phoca groenlandicus*)

Although large whales and marine turtles may be potentially affected through interactions with fishing gear, it is likely that the continued authorization of the small-mesh multispecies fishery should not have any adverse effects on the availability of prey for these species. Right whales and sei whales feed on copepods (Horwood 2002, Kenney 2002). The small-mesh multispecies fishery would not affect the availability of copepods for foraging right and sei whales because copepods are very small organisms that would pass through even small-mesh multispecies fishing gear rather than being captured in it. Humpback whales and fin whales also feed on krill as well as small schooling fish (e.g., sand lance, herring, mackerel) (Aguilar 2002, Clapham 2002). Small-mesh multispecies fishing gear operates on or very near the bottom. Fish species caught in small-mesh multispecies gear are species that live in benthic habitat (on or very near the bottom) such as flounders versus schooling fish such as herring and mackerel that occur within the water column.

The alternatives under consideration in this action will not increase small-mesh multispecies fishing effort in either stock area, since they are administrative in nature, or otherwise do not affect the magnitude or distribution of fishing effort. Specifically, the alternatives under consideration which are not likely to affect small-mesh multispecies fishing effort, and by extension would not likely impact protected resources, include:

- Establishment of ABCs, ACLs, and TALs,
- Post-season accountability measures; and
- In-season accountability measures

The continued authorization of the small-mesh multispecies fishery should likely not affect the availability of prey for foraging humpback or fin whales. Moreover, none of the turtle species are known to feed upon small-mesh multispecies fishery stocks. In summary, the actions proposed in this amendment would have neutral impacts on protected species in the region.

Section 5.4.1 Impacts to Atlantic Sturgeon

Formal consultation on the small-mesh multispecies fishery was reinitiated on February 9, 2012. NMFS has determined that there will not be any irreversible or irretrievable commitment of resources under section 7(d) of the ESA during the consultation period that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures. NMFS has also determined that the continued authorization of the small-mesh multispecies fishery during the consultation period, including the authorization of those fisheries to operate under the measures proposed in the Secretarial Amendment, is not likely to jeopardize the continued existence of ESA-listed species or result in the destructive or adverse modification of critical habitat.

While ESA Section 7 consultations are required when a proposed action may affect listed species, a conference is required only when the proposed action is likely to jeopardize the continued existence of a proposed species or destroy or adversely modify proposed critical habitat. Therefore, a conference would be required if it was determined that the small-mesh multispecies fishery was likely to jeopardize one or more of the five distinct population segments (DPS) of Atlantic sturgeon or one or more of the nine DPSs of loggerhead sea turtles. A biological assessment evaluates the potential effects of an action on listed and proposed species and designated and proposed critical habitat to determine whether any such species or habitat are likely to be adversely affected by the action. A biological assessment is used in determining whether formal consultation or a conference is necessary.

On February 6, 2012, NMFS listed the Gulf of Maine distinct population segment of Atlantic sturgeon as threatened, and listed the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon as endangered (77 FR 5880 and 75 FR 5914). This action considered whether the small-mesh multispecies fishery, including implementation of the proposed action, is likely to jeopardize Atlantic sturgeon DPSs, as they were proposed to be listed, and concluded that is not. While it is possible there may be interactions between Atlantic sturgeon and gear used in the small-mesh multispecies fishery, the number of interactions that will occur during the limited duration of this action is not likely to cause an appreciable reduction in survival and recovery. This is supported by updated bycatch estimates based upon NEFOP data (2006-2010). Atlantic sturgeon are known to be captured in sink gillnet, drift gillnet, and otter trawl gear. Of these gear types, sink gillnet gear poses the greatest known risk of mortality for bycaught sturgeon. Sturgeon deaths were rarely reported in the otter trawl observer dataset. However, the level of mortality after release from the gear is unknown. In an updated, preliminary analysis, the Northeast Fisheries Science Center (NEFSC) was able to use data from the NEFOP database to provide updated estimates for the 2006 to 2010 timeframe. Data were limited by observer coverage to waters outside the coastal boundary (fzone>0) and north of Cape Hatteras, NC. Sturgeon included in the data set were those identified by federal observers as Atlantic sturgeon, as well as those categorized as unknown sturgeon. At this time, data were limited to information collected by the NEFOP; limited data collected in the At-Sea Monitoring Program were not included, although preliminary views suggest the incidence of sturgeon encounters was low.

The preliminary analysis apportioned the estimated weight of all sturgeon takes to specific fishery management plans. The analysis estimates that between 2006 and 2010, a total of 15,587 lb of Atlantic sturgeon were captured and discarded in bottom otter trawl (7,740 lb) and sink gillnet (7,848 lb) gear. The analysis results indicate that 1.1% (85 lb) of the weight of sturgeon discards in bottom otter trawl gear could be attributed to the small-mesh bottom trawl fisheries if a correlation of FMP species landings (by weight) was used as a proxy for fishing effort. Additionally, the analysis results indicate that 0.7% (55 lb) of the weight of sturgeon discards in sink gillnet gear could be attributed to the small mesh gillnet fisheries if a correlation of FMP species landings (by weight) was used as a proxy for fishing effort.

Given the limited scope of this action, and the overall low effort in the small-mesh multispecies fishery, the magnitude of that interaction during the timeframe of interest is not likely to result in jeopardy to the species based on current assessments of each DPS. Since Atlantic sturgeon DPSs have been listed, the formal consultation for the NE multispecies fisheries, including the small-mesh multispecies fishery, was reinitiated, as required and additional evaluation will be included to describe any impacts of the fisheries on Atlantic sturgeon and define any measures needed to mitigate those impacts, if necessary. It is anticipated that any measures, terms and conditions included in an updated Biological Opinion will further reduce impacts to the species. It is expected that the completion of the Biological Opinion will occur before the beginning of the 2012 NE multispecies fishing year on May 1, 2012. Additionally, there would likely be slightly negative impacts on the sturgeon DPSs because of the limited scope of the proposed action and the overall low effort in the small-mesh multispecies fishery.

Section 5.5 Impacts to Human Communities

Section 5.5.1 ABC, ACL, and TAL Alternatives

Section 5.5.1.1 Stock Area ABC, ACLs, and TALs, including a Specifications Process (Preferred Alternative)

This alternative would implement an ABC, an ACL, and a TAL framework, including the specifications process, for each of the following stocks/stock group: Northern red hake, northern silver hake, southern red hake, and southern whiting (southern silver hake and offshore hake combined). It is likely that implementing the stock area catch and landings limits framework and specifications process, as described in Sections 3.1 and 3.2, would have neutral to positive economic impacts.

The ACLs and TALs for the stocks are greater than recent catches and landings, respectively, with the exception of northern red hake. It can be assumed that landings, as well as fishing effort would not change substantially due to this alternative. However, if there were changes, there would most likely be positive economic impacts to fishing communities because the TALs and ACLs are greater than previous years' landings. The proposed ACL for northern red hake is less than the catch in 2010; however, the proposed TAL is greater than 2010 landings of northern red hake. It is likely that there would also be a neutral to positive economic impact to those vessels targeting northern red hake. This alternative would likely result in no change to current fishing operations; however, the sustainable harvesting of the small-mesh multispecies stocks would lead to positive long-term benefits.

Based upon the average prices from 2005-2010 and the proposed Federal TAL, the estimated gross revenue would be greater than the average gross revenues earned from 2005-2010 for each of the species/stock areas (Table 51).

Table 51 Average landings and revenue for the species/stock areas, along with the proposed Federal TAL and estimated gross revenues (based upon average prices).

	Average Landings 2005-2010	Average Revenue 2005-2010	Proposed Federal TAL	Estimated Gross Revenue
Northern Red Hake	107,157 lb	$ 43,762	238,099 lb	$ 144,288
Southern Red Hake	485 lb	$ 414,250	2,383,197 lb	$ 1,086,738
Northern Silver Hake	2,238,561 lb	$ 1,305,332	20,075,292 lb	$ 19,473,033
Southern Whiting	15,475,112 lb	$ 8,827,030	59,709,995 lb	$ 50,454,946

Section 5.5.1.2 Status Quo/No Action

The status quo/no action alternative would maintain the current management measures for the small-mesh multispecies fishery. There would be no ABCs, ACLs, or TALs adopted for this fishery. This alternative would most likely result in neutral economic impacts to fishing communities because there would be no impact on overall fishing effort and by extension revenue.

Section 5.5.2 Post-Season Accountability Measure Alternatives

The reactive, or post-season, accountability measure would implement a pound-for-pound payback of any ACL overage in a subsequent year.

Section 5.5.2.1 Pound-for-Pound Payback of an ACL Overage (Preferred Alternative)

A reactive accountability measure is designed to respond to exceeding the ACL, and, if invoked, would prevent catches from exceeding the OFL in the future. This would likely lead to either no change in fishing (if the accountability measure is not invoked), or a reduction in fishing effort (if the accountability measure reduces the allowable landings). By allowing the overage to be deducted from future years this would give vessel owners an opportunity to adopt alternative fishing strategies to account for a pound-for-pound payback due to an ACL overage. If this alternative is invoked, it would result in short-term negative economic impacts by reducing the amount of a particular stock that could be landed in a given year.

Section 5.5.2.2 Status Quo/No Action

Not implementing a reactive accountability measure would have a neutral impact to vessels targeting small-mesh multispecies stocks because there is no change from the current management. It is possible, however, that by exceeding the ACL on a regular basis, long-term impacts on the stock could lead to long-term economic losses due to changes in the stock size.

Section 5.5.3 In-Season Accountability Measure Alternatives

In-season accountability measures grant the Northeast Regional Administrator the authority to implement a management measure, such as reducing the trip limit or closing the fishery, when landings are projected to reach a pre-determined level.

Section 5.5.3.1 Zero Possession at 100% of TAL

This alternative would prohibit retention of a particular stock when 100 percent of that stock's TAL is projected to be harvested. This alternative would result in lost revenue if implemented prior to the end of the fishing year. It could especially impact vessel owners in the inshore exemption areas if those areas are prevented from opening with a reasonable possession allowance.

Northern red hake is likely the only stock where an AM might be triggered in the near future. Based on vessel trip report data from 2006-2010 (which is used for this stock to ensure that all reported landings, including bait transfers-at-sea, are accounted for), 100 percent of the proposed northern red hake TAL would likely be harvested prior to the end of the fishing year (Figure 18), during the middle of September (approximately September 14). This would result in an average annual loss of 60,000 lb of northern red hake, which translates to approximately $22,000 per year loss in revenue. Using only fishing year 2009 vessel trip report data for northern red hake, the fishery would have harvested the proposed TAL by the end of August (Figure 19). This is significant because fishermen report that August and September are the most important months for the red hake bait fleet. This would have resulted in approximately $43,982 in lost revenue for the fleet (estimated at $0.37/lb for the 118,871 lb of northern red hake landed in excess of the proposed TAL (199,077.4 lb) for fishing year 2009). However, these losses may not be realized, as vessels may redirect the effort that would have been used to land red hake onto another incidental species, such as skates or dogfish.

This alternative would have a negative economic impact, if implemented and invoked within a fishing year.

Figure 18 Northern Red Hake Average Cumulative Landings, 2006-2010 (Vessel Trip Report Data)

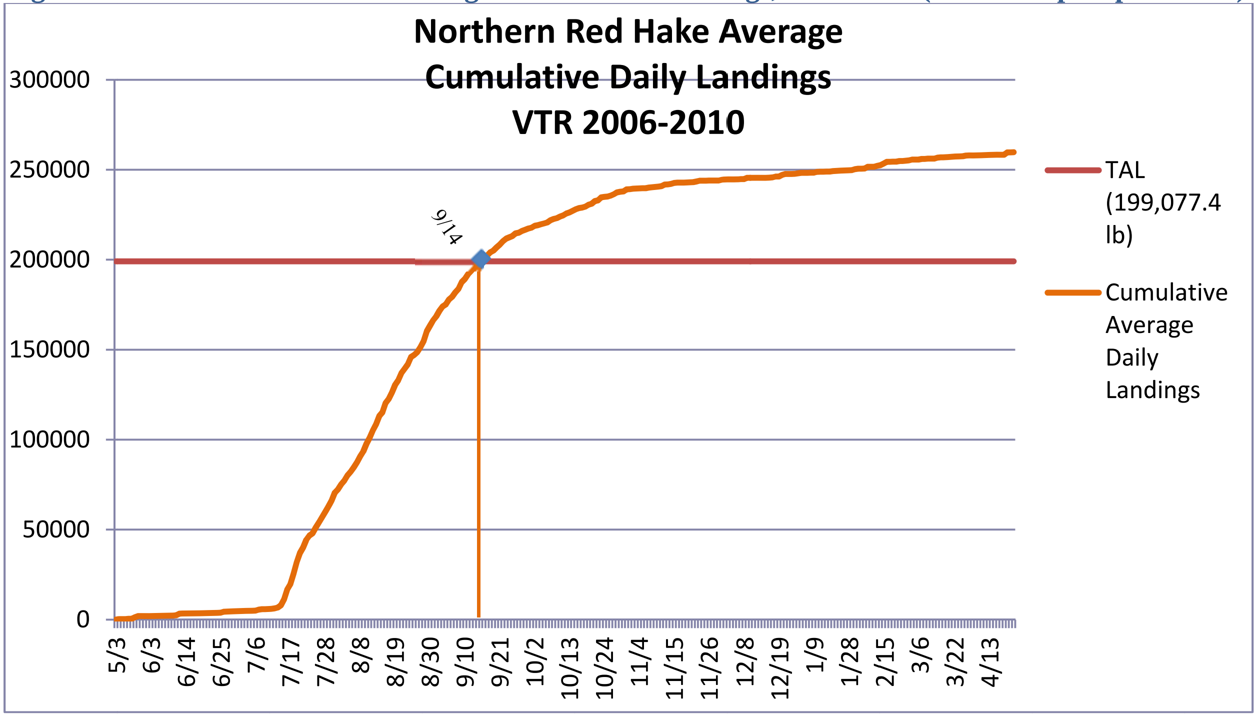
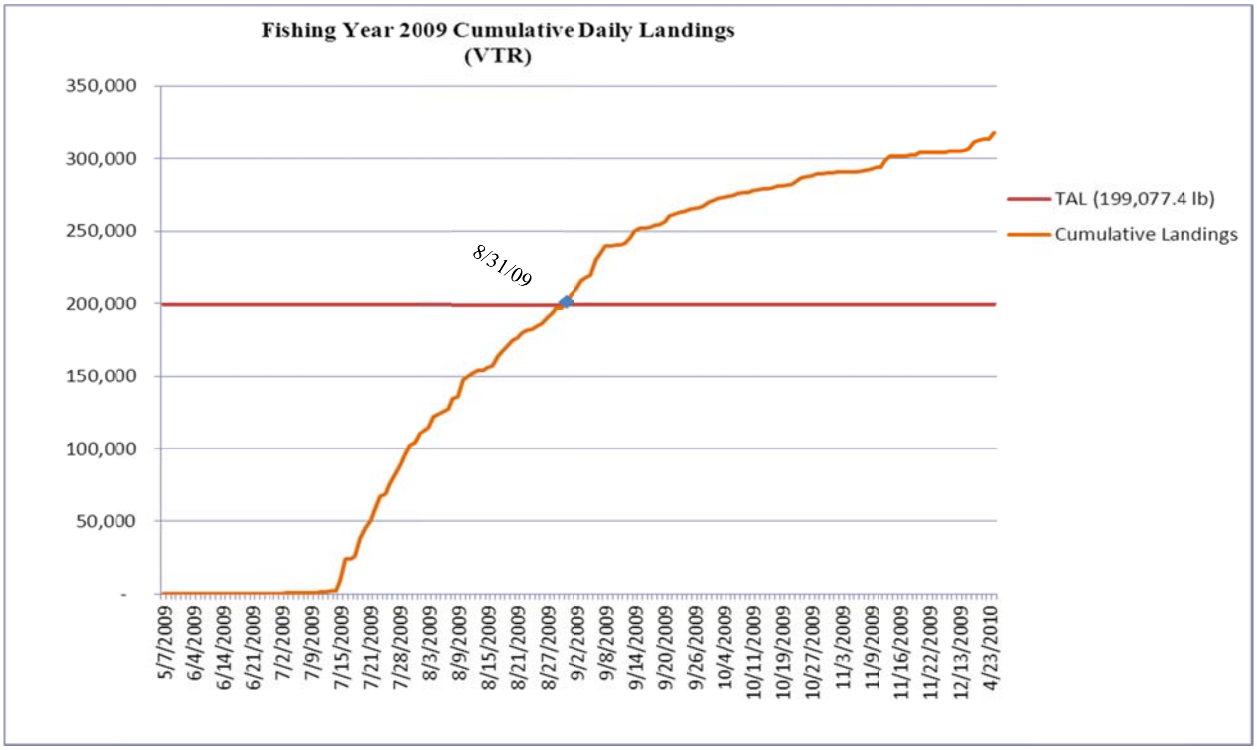


Figure 19 Northern Red Hake Fishing Year 2009 Daily Cumulative Landings, Vessel Trip Report Data



Section 5.5.3.2 Incidental Possession Limit Trigger (Preferred Alternative)

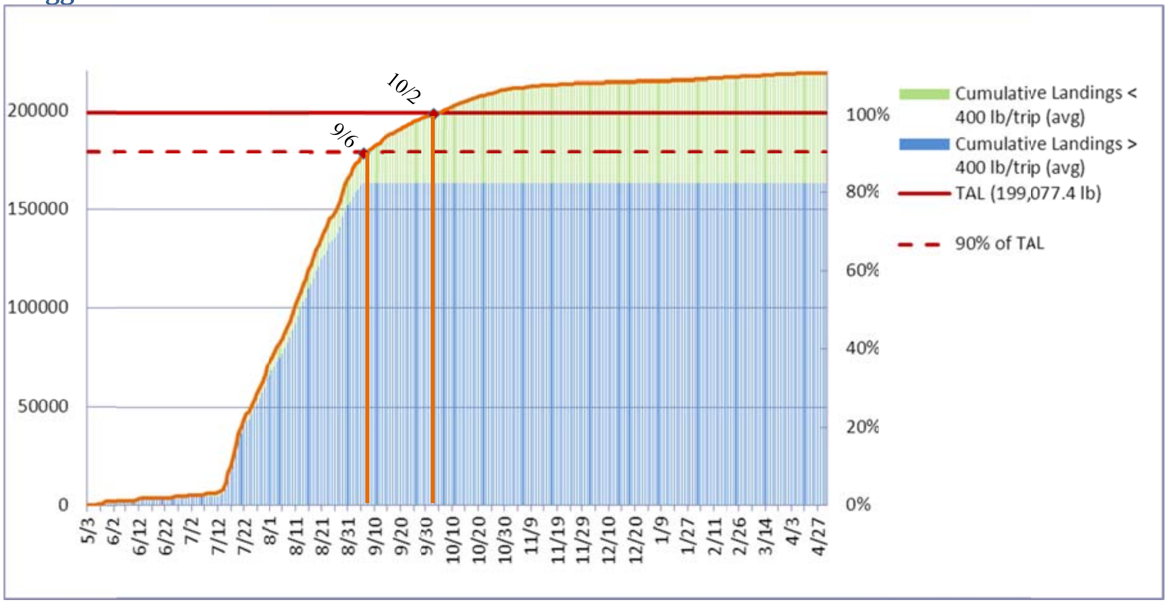
This alternative would reduce possession to an incidental limit when a trigger level is projected to be reached. Under this alternative, the incidental possession limit would remain in effect, even if the TAL is projected to be exceeded. This is intended to work in conjunction with the post-season accountability measure which would be invoked if the overage of the TAL causes the catch for that year to exceed the ACL.

Northern red hake is likely the only stock where an AM might be triggered in the near future. Table 49 illustrates the percent difference between the proposed ACLs and recent catch. In most cases, it is significantly higher than recent catch, and therefore unlikely that an AM might be triggered.

In the figure below (Figure 20), the proposed TAL and 90 percent of the proposed TAL are plotted with the 2006 – 2010 average daily landings of northern red hake, as reported through vessel trip reports. This graph demonstrates the effect of implementing a 400 lb incidental possession limit for northern red hake. Based on vessel trip reported landings, including bait landings, the 90-percent trigger would be reached in early September. Assuming that, because red hake is rarely, if ever, the target species, all the trips would still occur, those trips that landed less than or equal to 400 lb (blue) would remain unaffected. Those trips that previously landed more than 400 lb (green) after September 6 would presume to continue, but would be capped at 400 lb. The trips that would be affected by a 400 lb possession limit represent approximately 5-percent of the trips that landed red hake from 2006-2010. These trips were taken by 36 different vessels over that time, with an average of eleven vessels per year. The 400 lb incidental limit would affect over the 2006-2010 timeframe, on average, 7 trips per vessel, however, four vessels would be affected on approximately 30 trips. In recent years, it may affect a fewer number of vessels, but a higher number of trips per vessel. This results in an average loss of 781 lb per trip. At the average price of $0.37 per pound of red hake, this would result in approximately $289 lost revenue per trip for the 40 average trips per year, or a total loss across the fleet of $12,138. This may have a negative impact on fishing communities; however, as red hake is not commonly the target species, vessels may shift effort to another incidental species such as skates or dogfish.

The incidental possession limit for silver hake is not likely to be triggered in the foreseeable future, so it is difficult to estimate the impacts of that measure. In general, it could be expected that there would be a slightly negative impact on the human community because of a reduced possession limit. However, the magnitude of that impact is difficult to calculate.

Figure 20 Northern Red Hake Average Landings per Month (2006-2010) with Proposed TAL and Trigger



Section 5.5.3.3 Incidental Possession Limit Trigger and Zero Possession at 100% of TAL

This alternative would reduce the possession of a particular stock to the incidental limit at a trigger level and would prohibit possession of that stock when 100% of the TAL is projected to be reached prior to the end of the fishing year.

Such controls on the small-mesh multispecies fishery will likely have neutral impacts for fishing communities. The incidental possession limit trigger would have a low negative impact, as described above. The zero possession at 100% of TAL alternative could have a potentially negative impact to those vessels, as described in Section 5.5.3.1.

Section 5.5.3.4 Status Quo/No Action

This alternative would result in no proactive, or in-season, accountability measures being implemented. Not implementing a proactive accountability measure would have a neutral impact to vessels targeting small-mesh multispecies stocks because there is no change from the current management. It is possible, however, that by exceeding the recommended landing level on a regular basis, long-term impacts on the stock could lead to long-term economic losses due to changes in the stock size.

Section 5.6 Summary of Impacts of the Alternatives

Table 52 Impact Category Definitions and Qualifiers:

The following definitions and qualifiers are used in the narratives and tables of this EA:

Impact Definition			
	Direction		
VEC	Positive (+)	Negative (-)	Neutral (+/-)
Habitat	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
Target Species, Non-Target Species, Bycatch, Protected Resources	Actions that increase stock/population size	Actions that decrease stock/population size	Actions that have little or no positive or negative impact on stocks/populations
Human 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
High (H; as in high positive or high negative):	To a substantial degree
Likely	Some degree of uncertainty associated with the impact
ND	Impacts could not be determined at time of this writing

Table 53 Qualitative Summary of the Expected Impacts of Various Alternatives

	ABC, ACL, TAL Alternatives		Post-Season AM Alternatives		In-Season AM Alternatives			
VEC	**ABCs, ACLs, TALs (Preferred)**	**Status Quo/No Action**	**Pound-for-Pound Payback (Preferred)**	**Status Quo/No Action**	**Zero Possession at 100 % of TAL**	**Incidental Possession at Trigger (400/1,000)**	**Incidental Possession at Trigger and Zero Possession at 100% of TAL**	**Status Quo/No Action**
Target	**Positive** This alternative would set catch and landings limits for target species that are based on the best available science.	**Negative** This alternative would not set catch and landings limits for target species that are based on the best available science.	**Positive** This alternative would provide assurance that landings would stay within the limits that are based on the best available science.	**Negative** This alternative would not set catch and landings limits that are based on the best available science.	**Positive** This alternative would provide assurance that landings would stay within the limits that are based on the best available science	**Neutral** Allows trips fishing to continue, without causing large amounts of discards.	**Positive** This alternative would provide assurance that landings would stay within the limits that are based on the best available science.	**Negative** This alternative would not set catch and landings limits that are based on the best available science.
Non-Target	**Neutral** Potential redirected effort would be limited by the ACL frameworks in place for the other species that may be targeted.	**Neutral** This alternative would likely result in no change to current fishing operations.	**Neutral** This would likely lead to either no change in fishing, or a reduction in fishing effort, that would be accounted for under the analysis of the other species' ACL frameworks.	**Neutral** This alternative would likely result in no change to current fishing operations.	**Neutral** Potential redirected effort would be limited by the ACL frameworks in place for the other species that may be targeted.	**Neutral** Trips for other species would continue at the same incidental level of small-mesh multispecies that are currently landed.	**Neutral** This would likely lead to either no change in fishing, or a reduction in fishing effort, that would be accounted for under the analysis of the other species ACL framework.	**Neutral** Trips for other species would continue at the same incidental level of small-mesh multispecies that are currently landed.

	ABC, ACL, TAL Alternatives		Post-Season AM Alternatives		In-Season AM Alternatives			
EFH	**Neutral to Low Positive** It is likely that catch, and by extension, fishing effort, would not change due to the implementation of this action. However, if the catch limit for a stock (likely Northern Red Hake) is harvested and AMs are implemented, fishing effort may be reduced, leading to a positive impact.							
Protected Species	**Neutral** It is likely that catch, and by extension, fishing effort, would not change due to the implementation of this action.							
	ABCs, ACLs, TALs (Preferred)	**Status Quo/No Action**	**Pound-for-Pound Payback (Preferred)**	**Status Quo/No Action**	**Zero Possession at 100 % of TAL**	**Incidental Possession at Trigger (400/1,000)**	**Incidental Possession at Trigger and Zero Possession at 100% of TAL**	**Status Quo/No Action**
Human Communities	**Neutral to Positive** This alternative would likely result in no change to current fishing operations; however, the sustainable harvesting of the small-mesh multispecies stocks would lead to positive long-term benefits.	**Neutral** This alternative would likely result in no change to current fishing operations.	**Negative** If invoked, this alternative would result in short-term negative economic impacts by reducing the amount of a particular stock that could be landed in a given year.	**Neutral; Long-Term Negative** This alternative would likely result in no change to current fishing operations. This alternative could lead to long-term negative impacts by negatively affecting stock size and reducing future access to a sustainable stock.	**Negative** This alternative would result in lost revenue if implemented prior to the end of the fishing year.	**Negative** This alternative is expected to impact a low number of trips and result in a minor amount of revenue lost across the fleet.	**Low Negative to Negative** This alternative would result in some minor revenue lost for a few vessels if the trigger is reached. In addition, there would be further revenue lost if the full TAL is harvested prior to the end of the fishing year.	**Neutral; Long-Term Negative** This alternative would likely result in no change to current fishing operations. This alternative could lead to long-term negative impacts by negatively affecting stock size and reducing future access to a sustainable stock.

Section 6.0 Cumulative Effects Assessment

A cumulative effects analysis is required by the Council on Environmental Quality (CEQ) (40 CFR part 1508.7). The purpose of a cumulative effects analysis 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 addresses the significance of the expected cumulative impacts as they relate to the federally managed small-mesh multispecies fishery.

Section 6.1 Consideration of the Valued Ecosystem Components (VECs)

In Section 4.0 (Description of the 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. Managed resources (offshore hake, red hake, and silver hake)
2. Non-target species
3. Habitat including EFH for the managed resource and non-target species
4. ESA-listed and MMPA-protected species
5. Human communities

Section 6.2 Geographic Boundaries

The analysis of impacts focuses on actions related to the harvest of the small-mesh multispecies (offshore hake, red hake, and silver hake). The core geographic scope for each of the VECs is focused on the Western Atlantic Ocean (Section 4.0). The core geographic scopes for the managed resources are the range of the Mid-Atlantic Bight, the Gulf of Maine, and Georges Bank. 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. For habitat, the core geographic scope is focused on EFH within the EEZ, but includes all habitat utilized by small-mesh multispecies and other non-target species in the Western Atlantic Ocean. The core geographic scope for endangered and protected resources can be considered the overall range of these VECs in the Western Atlantic Ocean. For human 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 4.5).

Section 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 (1991, Amendment 4 to the Northeast Multispecies FMP for red and silver hake; and 2000, Amendment 12 to the Northeast Multispecies FMP for offshore hake). For endangered species and other protected resources, the scope of past and present actions is on a species-by-species basis (Section 4.4) 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 one year into the future. This period was chosen because the Council is expected to implement Amendment 19 to the FMP within the year that will supercede this Secretarial action.

Section 6.4 Actions Other Than Those Proposed in this Amendment

The impacts of each of the alternatives considered in this document are given in Section 5.0. Table 54 presents meaningful past (P), present (Pr), or reasonably foreseeable future (RFF) actions to be considered other than those actions being considered in this amendment 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.

Section 6.4.1 Past, Present, and Reasonably Foreseeable Future Actions

Section 6.4.1.1 Fishery-related Actions

The historical management practices of the Council have resulted in positive impacts on the health of the small-mesh multispecies stocks. Numerous actions have been taken to manage the fisheries for these three species through amendment and framework adjustment actions. In addition, the nature of the fishery management 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 Magnuson-Stevens Act. 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, which should, in the long-term, promote positive effects on human communities, especially those that are economically dependent upon the small-mesh multispecies stocks. There are two amendments currently under development by the Council that will impact the small-mesh multispecies fishery. The Council is developing Amendment 19 that will update the ACL and AM framework that is being proposed in this action. The other amendment under development is an update to the Omnibus Essential Fish Habitat Amendment that is intended to revise the existing EFH descriptions and habitat protection areas. Given the nature of the Omnibus EFH Amendment and Amendment 19, it is likely that these actions would have positive biological impacts; however, full analyses of these actions has not yet been completed.

Section 6.4.1.2 Non-fishing Actions

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 nearshore 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 may indirectly constrain the sustainability of the managed resources, non-target species, and protected resources. Decreased habitat suitability would tend to reduce the tolerance of these VECs to the impacts of fishing effort. Mitigation of this outcome through regulations that would reduce fishing effort could then negatively impact human communities. The overall impact to the affected species and their habitats on a population level is unknown, but likely neutral to low negative, since a large portion of these species have a limited or minor exposure to these local non-fishing perturbations.

In addition to guidelines mandated by the Magnuson-Stevens Act, 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 river and marine habitats.

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 Magnuson-Stevens Act (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.

Table 54 Impacts of Past (P), Present (Pr), and Reasonably Foreseeable Future (RFF) Actions on the five VECs (not including those actions considered in this proposed action).

Action	Description	Impacts on Managed Resource	Impacts on Non-target Species	Impacts on Habitat and EFH	Impacts on Protected Species	Impacts on Human Communities
P, Pr, RFF Original FMP and subsequent Amendments to the Small-Mesh Multispecies FMP, including Amendment 19	Established 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 Developed and Applied Standardized Bycatch Reporting Methodology (SBRM) through Northeast Region SBRM Omnibus Amendment	Established acceptable level of precision and accuracy for monitoring of bycatch in fisheries	**Neutral** May improve data quality for monitoring total removals of managed resource	**Neutral** May improve data quality for monitoring removals of non-target species	**Neutral** Will not affect distribution of effort	**Neutral** May increase observer coverage overall and will not affect distribution of effort	**Potentially Indirect Negative** May impose an inconvenience on vessel operations
P, Pr, RFF Agricultural runoff	Nutrients applied to agricultural land are introduced into aquatic systems	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality	**Indirect Negative** Reduced habitat quality negatively affects resource
P, Pr, RFF Port maintenance	Dredging of coastal, port, and harbor areas for port maintenance	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
P, Pr, RFF 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
P, Pr, RFF Beach nourishment	Offshore mining of sand for beaches	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat	**Mixed** Positive for mining companies,

					quality	possibly negative for fishing industry
	Placement of sand to nourish beach shorelines	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Positive** Beachgoers like sand; positive for tourism
P, Pr, RFF Marine transportation	Expansion of port facilities, vessel operations, and recreational marinas	**Indirect Negative** Localized decreases in habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Direct Negative** Reduced habitat quality	**Indirect Negative** Localized decreases in habitat quality	**Mixed** Positive for some interests, potential displacement for others
P, Pr, RFF Installation of pipelines, utility lines, and cables	Transportation of oil, gas, and energy through pipelines, utility lines, and cables	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Direct Negative** Reduced habitat quality	**Potentially Direct Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
RFF Offshore Wind Energy Facilities	Construction of wind turbines to harness electrical power (Several proposed from ME through NC)	**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	Transport natural gas via tanker to terminals offshore and onshore (1 terminal built in MA; 1 under construction; proposed in RI, NY, NJ and DE)	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Potentially Direct Negative** Localized decreases in habitat quality possible	**Uncertain – Likely Indirect Negative** Dependent on mitigation effects	**Uncertain – Likely Mixed** Dependent on mitigation effects
RFF Convening Gear Take Reduction Teams	Recommend measures to reduce mortality and injury to marine mammals	**Indirect Positive** Will improve data quality for monitoring total removals	**Indirect Positive** Reducing availability of gear could reduce bycatch	**Indirect Positive** Reducing availability of gear could reduce gear impacts	**Indirect Positive** Reducing availability of gear could reduce encounters	**Indirect Negative** Reducing availability of gear could reduce revenues
RFF Omnibus EFH Amendment	Reviewing and updating a gear effects evaluation and	**Indirect Positive** Will improve habitat protection, which is necessary for	**Indirect Positive** Will improve habitat protection, which is necessary	**Positive** Will improve habitat protection	**Uncertain - Neutral to Indirect Negative** May result in	**Indirect Positive** Improved habitat protection will result sustainable

	optimizing management measures for minimizing the adverse effects of fishing on EFH	sustainable fish stocks	for sustainable fish stocks		redistribution of effort to areas of increased protected resources stocks	fish stocks and long-term economic stability

Section 6.5 Magnitude and Significance of Cumulative Effects

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

Section 6.5.1 Managed Resources

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 54. The indirectly negative actions described in Table 54 are localized in nearshore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on the managed resources is expected to be insignificant 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 6.4), NMFS has several means under which it can review non-fishing actions of other Federal or state agencies that may impact NMFS' managed resources prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on resources under NMFS' jurisdiction.

Past fishery management actions taken through the FMP have had a positive cumulative effect on the managed resources. It is anticipated that the future management actions, described in Table 55, 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 offshore hake, red hake, and silver hake productivity depends. Overall, the past, present, and reasonably foreseeable future actions that are truly meaningful to the small-mesh multispecies resources have had a positive, but not significant, cumulative effect.

Table 55 Summary of the effects of past, present, and reasonably foreseeable future actions on the managed resources.

Action	Past to the Present		Reasonably Foreseeable Future
Original FMP and subsequent Amendments to the FMP	**Indirect Positive**		
Developed and Implement Standardized Bycatch Reporting Methodology	**Neutral**		
Agricultural runoff	**Indirect Negative**		
Port maintenance	**Uncertain – Likely Indirect Negative**		
Offshore disposal of dredged materials	**Indirect Negative**		
Beach nourishment – Offshore mining	**Indirect Negative**		
Beach nourishment – Sand placement	**Indirect Negative**		
Marine transportation	**Indirect Negative**		
Installation of pipelines, utility lines and cables	**Uncertain – Likely Indirect Negative**		
Offshore Wind Energy Facilities			**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals		**Uncertain – Likely Indirect Negative**	
Convening Gear Take Reduction Teams			**Indirect Positive**
Omnibus EFH Amendment			**Indirect Positive**
Amendment 19 (Council's ACL and AM Amendment)			**Uncertain – Likely Positive**
Summary of past, present, and future actions excluding those proposed in this document	**Overall, actions have had, or will have, positive impacts on the managed resources * See section 6.6 for explanation.**		

Section 6.5.2 Non-Target Species or Bycatch

Those past, present, and reasonably foreseeable future actions, whose effects may impact non-target species and the direction of those potential impacts, are summarized in Table 54. The effects of indirectly negative actions described in Table 54 are localized in nearshore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on non-target species 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 6.4), 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 (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 have had a positive cumulative effect on non-target species. Implementation and application of a standardized bycatch reporting methodology 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. Better assessment of potential bycatch issues allows more effective and specific management measures to be developed to address a bycatch problem. It is anticipated that future management actions, described in Table 56, 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, but not significant, cumulative effect on non-target species.

Table 56 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 to the FMP	**Indirect Positive**		
Developed and Implement Standardized Bycatch Reporting Methodology	**Neutral**		
Agricultural runoff	**Indirect Negative**		
Port maintenance	**Uncertain – Likely Indirect Negative**		
Offshore disposal of dredged materials	**Indirect Negative**		
Beach nourishment – Offshore mining	**Indirect Negative**		
Beach nourishment – Sand placement	**Indirect Negative**		
Marine transportation	**Indirect Negative**		
Installation of pipelines, utility lines and cables	**Uncertain – Likely Indirect Negative**		
Offshore Wind Energy Facilities			**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals		**Uncertain – Likely Indirect Negative**	
Convening Gear Take Reduction Teams			**Indirect Positive**
Omnibus EFH Amendment			**Indirect Positive**
Amendment 19 (Council's ACL and AM amendment)			**Uncertain – Likely Positive**
Summary of past, present, and future actions excluding those proposed in this document	**Overall, actions have had, or will have, positive impacts on the non-target species** *** See section 6.6 for explanation.**		

Section 6.5.3 Habitat (Including EFH)

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 54. The direct and indirect negative actions described in Table 54 are localized in nearshore 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 6.4), 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.

Past fishery management actions taken through the FMP process have had a positive cumulative effect on habitat and EFH. As required under these FMP actions, EFH and HAPCs will be redefined for the managed resources. It is anticipated that the future management actions, described in Table 57, 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, but not significant, cumulative effect.

Table 57 Summary of the effects of past, present, and reasonably foreseeable future actions on the habitat.

<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 to the FMP</td><td colspan="2">Indirect Positive</td><td></td></tr>
<tr><td>Developed and Implement Standardized Bycatch Reporting Methodology</td><td colspan="2">Neutral</td><td></td></tr>
<tr><td>Agricultural runoff</td><td colspan="3">Direct Negative</td></tr>
<tr><td>Port maintenance</td><td colspan="3">Uncertain – Likely Direct Negative</td></tr>
<tr><td>Offshore disposal of dredged materials</td><td colspan="3">Direct Negative</td></tr>
<tr><td>Beach nourishment – Offshore mining</td><td colspan="3">Direct Negative</td></tr>
<tr><td>Beach nourishment – Sand placement</td><td colspan="3">Direct Negative</td></tr>
<tr><td>Marine transportation</td><td colspan="3">Direct Negative</td></tr>
<tr><td>Installation of pipelines, utility lines and cables</td><td colspan="3">Uncertain – Likely Direct Negative</td></tr>
<tr><td>Offshore Wind Energy Facilities</td><td></td><td></td><td>Potentially Direct Negative</td></tr>
<tr><td>Liquefied Natural Gas (LNG) terminals</td><td></td><td colspan="2">Potentially Direct Negative</td></tr>
<tr><td>Convening Gear Take Reduction Teams</td><td></td><td></td><td>Indirect Positive</td></tr>
<tr><td>Omnibus EFH Amendment</td><td></td><td></td><td>Positive</td></tr>
<tr><td>Amendment 19 (Council’s ACL and AM amendment)</td><td></td><td></td><td>Uncertain – Likely Positive</td></tr>
<tr><td>Summary of past, present, and future actions excluding those proposed in this document</td><td colspan="3">Overall, actions have had, or will have, neutral to positive impacts on habitat, including EFH
* See section 6.6 for explanation.</td></tr>
</table>

Section 6.5.4 ESA-Listed and MMPA-Protected Species

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 54. The indirectly negative actions described in Table 54 are localized in nearshore 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 6.4), 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.

NMFS will implement any appropriate measures outlined in the BO to mitigate harm to Atlantic sturgeon. Further, the encounter rates and mortalities for Atlantic sturgeon that have been calculated as part of the preliminary analysis of NEFOP data (as discussed in Sec 4.4.4) include encounters and mortalities by all fisheries utilizing small-mesh otter trawl gear, including the squid fishery. Thus, it is likely that rates of encounters and mortalities by the small-mesh multispecies fishery would be lower than those estimates. Finally, this EA evaluates an action that is primarily administrative in nature and the biological impacts are primarily indirect. Therefore, impacts resulting from the approval of the Secretarial Amendment are not likely to be significant.

Past fishery management actions taken through the FMP 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 requirements. It is anticipated that the future management actions, described in Table 58, will result in additional indirect positive effects on 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, but not significant, cumulative effect.

Table 58 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 to the FMP	**Indirect Positive**		
Developed and Implement Standardized Bycatch Reporting Methodology	**Neutral**		
Agricultural runoff	**Indirect Negative**		
Port maintenance	**Uncertain – Likely Indirect Negative**		
Offshore disposal of dredged materials	**Indirect Negative**		
Beach nourishment – Offshore mining	**Indirect Negative**		
Beach nourishment – Sand placement	**Indirect Negative**		
Marine transportation	**Indirect Negative**		
Installation of pipelines, utility lines and cables	**Potentially Direct Negative**		
Offshore Wind Energy Facilities			**Uncertain – Likely Indirect Negative**
Liquefied Natural Gas (LNG) terminals		**Uncertain – Likely Indirect Negative**	
Convening Gear Take Reduction Teams			**Indirect Positive**
Omnibus EFH Amendment			**Uncertain - Neutral to Indirect Negative**
Amendment 19 (Council's ACL and AM amendment)			**Uncertain – Likely Indirect Positive**
Summary of past, present, and future actions excluding those proposed in this document	**Overall, actions have had, or will have, positive impacts on protected resources** *** See section 6.6 for explanation.**		

Section 6.5.5 Human 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 54. The indirectly negative actions described in Table 54 are localized in nearshore areas and marine project areas where they occur. Therefore, the magnitude of those impacts on human communities is expected to be limited in scope. 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 6.4), NMFS has several means under which it can review non-fishing actions of other Federal or state agencies prior to permitting or implementation of those projects. This serves to minimize the extent and magnitude of indirect negative impacts those actions could have on human communities.

Past fishery management actions taken through the FMP 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 59, will result in positive effects for human communities due to sustainable management practices, although additional indirect negative effects on the human 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 human communities have had an overall positive, but not significant, cumulative effect.

Despite the potential for slight negative short-term effects on human communities, the expectation is that there would be a positive long-term effect on human communities due to the long-term sustainability of offshore hake, red hake, and silver hake. Overall, the proposed actions in this document would not change the past and anticipated cumulative effects on human communities and thus, would not have any significant effect on human communities individually, or in conjunction with other anthropogenic activities (Table 59).

Table 59 Summary of the effects of past, present, and reasonably foreseeable future actions on human communities.

<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 to the FMP</td><td colspan="2">Indirect Positive</td><td></td></tr>
<tr><td>Developed and Implement Standardized Bycatch Reporting Methodology</td><td colspan="2">Potentially Indirect Negative</td><td></td></tr>
<tr><td>Agricultural runoff</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Port maintenance</td><td colspan="3">Uncertain – Likely Mixed</td></tr>
<tr><td>Offshore disposal of dredged materials</td><td colspan="3">Indirect Negative</td></tr>
<tr><td>Beach nourishment – Offshore mining</td><td colspan="3">Mixed</td></tr>
<tr><td>Beach nourishment – Sand placement</td><td colspan="3">Positive</td></tr>
<tr><td>Marine transportation</td><td colspan="3">Mixed</td></tr>
<tr><td>Installation of pipelines, utility lines and cables</td><td colspan="3">Uncertain – Likely Mixed</td></tr>
<tr><td>Offshore Wind Energy Facilities</td><td></td><td></td><td>Uncertain – Likely Mixed</td></tr>
<tr><td>Liquefied Natural Gas (LNG) terminals</td><td></td><td colspan="2">Uncertain – Likely Mixed</td></tr>
<tr><td>Convening Gear Take Reduction Teams</td><td></td><td></td><td>Indirect Negative</td></tr>
<tr><td>Omnibus EFH Amendment</td><td></td><td></td><td>Indirect Positive</td></tr>
<tr><td>Amendment 19 (Council’s ACL and AM amendment)</td><td></td><td></td><td>Uncertain – Likely Positive</td></tr>
<tr><td>Summary of past, present, and future actions excluding those proposed in this document</td><td colspan="3">Overall, actions have had, or will have, positive impacts on human communities
* See section 6.6 for explanation.</td></tr>
</table>

Section 6.6 Preferred Action on all the VECs

The Council has identified its preferred action alternatives in section 3.0. 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 action.

Table 60 Magnitude and significance of the cumulative effects; the additive and synergistic effects of the preferred action, as well as past, present, and future actions.

VEC	Status in 2011	Net Impact of P, Pr, and RFF Actions	Impact of the Preferred Action	Significant Cumulative Effects
Managed Resources	Complex and variable (Section 4.1)	Positive (Sections 6.4 and 6.5.1)	Neutral to positive (Section 5.1)	**None**
Non-target Species	Complex and variable (Section 4.2)	Positive (Sections 6.4 and 6.5.2)	Neutral (Section 5.2)	**None**
Habitat	Complex and variable (Section 4.3)	Neutral to positive (Sections 6.4 and 6.5.3)	Neutral to low positive (Section 5.3)	**None**
Protected Resources	Complex and variable (Section 4.4)	Positive (Sections 6.4 and 6.5.4)	Neutral (Section 5.4)	**None**
Human Communities	Complex and variable (Section 4.5)	Positive (Sections 6.4 and 6.5.5)	Short-term negative to long-term positive (Section 5.5)	**None**

The 2012 fishing year will be the first year of implementation for the required specification of ACLs and accountability measures. This represents a major change to the current management program and is expected to lead to improvements in resource sustainability over the long-term. Direct and indirect impacts of these measures could be broad in scope and are further discussed in section 5.1 through section 5.5. The magnitude and significance of the cumulative effects, which include the additive and synergistic effects of the proposed action, as well as past, present, and future actions, have been taken into account throughout this Section 6.0. The action proposed in this Secretarial amendment builds off action taken in the original FMP and subsequent amendments.

The proposed action in this document would positively reinforce the past and anticipated positive cumulative effects on the managed resources, 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 (Table 55).

The proposed action in this document has neutral impacts to non-target species and would not change the past and anticipated positive cumulative effects on non-target species. Thus, the proposed action would not have any significant effect on these species individually or in conjunction with other anthropogenic activities (Table 56).

The proposed action 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 (Table 57).

The proposed action 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 58).

The proposed action in the document may have short-term negative to long-term positive impacts on human communities. However, such anticipated impacts would not significantly change the past and anticipated cumulative effects on revenues and the social well-being of fishermen and/or associated businesses individually or in conjunction with other anthropogenic activities (Table 59).

Therefore, 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 action proposed in this document (Table 60).

Section 7.0 Compliance with Applicable Laws

Section 7.1 Magnuson-Stevens Fishery Conservation and Management Act

Section 7.1.1 Consistency with National Standards

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

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 will bring the small-mesh multispecies fishery into compliance with the Magnuson-Stevens Act National Standard 1 requirement to establishing an acceptable biological catch (ABC), an ACL, and accountability measures (AMs). The proposed ABCs, ACLs, and AMs are consistent with the process in the Magnuson-Stevens Act and the National Standard 1 guidelines. The proposed action will ensure that overfishing will not take place in the small-mesh multispecies fishery and that the resources will not become overfished.

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 small-mesh multispecies stock assessments from SAW 51, which includes an independent peer review, and recommendations from the Council's Scientific and Statistical Committee for setting ABCs for the stocks or stock group in the small-mesh multispecies fishery.

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. In general, management measures specifically designed for one stock are applied to the entire range of the stock. The small-mesh multispecies complex as a whole is managed in close coordination. The management measures are applied to all small-mesh multispecies stocks. They are designed and evaluated for their impact on the fishery as a whole.

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 quotas) results 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.

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 is expected to little to no impact on the efficiency of vessels operations. The measures prevent the ACLs and quotas from inducing derby-style fishing behavior and market reactions which would otherwise undermine the profitability of vessels that target small-mesh multispecies or land them as incidental catch while targeting other species. None of the measures in this action have economic allocation as their sole purpose – all are designed to contribute to the control of fishing mortality.

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 is specifically intended to take into account the differences in fisheries between the two small-mesh multispecies stock areas. These considerations are not changed under the proposed action.

National Standard 7

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

The proposed action does not duplicate measures or regulations implemented under other FMPs, but coordinates with them. The incidental possession limit trigger described in Section 3.2.2 enables those fisheries that landing small-mesh multispecies incidental to operate with minimal restriction. To the extent the current plan and measures proposed in this amendment impose costs on vessels and processors, those costs are necessary for the successful management of the fishery.

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 actions proposed in this amendment are not expected to have significant adverse effects on fishing communities (see Section 5.4), and some measures are likely to have positive effects, particularly those measures that increase allowable catch levels and minimize bycatch.

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 significant impact on bycatch of red crab or other species (Section 5.2).

National Standard 10

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

This amendment does not substantially change the impact of the small-mesh multispecies fishery on safety at sea since this action does not contain any management measures that would affect safety at sea.

Section 7.1.2 Magnuson-Stevens Act FMP Requirements

Section 303(a) of Magnuson-Stevens Act contains 15 required provisions for FMPs. The requirement applies to the FMP and in some cases, the FMP as amended and not the submission document for the proposed action meets the requirement. The preferred alternatives identified in the Secretarial Amendment do not propose to modify any of the management measures previously implemented under the FMP which were found to be fully in compliance with the Magnuson-Stevens Act. All the actions identified in the preferred alternatives are intended to address the requirement in § 303(a)(15) of the Magnuson-Stevens Act to "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" to ensure that the small-mesh multispecies fishery is fully in compliance with this required provision. This action does not address any other required provision under the Magnuson-Stevens Act.

Section 7.1.3 Magnuson-Stevens Act Requirements for a Secretarial Amendment

The Secretary may prepare an amendment to an FMP if "the appropriate Council fails to develop and submit to the Secretary, after a reasonable period of time…any necessary amendment" under the authority in Section 304(c). Because the Council has not yet submitted Amendment 19 to implement ACLs and AMs for the small-mesh multispecies fishery, the Secretary is preparing this amendment to the Northeast Multispecies FMP. In order to implement such an amendment, the Secretary "shall—(A) Conduct public hearings, at appropriate times and locations in the geographical areas concerned, so as to allow interested persons an opportunity to be heard in the preparation and amendment of the plan and any regulations implementing the plan".

In order to fulfill this requirement, NMFS held four public meetings throughout the Northeast Region and had an open comment period during the development of the measures considered in the Secretarial Amendment. The public meetings and the comment period were announced in an Advanced Notice of Proposed Rulemaking (ANPR) in the *Federal Register* (76 FR 57944; RIN 0648-BB39) on September 19, 2011. The public comment period was open until October 19, 2011. The public meetings were held on October 3, 2011 in East Setauket, NY; October 4, 2011, in Toms River, NJ; October 11, 2011 in Gloucester, MA; and October 12, 2011 in Narragansett, RI.

Three substantive comments were received during the public hearings and through the ANPR.

1. Frank Mirarchi (Scituate, MA) F/V Barbara L. Peters
   At the Gloucester Public Hearing, Mr. Mirarchi commented that he would prefer Alternative 2, as described in the scoping document (attached), because he is concerned that a stock area TAL could close the northern area before a number of the exemption area programs open. Mr. Mirarchi noted that he and his son depend on the whiting fishery to supplement their groundfish market and help them stay in business.

2. Roy Diehl (Union Beach, NJ)
   In his comment on the ANPR, Mr. Diehl noted that he would like to see trip limits that would not be too restrictive, and that any allocation or limits should be done in such a way to protect historical participants from all time frames, and not the "years that benefit the chosen few."

3. Donald Fox (Point Judith, RI)
   At the public hearing held in Narragansett, RI, Mr. Fox expressed concern that choosing a set of years for the purpose of subdividing the TAL in the Northern Area would lock the Agency and the Council into those relatively recent years (2004-2010) for future actions. Mr. Fox was particularly concerned about the possibility that future individual allocations (in the form of sector PSCs or ITQs) would be based on the same set of years.

When preparing a Secretarial Amendment NMFS is also required by section 304(c)(4)(A) to "submit such plan or amendment to the appropriate Council for consideration and comment." The Council was sent a letter with a copy of the proposed rule and the draft EA on January 12, 2012. As requested, the Council also received a presentation on the Secretarial Amendment at its February 2, 2012, meeting. The Council did not submit any comments on the Secretarial Amendment.

NMFS is also required to make the amendment available for public comment for 60 days, as well as providing a 60-day comment period on the proposed regulations, by section 304(c)(4)(B) and section 304(c)(6), respectively. In order to fulfill this requirement a combined proposed rule and notice of availability was published on December 23, 2011, with the comment period closing on February 21, 2012 on both the draft amendment and the proposed regulations (76 FR 80318).

Section 7.1.4 EFH Assessment

According to the EFH Final Rule, "Federal agencies are not required to provide NMFS with assessments regarding actions that they have determined would not adversely affect EFH." The action proposed under this framework will not have an adverse effect on EFH of federally managed species, and, therefore, no EFH Assessment is required or provided.

Section 7.2 National Environmental Policy Act (NEPA), including FONSI Statement

This section evaluates the proposed action in the context of NEPA, for determining the significance of Federal actions, in this case the establishment of ACLs and AMs for the small-mesh multispecies fishery through Secretarial Amendment.

Section 7.2.1 Finding of No Significant Impact

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

These include:

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

The proposed action is not expected to jeopardize the sustainability of the target species affected by this action – silver, red, and offshore hake. The intent of this action is to control the total amount of silver, red, and offshore hake that may be harvested at a level determined to be sustainable by the best available science and recommended by the Council's SSC (see Appendix B). The impacts of the proposed action on the small-mesh multispecies resource are discussed in Section 5.1 of the EA.

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

The proposed action is not expected to jeopardize the sustainability of any non-target species, as noted in Section 5.2 of the EA. The level of fishing effort resulting from the proposed action is the same as, or below the current levels. Although information about bycatch is limited and inconclusive with respect to fishery-wide impacts, the impact of the small-mesh multispecies fishery on non-target species is not significant, primarily because small-mesh multispecies are landed incidentally in a number of fisheries and are less often the target species themselves.

(3) Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Fishery Conservation and Management Act and identified in FMPs?

The alternatives under consideration in this action will not increase small-mesh multispecies effort in either stock area over the baseline effort level. The overall effect of the fishery on EFH was discussed and mitigated for in Northeast Multispecies Amendments 11, 12, and 13, and the alternatives under consideration do not change those findings. As discussed in Section 5.3 the EA, the action proposed in this amendment would not have an adverse impact on EFH for any federally managed species in the region.

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

This action is not expected to have substantial adverse impacts on public health because it would not significantly alter fishing effort, location, or other aspects of fishing behavior.

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

Impacts of this action on endangered and threatened species and marine mammals were assessed in Section 5.4 of the EA. The activities to be conducted under the proposed action are within the scope of the FMP and do not change the basis for the determinations made in previous consultations because it would not significantly alter fishing effort, location, or other aspects of fishing behavior. Further, as discussed in Section 5.4.1, the limited scope of the proposed action and the overall low effort in the small-mesh multispecies fishery, the proposed action is not expected to result in adverse impacts to the recently listed Atlantic sturgeon DPSs. An updated Biological Opinion for the small-mesh multispecies fishery must be completed to fully evaluate the impacts of the fishery on Atlantic sturgeon, and will detail any necessary measures, terms, and conditions to reduce the impact of the fishery on Atlantic sturgeon populations.

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

The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While the role of small-mesh multispecies within the ecosystem is not well understood, SAW 51 observed that the primary source of silver and red hake removals has been consumption since the 1980s. The maintenance of this prey at historical and sustainable levels is likely to promote biodiversity and ecosystem function over the long term.

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

The proposed action is designed to maintain a sustainable population of small-mesh multispecies. Neutral to positive impacts on the physical and biological environment are expected to result from this action. The action's potential social and economic impacts are expected to be neutral (ranging from short-term negative to long-term positive), as discussed in the EA (Section 5.5) and in the Executive Order 12866 review (Section 7.10). Under the proposed action, some vessels may experience a slight decrease in revenue, if certain measures are triggered (i.e., the in-season accountability measure), but that decrease may be offset by redirecting on other species. There are no significant natural or physical environmental effects resulting from the proposed action that may have an impact on communities or the human environment in the context of NEPA. Furthermore, the proposed action is expected to provide long-term benefits of a stable and sustainable fishery through the achievement of optimum yield and prevention of overfishing.

(8) To what degree are the effects on the quality of human environment expected to be highly controversial?

The effects of the proposed action are not expected to be highly controversial. They are consistent with the effects determined in the Amendments under which the small-mesh multispecies were regulated within the FMP (primarily Amendments 4, 7, 11, and 12) which have not been challenged.

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

The small-mesh multispecies fishery is not known to take place in any unique areas such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. Therefore, the proposed action is not expected to have a substantial impact on any of these areas.

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

The impacts of the proposed action on the human environment are described in Section 5.0 of the EA. This action is not expected to significantly alter fishing methods or activities that would have a significant impact on the human environment. The types of actions proposed in this amendment to the Northeast Multispecies FMP are consistent with previous actions and similar to types of management measures used widely in federally-managed fisheries. Therefore, the measures contained in this action are not expected to have highly uncertain, unique, or unknown risks on the human environment.

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

The proposed action, together with past and future actions, is not expected to result in significant cumulative impacts on the biological and physical components of the environment or on human communities (See Cumulative Effects Summary in Section 6.0.)

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

The small-mesh multispecies fishery is not known to be take place in any areas that might affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of significant scientific, cultural or historical resources. Therefore, this action is not expected to affect any of these areas.

(13) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

There is no evidence or indication that the small-mesh multispecies fishery has ever resulted in the introduction or spread of non-indigenous species. The proposed action is not expected to significantly alter fishing methods or activities in a way that would be expected to result in the introduction or spread of a non-indigenous species.

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

This action is not likely to establish any precedents for future actions with significant effects, nor does it represent a decision in principle about a future consideration. This action is taken under an existing fishery management program. The future management regime for the small-mesh multispecies fishery, should changes become necessary, has not been defined, and will depend on the advancements made in the scientific understanding of the species and population dynamics, or shifts in management philosophy. The impact of any future changes will be analyzed as to their significance in the process of developing and implementing them.

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

This 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. This action is not expected to alter fishing methods in any way except to change the level of catch or landings that are permitted for the fishery as a whole.

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

The impacts of the proposed action on the biological, physical, and human environment are described in Section 5.0. The cumulative effects of this action on target and non-target species

are detailed in Section 6.0. The proposed action is not expected to have a substantial effect on either the target or any non-target 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 action in this Secretarial amendment 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.

____ __________________
Regional Administrator, Northeast Region, NMFS Date

Section 7.3 Marine Mammal Protection Act (MMPA)

NMFS has reviewed the impacts of the action on marine mammals and has concluded that the management actions are consistent with the provisions of the MMPA, and will not alter existing measures to protect the species likely to inhabit the areas in which the small-mesh multispecies fishery occurs. For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see the relevant part of Section 5.0 of this document.

Section 7.4 Endangered Species Act (ESA)

Formal consultation on the small-mesh multispecies fishery was reinitiated on February 9, 2012. NMFS have determined that there will not be any irreversible or irretrievable commitment of resources under section 7(d) of the ESA during the consultation period that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures. NMFS has also determined that the continued authorization of the small-mesh multispecies fishery during the consultation period, including the authorization of those fisheries to operate under the measures proposed in the Secretarial Amendment, is not likely to jeopardize the continued existence of ESA-listed species or result in the destructive or adverse modification of critical habitat. No takes of ESA-listed marine mammals are expected or authorized during the consultation period.

Section 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 amendment document 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.

Section 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, NMFS is not requesting any abridgement of the rulemaking process for this action.

Section 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 fishing for small-mesh multispecies since it will notify these individuals of the measures contained in this amendment. This information will enable these individuals to adjust their management practices and make appropriate business decisions based upon this revision to the FMP. Until a proposed rule is prepared and published, this EA/RIR/RFA 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 resources and, therefore, represents an improvement over previously available information. This EA/RIR/RFA 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 Northeast Regional Office’s web page (www.nero.noaa.gov). 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, 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 Secretarial Amendment. 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 staff of the Northeast Regional Office, the Northeast Fisheries Science Center, the Council's Plan Development Team, 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 2010. 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, and the revenue produced by the sale of those landings to dealers. 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 choices are clearly articulated in Section 3.0 of this document, those being the management alternatives considered in this action. The supporting science and analyses, upon which the policy choices are based, are summarized and described in Sections 3.0 through 6.0 of this document. 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 Northeast Fisheries Science Center, the Northeast Regional Office, and NOAA Fisheries Service Headquarters. Senior level scientists with specialties in population dynamics, stock assessment methods, population biology, and the social sciences conduct the Center's analysis and technical review. Development and review by staff at the Regional Office is conducted by those with expertise in fisheries management and policy, habitat conservation, protected species, and compliance with the applicable law. Final approval of the action proposed in this 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 revision of the Northeast Multispecies FMP, NMFS must comply with the requirements of the Magnuson-Stevens Act, the National Environmental Policy Act, 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). NMFS has determined that the proposed action is consistent with the National Standards of the Magnuson-Stevens Act and all other applicable laws.

Section 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 the Paperwork Reduction Act.

Section 7.9 Executive Order 12866 (Regulatory Impact Review)

Section 7.9.1 Regulatory Impact Review

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.

Statement of the Problem and Management Objectives of the Regulatory Action

See Section 2.0 – Purpose and need of action.

Description of the Affected Fishery

See Section 4.5- Description of the Fishery.

Description of the Management Measure Alternatives

See Section 3.0 for a complete description of the proposed management measures and the alternatives that were considered by NMFS for the Secretarial Amendment.

Expected Economic Effects of the Proposed Action

See Section 5.5 for an evaluation of the expected economic effects of the proposed action.

Section 7.9.2 Determination of Significance under E.O. 12866

E.O. 12866 requires that the Office of Management and Budget review proposed regulatory programs that are considered to be significant. A "significant regulatory action" is one that is likely to: (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, 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 this 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."

NMFS has determined that, based on the information presented above, this action is expected to have no material economic effect. Because none of the factors defining "significant regulatory action" are triggered by this action, the action has been determined to be not significant for the purposes of E.O. 12866. See detailed discussion below.

E.O. 12866 Criteria

NMFS Guidelines provide criteria to be used to evaluate whether a proposed action is significant. A significant regulatory action means any regulatory action that is likely to result in a rule that may:

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

A "significant" regulatory action under E.O. 12866 is a rule that is likely to result in an annual effect on the economy of $100 million or more, or adversely effect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local or tribal governments or communities. A benefit-costs analysis should be completed to determine a significant regulatory action. A traditional, quantitative benefit-costs analysis identifies benefits and costs, and then monetizes both benefits and costs for the "no action" scenario and each proposed alternative to determine the economic efficiency of each alternative, and inform decision-making. In addition, the stream of monetized benefits and costs incurred over time is discounted to reflect the present values of the stream of benefits and costs. In general, the lower the real discount rate used, the greater the weight to future benefits and costs, all else held constant. A traditional, quantitative benefit-costs analysis was impossible for this action. Briefly, we could not obtain valid measures of economic value for estimating benefits and some costs due to a lack of existing empirical data necessary for theoretically valid measures of economic value, as well as time and resource constraints that prevent primary data collection and analysis.

Gross revenues for red hake in 2005-2010 averaged $500,000; while gross revenues for silver hake (including offshore) in 2005-2010 averaged $8.5 million. While a true benefit-cost analysis was not possible, we can assume that the impact to the nation is well below the $100 million threshold. Therefore, this action is not expected to have either an annual effect on the economy of $100 million, or adversely effect in a material way the economy, a sector of the economy, productivity, competition, the environment, public health or safety, or State, local, tribal governments or communities.

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

The proposed action does not create an inconsistency or otherwise interfere with an action taken or planned by another agency. The activity that would be allowed under this action involves commercial fishing for small-mesh multispecies in Federal waters of the EEZ, for which NMFS is the sole agency responsible for regulation. Therefore, there is no interference with actions taken by another agency. Furthermore, this action would create no inconsistencies in the management and regulation of commercial fisheries in the Northeast.

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

This action will not materially alter the budgetary impact of entitlements, grants, user fees or loan programs, or the rights and obligations of recipients of these programs.

(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.

This action does not raise novel legal or policy issues arising out of the President's priorities, or the principles set forth in E.O. 12866. All fishery management measures in the Northeast Multispecies FMP that regulate the small-mesh multispecies fishery and the proposed action are commonly used in FMPs for federally-managed fisheries.

Section 7.9.3 Regulatory Flexibility Analysis - Determination of Significance

The purpose of the Regulatory Flexibility Act (RFA) is to provide opportunities for small entities to participate in the development of proposed regulations and to identify ways to reduce the regulatory burden and record-keeping requirements on small businesses. To achieve this goal, the RFA requires government agencies to describe and analyze the effects of regulations and possible alternatives on small business entities. Based on this information, the Regulatory Flexibility Analysis determines whether the proposed action would have a "significant economic impact on a substantial number of small entities."

The problem statement and objectives, the management alternatives and the rational are referenced in the Background section above.

Section 7.9.3.1 Reasons for considering the Action

See Section 2.0

Section 7.9.3.2 Objectives and legal basis for the Action

See Section 2.0

Section 7.9.3.3 Description and Number of Small Entities to which the Rule Applies

All of the entities (fishing vessels) affected by this action are considered small entities under the Small Business Act size standards for small fishing businesses ($4.0 million in sales). Although some firms own more than one vessel, available data make it difficult to reliably identify ownership control over more than one vessel. For this analysis, the number of permitted vessels is considered to be a maximum estimate of the number of small business entities. The average number of permitted vessels landing at least one pound of silver hake or red hake from 2005-2010 was 562.

Section 7.9.3.4 Reporting, recordkeeping, and other compliance requirements

This action does not introduce any new reporting, recordkeeping, or other compliance requirements.

Section 7.9.3.5 Duplication, overlap or conflict with other Federal rules

The proposed rule does not duplicate, overlap or conflict with other Federal rules.

Section 7.9.3.6 Economic impacts on small entities resulting from the proposed action

The proposed management measures implement ACLs, TALs and accountability measures for silver hake and red hake stock areas. The following section discusses the impacts of these alternatives. If it was not possible to complete a quantitative impacts assessment, then a qualitative discussion is presented instead.

Section 7.9.3.6.1 Stock Area ABC, ACLs, and TALs

The proposed management alternative sets ABCs, ACLs and TALs for northern red hake, southern red hake, northern silver hake and southern whiting (silver hake and offshore hake combined). The ACL is set below the ABC to account for management uncertainty. The TAL is set below the ACL to account for discards and state landings. The proposed alternative sets an ABC, ACL, and TAL framework, while the status quo alternative does not establish such a framework. The proposed alternative also establishes a southern whiting management stock for offshore hake and silver hake. These species are combined because they are often landed together, are morphologically similar, and often not distinguished in the market.

Based on average prices (2005-2010) and the proposed Federal TAL, estimated gross revenues were calculated for each of the species/stock areas. Each of the estimated gross revenues for the species/stock areas were greater than the average gross revenues from 2005-2010. While we are unable to fully quantify the marginal cost and marginal benefit of implementing an ABC/ACL/TAL framework, we can assume that the proposed action will not constrain gross revenue per vessel and would not directly affect an individual vessel's profit. Therefore, the proposed action would not have a significant economic impact on a substantial number of small business entities.

Section 7.9.3.6.2 Accountability Measures

The proposed management alternatives implement an accountability measures framework for managing silver hake and red hake stock areas. The reactive accountability measure alternative would authorize NMFS, through the Northeast Regional Administrator, to deduct from a subsequent year's ACL any overage of a stock's ACL in a given year. The proactive (In-season) accountability measure alternatives would reduce the possession of a particular stock to an incidental level when the trigger limit for that stock's TAL is projected to be reached. While we are unable to fully quantify the marginal cost and marginal benefit of implementing the accountability measure framework, we can assume that the proposed action will not constrain gross revenue per vessel and would not directly affect an individual vessel's profit, more than a minimal amount, as described in Section 5.5.3.2. Therefore, the proposed action would not have a significant economic impact on a substantial number of small business entities.

Section 8.0 Persons and Agencies Consulted/How to Obtain a Copy of this Document

This Environmental Assessment was prepared and evaluated by the National Marine Fisheries Service.

The following persons aided in the preparation of this document: Moira Kelly, Sarah T. Biegel, Dr. Jerome Hermsen, Michael Pentony, Kevin Madley, Andrew Applegate, Dr. David Stevenson, Dr. Larry Alade, and Dr. Ayeisha Brinson.

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New England Fishery Management Council
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C.M. "Rip" Cunningham, *Acting Chairman* | Paul J. Howard, *Executive Director*

To: Paul J. Howard, Executive Director
From: Scientific and Statistical Committee
Date: September 13, 2011

Subject: **Acceptable Biological Catch Recommendations for Whiting for Fishing Years 2012 – 2014**

The Scientific and Statistical Committee (SSC) was asked to:

1. Recommend ABC for whiting stocks for fishing years 2012-2014.

In order to meet this term of reference, the SSC met August 10, 2011 in Boston, MA and considered the following:

1. Recommendations for Red, Silver, and Offshore Hake (Whiting) Allowable Biological Catches for 2012-2014, July 2011
2. Options for Whiting/Hake Biological Reference Points, MSY Proxies, And ABC, March 2011
3. Northeast Fisheries Science Center (NEFSC). 2011a. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-01; 70 p. http://www.nefsc.noaa.gov/publications/crd/crd1101/index.html
4. Northeast Fisheries Science Center (NEFSC). 2011b. 51st Northeast Regional Stock Assessment Workshop (51st SAW) Assessment Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 11-02. http://www.nefsc.noaa.gov/publications/crd/crd1102/index.html
5. Presentations by Whiting Plan Development Team members Andy Applegate, Loretta O'Brien, and Larry Alade.

The Whiting plan development team (PDT) computed a range of possible Acceptable Biological Catches (ABC) for red and silver hake stocks in the north and south based on the SSC recommended method 2. This method evaluates the consequences of scientific uncertainty in both the overfishing threshold and in stock biomass distributions. The PDT also evaluated two signal to noise reduction methods, medium term projections for silver hake using the ASAP Run 6 results, and the social and economic effects of alternative ABCs. The SSC agrees with the PDT that the alternative smoothing approaches confirmed the results of the three year moving average approach and suggests further research on the use of alternative smoothing techniques be evaluated through the standard SARC review process. The ASAP projections were not informative. The social and economic effects could only be addressed superficially by the PDT due to a lack of an accepted model for projecting alternative catch streams in the future.

The lack of an accepted stock assessment model for all the whiting stocks prevented the PDT from conducting true risk analysis. The potential impact on the stock of different catch levels could not be estimated due to this lack of an accepted stock assessment model, and thus the risk of the stock becoming overfished is unknowable. Therefore, the SSC can only provide general statements regarding potential risk of different choices of ABC for 2012 – 2014. Higher catches patently have higher probability of overfishing. Setting ABC equal to the OFL implies no buffer for scientific uncertainty in the assessment.

The Council has not expressed a risk tolerance level for the whiting stocks, which prevents the SSC from being able to recommend an ABC that corresponds to a specific probability of overfishing. Instead, the SSC is providing tables of possible ABC for each stock of red and silver hake where the Council can choose its level of risk tolerance regarding the probability of overfishing and then find the associated ABC from the table. In the silver hake tables, there are a range of probabilities of overfishing which have been removed due to the potential of bias in the estimation of the biological reference points. This potential bias is due to the choice of years used in calculating the reference point and the potential for a change in productivity of the systems. The highlighted and bolded rows in each table denote the recommended ABC for each stock. The table also provides the probability that the ABC will cause F to be greater than the median Fmsy proxy value. This column does not include uncertainty in the Fmsy proxy value and so should not be used as the basis for selecting an ABC, it is provided for information purposes only.

The SSC supports the PDT's proposal to combine the offshore hake ABC with the ABC for southern silver hake, because it is a mixed-species fishery, with a small portion of offshore hake in the mixed-species catch, and challenges in monitoring species-specific catch limits. The SSC agrees with the PDT recommendation to set the offshore hake ABC as a multiple of the southern silver hake ABC and monitoring the combined offshore hake and southern silver hake ABC. The SSC agrees with the PDT recommendation to use 4% as the proportion of offshore hake landings relative to the southern silver hake landings.

Many of the possible ABC values in Table 1 are associated with large increases in catch relative to recent amounts. Based on the experience of members in the SSC, large and sudden increases in catch are often associated with fishing mortality rates that are too high when later assessed. The SSC suggests that a gradual approach be used to increase the ABCs over time to prevent overcapitalization in the fishery and reduce the probability of exceeding sustainable catches.

The SSC recommends the following ABCs for the whiting stocks, but notes that the ABC in any of the rows in Table 1 which are not crosshatched can be selected by the Council as the ABC for that stock based on its risk tolerance:

1. **244 mt for northern red hake.**
2. **3,063 mt for southern red hake.**
3. **13,177 mt for northern silver hake.**
4. **32,635 mt for southern silver hake.**
5. **Setting a combined offshore hake and southern silver hake ABC, calculated as 1.04 multiplied by the Council selected ABC for southern silver hake.**

Table 1. Acceptable Biological Catch (ABC; metric tons) for the four red and silver hake stocks. The first column provides the percentile of the overfishing limit (OFL) which denotes the statistical uncertainty associated with the ABC value provided in the second column. The third column provides the associated probability of the ABC exceeding the median of the Fmsy proxy. The final four columns relate the ABC to recent catches (e.g. 3yrAvg denotes an average of 2008-2010 catches). The rows with bold font and yellow background denote the SSC recommendation for ABC. The maximum value that the Council may select is the largest ABC for each stock which is not crosshatched (314 mt and 3448 mt for the northern and southern stocks of red hake, and 17,300 mt and 43,090 mt for the northern and southern stocks of silver hake, respectively).

Red Hake North			ABC- percentage of currrent catch			
Percentile OFL	ABC (mt)	Prob F > median Fmsy	2010	3yr Avg	5 yr Avg	10y Avg
5	75	0.00	24%	37%	35%	31%
10	134	0.00	43%	66%	62%	55%
25	223	0.00	72%	111%	103%	92%
30	**244**	**0.00**	**78%**	**121%**	**113%**	**100%**
40	280	0.08	90%	139%	130%	115%
50	314	0.37	101%	156%	146%	129%

Red Hake South			ABC- percentage of currrent catch			
Percentile OFL	ABC (mt)	Prob F > median Fmsy	2010	3yr Avg	5 yr Avg	10y Avg
5	2263	0.00	167%	156%	151%	165%
10	2524	0.00	187%	174%	168%	184%
25	2954	0.10	218%	203%	197%	215%
30	**3063**	**0.16**	**226%**	**211%**	**204%**	**223%**
40	3259	0.27	241%	224%	217%	237%
50	3448	0.43	255%	237%	230%	251%

Silver Hake North			ABC- percentage of currrent catch			
Percentile OFL	ABC (mt)	Prob F > median Fmsy	2010	3yr Avg	5 yr Avg	10y Avg
5	5363	0.00	216%	358%	372%	295%
10	7434	0.00	300%	496%	516%	408%
25	**13177**	**0.00**	**532%**	**878%**	**915%**	**724%**
35	17300	0.00	698%	1153%	1201%	951%
40	19600	0.04	791%	1307%	1361%	1077%
50	24840	0.52	1004%	1659%	1728%	1367%

Silver Hake South			ABC- percentage of currrent catch			
Percentile OFL	ABC (mt)	Prob F > median Fmsy	2010	3yr Avg	5 yr Avg	10y Avg
5	13072	0.00	184%	185%	210%	191%
10	18290	0.00	257%	259%	294%	267%
25	**32635**	**0.00**	**459%**	**463%**	**525%**	**476%**
35	43090	0.00	606%	611%	693%	629%
40	48860	0.04	687%	693%	786%	713%

50	62301	0.51	876%	884%	1002%	910%

Options for Whiting/Hake Biological Reference Points, MSY Proxies, And ABC

Whiting PDT

March 2011

1.0 Issue

The Magnuson Stevens Fishery Conservation and Management Act requires Councils and NOAA's National Marine Fisheries Service (NMFS) to establish annual catch limits (ACLs) for managed fish stocks, overfished stocks by 2010 and all stocks by 2011. As stocks with index based assessments, the small mesh multispecies stocks (silver, red, and offshore hake, collectively known as whiting in the fishery and the management plan) have never had total allowable catches (TACs) established and are managed by minimum mesh and possession limits by the Northeast Multispecies Fishery Management Plan (FMP). For simplicity, this report will refer to these species as 'hakes', as they are known in the scientific literature. A related species, white hake, managed by the Northeast Multispecies FMP as a large mesh species is not addressed here.

Now the Scientific and Statistical Committee (SSC) must approve an Acceptable Biological Catch (ABC) limit and the New England Fishery Management Council (Council) must set ACLs for the managed small mesh multispecies stocks based on new assessment data, coming from the recent benchmark assessment completed in December 2010 and published in January 2011.

The background and context of the issue is described in Section 3.0. A synopsis of the recent benchmark assessment is given in Section 4.0, but for more details, the reader is referred to the SAW 51 benchmark assessment reports (NEFSC 2011). And because important new data has been developed, indicating that consumption of silver hake is considerably higher than removals by the fishery, a brief description of the amount consumed by important predators (including cannibalism by larger silver hake) is presented in Section 5.0. The accepted assessment and biological reference points do not include the removals due to predation, so the OFL and ABC options only include the removals due to fishing, i.e. landings and dead discards.

Most important to the issue addressed in this report, a description of various sources of scientific and management uncertainty is given in Section 6.0. Some sources of uncertainty are common to all managed stocks, while some are more important or peculiar to silver, red, or offshore hake, or all three. Section 7.0 describes the proposed biological reference points that the NEFSC 2011 benchmark assessment proposes for the small mesh multispecies (silver, red, and offshore hake). Both catch and survey data were deemed unreliable for management of offshore hake, so the PDT in Section 8.4 recommends adding an allowance for the customary catches of offshore hake into the southern silver hake ABC. The PDT therefore recommends this approach rather than track offshore hake catches separately, which would require fishermen to separate mixed hake catches of silver and offshore hake, and monitor the fishery removals against a highly uncertain and almost meaningless offshore hake ABC.

Three potential methods for setting ABCs are applied to silver and red hake data and explored in Section 8.0 to estimate scientific uncertainty of the F_{msy} proxy (recommended by NEFSC 2011 for the index based hake assessments) and of the 2008-2010 mean biomass indexed by the spring (red hake) and fall (silver hake) survey. Method 1 is the same as the procedure adopted for many groundfish stocks and skates, i.e. choice of an ABC that is a fixed percentage of OFL. Method 3 is similar, but the fixed percentage varies by stock depending on the precision of the F_{msy} estimate. Method 2 is the most complex and requires an annual estimation of uncertainty of OFL to estimate ABC from a fixed percentage of the cumulative frequency distribution of OFL. A more detailed description of the three methods is given in Section 8.1.

Section 8.0 also includes a risk analysis that various levels of catch (i.e. mortality) will exceed the 25th, 50th, and 75th percentiles of the cumulative F_{msy} proxy distribution (CFD). Exceeding the 50th percentile of the F_{msy} proxy distribution is most often thought of as 'overfishing', but other percentiles of the cumulative frequency distributions provide a measure of precision. Each section also includes an analysis of how the three methods respond to changes in stock biomass, scenarios derived from adding or subtracting one standard deviation of the three year moving average biomass from the 2008-2010 values that are now available (converted to FSV Albatross units using peer reviewed calibration methods). Table 19 and Table 20 summarize the results and sensitivity analysis for the three methods, comparing the results to 2009 landings.

Lastly, the Whiting PDT summarizes the characteristics and provides some caveats about the three methods in Section 9.0.

2.0 Table of Contents

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3.0 Background

Amendment 19 to develop Annual Catch Limits (ACLs) for hakes was postponed until after the benchmark assessment results became available (NEFSC 2011) in January 2011. It was hoped that the benchmark would produce analytical assessments with estimates of maximum sustainable yield (MSY) based reference points and scientific uncertainty. Unfortunately, despite many attempts with different models, the analytical assessments ultimately could not resolve different signals coming from low catches (especially compared with those in the early part of the time series), increasing stock biomass, and an increasingly truncated age structure in survey catches (i.e. increasing absence of older fish, particularly silver hake).

Nonetheless, the benchmark assessment made progress on resolving stock structure, species identification in the survey and commercial catches, and in estimating consumption. Despite the inclusion of predatory consumption estimates which were almost an order of magnitude greater than catch (Section 5.0), the analytical models still did not perform well. Instead, the SAW accepted an index based assessment for both red and silver hake status determination, similar to previous assessments, with updated reference points. There was no reliable information about catch or trends in abundance and biomass to guide management of offshore hake.

The Whiting PDT is considering various MSY proxy approaches that may be used to determine red and silver hake ABCs. An allowance for a small percentage of offshore hake is being proposed for the southern silver hake ACL, to be managed jointly as one complex.

Using guidance from the SSC, the Whiting PDT will return with ABC specification recommendations for SSC approval in August. These will be incorporated into a developing Draft Amendment 19 for approval at the September Council meeting.

4.0 Benchmark assessment and biological reference points

4.1 Silver hake

4.1.1 Stock Distribution and Identification

Silver hake range from Newfoundland to South Carolina and are most abundant from Nova Scotia to New Jersey. Silver hake are found over a wide range of depths, from shallow waters to greater than 400 m (219 fathoms). Larger and older silver hake tend to be found further to the north and in deeper water. There are seasonal patterns with movement inshore during the spring and summer.

Management is based on two stocks (north and south) due to differences in morphology of silver hake in the two areas (Map 1), population trends, and fishery patterns. The northern stock is distributed in the Gulf of Maine-northern Georges Bank region. The southern stock extends from southern Georges Bank to Cape Hatteras. There was no strong biological evidence to support either a separate or combined silver hake assessment. The two management units were retained in this assessment.

4.1.2 Catches

Nominal (reported) annual landings from the northern area were high in the 1950s and 1960s averaging 52,200 mt, followed by a period of lower landings (30,850 mt) through 1975 (Table 1). After the industrial and distant water fleet fisheries ended in the late 1970s, landings averaged only 8,000 mt. From 2005-2009, annual landings declined to about 1000 mt. Nominal annual landings from the southern area averaged 14,700 mt in the 1950s, followed by a period of extremely high landings over 300,000 mt in 1965 (Table 1). Landings then averaged 61,000 mt during the 1970s. After the industrial and distant water fleet fisheries ended in the late 1970s, landings averaged only 12,000 mt through 1999. From 2001-2009, annual landings declined to about 7000 mt (Table 1).

Prior to 1991 landings of silver hake and offshore hake were not reported by species. Since 1991 reporting by species has occurred but to varying extents. This introduces a source of uncertainty in landings data particularly for the southern region where offshore hake are more abundant (Garcia-Vazquez et al., 2009). Therefore, two models (length-based and depth-based estimators) were developed to estimate the proportion of silver hake landed from the total hake landings (offshore and silver hake combined).

Estimated annual discards of silver hake in the north ranged from 38 mt (2006) to 2,900 mt (1982) and in the south discards ranged from 131 mt (2007) to 6,600 mt (1989) (Table 1). Silver hake discards from the longline and sink gill net fishery were minimal for both stock areas (Table 2 and Table 3). However, the otter trawl fisheries have been a significant source of discards for silver hake and the trends were variable.

4.1.3 Data and Assessment

Data available included fishery landings and discards by fleet, length compositions of landings and discards, age-based surveys indices from the NEFSC fall and spring surveys, and estimates of minimum consumption at age for a subset of fish predators sampled for stomach contents on the NEFSC surveys. The NEFSC bottom trawl survey switched from the FRV *Albatross IV* to the FSV *Bigelow* in spring 2009. Survey data given here are in "*Albatross IV*" units.

Two assessment models were attempted, An Age Structured Assessment Program (ASAP) and An Index Based Method (AIM). However, due to the difficulties reconciling the inconsistent interpretations from the age profiles in the fishery and survey data in the ASAP model, and the inadequate diagnostics from the AIM model, neither model formulations were considered for management. Thus, for the purpose of this report, the index method based on the three year survey biomass and relative exploitation (catch/index) was used. For additional details on the ASAP and AIM model analyses, please refer to Background Document 3.

The index method that is being used was based on an update of the previous index method in the 2003 Stock Assessment and Fishery Evaluation (SAFE Report) report. Relative abundance indices and associated reference points were previously based on the delta method estimator. For this new assessment, the "delta" estimators were replaced with arithmetic estimates (i.e. no log transform was applied). The delta transformation inflated the variance of the survey and it also was sensitive to treatment of tows with no catch. As a result, the arithmetic mean is recommended for deriving fall survey estimates. The same years (1973-1982) as used previously were used to define the biomass reference points for the fall survey index. Landings for the period (1973-1982) were used previously to characterize the relative exploitation reference points. However, discards since 1989 can be reliably estimated, so the relative exploitation index is now defined using catch over the relative biomass. Historical discarding, particularly in the distant water fleet (DWF), has likely been very small. Therefore, comparison of relative exploitation index based on catch/biomass with reference points based on landings over biomass is justified.

Trends in landings and discards by gear are giving in Table 2 and Table 3. Most of the landings are derived from commercial trips using trawls, while the discards are more or less evenly split in the north by large and small mesh, with a significant contribution from shrimp trawls, although the shrimp trawl discards have declined, probably due to the introduction of the Nordmore Grate (Table 3). In the south, most of the estimated discards come from vessels using small mesh. Trends in recruitment and age 3+ abundance are presented in Figure 1, showing a general decline in the abundance of older fish in both the northern and southern stock units. In both stocks, the exploitation ratio has declined from values prevalent during 1963-1974 and has remained well below the overfishing definition mortality thresholds (Figure 4).

Map 1. Statistical areas used to define the northern and southern silver hake stocks.

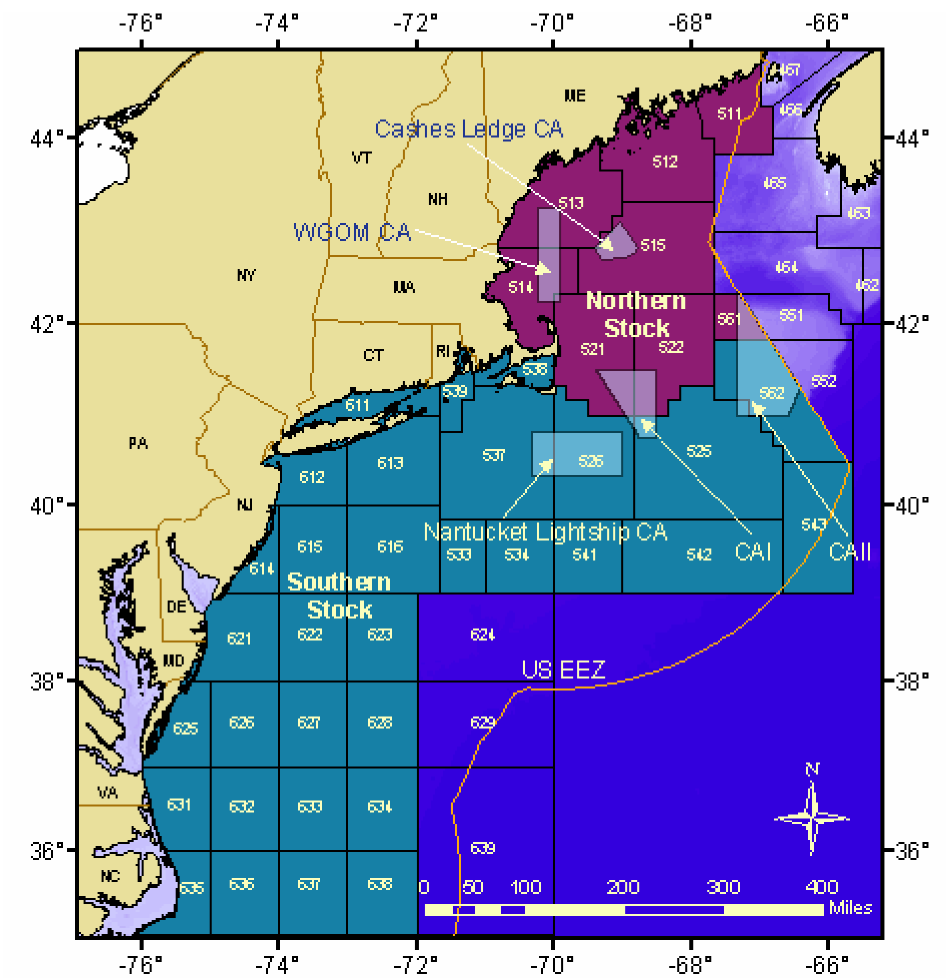


Table 1. Silver hake landings, catch, survey biomass, and exploitation trends for northern and southern stocks (Source: NEFSC 2011).

Northern stock

					NEFSC Survey		Replacement Ratio		Relative Fishing	
Year	*Catch (mt)*	*Pct DWF landings*	*Pct discards*	*Pct recreational*	*Fall (kg/tow)*	*3-yr average*	*Fall (kg/tow)*	*3-yr average*	*Fall (mt/kg)*	*3-yr average*
1955	53361									
1956	42150									
1957	62750									
1958	49903									
1959	50608									
1960	45543									
1961	39688									
1962	79002									
1963	73924				23.1				3.2	
1964	94462				4.34				21.77	
1965	45279				7.06	11.5			6.41	10.46
1966	47808				4.19	5.2			11.41	13.2
1967	33371				2.27	4.51			14.7	10.84
1968	41378.94				2.28	2.91			18.15	14.75
1969	24054.96				2.41	2.32			9.98	14.28
1970	27527.97				3.03	2.57			9.09	12.41
1971	36398.22				2.67	2.7			13.63	10.9
1972	25223.95				5.78	3.83			4.36	9.03
1973	32090.95	56%			4.12	4.19			7.79	8.6
1974	20682	67%			3.45	4.45			5.99	6.05
1975	39874	68%			8.09	5.22			4.93	6.24
1976	13634	1%			11.25	7.6			1.21	4.05
1977	12457	0%			6.72	8.69			1.85	2.66
1978	12609	0%			6.32	8.1			2	1.69
1979	3415	0%			6.18	6.41			0.55	1.47
1980	4730	0%			7.23	6.58			0.65	1.07
1981	7054	0%	37%		4.52	5.98			1.56	0.92
1982	7569	0%	38%		6.28	6.01			1.21	1.14
1983	7954	0%	33%		8.76	6.52			0.91	1.22
1984	10880	0%	24%		3.36	6.13			3.24	1.78
1985	10859	0%	24%		8.28	6.8			1.31	1.82
1986	10856	0%	22%		13.04	8.23			0.83	1.79
1987	7765	0%	27%		9.79	10.37			0.79	0.98
1988	8574	0%	21%		6.05	9.63			1.42	1.01
1989	6963	0%	33%		10.53	8.79			0.66	0.96
1990	8335	0%	23%		15.61	10.73			0.53	0.87
1991	7311	0%	17%		10.52	12.22			0.69	0.63
1992	6730	0%	21%		10.25	12.13			0.66	0.63
1993	5050	0%	14%		7.5	9.42			0.67	0.67
1994	4140	0%	6%		6.84	8.2			0.61	0.65
1995	3224	0%	20%		12.89	9.08			0.25	0.51
1996	4443	0%	19%		7.57	9.1			0.59	0.48
1997	3045	0%	8%		5.66	8.71			0.54	0.46
1998	2738	0%	25%		18.91	10.71			0.14	0.42
1999	4190	0%	18%		11.15	11.91			0.38	0.35
2000	2952	0%	12%		13.51	14.52			0.22	0.25
2001	3868	0%	12%		8.33	11			0.46	0.35
2002	3106	0%	17%		7.99	9.94			0.39	0.36
2003	2006	0%	10%		8.29	8.2			0.24	0.37
2004	1165	0%	10%		3.28	6.52			0.35	0.33
2005	890	0%	7%		1.72	4.43			0.52	0.37
2006	941	0%	4%		3.69	2.9			0.26	0.38
2007	1764	0%	43%		6.44	3.95			0.27	0.35
2008	788	0%	21%		5.27	5.13			0.15	0.23
2009	1232	0%	15%		6.89	6.2			0.18	0.2

Southern stock

Year	Catch (mt)	Pct DWF landings	Pct discards	Pct recreational	NEFSC Survey Fall (kg/tow)	NEFSC Survey 3-yr average	Replacement Ratio Fall	Replacement Ratio Spring	Relative Fishing Mortality Fall (mt/kg)	Relative Fishing Mortality 3-yr average
1955	13255									
1956	14241									
1957	16426									
1958	12902									
1959	16387									
1960	8816									
1961	12649									
1962	17939									
1963	89425				4.66				19.19	
1964	147048				4.06				36.22	
1965	294117				5.28	4.67			55.7	37.04
1966	202318				2.64	3.99			76.64	56.19
1967	87383				2.44	3.45			35.81	56.05
1968	58157				2.73	2.6			21.3	44.58
1969	74891				1.26	2.14			59.44	38.85
1970	26832				1.35	1.78			19.88	33.54
1971	70506				2.21	1.61			31.9	37.07
1972	88179				2.13	1.9			41.4	31.06
1973	102078	94%			1.7	2.01			60.05	44.45
1974	102396	93%			0.85	1.56			120.47	73.97
1975	72164	89%			1.79	1.45			40.32	73.61
1976	64608	85%			1.99	1.54			32.47	64.42
1977	57160	81%			1.68	1.82			34.02	35.6
1978	25834	53%			2.5	2.06			10.33	25.61
1979	16398	27%			1.68	1.95			9.76	18.04
1980	11684	13%			1.63	1.94			7.17	9.09
1981	16931	16%			1.12	1.48			15.12	10.68
1982	18806	12%			1.56	1.44			12.06	11.45
1983	16674	4%			2.57	1.75			6.49	11.22
1984	17838	2%			1.4	1.84			12.74	10.43
1985	16691	8%			3.55	2.51			4.7	7.98
1986	14029	4%			1.45	2.13			9.68	9.04
1987	13804	0%			1.95	2.32			7.08	7.15
1988	13447	0%			1.78	1.73			7.55	8.1
1989	19568	0%			1.87	1.87			10.46	8.37
1990	18992	0%			1.52	1.72			12.49	10.17
1991	12821	0%			0.85	1.41			15.08	12.68
1992	13977	0%			0.99	1.12			14.12	13.9
1993	17653	0%			1.28	1.04			13.79	14.33
1994	18118	0%			0.79	1.02			22.93	16.95
1995	13394	0%			1.59	1.22			8.42	15.05
1996	12613	0%			0.45	0.94			28.03	19.8
1997	13172	0%			0.83	0.96			15.87	17.44
1998	13084	0%			0.57	0.62			22.95	22.28
1999	13965	0%			0.82	0.74			17.03	18.62
2000	9800	0%			0.72	0.7			13.61	17.87
2001	9072	0%			2.04	1.19			4.45	11.7
2002	5298	0%			1.18	1.31			4.49	7.52
2003	6884	0%			1.42	1.55			4.85	4.6
2004	8168	0%			1.24	1.28			6.59	5.31
2005	7971	0%			0.94	1.2			8.48	6.64
2006	4745	0%			1.42	1.2			3.34	6.14
2007	5212	0%			0.87	1.08			5.99	5.94
2008	6616	0%			1.36	1.22			4.86	4.73
2009	7434	0%	11%		1.1	1.11			6.76	5.87

Table 2. Silver hake landings percent by gear type (Source: NEFSC 2011).

Northern stock

Year	*Longline*	*Fish trawl*	*Shrimp trawl*	*Sink gillnet*	*Other*	*Total (mt)*
1964	0%	100%	0%	0%	0%	37,222
1965	0%	100%	0%	0%	0%	29,512
1966	0%	100%	0%	0%	0%	33,569
1967	0%	100%	0%	0%	0%	26,489
1968	0%	100%	0%	0%	0%	30,873
1969	0%	100%	0%	0%	0%	16,008
1970	0%	100%	0%	0%	0%	15,223
1971	0%	100%	0%	0%	0%	11,158
1972	0%	100%	0%	0%	0%	6,440
1973	0%	100%	0%	0%	0%	14,005
1974	0%	100%	0%	0%	0%	6,907
1975	0%	98%	2%	0%	0%	12,566
1976	0%	99%	0%	0%	0%	13,483
1977	0%	99%	0%	0%	0%	12,455
1978	0%	99%	0%	1%	1%	12,609
1979	0%	99%	0%	1%	0%	3,415
1980	0%	99%	0%	1%	0%	4,730
1981	0%	95%	4%	1%	0%	4,416
1982	0%	97%	3%	1%	0%	4,664
1983	0%	94%	5%	1%	1%	5,312
1984	0%	97%	2%	0%	1%	8,289
1985	0%	93%	6%	0%	1%	8,297
1986	0%	89%	9%	1%	2%	8,502
1987	0%	89%	7%	1%	3%	5,658
1988	0%	91%	6%	0%	2%	6,789
1989	0%	93%	5%	1%	1%	4,648
1990	0%	95%	4%	1%	0%	6,377
1991	0%	95%	3%	1%	1%	6,055
1992	0%	96%	2%	1%	2%	5,306
1993	0%	96%	0%	1%	3%	4,364
1994	0%	95%	1%	2%	2%	3,899
1995	0%	87%	1%	2%	10%	2,594
1996	0%	97%	1%	2%	0%	3,619
1997	0%	93%	5%	2%	1%	2,802
1998	0%	98%	0%	1%	0%	2,045
1999	0%	98%	0%	1%	0%	3,444
2000	0%	95%	1%	2%	3%	2,592
2001	0%	97%	0%	1%	2%	3,391
2002	0%	99%	0%	1%	0%	2,593
2003	0%	97%	0%	1%	2%	1,808
2004	0%	92%	0%	2%	5%	1,049
2005	0%	89%	0%	4%	7%	827
2006	0%	98%	0%	2%	0%	903
2007	0%	99%	0%	1%	0%	1,014
2008	0%	93%	0%	7%	0%	620
2009	0%	79%	1%	19%	1%	1,038

Southern stock

Year	*Longline*	*Fish trawl*	*Sink gillnet*	*Other*	*Total*
1964	0%	100%	0%	0%	26,518
1965	0%	100%	0%	0%	23,765
1966	0%	100%	0%	0%	11,212
1967	0%	100%	0%	0%	9,500
1968	0%	100%	0%	0%	9,074
1969	0%	100%	0%	0%	8,165
1970	0%	100%	0%	0%	6,879
1971	0%	100%	0%	0%	5,546
1972	0%	98%	0%	2%	5,973
1973	0%	100%	0%	0%	6,604
1974	0%	100%	0%	0%	7,751
1975	0%	100%	0%	0%	8,441
1976	0%	100%	0%	0%	10,434
1977	0%	100%	0%	0%	11,458
1978	0%	100%	0%	0%	12,779
1979	0%	100%	0%	0%	13,498
1980	0%	100%	0%	0%	11,848
1981	0%	100%	0%	0%	11,783
1982	0%	100%	0%	0%	12,164
1983	0%	100%	0%	0%	11,520
1984	0%	100%	0%	0%	12,731
1985	0%	100%	0%	0%	11,843
1986	0%	100%	0%	0%	9,573
1987	0%	100%	0%	0%	10,121
1988	0%	100%	0%	0%	9,195
1989	0%	100%	0%	0%	13,428
1990	0%	100%	0%	0%	13,610
1991	0%	100%	0%	0%	10,492
1992	0%	100%	0%	0%	10,873
1993	0%	100%	0%	0%	12,942
1994	0%	93%	0%	7%	12,159
1995	0%	89%	0%	11%	12,102
1996	0%	100%	0%	0%	12,561
1997	0%	100%	0%	0%	12,763
1998	0%	100%	0%	0%	12,828
1999	0%	100%	0%	0%	10,577
2000	0%	100%	0%	0%	9,769
2001	0%	100%	0%	0%	9,517
2002	0%	100%	0%	0%	5,345
2003	0%	100%	0%	0%	6,835
2004	0%	96%	1%	3%	7,436
2005	1%	93%	0%	6%	6,671
2006	1%	92%	1%	6%	4,629
2007	0%	95%	1%	4%	5,345
2008	0%	89%	3%	9%	5,638
2009	0%	70%	3%	27%	6,720

Table 3. Silver hake discard percent by gear type (Source: NEFSC 2011). The discards from 1981-1988 (1991 for scallop dredge and longline) are hind-cast using the first three years of available data. The otter trawl discards are hind-cast combining mesh-sizes.

Northern stock

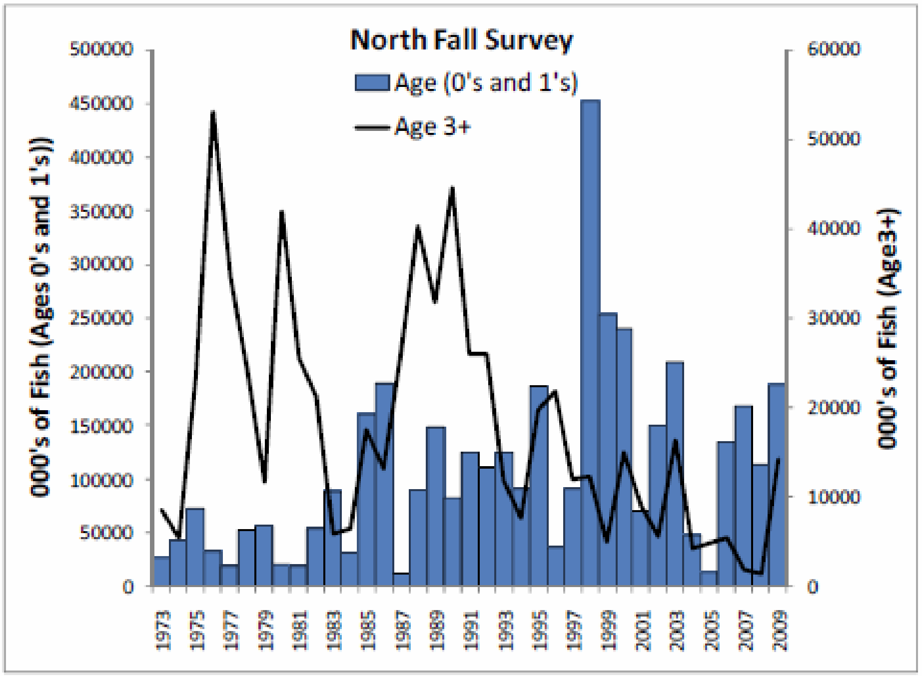
Year	*Longline*	*mesh trawl*	*mesh trawl*	*Sink gillnet*	*Scallop dredge*	*Shrimp trawl*	*Total (mt)*
1981	0%	88%	0%	3%	1%	8%	2,638
1982	0%	87%	0%	2%	1%	10%	2,905
1983	0%	85%	0%	2%	1%	13%	2,642
1984	0%	78%	0%	2%	0%	19%	2,592
1985	0%	71%	0%	2%	0%	27%	2,562
1986	0%	62%	0%	2%	0%	36%	2,354
1987	0%	61%	0%	3%	1%	36%	2,107
1988	0%	68%	0%	3%	2%	28%	1,785
1989	0%	13%	51%	2%	1%	33%	2,342
1990	0%	35%	32%	4%	2%	28%	1,989
1991	0%	31%	41%	4%	0%	24%	1,251
1992	0%	26%	41%	3%	0%	30%	1,430
1993	0%	35%	26%	8%	8%	23%	740
1994	0%	19%	28%	18%	0%	35%	240
1995	0%	19%	3%	5%	1%	72%	634
1996	0%	8%	3%	7%	0%	83%	826
1997	0%	23%	6%	11%	3%	57%	249
1998	0%	20%	42%	1%	5%	31%	694
1999	0%	24%	58%	3%	3%	13%	719
2000	0%	52%	0%	7%	1%	39%	355
2001	0%	85%	4%	3%	1%	8%	477
2002	0%	75%	20%	2%	1%	2%	513
2003	0%	37%	45%	5%	2%	11%	202
2004	0%	59%	26%	3%	0%	12%	113
2005	0%	65%	15%	2%	1%	17%	62
2006	0%	55%	13%	3%	3%	26%	38
2007	0%	3%	95%	0%	0%	2%	749
2008	0%	27%	43%	4%	0%	26%	167
2009	0%	32%	44%	3%	1%	20%	216

Southern stock

Year	*Longline*	*Large mesh trawl*	*Small mesh trawl*	*Sink gillnet*	*Scallop dredge*	*Total (mt)*
1981	0%	97%	0%	0%	3%	3,603
1982	0%	99%	0%	0%	1%	4,788
1983	0%	99%	0%	0%	1%	4,952
1984	0%	99%	0%	0%	1%	5,023
1985	0%	99%	0%	0%	1%	3,982
1986	0%	99%	0%	0%	1%	4,456
1987	0%	98%	0%	0%	2%	4,374
1988	0%	98%	0%	0%	2%	4,626
1989	0%	2%	96%	0%	2%	6,642
1990	0%	45%	51%	0%	4%	6,193
1991	0%	37%	62%	0%	1%	3,234
1992	0%	19%	81%	0%	0%	3,480
1993	0%	5%	88%	0%	7%	5,245
1994	0%	9%	90%	0%	0%	5,992
1995	0%	10%	81%	0%	9%	1,439
1996	0%	4%	89%	0%	7%	491
1997	0%	58%	35%	0%	8%	639
1998	0%	1%	95%	0%	4%	354
1999	0%	1%	98%	0%	1%	3,552
2000	0%	3%	57%	2%	38%	333
2001	0%	2%	92%	0%	6%	192
2002	0%	3%	92%	0%	5%	280
2003	0%	2%	97%	0%	1%	676
2004	0%	7%	92%	0%	1%	1,244
2005	0%	3%	96%	0%	1%	1,574
2006	0%	15%	77%	0%	8%	160
2007	0%	16%	77%	0%	7%	132
2008	0%	2%	97%	0%	1%	1,045
2009	0%	7%	90%	0%	3%	828

Figure 1. Trends in fall survey abundance by age group for silver hake.

Northern stock	**Southern stock**



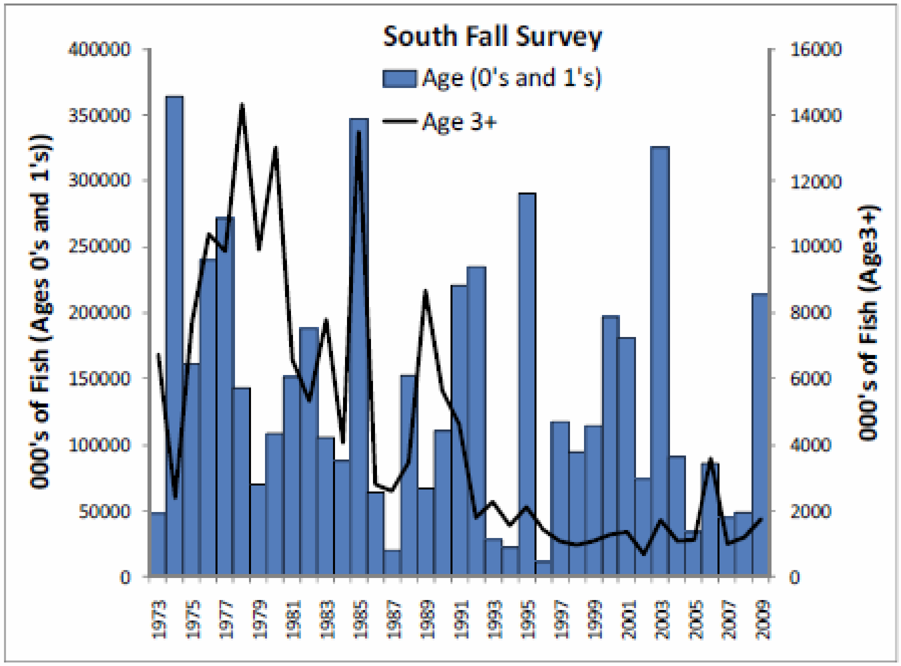
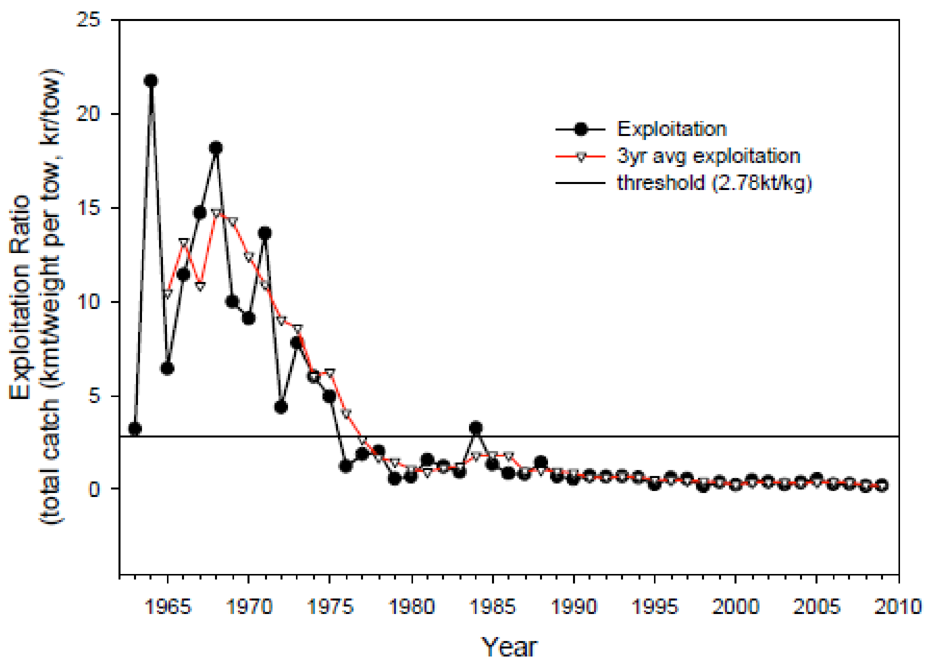
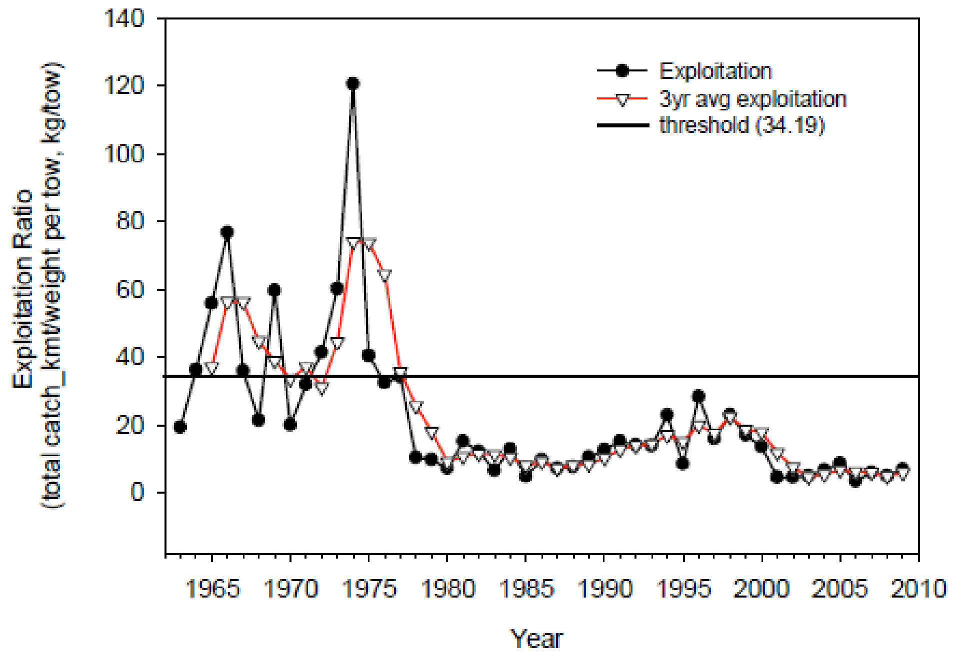


Figure 2. Exploitation indices (fall survey) and newly proposed overfishing threshold for silver hake.

Northern stock	Southern stock
	

4.2 Red hake

4.2.1 Stock Distribution and Identification

Red hake is a demersal gadoid species distributed from the Gulf of St. Lawrence to North Carolina, and is most abundant from the western Gulf of Maine through Southern New England waters (Bigelow and Schroeder 1953). Red hake are separated into northern and southern stocks for management purposes (Map 2). The northern stock extends from the Gulf of Maine to northern Georges Bank region, while the southern stock extends from the southern Georges Bank to Mid-Atlantic Bight region. Red hake stock structure was determined by considering distribution, homogeneous maturity, and differences in growth. There was no strong biological evidence to support either a separate or combined assessment. Analysis of otoliths from red hake captured in the northwestern and eastern part of the Bay of Fundy (Gulf of Maine) varied from the otolith morphology for red hake captured elsewhere and had intermediate characteristics with white hake, suggesting the possible existence of hybridization in that area (Penttila and Dery 1988).

4.2.2 Catches

Nominal red hake commercial landings in the northern stock peaked at 15,000 mt in 1972 and 1973, followed by a sharp decline in 1977 corresponding to the departure of the distant water fleets (Table 4). Landings then averaged 1,000 mt from 1977-1994, but declined to an average of only 100 mt through 2009. In the southern stock, nominal landings peaked at over 100,000 mt in 1965 with a second peak of 60,000 in 1972 (Table 4). Landings then averaged 2,000 mt from 1977-1994, but declined to average 900 mt through 2009. Discards from the northern stock averaged 1300 mt in the early 1980s, declined to about 250 mt from 1995-2000 and have averaged 100 mt through 2009 (Table 6). Discards from the southern stock averaged 4,000 mt in the 1980s, declined to about 1,000 mt from 1995-2000 and have averaged 700 mt through 2009 (Table 6). Recreational landings have been relatively small with averages of 300 mt in the south compared to less than 3 mt in the north (Table 4).

Catch data are a major source of uncertainty for this assessment because of mixed reporting of landings of red and white hake and uncertain identification to species by observers. Therefore, a length-based model was developed to estimate the proportion of red hake in the total hake catch (red and white hake combined). The model estimates for the northern stock area were generally lower than the nominal and the large peak in landings in the 1970s is eliminated. The landings for the southern stock area were also lower but the trend was similar. The complete change in trend in the north was not considered acceptable, so the length-based split was not used, and the nominal catch was used in the assessment. From 1994 to 2009, landings for bait in the north have averaged 50% of the reported landings (Table 4) and ranged from one percent of the reported landings early in the time series to five times the reported landings in more recent years. In some years, less than three vessels reported bait landings on VTRs. Therefore, bait landings cannot be tabulated separately.

4.2.3 Data and Assessment

Information used in the 2010 assessment include data from the NEFSC surveys, as well as commercial fishery data from vessel trip reports, dealer landings records and on-board fishery observers through 2009. The NEFSC bottom trawl survey switched from the FRV *Albatross IV* to the FSV *Bigelow* in spring 2009. Survey data given here are in "*Albatross IV*" units. Although some statistical catch at length models (SCALE and SS3) were applied, model diagnostics were not adequate for stock status determination or for the provision of fishery management advice. Therefore, the assessment is based on the spring survey indices and exploitation indices from each area. Examination of the effect of using the delta transformation on the variability of red hake survey indices indicated that the transformation did not reduce the variance. The delta transform and was very sensitive to the treatment of zero weight tows which occurred when the weight of fish was less than 0.1 kg prior to 2001. Therefore, the arithmetic mean is considered a better option for assessment purposes (Table 4).

Nearly all commercial landings for both the northern and southern red hake stocks come from trips using trawls (Table 5). The majority of estimated discards also come from trips using trawls (Table 6), more or less evenly split between large and small mesh in the north and predominately from trips using small mesh in the south. Average fish size in survey catches shows a general downward trend since the mid-1980s in both the northern and southern stocks (Figure 3). Exploitation, measured as catch/survey biomass, has declined from values prevalent during the 1970s and has fluctuated around the overfishing definition thresholds (Figure 4). The 2009 exploitation ratio was below the threshold and overfishing is therefore not occurring.

Map 2. Statistical areas used to define the northern and southern red hake stocks.

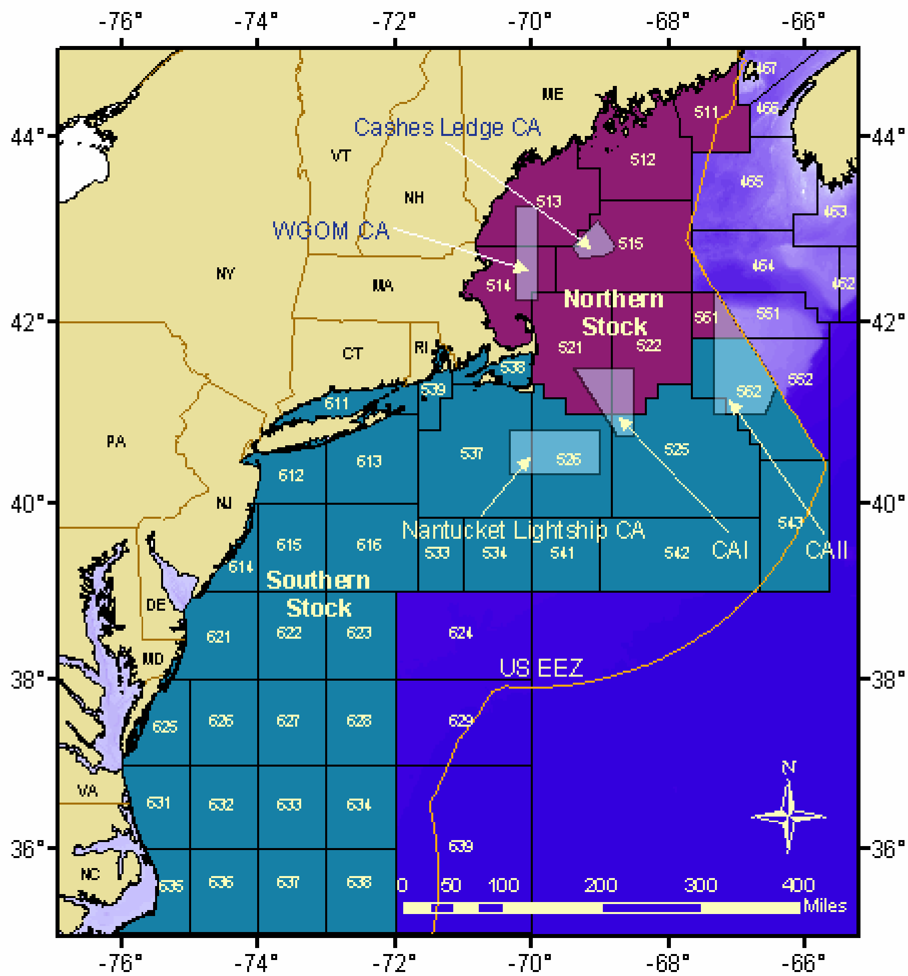


Table 4. Red hake landings, catch, survey biomass, and exploitation trends for northern and southern stocks (Source: NEFSC 2011).

Northern stock

Year	Catch (mt)	Pct DWF landings	Pct discards	Pct recreational	NEFSC Survey		Replacement Ratio		Relative Fishing Mortality	
					Fall (kg/tow)	Spring (kg/tow)	Fall	Spring	Fall (mt/kg)	Spring (mt/kg)
1963	3,281	63%		0%	4.85				676.5	
1964	1,409	80%		0%	1.31				1075.6	
1965	2,773	93%		0%	1.22				2273	
1966	5,575	84%		0%	0.92				6059.8	
1967	1,863	69%		0%	0.49				3802	
1968	2,627	79%		0%	0.26	1.14	0.148		10103.8	2304.4
1969	2,021	93%		0%	0.67	0.64	0.798		3016.4	3157.8
1970	1,032	75%		0%	0.6	0.54	0.843		1720	1911.1
1971	4,805	92%		0%	1.33	0.65	2.262		3612.8	7392.3
1972	15,026	96%		0%	2.34	1.56	3.493		6421.4	9632.1
1973	15,288	98%		0%	1.56	4.31	1.500	4.757	9800	3547.1
1974	7,223	88%		0%	0.68	2.43	0.523	1.578	10622.1	2972.4
1975	8,701	95%		0%	1.76	4.25	1.352	2.239	4943.8	2047.3
1976	6,337	90%		0%	1.7	3.37	1.108	1.277	3727.6	1880.4
1977	891	0%		0%	3.49	2.66	2.170	0.835	255.3	335
1978	1,223	0%		0%	3.06	2.57	1.665	0.755	399.7	475.9
1979	1,523	0%		0%	1.82	2.04	0.851	0.668	836.8	746.6
1980	1,033	0%		0%	3.76	3.88	1.589	1.303	274.7	266.2
1981	2,601	0%	51%	1%	2.81	6.35	1.016	2.187	925.8	409.7
1982	2,673	0%	55%	0%	1.67	2.13	0.559	0.609	1600.5	1254.8
1983	2,248	0%	60%	0%	4.11	3.7	1.566	1.090	547	607.6
1984	2,388	0%	56%	0%	3.54	2.98	1.249	0.823	674.5	801.2
1985	2,262	0%	56%	0%	4.73	3.91	1.488	1.027	478.3	578.6
1986	2,646	0%	45%	0%	2.84	3.26	0.842	0.855	931.8	811.8
1987	2,066	0%	51%	0%	2.25	2.94	0.666	0.920	918.2	702.7
1988	1,763	0%	51%	0%	2.54	2	0.727	0.596	694	881.4
1989	2,224	0%	65%	0%	4.67	1.65	1.469	0.547	476.1	1347.6
1990	1,425	0%	42%	0%	3.32	1.33	0.975	0.483	429.1	1071.2
1991	1,563	0%	52%	0%	2.56	1.62	0.820	0.725	610.6	964.8
1992	1,645	0%	44%	0%	2.29	2.5	0.746	1.310	718.2	657.8
1993	853	0%	10%	0%	1.99	2.82	0.647	1.550	428.4	302.3
1994	806	0%	10%	0%	3.69	1.59	1.244	0.801	218.4	506.9
1995	250	0%	25%	0%	3.28	1.97	1.184	0.999	76.2	126.9
1996	1,070	0%	61%	1%	2.53	1.79	0.916	0.852	423	597.8
1997	464	0%	27%	0%	2.92	1.81	1.060	0.848	158.8	256.2
1998	317	0%	41%	0%	4.84	2.52	1.679	1.263	65.5	125.8
1999	687	0%	68%	0%	3.32	2.32	0.962	1.198	207	296.2
2000	252	0%	22%	0%	5.66	3.19	1.676	1.532	44.5	78.9
2001	358	0%	38%	0%	4.89	3.58	1.269	1.539	73.1	99.9
2002	376	0%	27%	0%	5.37	4.46	1.241	1.662	70	84.3
2003	297	0%	30%	0%	3.55	1	0.737	0.311	83.7	297.2
2004	160	0%	36%	0%	1.56	1.77	0.342	0.608	102.6	90.4
2005	153	0%	37%	0%	1.16	1.1	0.276	0.393	132.1	139.3
2006	277	0%	65%	0%	2.19	0.91	0.662	0.382	126.4	304.3
2007	197	0%	65%	0%	2.42	2.06	0.875	1.115	81.3	95.5
2008	112	0%	53%	0%	1.91	3.49	0.878	2.551	58.5	32
2009	180	0%	53%	0%	12.46	1.75	6.742	0.938	14.5	103.1

Southern stock

					NEFSC Survey		Replacement Ratio		Relative Fishing Mortality	
Year	*Catch (mt)*	*Pct DWF landings*	*Pct discards*	*Pct recreational*	*Fall (kg/tow)*	*Spring (kg/tow)*	*Fall*	*Spring*	*Fall (mt/kg)*	*Spring (mt/kg)*
1963	31,901	7%		2%						
1964	43,373	25%		2%						
1965	92,990	73%		1%						
1966	107,922	96%		0%						
1967	58,783	88%		0%	1.69				34782.8	
1968	18,138	61%		3%	3.07	1.29			5908.1	14060.5
1969	52,928	90%		1%	3.55	1.08			14909.3	49007.4
1970	11,454	59%		4%	2.26	1.72			5068.1	6659.3
1971	35,134	91%		1%	2.57	3.49			13670.8	10067
1972	61,194	97%		0%	3.85	3.59	1.465		15894.5	17045.7
1973	51,362	93%		1%	2.35	3.99	0.768	1.786	21856.2	12872.7
1974	26,643	92%		1%	0.91	2.84	0.312	1.024	29278	9381.3
1975	19,976	90%		0%	4.88	3.18	2.044	1.017	4093.4	6281.8
1976	22,465	83%		3%	3.34	5.31	1.147	1.554	6726	4230.7
1977	7,062	64%		11%	2.51	2.3	0.819	0.608	2813.5	3070.4
1978	5,463	39%		18%	1.88	7.65	0.672	2.171	2905.9	714.1
1979	7,592	13%		3%	2.38	1.51	0.880	0.355	3189.9	5027.8
1980	4,226	4%		3%	3.13	2.38	1.044	0.597	1350.2	1775.6
1981	5,211	4%	52%	3%	2.32	4.61	0.876	1.204	2246	1130.3
1982	6,975	3%	54%	0%	3.1	3.34	1.268	0.905	2250.1	2088.4
1983	5,465	2%	71%	2%	6.04	2.21	2.358	0.567	904.8	2472.7
1984	5,730	1%	68%	10%	1.18	1.33	0.348	0.473	4855.5	4307.9
1985	3,901	2%	76%	1%	1.99	1.39	0.631	0.501	1960.2	2806.3
1986	4,288	1%	79%	5%	0.96	1.73	0.328	0.672	4466.7	2478.6
1987	4,728	0%	70%	10%	0.76	0.88	0.286	0.440	6221.6	5373.2
1988	4,584	0%	76%	5%	0.77	1.01	0.352	0.670	5952.6	4538.1
1989	6,372	0%	79%	7%	1.18	0.49	1.042	0.386	5400.3	13004.9
1990	6,060	0%	78%	8%	1.22	0.71	1.078	0.646	4967.2	8535.1
1991	3,822	0%	68%	7%	1.61	0.61	1.646	0.633	2373.6	6264.8
1992	7,782	0%	82%	2%	0.63	0.46	0.569	0.622	12352.9	16918.1
1993	6,321	0%	84%	1%	0.9	0.42	0.832	0.640	7023.5	15050.4
1994	2,772	0%	62%	2%	0.8	0.67	0.722	1.245	3464.7	4136.9
1995	2,801	0%	47%	2%	0.46	0.52	0.446	0.906	6090	5387.3
1996	1,099	0%	35%	2%	0.39	0.45	0.443	0.840	2817.4	2441.8
1997	3,595	0%	67%	5%	0.6	1.16	0.943	2.302	5991.5	3099
1998	1,948	0%	38%	3%	0.5	0.21	0.794	0.326	3895.1	9274
1999	2,465	0%	43%	2%	0.54	0.45	0.982	0.748	4564	5476.8
2000	1,712	0%	15%	3%	0.48	0.42	0.964	0.753	3565.8	4075.1
2001	1,630	0%	8%	1%	0.55	0.64	1.096	1.190	2964.1	2547.2
2002	1,000	0%	33%	1%	0.6	0.54	1.124	0.938	1667.2	1852.4
2003	986	0%	35%	2%	0.55	0.21	1.030	0.465	1792.1	4693.6
2004	1,214	0%	51%	1%	0.4	0.15	0.735	0.332	3035.9	8095.7
2005	1,419	0%	71%	4%	0.63	0.38	1.221	0.969	2251.6	3732.9
2006	1,103	0%	61%	5%	0.82	0.38	1.502	0.990	1344.7	2901.7
2007	2,035	0%	76%	1%	0.55	0.86	0.917	2.590	3699.3	2365.8
2008	1,467	0%	55%	5%	0.73	0.47	1.237	1.187	2009.8	3121.6
2009	1,543	0%	56%	6%	1.02	1.34	1.629	2.991	1513.1	1151.8

Table 5. Red hake landings percent by gear type (Source: NEFSC 2011).

Northern stock

Year	Longline	Fish trawl	Shrimp trawl	Sink gillnet	Other	Total (mt)
1964		100%	0%	0%		288
1965		100%	0%	0%		200
1966		100%	0%	0%	0%	885
1967		100%	0%	0%		577
1968		100%	0%	0%		552
1969	1%	99%	0%	0%		146
1970	0%	100%	0%	0%	0%	261
1971	0%	100%	0%	0%	0%	377
1972	0%	100%	0%	0%	0%	538
1973	0%	94%	0%	6%		362
1974		100%	0%	0%	0%	891
1975	2%	88%	8%	1%	1%	450
1976	6%	90%	1%	3%	0%	653
1977	3%	93%	2%	3%		889
1978	2%	97%	0%	0%	0%	1,223
1979		100%	0%	0%		1,523
1980	0%	99%	0%	0%	0%	1,029
1981	0%	91%	0%	8%	0%	1,246
1982		95%	2%	3%	0%	1,210
1983	0%	97%	2%	0%	0%	895
1984		98%	2%	0%	0%	1,059
1985	0%	93%	4%	2%		992
1986		81%	18%	0%	1%	1,457
1987	0%	80%	17%	0%	2%	1,013
1988	0%	92%	5%	1%	2%	862
1989	0%	89%	6%	4%	0%	776
1990	0%	87%	9%	3%	0%	826
1991	1%	86%	9%	4%	0%	743
1992	0%	94%	2%	3%	1%	918
1993	0%	95%		1%	4%	768
1994	0%	95%	0%	1%	4%	727
1995	1%	92%	0%	1%	6%	186
1996	0%	99%	0%	0%	0%	409
1997	1%	96%	0%	1%	3%	338
1998	1%	98%	0%	1%	1%	187
1999		98%	0%	2%	0%	220
2000		97%	0%	1%	2%	197
2001		94%	0%	1%	5%	222
2002		99%	0%	1%		275
2003		98%	0%	0%	1%	210
2004		97%	0%		3%	103
2005		99%	0%		1%	96
2006	0%	100%	0%			96
2007	0%	100%	0%			69
2008		100%	0%			52
2009	0%	100%	0%			85

Southern stock

Year	Longline	Fish trawl	Sink gillnet	Other	Total (mt)
1964	0%	100%	0%	0%	32,622
1965	0%	100%	0%	0%	25,246
1966	0%	100%	0%	0%	3,985
1967	0%	100%	0%	0%	6,764
1968	0%	100%	0%	0%	7,001
1969	0%	100%	0%	0%	5,539
1970	0%	100%	0%	0%	4,679
1971	0%	100%	0%	0%	3,227
1972	0%	99%	0%	1%	1,995
1973	0%	100%	0%	0%	3,603
1974	0%	100%	0%	0%	2,183
1975	0%	100%	0%	0%	2,065
1976	0%	100%	0%	0%	3,905
1977	0%	100%	0%	0%	2,522
1978	0%	98%	0%	2%	3,327
1979	0%	99%	0%	1%	6,624
1980	0%	99%	0%	1%	3,927
1981	0%	98%	0%	2%	2,124
1982	0%	98%	0%	2%	2,993
1983	0%	95%	0%	5%	1,334
1984	0%	91%	0%	9%	1,214
1985	0%	93%	0%	6%	827
1986	0%	93%	0%	7%	644
1987	0%	94%	0%	6%	943
1988	0%	92%	0%	8%	871
1989	0%	90%	0%	10%	931
1990	0%	93%	0%	7%	798
1991	0%	94%	0%	6%	925
1992	1%	95%	0%	4%	1,245
1993	0%	92%	0%	8%	924
1994	0%	87%	0%	13%	983
1995	0%	69%	0%	30%	1,428
1996	0%	99%	0%	1%	700
1997	0%	98%	0%	1%	999
1998	0%	99%	0%	1%	1,154
1999	0%	99%	0%	1%	1,351
2000	0%	99%	0%	1%	1,417
2001	0%	98%	1%	1%	1,469
2002	0%	99%	0%	1%	663
2003	0%	100%	0%	0%	623
2004	0%	98%	0%	2%	588
2005	0%	98%	0%	2%	356
2006	0%	98%	0%	2%	375
2007	0%	98%	0%	2%	470
2008	0%	98%	1%	1%	580
2009	0%	96%	0%	4%	575

Table 6. Red hake discard percent by gear type (Source: NEFSC 2011). The discards from 1981-1988 (1991 for scallop dredge and longline) are hind-cast using the first three years of available data. The otter trawl discards are hind-cast combining mesh-sizes.

Northern stock

Year	*Longline*	*Large mesh trawl*	*Small mesh trawl*	*Shrimp trawl*	*Sink gillnet*	*Other*	*Total (mt)*
1981	0%	90%	0%	0%	1%	8%	1325
1982	0%	89%	0%	0%	1%	10%	1460
1983	0%	86%	0%	0%	1%	13%	1353
1984	0%	78%	0%	0%	0%	21%	1327
1985	0%	70%	0%	0%	0%	30%	1270
1986	0%	61%	0%	0%	0%	38%	1189
1987	1%	61%	0%	0%	1%	37%	1053
1988	1%	68%	0%	1%	1%	29%	897
1989	1%	27%	48%	1%	1%	23%	1447
1990	1%	24%	19%	1%	2%	53%	595
1991	6%	27%	40%	0%	0%	26%	818
1992	0%	20%	67%	0%	0%	12%	726
1993	0%	25%	39%	1%	29%	6%	83
1994	0%	12%	69%	5%	5%	10%	77
1995	13%	25%	41%	3%	2%	17%	63
1996	1%	2%	80%	1%	1%	16%	656
1997	6%	10%	3%	1%	5%	76%	125
1998	5%	6%	73%	1%	0%	14%	130
1999	1%	67%	29%	1%	1%	2%	468
2000	10%	49%	1%	7%	11%	22%	55
2001	4%	35%	48%	9%	4%	1%	135
2002	1%	35%	53%	3%	7%	0%	101
2003	0%	33%	32%	3%	33%	0%	88
2004	3%	46%	45%	3%	2%	1%	57
2005	5%	63%	19%	1%	12%	0%	57
2006	1%	23%	69%	5%	1%	2%	181
2007	1%	17%	61%	0%	16%	6%	127
2008	4%	58%	31%	4%	1%	2%	59
2009	1%	48%	47%	1%	2%	1%	95

Southern stock

Year	*Longline*	*Large mesh trawl*	*Small mesh trawl*	*Sink gillnet*	*Other*	*Total (mt)*
1981	0%	100%	0%	0%	0%	2,715
1982	0%	100%	0%	0%	0%	3,776
1983	0%	100%	0%	0%	0%	3,889
1984	0%	100%	0%	0%	0%	3,910
1985	0%	100%	0%	0%	0%	2,969
1986	0%	100%	0%	0%	0%	3,389
1987	0%	99%	0%	0%	1%	3,313
1988	0%	99%	0%	0%	1%	3,462
1989	0%	1%	98%	0%	0%	5,006
1990	0%	28%	71%	0%	1%	4,748
1991	0%	17%	82%	0%	1%	2,612
1992	0%	12%	88%	0%	0%	6,343
1993	0%	1%	99%	0%	0%	5,308
1994	0%	2%	95%	0%	3%	1,720
1995	0%	3%	95%	0%	2%	1,329
1996	0%	3%	91%	0%	5%	380
1997	0%	12%	85%	0%	3%	2,423
1998	0%	0%	99%	0%	1%	740
1999	0%	0%	93%	0%	6%	1,060
2000	0%	5%	47%	0%	47%	250
2001	1%	0%	72%	0%	27%	138
2002	0%	0%	92%	0%	8%	327
2003	0%	14%	83%	0%	3%	345
2004	0%	18%	77%	0%	5%	616
2005	0%	13%	81%	0%	6%	1,007
2006	0%	15%	70%	0%	15%	674
2007	0%	8%	90%	0%	1%	1,545
2008	1%	14%	78%	0%	7%	814
2009	1%	16%	76%	0%	0	869

Figure 3. Trends in length composition of red hake from the spring survey.

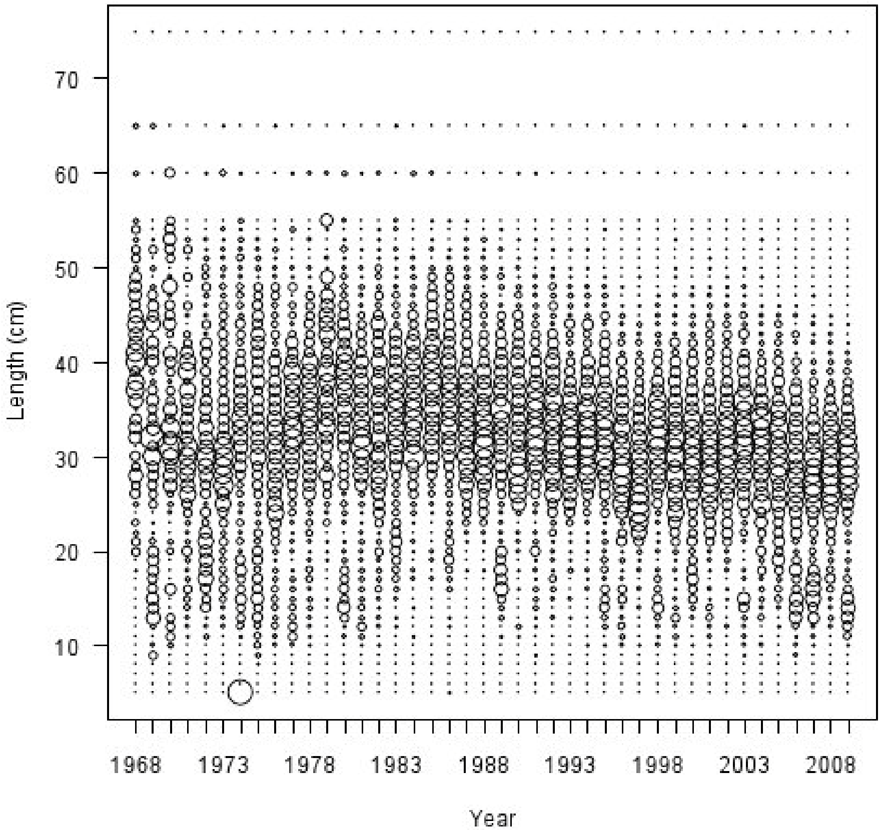
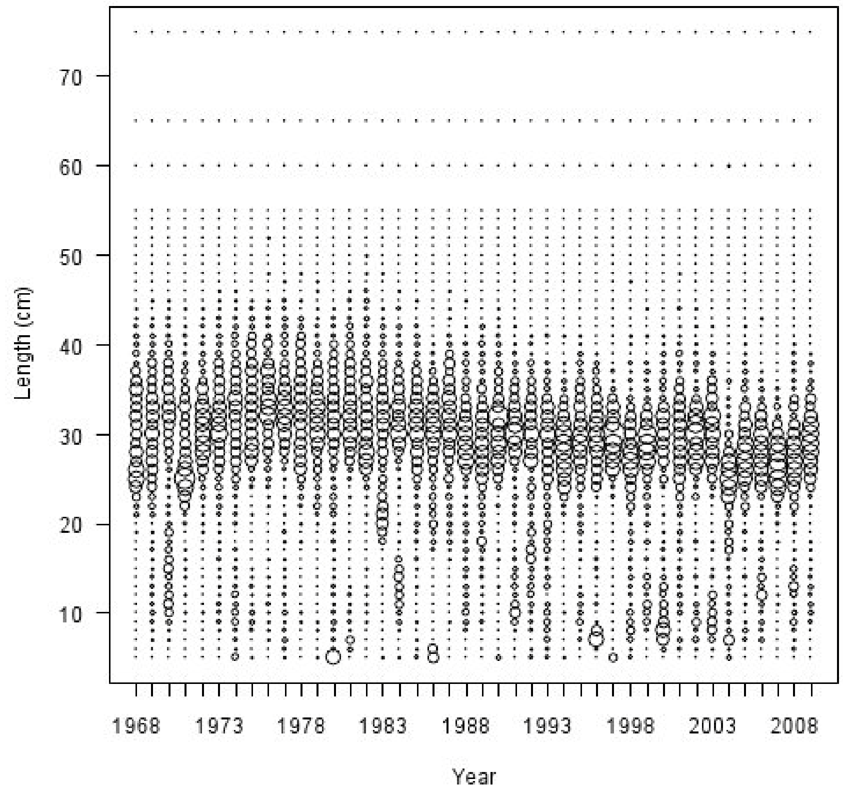
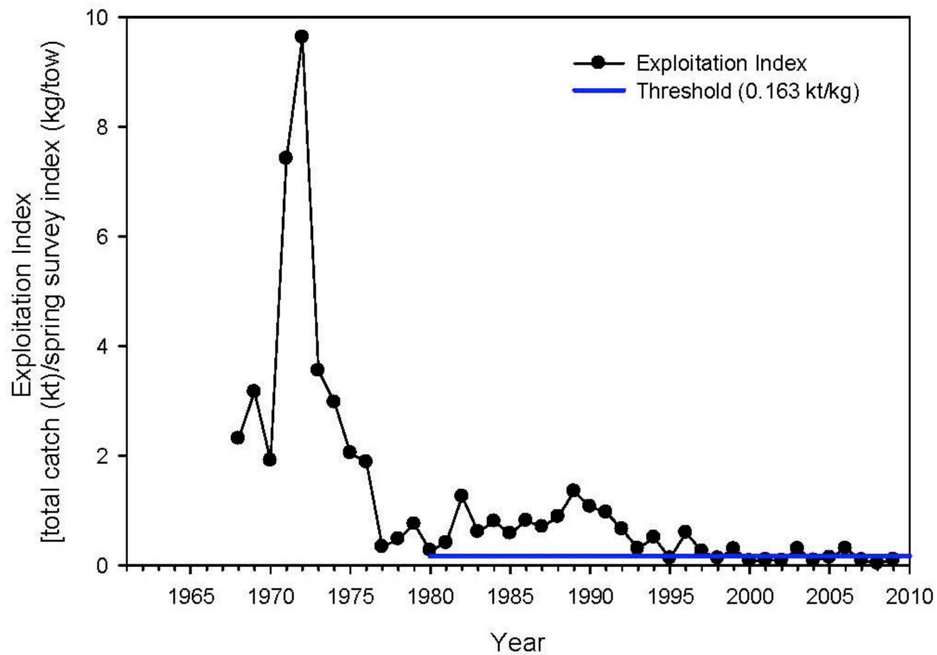
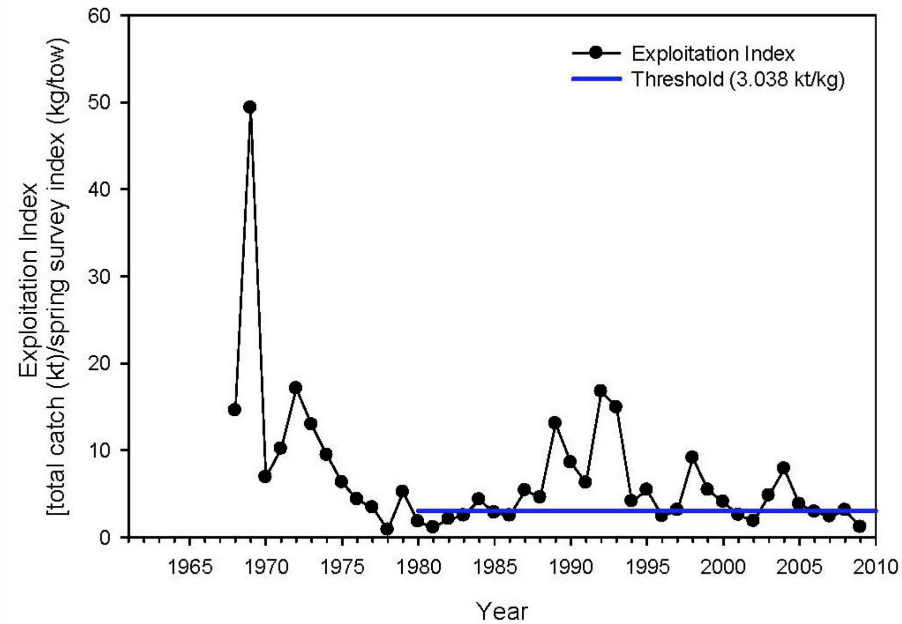
Northern stock	**Southern stock**
	

Figure 4. Exploitation indices (spring survey) and newly proposed overfishing threshold for red hake.

Northern stock



Southern stock



4.3 Offshore hake

4.3.1 Stock Distribution and Identification

Offshore hake are distributed off the continental slope of the northwest Atlantic and southward to the Caribbean and the Gulf of Mexico (Chang et al 1999). They are found from southern Georges Bank through the Mid-Atlantic Bight at depths ranging from 160-550 meters (Bigelow and Schroeder 1953, Klein-MacPhee 2002). Offshore hake and silver hake (*M. bilinearis*) are sympatric over a considerable range of the continental slope, but are often separated by depth (Helser 1996). Due to their similar morphology and spatial overlap, they have been misidentified for years. The fishing industry did not separate the commercial landings of the two species until 1991, and the extent to which they are still landed as a single species is uncertain (Helser 1996).

4.3.2 Catches

Nominal offshore hake commercial landings, which have only been reported since 1991, have varied from 120 mt in the early 1990s to less than 5 mt in 2001-2002, the lowest in the time series. Landings and catches data are uncertain because landings of hakes (silver, offshore and red hake) were not reported by species until 1991. Those that are reported may not be identified correctly (Garcia-Vazquez et al., 2009). Two models (length-based and a depth-based) were developed to estimate the proportion of offshore hake landed from the total mixed hake landings based on species composition in the NEFSC trawl surveys. The two model estimates were similar, both were much higher than the nominal landings, and the higher estimates were used in this assessment. Landings (Table 7) may have been as high as 25,000 mt in the 1960s and have averaged 300-600 mt over the last decade, which is much greater than the 13 mt indicated from nominal landings. Nearly all landings come from commercial trips on vessels using trawls (Table 8).

Discards from the longline and sink gill net fishery were minimal for silver and offshore hake (Table 8). Discards from the otter trawl fisheries have been significant and variable for silver hake. The same problem with species identification that exists with landings also exists with discards. There are discards of offshore hake estimated for the north but because the geographical distribution of offshore hake is limited to the southern stock of silver hake, any discards from the northern stock are assumed to be silver hake. The length-based estimator was used to separate hake discards by species for the southern region.

4.3.3 Data and Assessment

Data used in the assessment include survey indices from the NEFSC fall survey, landings and discards. Models were utilized to apportion the landings and discards into hake species. A length-based landings model used the catch-at-length for silver hake and the proportion of offshore hake at length from the survey to apportion catch. A depth-based landings model used VMS data and depth-based logistic functions from the survey to apportion landings. The NEFSC bottom trawl survey switched from the FRV *Albatross IV* to the FSV *Bigelow* in spring 2009. Survey data given here are in "*Albatross IV*" units.

Two assessment models were attempted, An Index Method (AIM) and Survival Estimation in Non-Equilibrium Situations Model (SEINE). Neither model was considered adequate for management. Trends in catch and the exploitation ratio are shown in Figure 5.

Table 7. Offshore hake landings, catch and survey biomass (Source: NEFSC 2011).

				NEFSC Survey	
Year	*Catch (mt)*	*Pct DWF landings*	*Pct discards*	*Fall (kg/tow)*	*Spring (kg/tow)*
1963	3956.8				
1964	6506.4				
1965	13013.8				
1966	8951.9				
1967	3866.4			0.11	
1968	339.4			0.19	0.06
1969	670.3			0.14	0.11
1970	680.2			0.11	0.28
1971	1383.7			0.06	0.16
1972	6175.7			0.69	0.45
1973	2514.8			0.1	0.81
1974	7467.5			0.22	1.06
1975	2088.7			0.27	0.65
1976	4132.8			0.61	0.94
1977	2148.1			0.35	0.71
1978	1298			0.54	1.38
1979	1976.9			0.23	1.73
1980	1862.4			0.33	4.61
1981	1497.6			1.41	0.85
1982	542.4			0.04	0.55
1983	417.7			0.14	0.33
1984	328.1			0.11	0.14
1985	455.2			0.48	0.51
1986	549.8			0.26	0.45
1987	692.4			0.19	0.53
1988	373.9			0.12	0.14
1989	502.8		0%	0.2	0.28
1990	811.2		0%	0.39	0.21
1991	936		0%	0.14	0.6
1992	494.1		0%	0.15	0.24
1993	631.1		0%	0.11	0.08
1994	147.8		0%	0.01	0.03
1995	218.7		0%	0.14	0.03
1996	506.2		0%	0.11	0.05
1997	256.1		1%	0.11	0.06
1998	276.8		63%	0.09	0.06
1999	172.5		1%	0.03	0.03
2000	307.6		0%	0.04	0.13
2001	649.1		2%	0.48	0.14
2002	479.2		31%	0.2	0.34
2003	639.2		0%	0.54	0.24
2004	540.4		1%	0.06	0.14
2005	293.1		2%	0.03	0.05
2006	85.4		5%	0.14	0.02
2007	296.3		7%	0.3	0.21
2008	97		1%	0.11	0.07
2009	156.4		16%	0.14	0.08

Table 8. Offshore hake catch percent by gear type for Southern Georges Bank, Southern New England, and the Mid-Atlantic region (Source: NEFSC 2011).

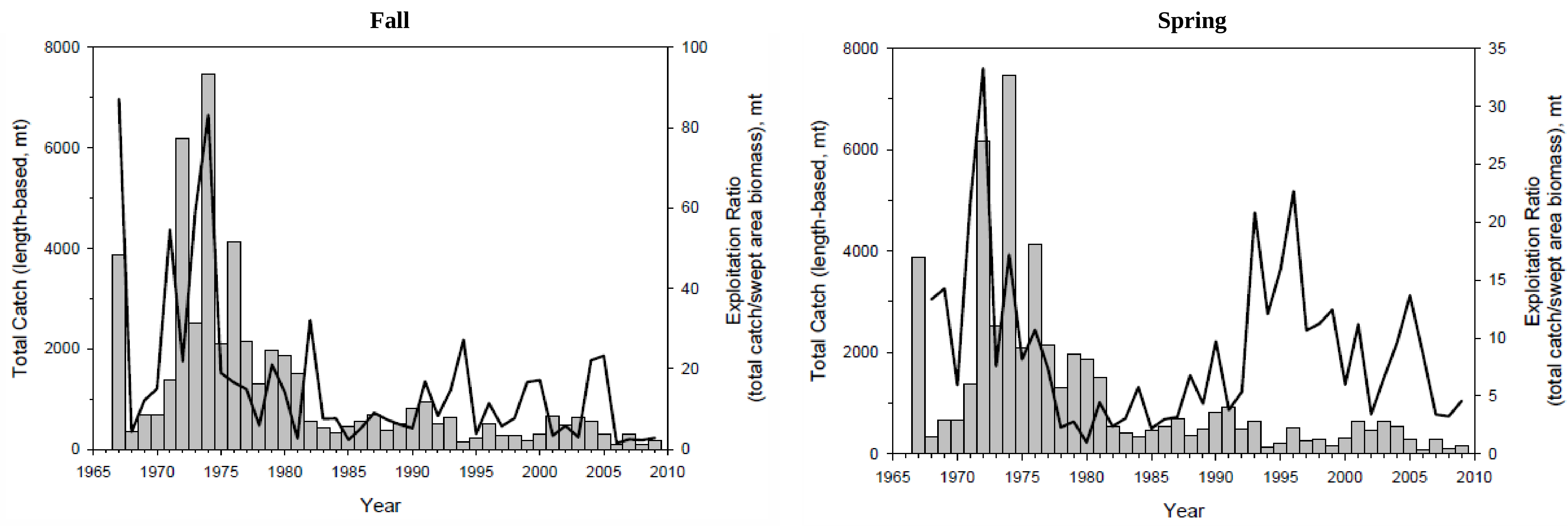
Landings

Year	Longline	Fish trawl	Sink gillnet	Other	Total (mt)
1991	0%	100%	0%	0%	30
1992	0%	100%	0%	0%	119
1993	0%	100%	0%	0%	98
1994	0%	100%	0%	0%	115
1995	0%	64%	0%	36%	71
1996	0%	100%	0%	0%	67
1997	0%	100%	0%	0%	22
1998	0%	100%	0%	0%	5
1999	0%	100%	0%	0%	7
2000	0%	100%	0%	0%	4
2001	0%	100%	0%	0%	2
2002	0%	100%	0%	0%	6
2003	0%	100%	0%	0%	10
2004	0%	99%	0%	1%	23
2005	0%	35%	0%	65%	12
2006	0%	97%	0%	3%	37
2007	2%	96%	0%	2%	12
2008	0%	95%	0%	5%	21
2009	1%	92%	0%	7%	17

Discards

Year	Large mesh trawl	Small mesh trawl	Sink gillnet	Scallop dredge	Total (mt)
1989					0
1990					0
1991					0
1992					0
1993					0
1994					0
1995	0%	0%	0%	100%	0
1996					0
1997	0%	55%	1%	44%	3
1998	0%	98%	0%	2%	174
1999	0%	67%	0%	33%	2
2000	56%	38%	0%	5%	1
2001	1%	99%	0%	0%	10
2002	0%	98%	0%	2%	146
2003	0%	0%	0%	100%	2
2004	1%	62%	0%	37%	5
2005	0%	100%	0%	0%	6
2006	9%	91%	0%	0%	5
2007	6%	94%	0%	0%	21
2008	96%	1%	0%	3%	1
2009	21%	79%	0%	0%	26

Figure 5. Exploitation ratios for total catch (total catch/swept area biomass) for offshore hake (Source: NEFSC 2011).



5.0 Special ecosystem considerations

5.1 Consumption of Hakes

Food habits were evaluated for a wide range (14) of fish predators that eat silver hake and commonly occur in NEFSC bottom trawl surveys. The amount of food eaten and the type of food eaten were the primary food habits data examined. From these data, per capita consumption, total consumption of silver hake, and an estimate of the amount of silver hake removed by these fish predators were calculated. Combined with abundance estimates of these predators, an amount of silver hake removed by these predators was then calculated. Consumption estimates of silver hake were presented as an estimate that is biased towards conservative values because consumption by birds, marine mammals, large pelagic fish and organisms outside of the survey area were not included. Moreover, swept-area biomass estimates for many of predators were based on bottom trawl survey data (without adjustments for bottom trawl catchability), although stock assessment results were used for some predators, such that predator abundance estimates and associated silver hake consumption would be mostly underestimates as well. Based upon length frequencies of silver hakes in the stomachs, these estimates of consumptive removals were then partitioned into size (age) classes (with age 0s being omitted) and used as an input matrix into the assessment model (ASAP).

Results suggest that even these conservative estimates of consumption by fish predators were relatively large compared to recent landings and discards. That is, estimated consumption of silver hake is on the same order of magnitude or one order or magnitude higher as estimates of silver hake stock catch. These estimates of consumption of silver hake also exhibit similar trends as landings estimates, until recent years. Estimates of predatory removal of silver hake via consumption are likely conservative given nature of these consumption estimates, but are at least 5-10x higher than catches. These consumption estimates should be useful to inform both the scaling of biomass estimates and the magnitude of mortalities for silver hake. These estimates are also likely to be quite informative to the dynamics of silver hake, as they represent a major source of removals and internal dynamics (cannibalism) that is being accounted for.

Similar efforts, but with less detailed analyses, were executed for red hake, but insufficient information was extant for offshore hake. Similar, but less pronounced results were observed for red hake landings and consumption.

- High consumption (M2) compared to catch increases uncertainty of natural mortality (M1)
- These consumption estimates are also likely to be quite informative to the dynamics of silver hake, as they represent a major source of removals and internal dynamics (cannibalism) that is being accounted for.
- These consumption estimates are conservative because other important predation by birds, marine mammals, etc. have not been estimated. Uncertainty in consumption estimates is not available, but it appears that consumption is higher than catch since 1980.
- The silver hake OFL and MSY estimates are based on fishery catch only and do not include removals due to consumption. Therefore the Council should not add further consideration of scientific uncertainty into the OFL due to uncertainty and annual variation in consumption estimates.

Table 9. Species of consistent silver hake predators. Whether abundances were estimated from recent stock assessments (SA) or swept area (SWA) from surveys are noted, as is the resolution of the diet data (all predators were presented as two year averages). *Pollock was ultimately excluded from the analyses due to an excessive degree of variability in diet composition comprised of silver hake.

Common Name	**Species Name**	**Assessment or Swept Area**	**Diet Resolution**
Spiny dogfish	*Squalusa canthias*	SWA	2yr
Little skate	*Raja ocellata*	SWA	2yr
Winter skate	*Raja erinacea*	SWA	2yr
Thorny skate	*Raja radiata*	SWA	2yr
Silver Hake	*Merluccius bilinearis*	SWA	2yr
Atlantic cod	*Gadus morhua*	SA	2yr
Pollock*	*Pollachius virens*	SA	2yr
Red hake	*Urophycis chuss*	SWA	2yr
White hake	*Urophycis tenuis*	SWA	2yr
Fourspot flounder	*Paralichthys oblongus*	SWA	2yr
Summer Flounder	*Paralichthys dentatus*	SA	2yr
Windowpane	*Scophthalmus aquosus*	SWA	2yr
Bluefish	*Pomatomuss altatrix*	SA	2yr
Goosefish	*Lophius americanus*	SA	2yr

Table 10. Proportion of all silver hake lengths in all predators of silver hake at size, in 5 cm size classes.

Year	<5	5-10	11-15	16-20	21-25	26-30	31-35	36-40	41-45
1973	0.053	0.263	0.316	0.211	0.053	0	0.105	0	0
1974	0	0.067	0.467	0.2	0.067	0.2	0	0	0
1975	0.667	0.333	0	0	0	0	0	0	0
1976	0.231	0.308	0.231	0.154	0	0.077	0	0	0
1977	0.759	0.034	0	0.034	0.103	0.034	0.034	0	0
1978	0.776	0.096	0.032	0.032	0.016	0.016	0.032	0	0
1979	0.053	0.105	0.316	0.263	0.105	0.053	0.053	0.053	0
1980	0	0.071	0.143	0.214	0.143	0.214	0	0.143	0.071
1981	0.143	0	0	0.143	0.571	0.143	0	0	0
1982	0.094	0.156	0.156	0.125	0.188	0.094	0.156	0.031	0
1983	0	0.054	0.405	0.189	0.216	0.081	0.054	0	0
1984	0.216	0.081	0.054	0.135	0.297	0.162	0.027	0.027	0
1985	0.106	0.187	0.211	0.154	0.203	0.098	0.024	0.008	0.008
1986	0.055	0.097	0.29	0.255	0.166	0.103	0.028	0.007	0
1987	0.06	0.048	0.048	0.145	0.434	0.241	0.024	0	0
1988	0.143	0.446	0.286	0.012	0.042	0.036	0.024	0.006	0
1989	0.08	0.492	0.174	0.148	0.061	0.035	0.01	0	0
1990	0.227	0.241	0.124	0.149	0.188	0.057	0.007	0.007	0
1991	0.157	0.442	0.235	0.078	0.041	0.046	0	0	0
1992	0.129	0.3	0.229	0.194	0.077	0.06	0.011	0	0
1993	0.176	0.127	0.337	0.173	0.15	0.037	0	0	0
1994	0.159	0.37	0.077	0.159	0.183	0.053	0	0	0
1995	0.056	0.222	0.268	0.193	0.18	0.072	0.007	0	0.003
1996	0.09	0.244	0.167	0.141	0.256	0.103	0	0	0
1997	0.183	0.639	0.063	0.042	0.037	0.021	0.005	0	0
1998	0.106	0.229	0.402	0.162	0.067	0.022	0.006	0	0.006
1999	0.047	0.253	0.24	0.197	0.219	0.039	0.004	0	0
2000	0.246	0.192	0.069	0.277	0.177	0.038	0	0	0
2001	0.099	0.441	0.053	0.138	0.211	0.039	0.007	0.013	0
2002	0.108	0.313	0.325	0.06	0.12	0.06	0	0	0
2003	0.095	0.23	0.459	0.135	0.041	0.034	0	0.007	0
2004	0.013	0.227	0.16	0.213	0.28	0.107	0	0	0
2005	0.133	0.167	0.1	0.3	0.267	0.033	0	0	0
2006	0.115	0.462	0.115	0.038	0.192	0.038	0.038	0	0
2007	0.186	0.116	0.209	0.163	0.186	0.093	0.047	0	0
2008	0.075	0.275	0.1	0.125	0.325	0.1	0	0	0
2009	0.036	0.384	0.268	0.08	0.125	0.08	0.027	0	0

Figure 6. Estimates of total silver hake biomass removed, as that consumed by major fish predators and total catch in the fishery.

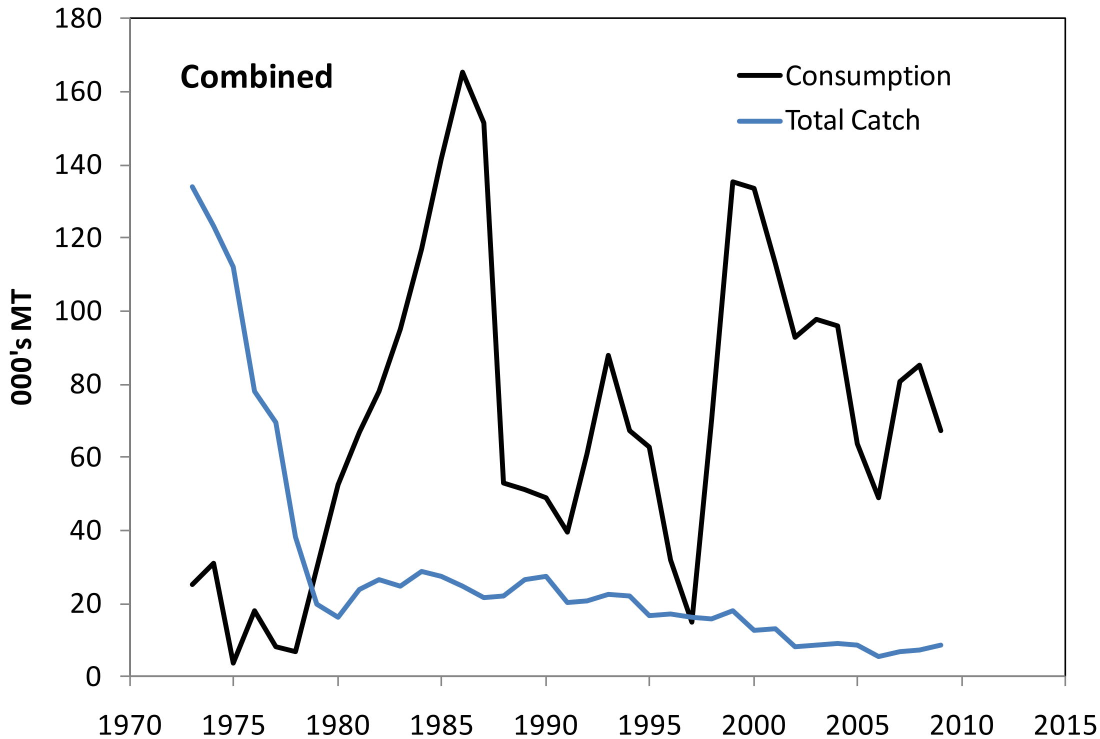
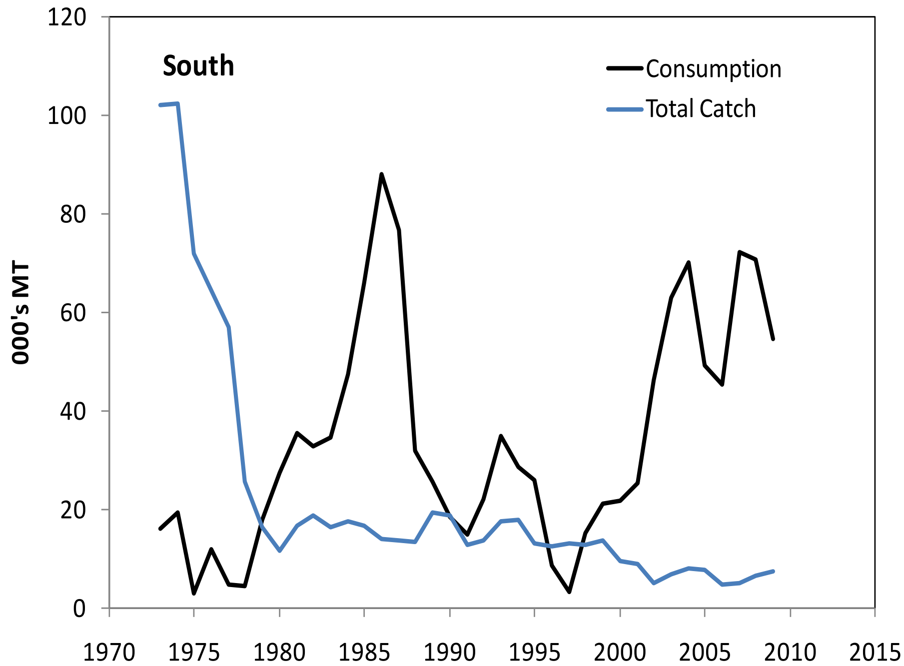


Figure 7. Estimates of total silver hake biomass removed, as that consumed by major fish predators and total catch in the fishery for the north (top) and south (bottom) stocks.



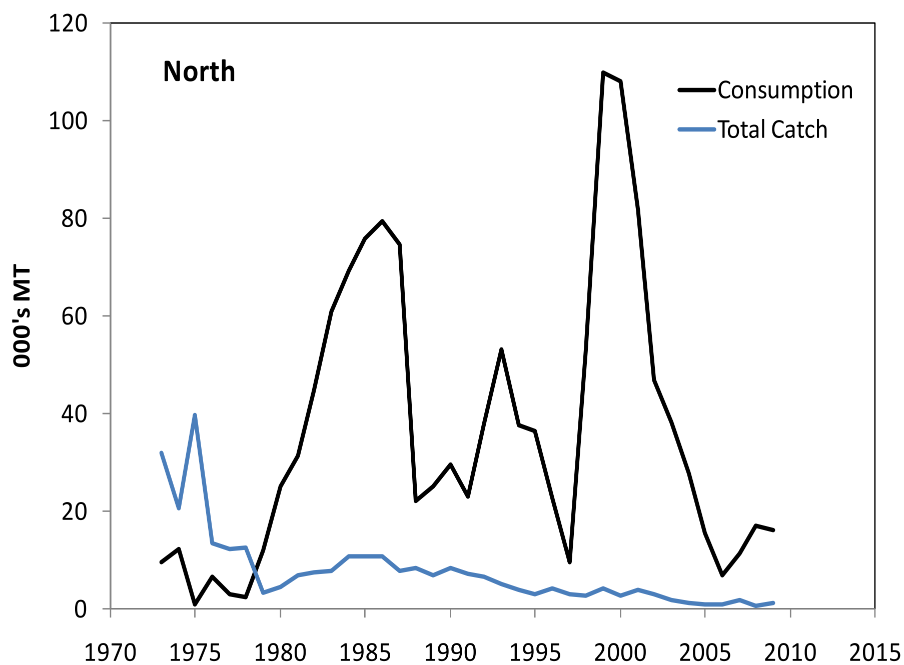


Figure 8. Proportion of total consumption by size classes of silver hake eaten by the predators in this study.

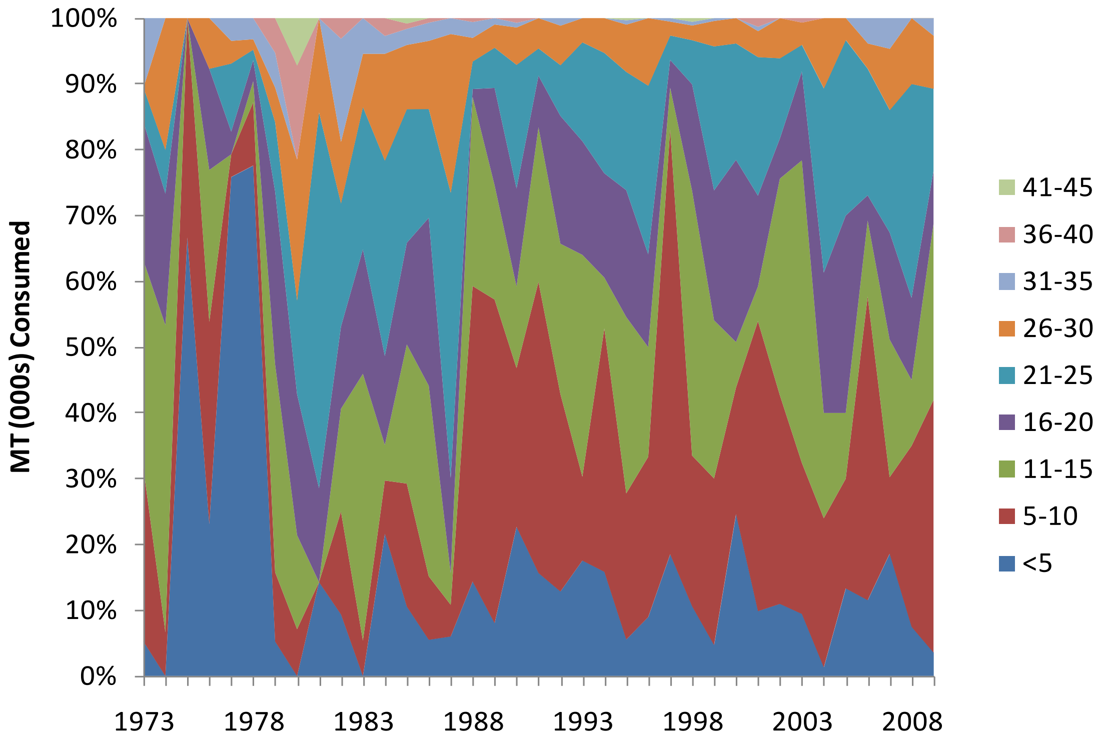
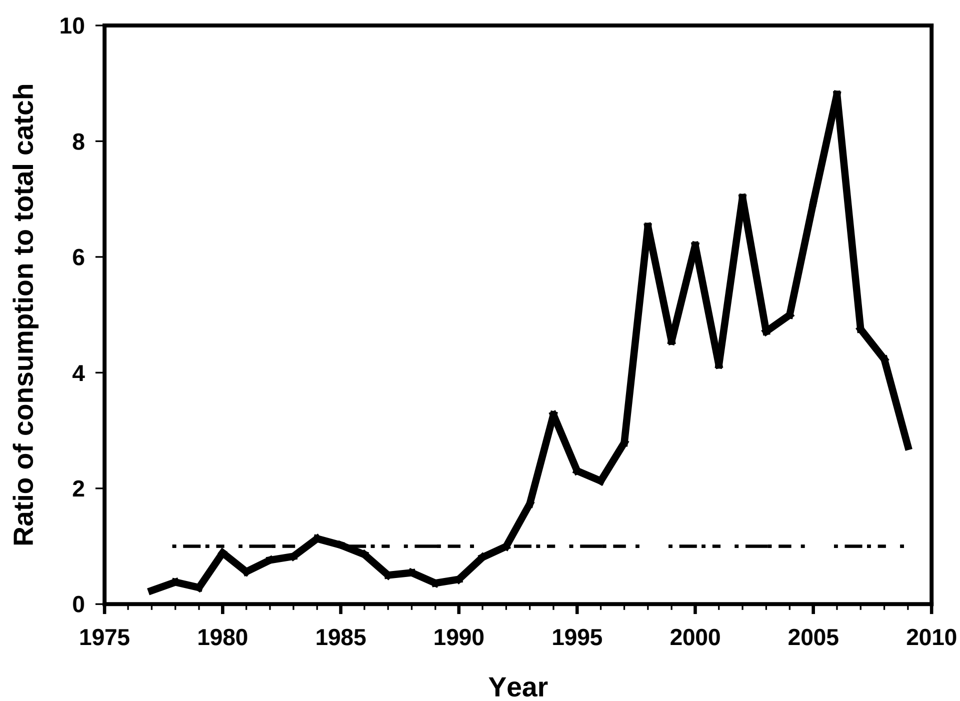


Figure 9. Ratio of consumption landings of red hake. Dashed line is at one.



6.0 Sources of uncertainty

6.1 Sources of scientific uncertainty

Common uncertainties about the stock and population size also apply to hakes. Because the lack of analytical model available for any of the hakes, the, scientific uncertainty for the hakes is on the higher end of the usual spectrum, and difficult to quantify..

In addition, scientific data (either commercial catch or survey catch) appear to be unreliable to manage offshore hake as a separate stock. Thus there is little to base conclusions about trends in population size and health.

The following sources of scientific uncertainty apply to hakes:

- Discards
- Unreported landings
- Inaccurate reporting of hake landings (i.e. mixed hake landings)
- Stock structure
- Annual variation/Environmental variability
- Survey sampling error
- Model error
- Retrospective pattern (No model to provide estimate)
- Consumption estimates
- Offshore hake distribution

6.2 Sources of Management Uncertainty

It is difficult to quantify management uncertainty except through several years of observation under a stable management system or through MSE models that accurately predict fishing behavior and response to regulation. Since neither of these factors exist for hakes, a qualitative assessment of management uncertainty and risk is necessary which the Council must balance against the long term cost of harvesting less than MSY. Population projections at various fishing levels are unavailable because no analytic assessment is available. To account for this and examine how the various ABC setting methods would perform, the PDT provided ABC estimates based on the historic variation in the survey biomass indices, represented by adding and subtracting one standard deviation of the three year moving average for survey biomass from the 2010 value.

The table below describes types of management uncertainty that apply to the Northeast US whiting fishery with respect to the potential for exceeding ACLs. These uncertainties range from unreported landings and unregulated (or lightly regulated fishing) to uncertainties about catch, with comments about how these uncertainties arise and how the Council might address them. Some may seem like scientific uncertainty, but the errors associated with the uncertainties arise from issues that can be addressed by management.

The Council should take these issues into account in setting an ACL buffer to account for management uncertainty.

Table 11. Sources and assessment of management uncertainty for hake stocks.

Type of Uncertainty	Degree of problem	Risk	Comments	Solution to reduce degree or risk of uncertainty
Unregulated and illegal fishing	Low	Low	1. No foreign or JV fishing exists in the EEZ. 2. Catch by state-registered vessels could be considered a form of unregulated fishing when there are no compatible regulations or limits. 3. Landings exceeding possession limits	1. Timely reports of state landings and discard estimation. 2. State water landings could be counted against the ACL, rather than being an assumed fraction.
Landings by Federally-permitted vessels	Very low	Very low	4. Landings may be mis-reported, particularly during directed fishery closures 5. No-sale fish which are landed, but not sold 6. Unreported bait sales 7. UFPC sales	3. Rely on easy to enforce measures.
Discard estimation error	Moderate	Low	8. Sub-sampled trips may be biased or are of insufficient sampling frequency	4. Risk can be reduced by incorporating estimated variance in estimates. 5. Error can be reduced by increasing frequency of observed trips.
Discard variability and estimation error	Moderate	Moderate	9. Assumed discards fail to adequately apply to future catches 10. Existing discard estimates have uncertainty due to subsampling the commercial catch	6. More frequent estimation and real-time monitoring of discards
Open access fishing	Moderate	High	11. Any vessel with a NE Multispecies FMP permit may fish for hakes, far too many for the current hake possession limits if more vessels begin targeting	7. Limit the type and number of vessels that may target hake in Federal waters

			hakes 12. Low prices and limited markets have kept a lid on landings since 2002 when the possession limits became effective.	
Species identification	Low	Low	13. Landings of offshore hake are often mis-identified as silver hake and small red hake are difficult to distinguish from white hake.	8. Subsampling landings to identify species, or other programs to encourage fishermen and processors to separate and report landings would reduce uncertainty.

7.0 Maximum Sustainable Yield (MSY) and Overfishing Level (OFL)

The benchmark assessment (NEFSC 2011) proposed new overfishing definitions based on MSY proxy estimates. The PDT assumes that the OFL is equivalent to applying the F_{msy} proxy to the current survey biomass using a three year moving average.

In the absence of an agreed ASAP model run, the proposed new overfishing definition for northern and southern silver hake stocks are:

> *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. Catch per tow is in “Albatross” units.

The proposed new overfishing definition for northern and southern red hake stocks are:

> *Red hake is overfished when the three-year moving arithmetic average of the spring survey weight per tow (i.e., the biomass threshold) is less than one half of the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1980 – 2010. The current estimates of $B_{THRESHOLD}$ for the northern and southern stocks are 1.27 kg/tow and 0.51 kg/tow, respectively.*
>
> *Overfishing occurs when the ratio between catch and spring survey biomass exceeds 0.163 kt/kg and 3.038 kt/kg, respectively, derived from AIM analyses from 1980-2009.*

To estimate MSY, the benchmark assessment applied the F_{MSY} proxy to the B_{MSY} proxy to estimate MSY equal to 412 mt for the northern stock and 3,086 mt for the southern stock. Catch per tow is in “Albatross” units.

The 80% confidence interval around the F_{MSY} proxy for the north is 0.062 - 0.240 kt/kg/tow and for the south is 2.240 - 3.700 kt/kg/tow.

For offshore hake, the benchmark assessment (NEFSC 2011) proposed no overfishing definition. So no OFL can therefore be estimated with currently available data.

8.0 Options for setting ABC for stocks with index based assessments

For red and silver hake, the Whiting PDT considered and developed three potential methods for setting hake ABCs, using data and analysis from the benchmark assessment (NEFSC 2011). Examples are given below for each stock based on the estimated uncertainty of F_{msy}-proxy and uncertainty about the survey biomass index. To demonstrate the effect that rising and falling stock biomass and possible assumptions about future stock biomass would have on ABC method results, the PDT also included ABC estimates assuming that the three year moving average was one standard deviation (of the time series of three year moving biomass averages) higher or lower than the 2010 estimate.

Amendment 19 is expected to become effective for the 2012 fishing year and by that time the spring 2011 biomass index will be available for setting the ABC based on 2009-2011 survey data for red hake. This information should also be available for the Draft Amendment slated for Council approval in September 2011. Since none of the stocks are overfished, the Whiting PDT anticipates that the Council will approve a three year specification cycle.

One approach to accommodate a three year specification is to assume that the next year's survey data biomass index will equal the last available year, while the first year in the series is dropped. So for 2012, the three year biomass index, OFL and ABC estimates would use 2009-2011 data, while for 2013 the specifications would use 2010 and two years of 2011 data (if available). The third year of specifications could be based on the 2011 index only, or be the same as the specifications for 2012. To represent the response of the three methods to changes in future stock biomass, the Whiting PDT estimated the associated ABCs assuming that the biomass changes by an amount equivalent to one standard deviation estimated from the entire survey biomass time series.

8.1 Description of method options

Method 1 – 75% of F_{msy}

Method 1 assumed a constant fraction of F_{msy} as a buffer to account for scientific uncertainty, for example 75% of F_{msy}. This buffer would apply across all hake stocks. In actuality, the buffer would account for various amounts of scientific uncertainty for each stock because the amount of scientific uncertainty is less for assessment with more precision, and vice versa. This approach would be the simplest approach for an index based stock with an exploitation ratio threshold that serves as a proxy for F_{msy}.

This method is currently used for groundfish and skate stocks in the absence of what an appropriate buffer should be between OFL and ABC. This approach however does not offer a robust statistical measure of uncertainty.

Method 2 – constant percentile of OFL

Method 2 was based on uncertainty in both the F_{msy} proxy and on stock biomass distributions. Sources of uncertainty for F_{msy} would include variation in estimation of fishery removals (landings and discards), whereas, precision of the survey biomass indices can vary over time due to the number of tows and the variation in catch. Scientific uncertainty would be reassessed during each specification cycle for which the ABC would be based on a 25th percentile (or an alternative level) of the OFL distribution.

'Method 2' would be implemented by the following three steps:

1. SSC determines an appropriate level for ABC.

    - For example, the SSC determines that setting the ABC at the 25^{th} percentile of the OFL as a precautionary approach, based on scientific uncertainty that is appropriate for hake stocks with an index based OFL.

2. The corresponding ABC will be based on the 25th percentile (or another percentile established by the SSC) of the current OFL (which itself accounts for uncertainty on F_{msy} proxy and the survey biomass estimate) derived from the cumulative frequency distribution. The ABC control rule would state that ABC is based equal to the value associated with the appropriate percentile on the cumulative frequency distribution of the estimated OFL.

    - In the above example, the 25th percentile for OFL (applying F_{msy} proxy to the 2008-2010 average survey biomass) corresponds to 2,435 mt for the southern red hake stock and 32,350 mt for the northern silver hake stock.

3. Each year, the cumulative frequency distribution for the OFL would be re-calculated based on the distribution of the mean and variance of the survey in the most recent three year period. The ABC would be set at the 25^{th} percentile (or an alternative level approved by the SSC) of the OFL distribution (i.e., repeat step 2 at the 25^{th} percentile.).

<u>Method 3 – constant fraction of OFL based on F_{msy} proxy uncertainty</u>

Similar to Method 2, the scientific uncertainty in the F_{msy} proxy was be estimated and an acceptable level of preventing overfishing (e.g. 75%) would be chosen. But instead of the process for Method 2 described above, the ABC would be expressed as a constant fraction of the OFL which itself would be specified on an annual basis using the three year average survey biomass. For stocks with more precise estimates of F_{msy} proxy, a higher than 75% of OFL could be set as the ABC, and vice versa. For future specifications, ABC as a fraction of OFL would not change unless a new reference point for overfishing was adopted.

'Method 3' in the table would be implemented by the following four steps:

1. SSC determines an appropriate risk level. For example, the SSC determines that a 25^{th} percentile of the F_{msy} proxy is acceptable for hake stocks with an index based OFL. For each stock (each stock having a different level of estimated precision of F_{msy} proxy), an F/F_{msy} proxy is calculated which corresponds to this level of risk.

    - For example, the F/ F_{msy} proxy fraction that corresponds to a 25^{th} percentile on the cumulative frequency distribution of F_{msy} proxy, e.g. 70.7% for northern red hake and 87.5% for southern red hake.

2. ABC for each stock is determined as the product of F/F_{msy} proxy and the annual OFL. The ABC control rule would state that "ABC = xx% of OFL for yyy stock."

    - As an example for southern red hake, 88% of the OFL based on 2008-2010 survey data is 2,538 mt.

3. For each stock, subsequent specifications would simply calculate ABC as a constant fraction of OFL.

- For example, if it was determined that the 2012 OFL was 3,200 mt, the 2012 ABC would equal 2,800 mt (87.5% x 3,200 mt)

8.2 Application to silver hake

Estimating Uncertainty in Overfishing Levels

In the absence of an analytical model, multiyear projections for both stocks of silver hake were not feasible. However, the SARC 51 panel reviewers recommended the previous approach that uses the 3-yr moving average of the fall survey biomass and exploitation ratios to determine stock status for the northern and southern stock of silver hake. Additionally, reference points were updated such that the fall survey arithmetic mean weight per tow (kg/tow) was used rather than the previous delta stratified mean weights and the relative exploitation rates is now based on total catch (landings + discards) rather than landings only. The catch and survey indices for each stock are summarized in Tables 8.1-1and 8.1-2. Based on the new reference points and updated survey indices, the OFL for both stocks of silver hake were derived by applying the most recent 3-year average fall biomass survey from 2008-2010 to the F_{msy} proxy (OFL=F_{msy}*2010 fall survey biomass (2008-2010 moving average)). The implied 2010 OFL for the northern and southern stocks of silver hake were estimated at 23,600 mt and 60,120 mt respectively (Table 12 and Table 13; Figure 10).

Uncertainty in the OFLs for both the northern and southern stocks of silver hake were estimated as a joint product of the probability distribution between the F_{msy} proxy and the most recent 3-year moving average of the fall survey biomass (2008-2010) assuming a normal error structure for the fall survey. Variance for the fall survey index explicitly incorporates the Bigelow conversion coefficients and standard errors from the calibration experiment (Miller et al 2010) for 2009 and 2010 to approximate the Albatross variance equivalent based on the following relationship:

$$V_{3yravg} = \left[\frac{V\left[I_{ALB}^{2008}\right] + V\left[\frac{I_{HB}^{2009}}{\rho}\right] + V\left[\frac{I_{HB}^{2010}}{\rho}\right]}{3} \right]$$

The variance for the observed indices for each year and vessel was estimated from the expected values $E(I_{vessel}^{yr})$ of the stratified mean weight (kg/tow) and the observed coefficient of variance (CV) as:

$$V(I_{vessel}^{yr}) = (CV * E(I))^2$$

The variances for the 2009 and 2010 Henry B. Bigelow survey indices, calibrated to Albatross IV units (Miller et al 2010) by applying the conversion coefficient (ρ), were estimated using Taylor series expansion in the following relationship:

$$V\left[\frac{I_{HB}^{yr}}{\rho}\right] = \left(\frac{I_{HB}^{yr}}{\rho}\right)^2 \times \left[\frac{V(I_{HB}^{yr})}{(I_{HB}^{yr})^2} + \frac{V(\rho)}{\rho^2}\right]$$

Although survey mean weights were estimated from a length-based based model, the standard errors were derived from the constant model as a proxy for the length-based estimates due to unavailable variance estimates for the length-based calibration approach. A comparison of the aggregated survey mean weights between length-based and constant model approach suggested minimal differences, therefore, the application of the variance from the constant model was assumed to be a reasonable approximation for the length-based model.

Probability distributions for Relative F (F_{msy} proxy) were obtained from lognormal distribution of the mean and variance. The normal distribution of the mean and variance was attempted but deemed less desirable due to the large variances in the F_{msy} proxy and distribution of relative F estimates less than zero for the northern and southern stock areas. The large variances can be explained by the substantial decline in catches (i.e. low exploitation ratio) between the late 1970's and early 1980s when the departure of the foreign fleets occurred (Figure 10).

In recent years, exploitation has been low and relatively stable with the exception in the south during ht 1990's and 2000's when relative F increased briefly and then declined due to a decline in the survey biomass relative to silver hake catch. Although the transition from the 1970's to the 1980's highlight high and low productivity in the stock dynamics, this resulted in high estimates of OFLs with wide variances for both northern and southern stock of silver hake.

Figure 10. OFL estimates and 95% CI based on 10 moving averages in the FMSY and fall survey index from 2008-2010 for both the northern and southern stock of silver hake. The symbol * represents baseline OFL derived from the SARC 51 recommended $F_{threshold}$ (average 1973-1982).

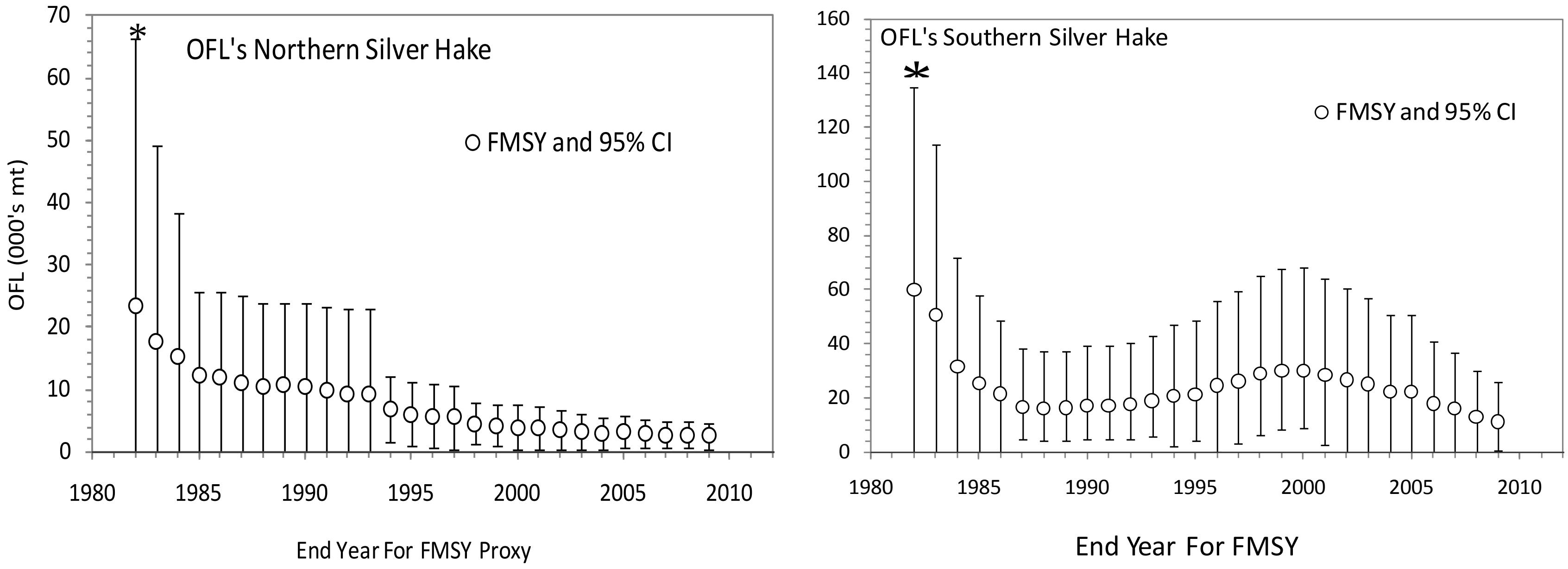


Table 12. Summary of catch and survey indices in Albatross units for northern silver hake, 1955-2010

Silver Hake northern Stock

Year	Northern Fall Survey (arithmetic kg/tow	Northern Fall Survey (3-year average)	Northern Landings (000'smt)	Northern Discards (000's mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 year avg)
1955			53.36		53.36		
1956			42.15		42.15	3-yr Survey (08-10) kg/tow	8.50
1957			62.75		62.75		
1958			49.90		49.90	FMSY Proxy (kt/kg)	2.77
1959			50.61		50.61		
1960			45.54		45.54	OFL (000's mt)	23.60
1961			39.69		39.69		
1962			79.00		79.00		
1963	23.10		73.92		73.92	3.20	
1964	4.34		94.46		94.46	21.77	
1965	7.06	11.50	45.28		45.28	6.41	10.46
1966	4.19	5.20	47.81		47.81	11.41	13.20
1967	2.27	4.51	33.37		33.37	14.70	10.84
1968	2.28	2.91	41.38		41.38	18.15	14.75
1969	2.41	2.32	24.06		24.06	9.98	14.28
1970	3.03	2.57	27.53		27.53	9.09	12.41
1971	2.67	2.70	36.40		36.40	13.63	10.90
1972	5.78	3.83	25.22		25.22	4.36	9.03
1973	4.12	4.19	32.09		32.09	7.79	8.60
1974	3.45	4.45	20.68		20.68	5.99	6.05
1975	8.09	5.22	39.87		39.87	4.93	6.24
1976	11.25	7.60	13.63		13.63	1.21	4.05
1977	6.72	8.69	12.46		12.46	1.85	2.66
1978	6.32	8.10	12.61		12.61	2.00	1.69
1979	6.18	6.41	3.42		3.42	0.55	1.47
1980	7.23	6.58	4.73		4.73	0.65	1.07
1981	4.52	5.98	4.42	2.64	7.05	1.56	0.92
1982	6.28	6.01	4.66	2.91	7.57	1.21	1.14
1983	8.76	6.52	5.31	2.64	7.95	0.91	1.22
1984	3.36	6.13	8.29	2.59	10.88	3.24	1.78
1985	8.28	6.80	8.30	2.56	10.86	1.31	1.82
1986	13.04	8.23	8.50	2.35	10.86	0.83	1.79
1987	9.79	10.37	5.66	2.11	7.77	0.79	0.98
1988	6.05	9.63	6.79	1.79	8.57	1.42	1.01
1989	10.53	8.79	4.65	2.32	6.96	0.66	0.96
1990	15.61	10.73	6.38	1.96	8.34	0.53	0.87
1991	10.52	12.22	6.06	1.26	7.31	0.69	0.63
1992	10.25	12.13	5.31	1.42	6.73	0.66	0.63
1993	7.50	9.42	4.36	0.69	5.05	0.67	0.67
1994	6.84	8.20	3.90	0.24	4.14	0.61	0.65
1995	12.89	9.08	2.59	0.63	3.22	0.25	0.51
1996	7.57	9.10	3.62	0.82	4.44	0.59	0.48
1997	5.66	8.71	2.80	0.24	3.05	0.54	0.46
1998	18.91	10.71	2.05	0.69	2.74	0.14	0.42
1999	11.15	11.91	3.45	0.74	4.19	0.38	0.35
2000	13.51	14.52	2.59	0.36	2.95	0.22	0.25
2001	8.33	11.00	3.39	0.48	3.87	0.46	0.35
2002	7.99	9.94	2.59	0.51	3.11	0.39	0.36
2003	8.29	8.20	1.81	0.20	2.01	0.24	0.37
2004	3.28	6.52	1.05	0.12	1.16	0.35	0.33
2005	1.72	4.43	0.83	0.06	0.89	0.52	0.37
2006	3.69	2.90	0.90	0.04	0.94	0.26	0.38
2007	6.44	3.95	1.01	0.75	1.76	0.27	0.35
2008	5.27	5.13	0.62	0.17	0.79	0.15	0.23
2009	6.89	6.20	1.04	0.19	1.23	0.18	0.20
2010	13.35	8.50					

Table 13. Summary of Catch and survey indices in Albatross units for southern silver hake, 1955-2010

Silver Hake Southern Stock

Year	Southern Fall Survey (arithmetic kg/tow)	Southern Fall Survey (3-year average)	Southern Landings (000'smt)	Southern Discards (000's mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1955			13.26		13.26		
1956			14.24		14.24		
1957			16.43		16.43		
1958			12.90		12.90		
1959			16.39		16.39		
1960			8.82		8.82		
1961			12.65		12.65		
1962			17.94		17.94		
1963	4.66		89.43		89.43	19.19	
1964	4.06		147.05		147.05	36.22	
1965	5.28	4.67	294.12		294.12	55.70	37.04
1966	2.64	3.99	202.32		202.32	76.64	56.19
1967	2.44	3.45	87.38		87.38	35.81	56.05
1968	2.73	2.60	58.16		58.16	21.30	44.58
1969	1.26	2.14	74.89		74.89	59.44	38.85
1970	1.35	1.78	26.83		26.83	19.88	33.54
1971	2.21	1.61	70.51		70.51	31.90	37.07
1972	2.13	1.90	88.18		88.18	41.40	31.06
1973	1.70	2.01	102.08		102.08	60.05	44.45
1974	0.85	1.56	102.40		102.40	120.47	73.97
1975	1.79	1.45	72.16		72.16	40.32	73.61
1976	1.99	1.54	64.61		64.61	32.47	64.42
1977	1.68	1.82	57.16		57.16	34.02	35.60
1978	2.50	2.06	25.83		25.83	10.33	25.61
1979	1.68	1.95	16.40		16.40	9.76	18.04
1980	1.63	1.94	11.68		11.68	7.17	9.09
1981	1.12	1.48	13.43	3.50	16.93	15.12	10.68
1982	1.56	1.44	14.15	4.65	18.81	12.06	11.45
1983	2.57	1.75	11.86	4.81	16.67	6.49	11.22
1984	1.40	1.84	12.96	4.88	17.84	12.74	10.43
1985	3.55	2.51	12.82	3.87	16.69	4.70	7.98
1986	1.45	2.13	9.70	4.33	14.03	9.68	9.04
1987	1.95	2.32	9.55	4.25	13.80	7.08	7.15
1988	1.78	1.73	8.95	4.50	13.45	7.55	8.10
1989	1.87	1.87	13.00	6.57	19.57	10.46	8.37
1990	1.52	1.72	13.02	5.97	18.99	12.49	10.17
1991	0.85	1.41	9.74	3.08	12.82	15.08	12.68
1992	0.99	1.12	10.53	3.45	13.98	14.12	13.90
1993	1.28	1.04	12.49	5.17	17.65	13.79	14.33
1994	0.79	1.02	12.18	5.94	18.12	22.93	16.95
1995	1.59	1.22	11.99	1.40	13.39	8.42	15.05
1996	0.45	0.94	12.13	0.48	12.61	28.03	19.80
1997	0.83	0.96	12.55	0.62	13.17	15.87	17.44
1998	0.57	0.62	12.56	0.53	13.08	22.95	22.28
1999	0.82	0.74	10.42	3.55	13.97	17.03	18.62
2000	0.72	0.70	9.47	0.33	9.80	13.61	17.87
2001	2.04	1.19	8.88	0.19	9.07	4.45	11.70
2002	1.18	1.31	4.89	0.41	5.30	4.49	7.52
2003	1.42	1.55	6.28	0.60	6.89	4.85	4.60
2004	1.24	1.28	6.97	1.20	8.17	6.59	5.31
2005	0.94	1.20	6.40	1.58	7.97	8.48	6.64
2006	1.42	1.20	4.58	0.16	4.74	3.34	6.14
2007	0.87	1.08	5.07	0.15	5.21	5.99	5.94
2008	1.36	1.22	5.58	1.03	6.62	4.86	4.73
2009	1.10	1.11	6.60	0.84	7.43	6.76	5.87
2010	2.82	1.76					

3-yr Survey (08-10) kg/tow	1.76
FMSY Proxy (kt/kg)	34.18
OFL (000's mt)	60.12

Risk Analyses (Probability of overfishing)

The probability of mortality exceeding the potential choices for F_{msy} from its cumulative distribution (25th, 50th, and 75th percentiles) was estimated (Table 14**,** Figure 11**,** and Figure 12). For each catch scenario, a relative exploitation was calculated at each realization of the survey biomass distribution from the cumulative probability distribution. The probability of F for a given catch exceeded a percentile of F_{msy} was estimated as the sum product of the probability of each relative F exceeding $F_{threshold}$ at given percentile (1 or 0) and the probability of each survey realization.

Application of proposed ABC's Methods for Silver hake

Method 1 (M1): Requires adjusting the F_{msy} proxy by a prescribed specification (e.g. 75% of $F_{threshold}$) and applying the adjustment to the three year moving average of the fall survey. For silver hake, this implies an ABC of 17,700 mt in the north and 45,100 mt in the south, which are all well above the recent catches in both management regions. Based on this method, the risk of mortality exceeding the 25^{th} percentile level of F_{msy} is 98% and zero at the 50^{th} and 75^{th} percentile (Table 14, Figure 11, and Figure 12). This approach is commonly used in groundfish stocks with index based assessments. However, it does not account for varying levels of scientific uncertainty and risk of exceeding the OFL.

Method2 (M2): The estimated ABC based on the corresponding 25^{th} percentile of the OFL is 13,100 mt for northern silver hake and 32,400 mt for southern silver hake. The corresponding relative F at the 25^{th} percentile of the 2010 OFL was approximately 1.56 kt/kg in the north and 19.1kt/kg in the south. Given the estimated ABCs for both management regions, the risk of exceeding the 25^{th} percentile of the F_{msy} proxy is about 38% in the north and 39% in the south. The risk at the 50^{th} and 75^{th} percentile of the F_{msy} proxy is zero in both the northern and southern management regions (Table 14, Figure 11, and Figure 12). For this approach, the 25^{th} percentile on OFL would be recalculated each year with new survey data.

Method3 (M3): The corresponding ABC is estimated as the constant ratio of a specified percentile of F_{masy} proxy to the estimated F_{msy} proxy from the overfishing definition and applied to the current year OFL. For example, the fraction that corresponds to the 25^{th} percentile F_{msy}/F_{msy} in the north is 57% and 56% in the south. Applying this ratio as a constant to the estimated 2010 OFL, results in ABC of 13,482 mt in the north and 33,518 mt in the south. Based on ABC estimates for this method, the risk of exceeding the 25^{th} percentile of the F_{msy} proxy is 48% in the north and 47% in the south (Table 14, Figure 11, and Figure 12). These ratios would be used each year to set ABC relative to updated estimates of OFL using the most recent survey data. The F/F_{msy} ratio as a function of the cumulative frequency distribution of F_{msy} proxy is illustrated in Figure 13.

Figure 11. OFL frequency distribution for the northern (TOP) and southern (BOTTOM) stock of silver hake derived as a product of the fall survey distribution from the most recent 3yr mean and variance and the distribution around the SARC 51 $F_{threshold}$ with an underlying lognormal error structure. M1, M2 and M3 refer to the three proposed methods for estimating ABC.

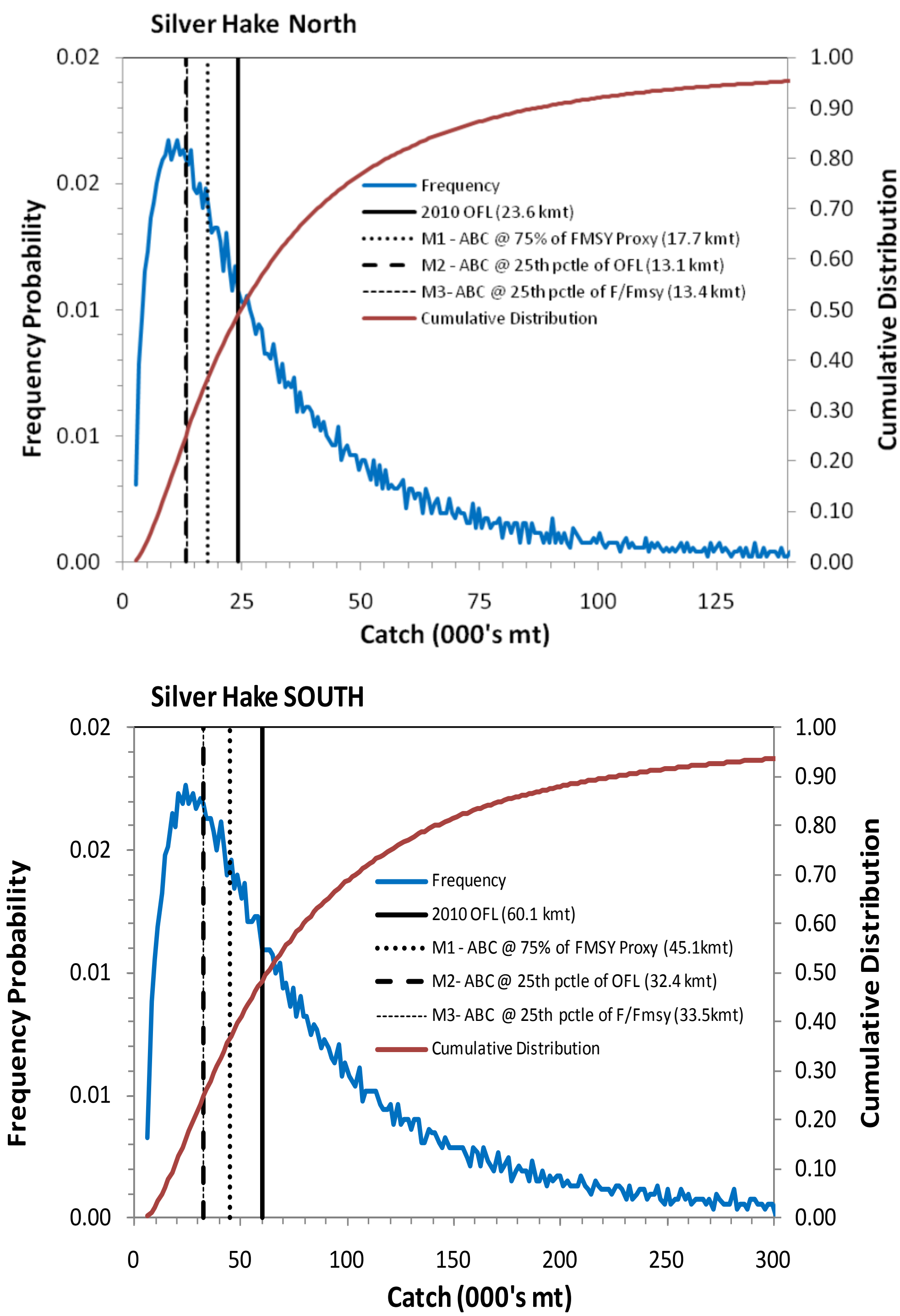
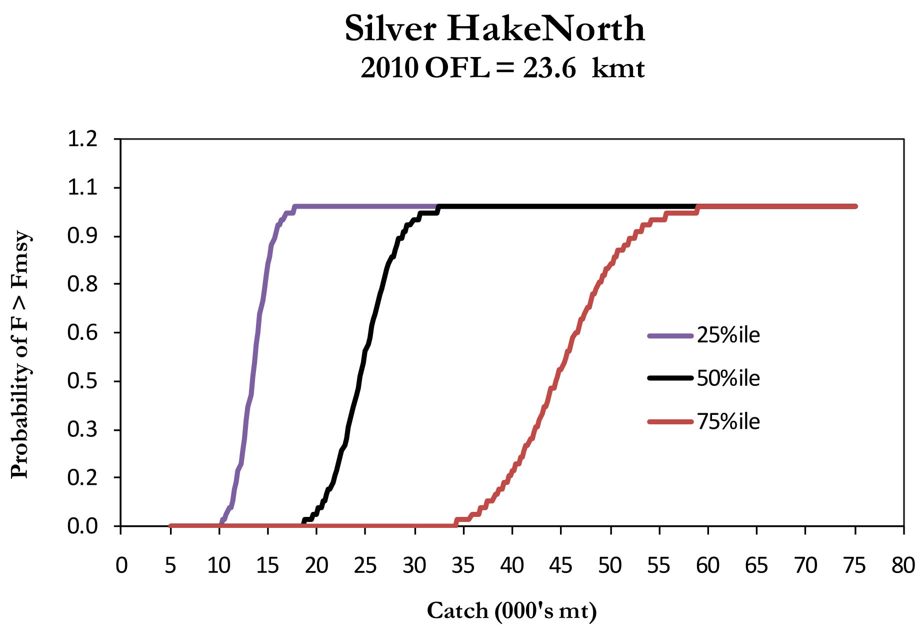


Figure 12. Probability of overfishing for northern (TOP) and southern (BOTTOM) silver hake based on 2010 OFL at the 25th, 50th and 75 percentile of F_{msy}. The probability of overfishing is a product of the probability of F > F_{msy} at each survey realization and the probabilities corresponding to the survey biomass distribution.



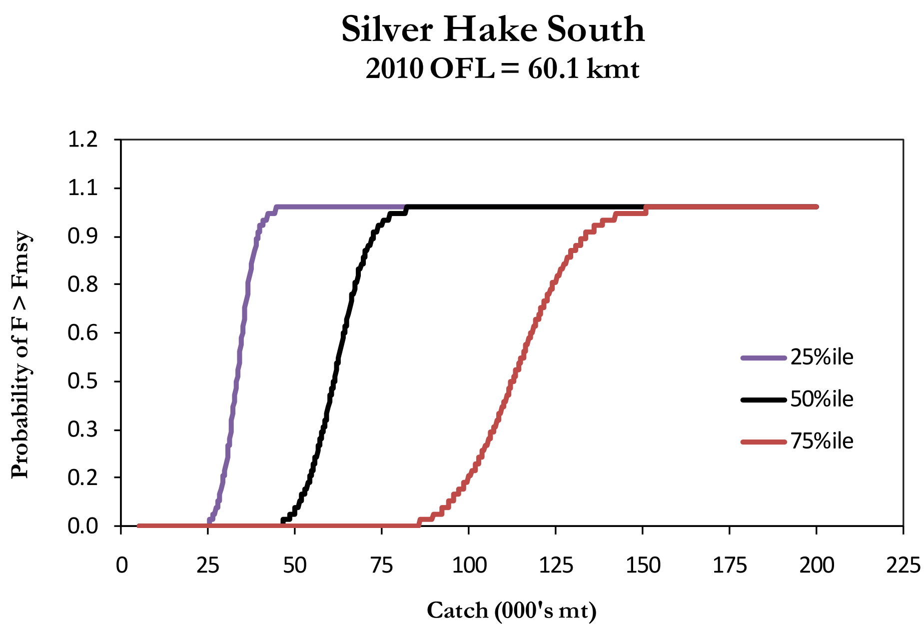


Figure 13. Example of 2010 ABC (2008-2010 biomass index) control rule for the northern stock (TOP) and southern stock (BOTTOM) of silver hake using Method 3. Instead of a fixed percent for all stocks (e.g. 75% of OFL), the ABC could be set at 85% of OFL, chosen based on the estimated uncertainty of F_{msy} proxy.

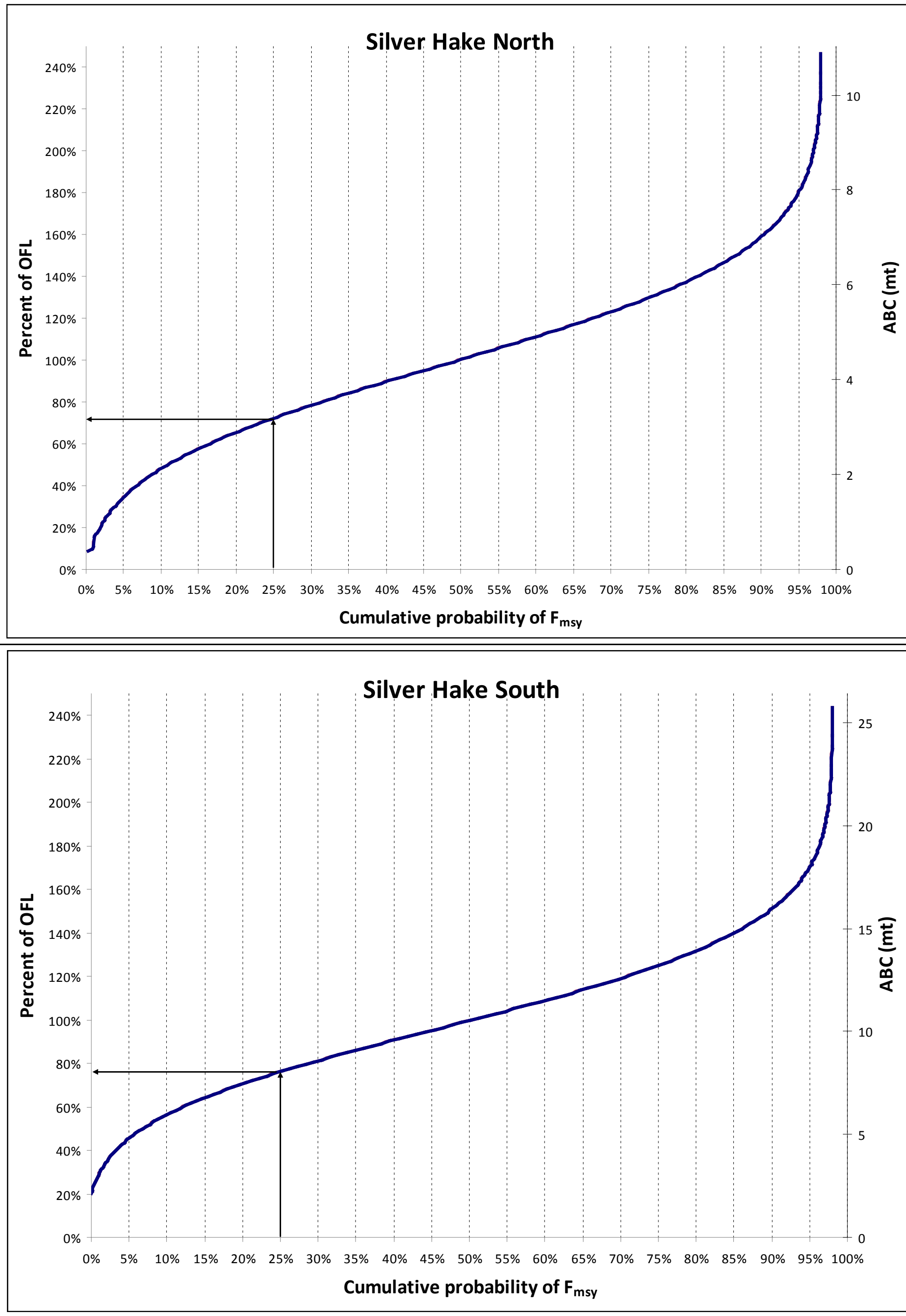


Table 14. Probability of mortality exceeding the 25th, 50th and 75 percentile of F_{msy} for northern (TOP) and Southern (BOTTOM) silver hake based on 2010 OFL.

Silver hake NORTH_2010 OFL = 23.6 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	17.7	98%	0%	0%
2	13.1	38%	0%	0%
3	13.5	48%	0%	0%

Silver Hake SOUTH_2010 OFL = 60.1 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	45.1	99%	0%	0%
2	32.4	39%	0%	0%
3	33.5	47%	0%	0%

Multiyear specifications

In the absence of an analytical model to conduct projections for silver hake, the following approaches were considered for setting multiyear specifications for both stocks of silver hake. These scenarios are intended to illustrate how the three models would respond to changes in stock biomass, estimated by the three year moving average for the fall survey biomass index. They are not to be intended to substitute for assumptions about future biomass, which could include multiyear specifications that assume that 2011 and 2012 survey values will equal the 2010 value.

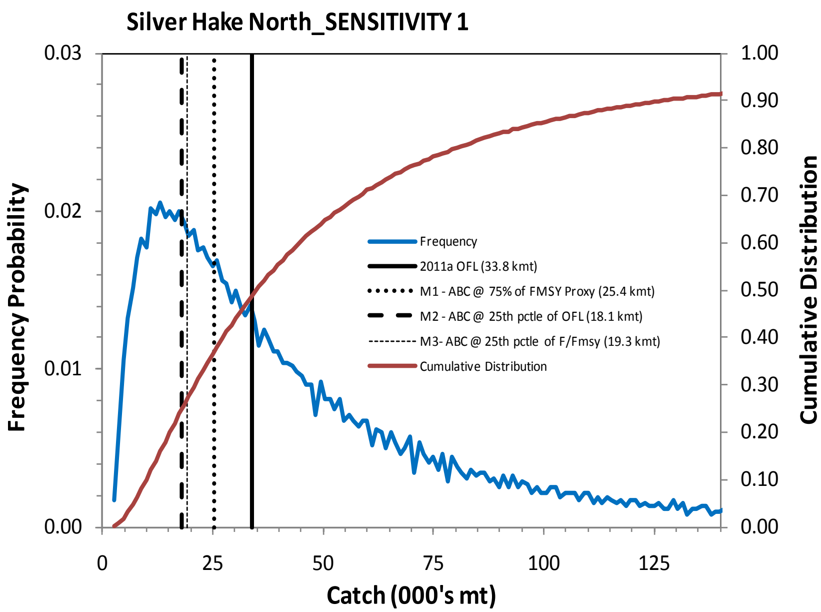
One approach to setting future specifications for two or three years could follow the procedure described below:

1) Set ABC at a constant level, using the most recent three year average. For example, update the three year average, dropping the first year of the three year period and adding a new year with the expectation that the new data will have the same value as the most recent survey. For example, the 2012 silver hake specifications could be based on the 2009-2011 average biomass from the fall survey. The 2013 specifications would then be based on the 2010 and 2011 biomass, plus an assumed 2012 survey biomass that is equal to the 2011 value.

   Sensitivity analyses are presented in Table 15that demonstrates using two current survey estimates (2009-2010) and assuming the 3rd estimate for 2011. The assumed 2011 survey estimate was derived from the 2010 survey estimate ± 1 standard deviation. The standard deviation was calculated from the times series of the annual survey biomass estimates. The probability distribution of OFL and candidate ABCs are presented in Figure 14 and Figure 16 and the probability of overfishing is presented in Figure 15 and Figure 17.

2) Alternatively, the Council could require annual automatic specifications when new survey data become available. This annual specification process would be easier to manage using Method 3

Figure 14. Sensitivity analyses on the Probability distribution of 2011OFL for northern silver hake and candidate ABCs based on 1 standard deviation above the 2010 fall survey estimate. Note that the 2011a survey (SENSITIVITY 1) is based on three year average (2009-2011) and standard deviations were derived using the entire fall survey time series from 1963-2010.



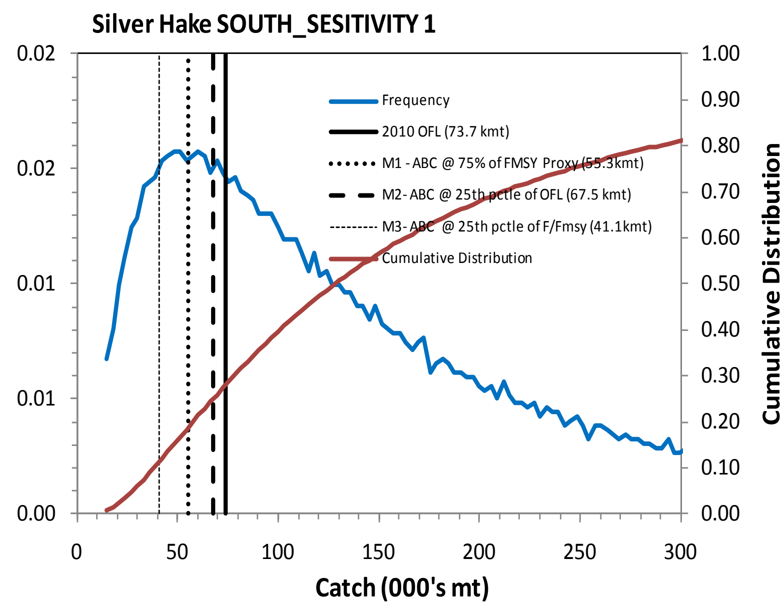


Figure 15. Sensitivity analyses on the Probability of overfishing in 2011 for $\mathbf{F_{msy}}$ at 25th, 50th and 75th percentile for Northern (LEFT) and southern silver hake (RIGHT) based on 1 standard deviation above the 2010 fall survey estimate

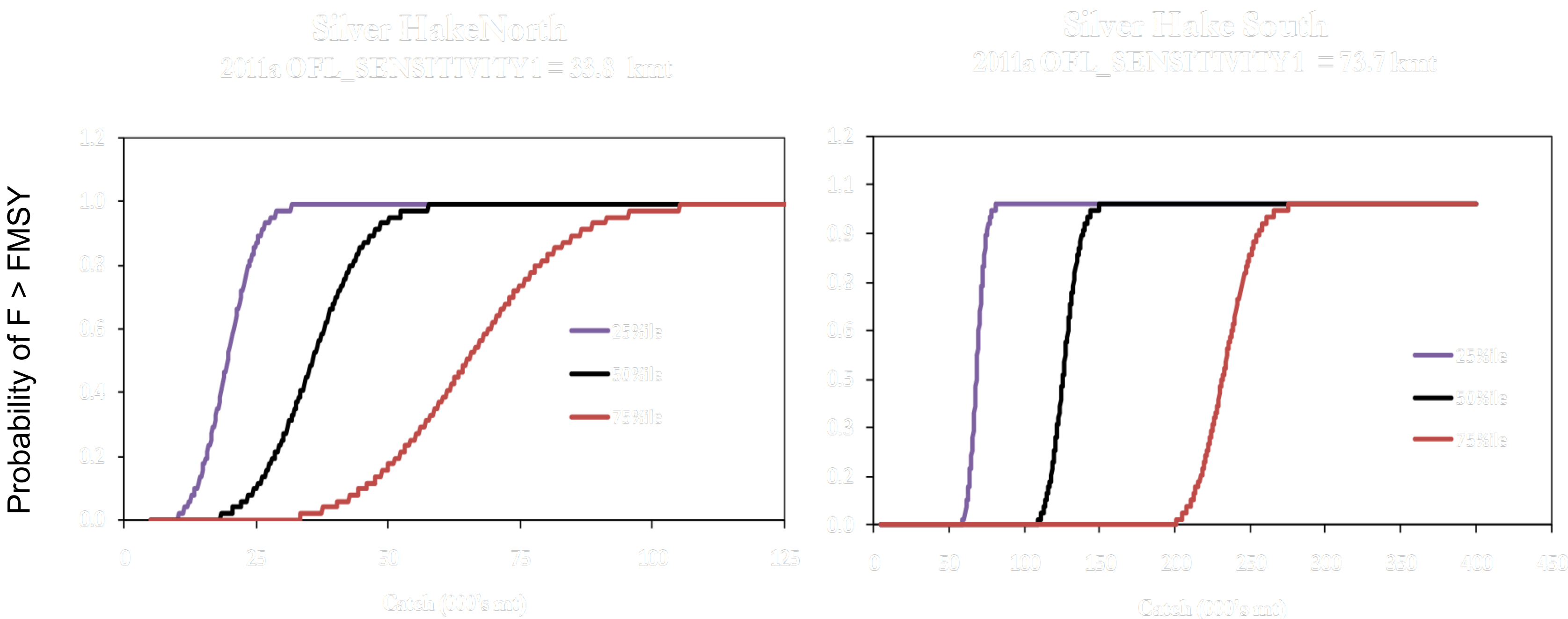
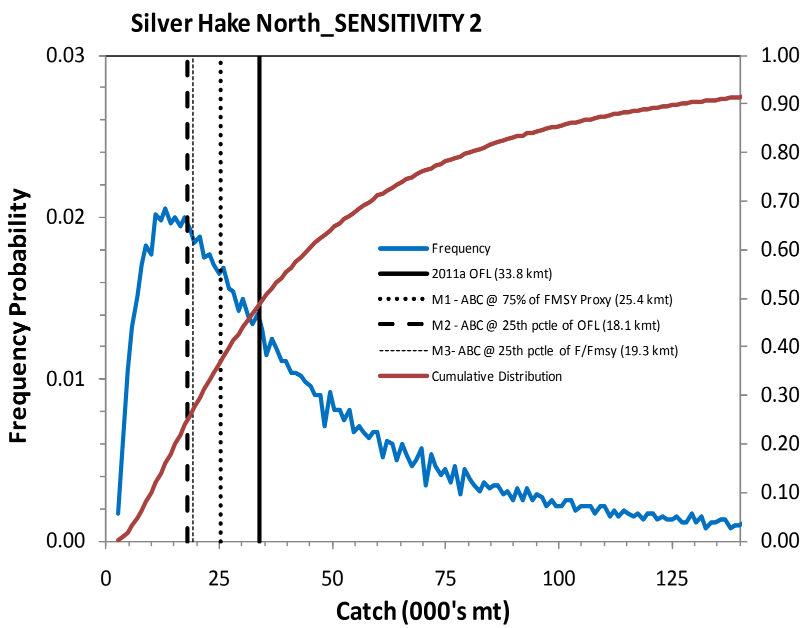


Figure 16. Sensitivity analyses on the Probability distribution of 2011OFL for northern silver hake and candidate ABCs based on 1 standard deviation below the 2010 fall survey estimate. Note that the 2011a survey (SENSITIVITY 2) is based on three year average (2009-2011) and standard deviations were derived using the entire fall survey time series from 1963-2010.



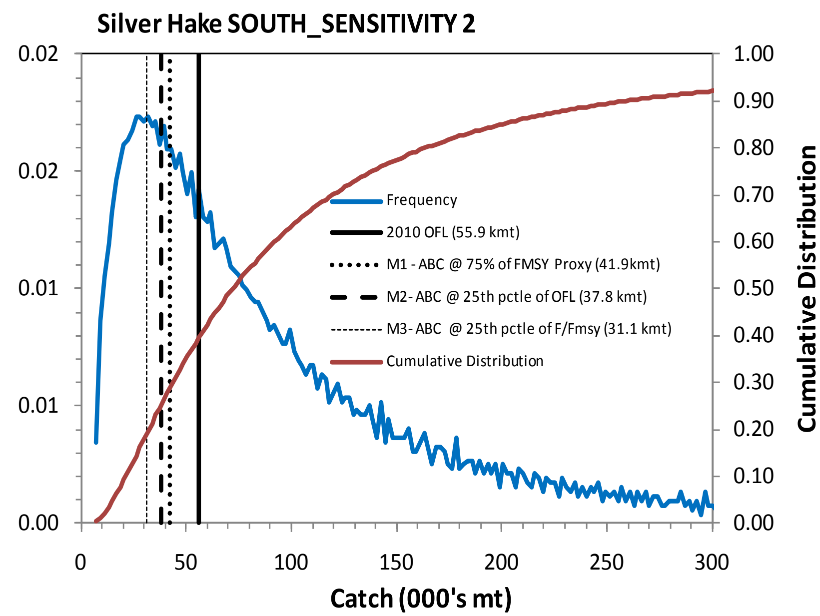


Figure 17. Sensitivity analyses on the Probability of overfishing in 2011 for $\mathbf{F_{msy}}$ at 25th, 50th and 75th percentile for Northern (LEFT) and southern silver hake (RIGHT) based on sensitivity based on 1 standard deviation below the 2010 fall survey estimate.

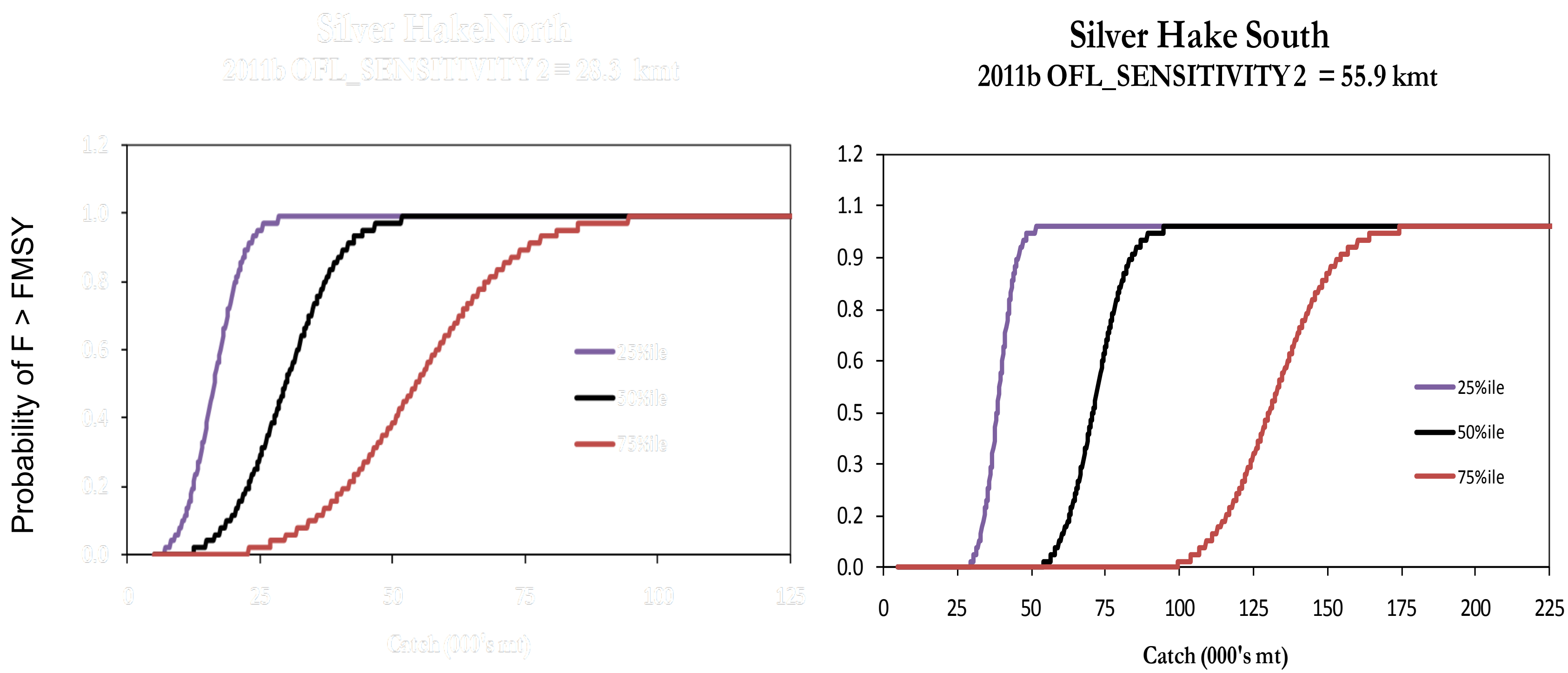


Table 15. Probability of F > F_{msy} for northern (LEFT) and southern (RIGHT) Silver hake for 2010 OFL and 2011 OFL assuming +1 SD (SENSITIVTY 1_2011a) and -1 SD (SENSITIVITY 2_2011b)

Silver hake NORTH_2010 OFL = 23.6 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	17.7	98%	0%	0%
2	13.1	38%	0%	0%
3	13.5	48%	0%	0%
SENSITIVITY 1_2011a OFL = 33.8 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	25.4	89%	12%	0%
2	18.1	39%	0%	0%
3	19.3	47%	2%	0%
SENSITIVITY 2_2011b OFL = 28.3 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	21.2	83%	16%	0%
2	14.9	37%	4%	0%
3	16.2	49%	4%	0%

Silver Hake SOUTH_2010 OFL = 60.1 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	45.1	99%	0%	0%
2	32.4	39%	0%	0%
3	33.5	47%	0%	0%
SENSITIVITY 1_2011a OFL = 73.7 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	55.2	0%	0%	0%
2	67.5	39%	0%	0%
3	41.1	0%	0%	0%
SENSITIVITY 2_2011b OFL = 55.9 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	41.9	72%	0%	0%
2	37.8	41%	0%	0%
3	31.1	4%	0%	0%

8.3 Application to red hake

Estimation of OFL uncertainty

Although SARC 51 did not accept a new assessment model, the SARC agreed to use the relative F (RelF) from the AIM analysis strictly as a proxy F_{msy}. In addition, the previous biological reference point's were revised such that the spring survey arithmetic stratified mean weight per tow (kg/tow) rather than a delta stratified mean would be used to calculate the three-year moving average of mean weight per tow for determination of stock status. The catch and survey indices for each stock are presented in Table 16 and Table 17. The 2010 overfishing limit (OFL= F_{msy} *2010 spring survey biomass (2008-2010 moving average)) for northern and southern red hake is estimated at 394 mt and 2,899 mt (Figure 18), respectively.

The uncertainty in the OFL estimate was estimated as the joint probability distribution of F_{msy} and the 3-year spring survey moving average of biomass. The probability distribution of RelF (proxy F_{msy}) was obtained from the AIM bootstrap distribution. For each bootstrap calculation, the saved predicted values of ln (replacement ratio) and random residuals from the initial regression of the replacement ratio and the RelF estimates are passed to a regression routine, and the α and β values saved to obtain 1,000 realizations of the replacement F ($-\alpha/\beta$). The probability distribution of the spring survey three-year (2008-2010) moving average of biomass was estimated from a normal distribution of the mean and variance. The variance of the spring survey 3-year moving average (V3yravg) was estimated as:

$$V_{3yravg} = \left[\frac{V\left[I_{ALB}^{2008}\right] + V\left[\frac{I_{HB}^{2009}}{\rho}\right] + V\left[\frac{I_{HB}^{2010}}{\rho}\right]}{3} \right]$$

The variance for the observed survey indices for each year and vessel was estimated from the expected values E(I) of the stratified mean weight (kg/tow) and the coefficient of variance (CV) as:

$$V(I_{vessel}^{yr}) = (CV * E(I))^2$$

The variances for the 2009 and 2010 Henry B. Bigelow survey indices, calibrated to Albatross IV units by applying length-based conversion coefficients (ρ) (Miller et al 2010), were estimated using Taylor series expansion :

$$V\left[\frac{I_{HB}^{yr}}{\rho}\right] = \left(\frac{I_{HB}^{yr}}{\rho}\right)^2 \times \left[\frac{V(I_{HB}^{yr})}{(I_{HB}^{yr})^2} + \frac{V(\rho)}{\rho^2}\right]$$

Although survey mean weights were estimated from a length-based model, the standard errors were derived from the constant model due to unavailable variance estimates from the length-based approach. A comparison of the calibrated survey mean weight between length-based and constant model approaches suggested minimal differences, therefore, the application of the standard error from the constant model was assumed to be a reasonable approximation for the length-based estimates.

Table 16. Catch and survey indices for northern red hake, 1962-2010, and threshold biological reference points.

Red Hake , Northern Stock							
Year	Northern Spring Survey (arithmetic kg/tow)	Northern spring Survey (3-yr average)	Northern Landings (000 mt)	Northern Discards (000 mt)	Northern total catch (000 mt)	Northern Exploitation Index	Northern Exploitation Index (3 Yr avg)
1962			1.918	1.600	3.518		
1963			3.285	1.600	4.885	Ref. Pt.	Threshold
1964			1.410	1.701	3.111	Biomass	1.265
1965			2.774	1.624	4.398		
1966			5.578	1.603	7.181	Exploitation	0.163
1967			1.865	1.404	3.269		
1968	1.138		2.629	1.301	3.930	3.454	
1969	0.639		2.022	1.117	3.138	4.909	
1970	0.541	0.773	1.033	1.098	2.130	3.939	4.101
1971	0.648	0.609	4.806	1.162	5.969	9.211	6.020
1972	1.560	0.916	15.028	0.963	15.991	10.248	7.800
1973	4.311	2.173	15.289	0.909	16.199	3.757	7.739
1974	2.431	2.768	7.226	0.815	8.041	3.308	5.771
1975	4.254	3.665	8.703	1.199	9.902	2.328	3.131
1976	3.371	3.352	6.339	0.925	7.264	2.155	2.597
1977	2.656	3.427	0.894	1.081	1.976	0.744	1.742
1978	2.571	2.866	1.227	1.117	2.345	0.912	1.270
1979	2.041	2.422	1.529	1.223	2.751	1.348	1.001
1980	3.883	2.831	1.033	1.366	2.399	0.618	0.959
1981	6.353	4.092	1.277	1.324	2.601	0.409	0.792
1982	2.127	4.121	1.213	1.460	2.673	1.257	0.761
1983	3.698	4.059	0.895	1.353	2.248	0.608	0.758
1984	2.982	2.936	1.060	1.327	2.388	0.801	0.888
1985	3.913	3.531	0.992	1.270	2.262	0.578	0.662
1986	3.260	3.385	1.458	1.189	2.646	0.812	0.730
1987	2.941	3.371	1.013	1.052	2.066	0.702	0.697
1988	1.996	2.732	0.866	0.897	1.763	0.883	0.799
1989	1.651	2.196	0.777	1.447	2.224	1.347	0.977
1990	1.331	1.660	0.830	0.595	1.425	1.070	1.100
1991	1.621	1.535	0.745	0.818	1.563	0.964	1.127
1992	2.501	1.818	0.918	0.726	1.645	0.658	0.897
1993	2.824	2.315	0.769	0.083	0.853	0.302	0.641
1994	1.590	2.305	0.729	0.077	0.806	0.507	0.489
1995	1.973	2.129	0.187	0.063	0.250	0.127	0.312
1996	1.792	1.785	0.414	0.656	1.070	0.597	0.410
1997	1.811	1.859	0.339	0.125	0.464	0.256	0.327
1998	2.519	2.041	0.187	0.130	0.317	0.126	0.326
1999	2.322	2.217	0.220	0.468	0.687	0.296	0.226
2000	3.186	2.676	0.197	0.055	0.252	0.079	0.167
2001	3.579	3.029	0.223	0.135	0.358	0.100	0.158
2002	4.460	3.742	0.275	0.101	0.376	0.084	0.088
2003	0.996	3.012	0.210	0.088	0.297	0.298	0.161
2004	1.772	2.409	0.103	0.057	0.160	0.090	0.158
2005	1.097	1.288	0.096	0.057	0.153	0.140	0.176
2006	0.912	1.260	0.096	0.181	0.277	0.303	0.178
2007	2.056	1.355	0.069	0.127	0.197	0.096	0.180
2008	3.488	2.152	0.052	0.059	0.112	0.032	0.144
2009	1.748	2.431	0.085	0.095	0.180	0.103	0.077
2010	2.020	2.419					

Table 17. Catch and survey indices for southern red hake, 1962-2010, and threshold biological reference points.

Red Hake Southern Stock							
Year	Southern Spring Survey (arithmetic kg/tow)	Southern Spring Survey (3-year average)	Southern Landings (000 mt)	Southern Discards (000 mt)	Southern total catch (000 mt)	Southern Exploitation Index	Southern Exploitation Index (3 year avg)
1962			12.757	4.000	16.757	Ref. Pt	Threshold
1963			32.671	4.000	36.671	Biomass	0.51
1964			44.221	3.758	47.979		
1965			93.624	4.292	97.916	Exploitation	3.04
1966			108.016	3.773	111.789		
1967			58.948	3.660	62.608		
1968	1.285		18.713	3.715	22.428	17.450	
1969	1.082		53.417	3.623	57.040	52.707	
1970	1.723	1.364	11.864	3.141	15.005	8.708	26.288
1971	3.488	2.098	35.421	2.313	37.734	10.817	24.077
1972	3.590	2.934	61.371	2.098	63.469	17.680	12.402
1973	3.992	3.690	51.679	2.240	53.919	13.506	14.001
1974	2.838	3.473	26.834	2.158	28.992	10.217	13.801
1975	3.179	3.336	20.028	1.763	21.791	6.855	10.193
1976	5.314	3.777	23.110	1.827	24.937	4.693	7.255
1977	2.300	3.598	7.812	1.818	9.630	4.186	5.245
1978	7.648	5.087	6.434	2.436	8.870	1.160	3.346
1979	1.514	3.821	7.837	2.665	10.502	6.938	4.095
1980	2.380	3.847	4.226	2.702	6.928	2.911	3.670
1981	4.613	2.835	2.496	2.715	5.211	1.130	3.660
1982	3.342	3.445	3.199	3.776	6.975	2.087	2.043
1983	2.207	3.387	1.576	3.889	5.465	2.476	1.898
1984	1.331	2.293	1.819	3.910	5.729	4.305	2.956
1985	1.392	1.643	0.932	2.968	3.901	2.802	3.194
1986	1.734	1.486	0.899	3.389	4.288	2.473	3.193
1987	0.878	1.335	1.415	3.313	4.728	5.389	3.554
1988	1.006	1.206	1.122	3.462	4.584	4.557	4.139
1989	0.487	0.790	1.367	5.006	6.372	13.077	7.674
1990	0.707	0.733	1.312	4.748	6.060	8.573	8.735
1991	0.611	0.602	1.210	2.612	3.822	6.257	9.302
1992	0.465	0.594	1.439	6.343	7.782	16.743	10.524
1993	0.424	0.500	1.014	5.308	6.321	14.926	12.642
1994	0.675	0.521	1.052	1.720	2.772	4.108	11.926
1995	0.516	0.538	1.473	1.329	2.801	5.433	8.156
1996	0.453	0.548	0.719	0.380	1.099	2.426	3.989
1997	1.161	0.710	1.172	2.422	3.595	3.097	3.652
1998	0.214	0.609	1.207	0.740	1.948	9.118	4.880
1999	0.455	0.610	1.404	1.060	2.465	5.420	5.878
2000	0.423	0.364	1.462	0.250	1.712	4.047	6.195
2001	0.642	0.507	1.492	0.138	1.630	2.540	4.002
2002	0.542	0.536	0.673	0.327	1.000	1.846	2.811
2003	0.206	0.463	0.641	0.345	0.986	4.794	3.060
2004	0.154	0.301	0.599	0.616	1.214	7.865	4.835
2005	0.376	0.245	0.411	1.007	1.418	3.772	5.477
2006	0.380	0.304	0.429	0.674	1.103	2.902	4.846
2007	0.857	0.538	0.489	1.545	2.035	2.373	3.015
2008	0.473	0.570	0.653	0.814	1.467	3.099	2.791
2009	1.342	0.891	0.674	0.869	1.543	1.150	2.207
2010	1.045	0.954					

Risk Analyses (Probability of overfishing)

The probability of mortality exceeding F_{msy} was estimated for a range of 2011 catches for 3 scenarios of F_{msy} (25th, 50th, and 75th percentiles) for the northern and southern stock (Table 18, Figure 18, and Figure 19). For each catch scenario, a RelF was calculated at each realization of the survey biomass distribution (from the normal distribution as described above). The probability that a catch exceeded a percentile of F_{msy} was estimated as the sum of the products of the probability of each relative F exceeding that catch (1 or 0) and the probability of each survey realization.

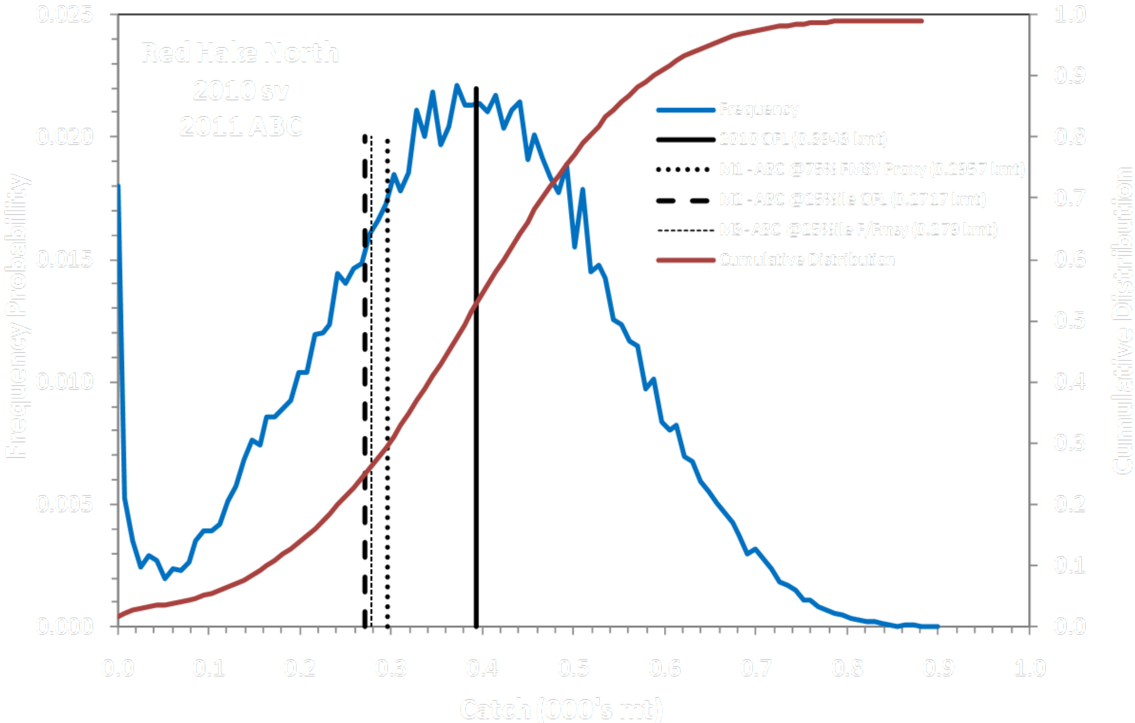
Application of proposed ABC's Methods for Red hake

Method 1: Requires adjusting the F_{msy} proxy by a prescribed specification (e.g. 75% of $F_{threshold}$) and applying the adjustment to the 3-year moving average of the spring survey. For red hake, this implies an ABC of 2,957 mt in the north and 2,174 mt in the south, which are well above the recent catches in both management regions (Table 18, Figure 18, and Figure 19). This approach is commonly used in groundfish stocks with index based assessments. However, it does not account for any scientific uncertainty or risk of exceeding the OFL.

Method 2: The estimated ABC based on the 25th percentile of the 2010 OFL is 271 mt for northern red hake and 2,435 mt for southern red hake (Figure 18; Table 20). The corresponding relative F at the 25th percentile of the 2010 OFL was 1.67 kt/kg in the north and 0.80 kt/kg in the south. Given the estimated ABCs for both management regions, the risk of exceeding the 25th percentile of the Fmsy proxy is about 39% in the north and 37% in the south. The risk at the 50th and 75th percentile of the Fmsy proxy is 0% in the north about 10% and 2%, respectively, in the south (Table 18). The 25th percentile on OFL would be recalculated each year with new survey data.

Method 3: The corresponding ABC is estimated as the constant ratio of a specified percentile of F_{msy} to the estimated F_{msy} proxy from the overfishing definition and applied to the current year OFL. For example, the 25^{th} percentile F_{msy} / F_{msy} in the north is 70.7% and 87.5% in the south. Applying these ratios to the estimated 2010 OFLs result in an ABC of 288 mt in the north and 2,537 mt in the south (Figure 18; Table 20). Based on ABC estimates for this method, the risk of exceeding the 25th percentile of the F_{msy} proxy is about 50% in the north and in the south (Table 18). These ratios would be used each year to set ABC relative to updated estimates of OFL estimated with the most recent survey data, as demonstrated in Table 18. The F/ F_{msy} ratio as a function of the cumulative frequency distribution of F_{msy} proxy is illustrated in Figure 20.

Figure 18. OFL frequency distribution for the northern (TOP) and southern (BOTTOM) stocks of red hake derived as a product of the fall survey distribution from the most recent 3yr mean and variance and the distribution around the recommended SARC 51 $F_{Threshold}$. M1, M2 and M3 refer to the three proposed methods for estimating ABC.



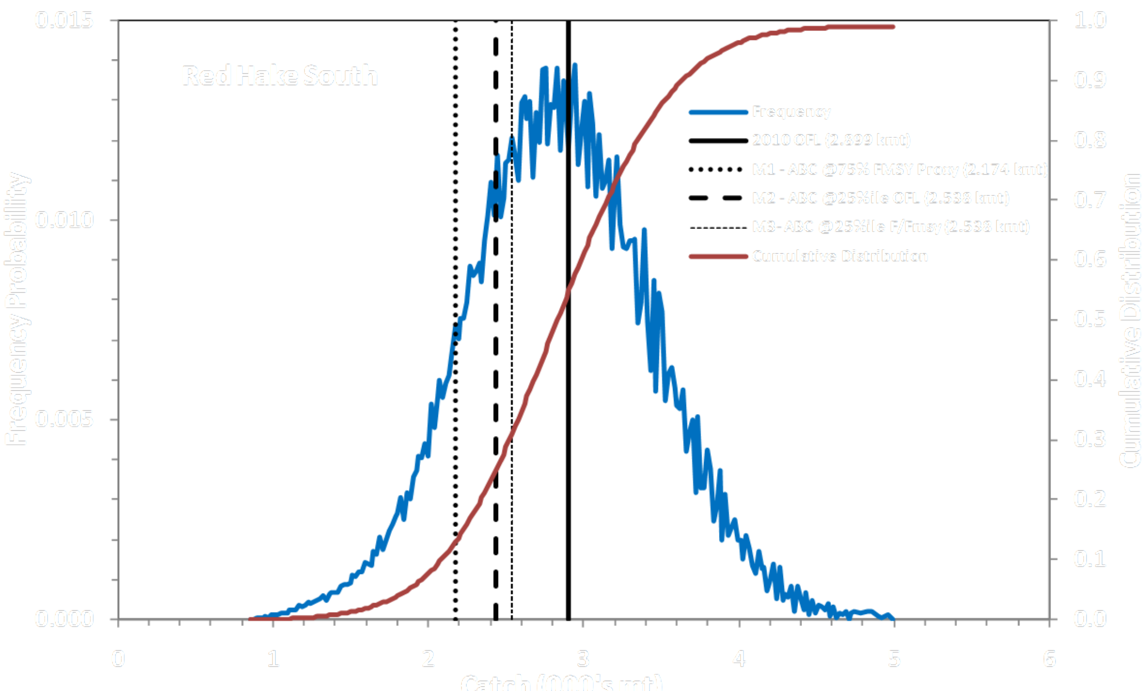


Figure 19. Probability of overfishing for northern (TOP) and southern (BOTTOM) red hake based on 2010 OFL at the 25th, 50th and 75 percentile of F_{msy}. Probability of overfishing for northern (TOP) and Southern (BOTTOM) red hake based on 2010 OFL at the 25th, 50th and 75 percentile of F_{msy}. The probability of overfishing is a product of the probabilities of $F > F_{msy}$ at each realization of the survey biomass distribution and the probabilities corresponding to the survey biomass distribution.

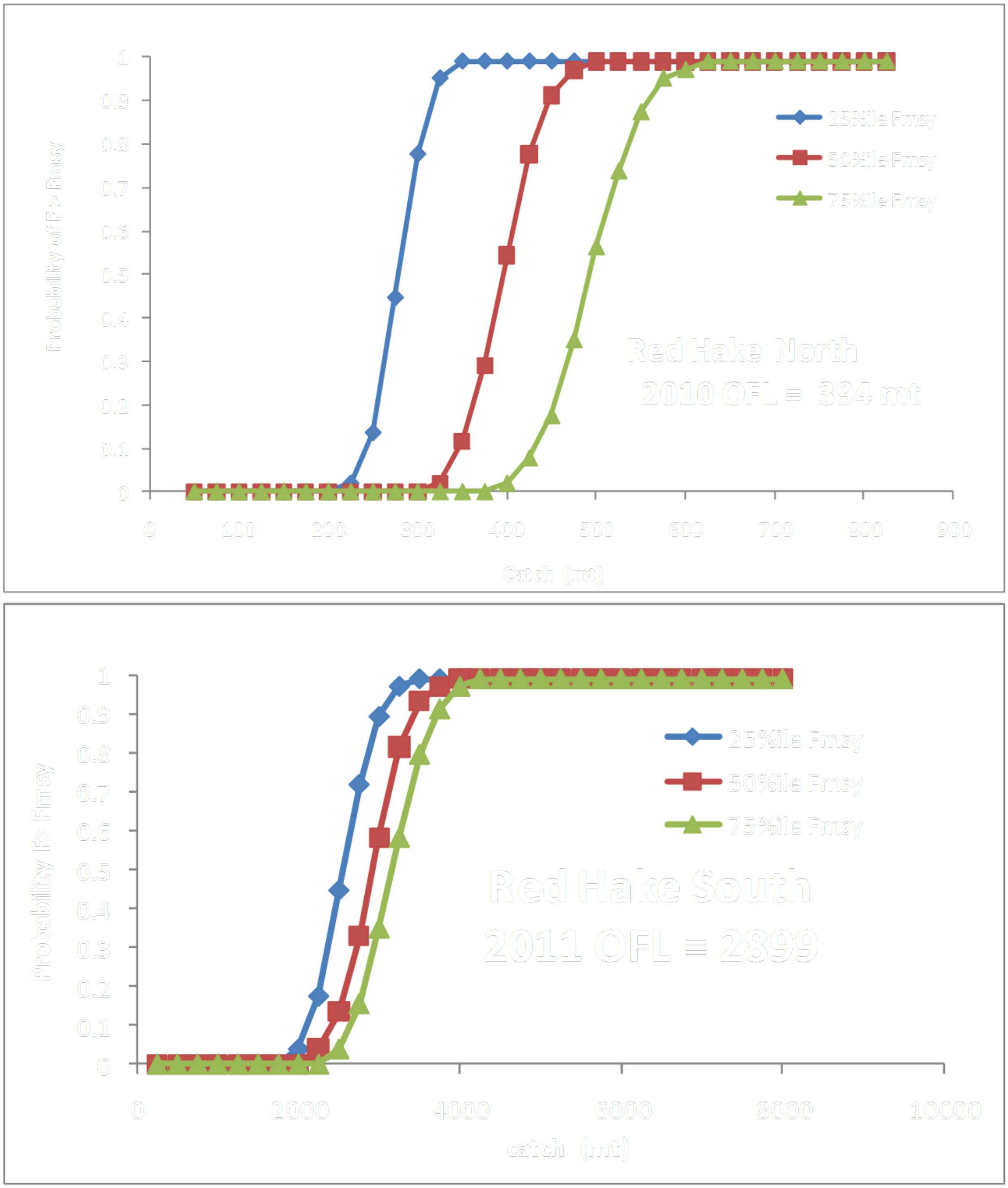
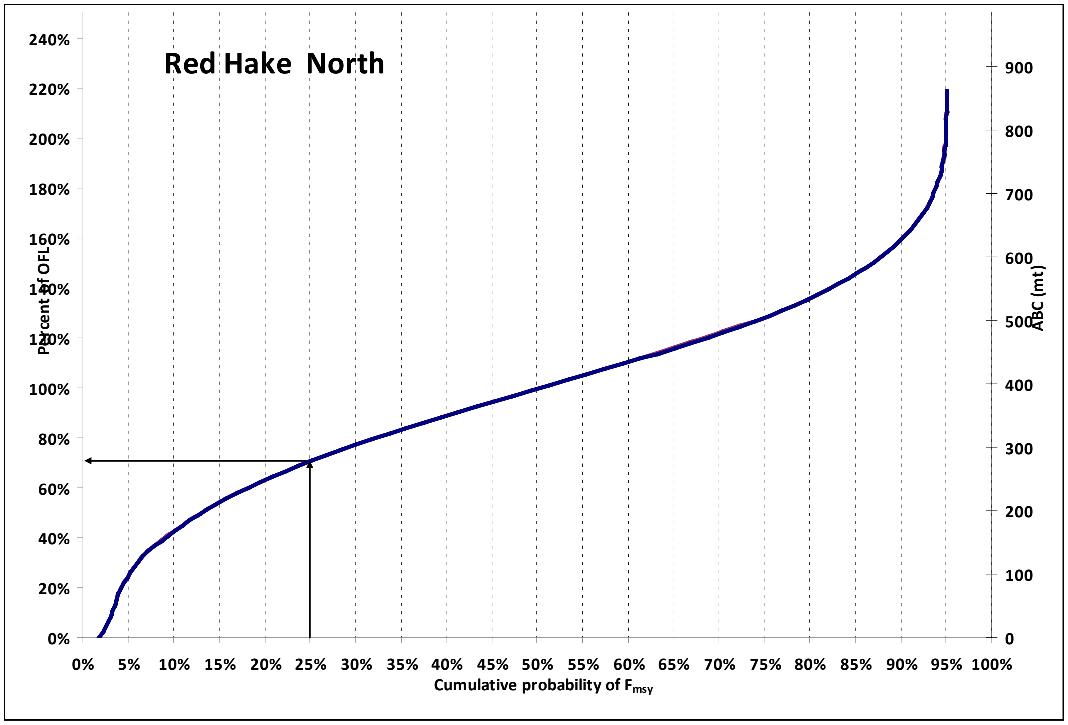


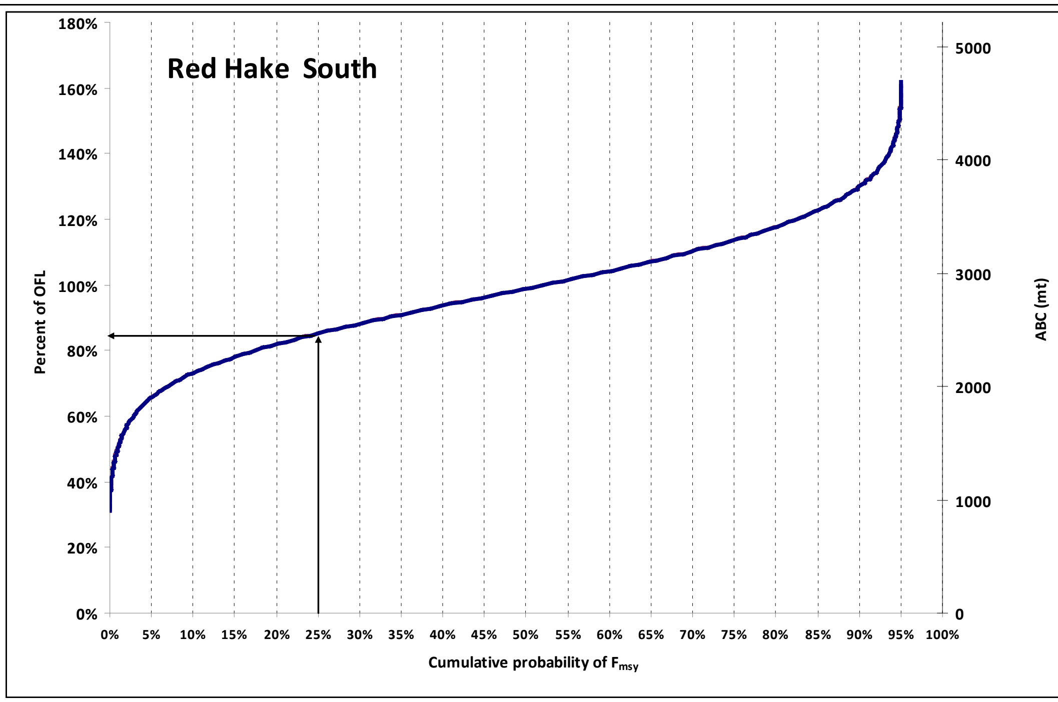
Table 18. Probability of overfishing for northern (LEFT) and southern (RIGHT) red hake based on 2010 OFL and sensitivity scenarios in 2011 at the 25th, 50th and 75 percentile of F_{mssy} for each of the 3 methods for ABC selection.

2010 OFL = 0.394 kmt				NORTH
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	0.296	74%	0%	0%
2	0.272	39%	0%	0%
3	0.279	50%	0%	0%
SENSITIVITY 1_2011a OFL =0.364 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	0.273	74%	0%	0%
2	0.251	39%	0%	0%
3	0.257	49%	0%	0%
SENSITIVITY 2_2011b OFL = 0.265 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	0.199	68%	0%	0%
2	0.181	39%	0%	0%
3	0.188	50%	0%	0%

2010 OFL = 2.899 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	2.174	12%	2%	0%
2	2.435	37%	10%	2%
3	2.538	49%	16%	6%
SENSITIVITY 1_2011a OFL = 4.870 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	3.653	4%	0%	0%
2	4.185	41%	4%	0%
3	4.263	49%	6%	0%
SENSITIVITY 2_2011b OFL = 1.502 kmt				
Method	ABC (000's mt)	25th pctle FMSY	50th pctle FMSY	75th pctle FMSY
1	1.127	29%	17%	14%
2	1.129	29%	17%	14%
3	1.315	48%	31%	23%

Figure 20. Example of 2010 ABC (2008-2010 biomass index) control rule for the northern stock of red hake (TOP) and southern stock of red hake (BOTTOM) using Method 3. Instead of a fixed percent for all stocks (e.g. 75% of OFL), the ABC could be set at 85% of OFL (2899 mt), chosen based on the estimated uncertainty of F_{msy} proxy.





Multiyear specifications

No projection analyses were accepted from the AIM analysis for red hake. In the absence of such projections, the following approaches were considered for setting multiyear specifications for both stocks of red hake. The examples presented here are intended to illustrate how the three methods would respond to changes in stock biomass, estimated by the three year moving average for the spring survey biomass index. They are not to be intended to substitute for assumptions about future biomass, which could include multiyear specifications that assume that 2011 and 2012 survey values will equal the 2010 value.

One approach to setting future specifications for two or three years could follow the procedure described below:

1) Set ABC at a constant level, using the most recent three year average. For example, update the three year average, dropping the first year of the three year period and adding a new year with the expectation that the new data will have the same value as the most recent survey. For example, the 2012 red hake specifications could be based on the 2009-2011 average biomass from the spring survey. The 2013 specifications would then be based on the 2010 and 2011 biomass, plus an assumed 2012 survey biomass that is equal to the 2011 value.

   Sensitivity analyses are presented in Table 18 and Table 20 that demonstrate using two current survey estimates (2009-2010) and assuming the 3rd estimate (2011). The assumed 2011 survey estimate was derived from the 2010 survey estimate ± 1 standard deviation. The standard deviation was calculated from the times series of the annual survey biomass estimates. The probability distribution of OFL and candidate ABCs are presented in Figure 21 and Figure 22 and the probability of overfishing is presented in Figure 23and Table 18.

2) Alternatively, the Council could require annual automatic specifications when new survey data becomes available. This annual specification process would be easier to manage using Method 3

Figure 21. Probability distribution of OFL for northern red hake and candidate ABCs based on sensitivity analyses on the 2011. The 2011 estimate is based on the three year average (2009-2011) by assuming 2011 survey estimate = 2010 + 1 standard deviation of the survey time series.

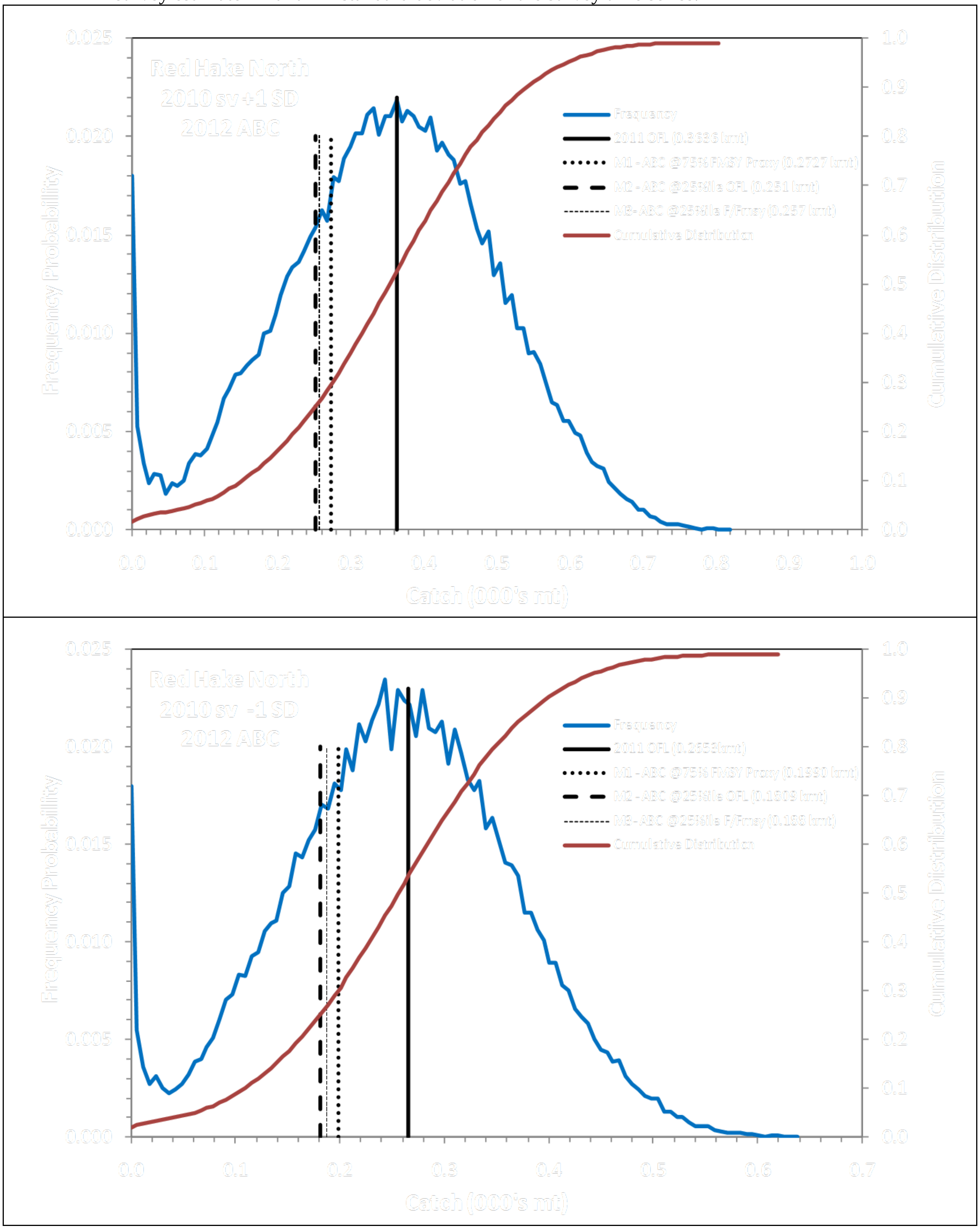


Figure 22. Probability distribution of OFL for southern red hake and candidate ABCs based on sensitivity analyses on the 2011. The 2011 estimate is based on the three year average (2009-2011) by assuming 2011 survey estimate = 2010 - 1 standard deviation of the survey time series.

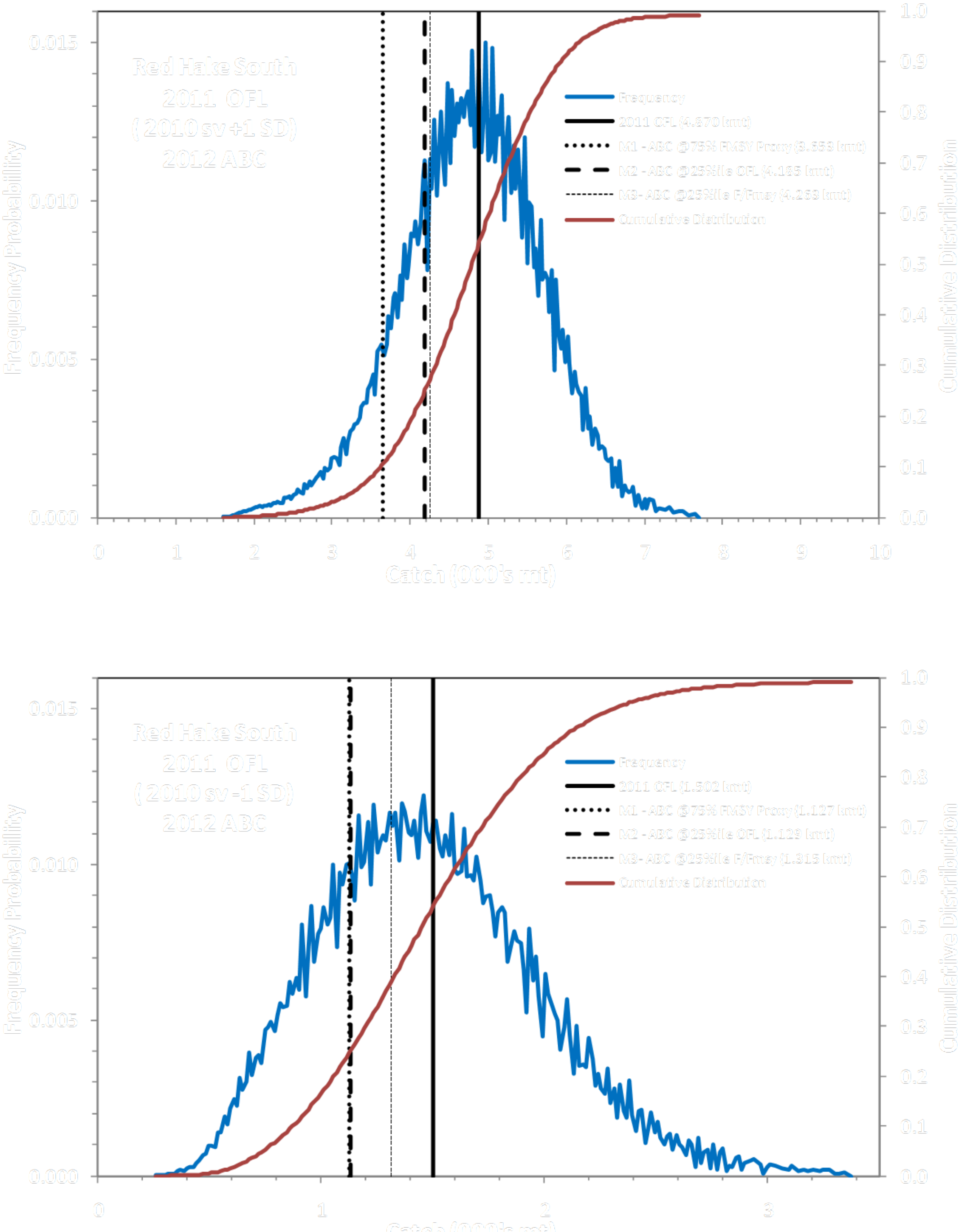


Figure 23, Probability of overfishing in 2011 for two sensitivity analyses (±1 standard deviation) for 3 scenarios of F_{msy} : 25th, 50th and 75th percentile for northern and southern red hake.

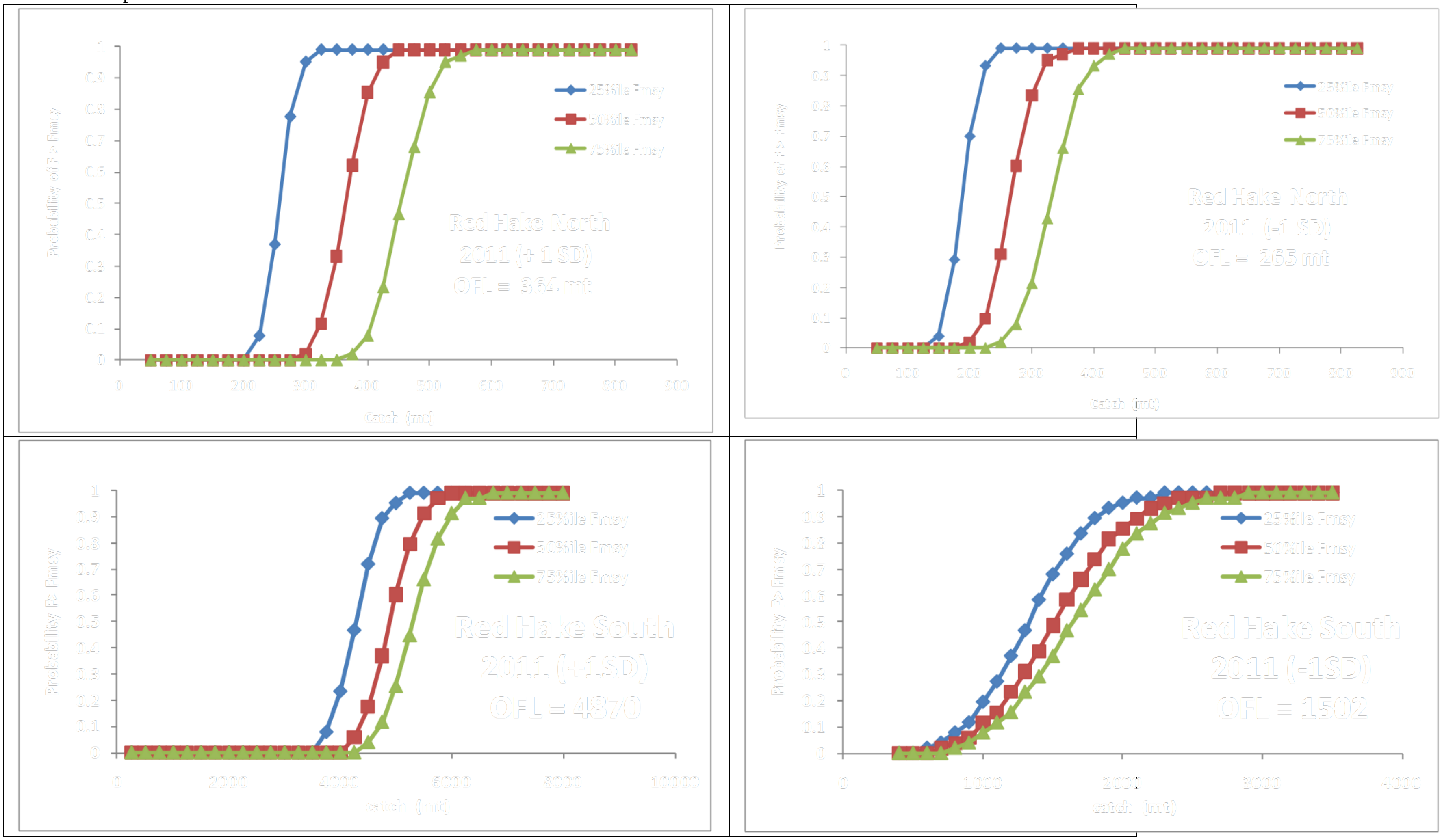


Table 19. Example relationship between **silver hake** OFL and candidate ABC three methods described in Section 8.1 to account for scientific uncertainty.

ACL fishing year		**2009 catch (mt)**	**OFL and ABC (mt)**		
Survey years			**2008-2010**	**+1 Standard Deviation**	**-1 Standard Deviation**
Northern stock	Survey biomass (kg/tow)	1,232	8.50	12.19	10.20
	OFL F_{msy} = 2.78 kt/kg		23,596	33,834	28,308
	Method 1 75% F_{msy} = 2.08 kt/kg		17,697	25,357	21,231
	Method 2 25th percentile of OFL		13,140	18,091	14866
	Method 3 57% of F_{msy} = 1.59 kt/kg		13,482	19,331	16,174
Southern stock	Survey biomass (kg/tow)	7,434	1.76	2.16	1.63
	OFL F_{msy} = 34.18 kt/kg		60,124	73,704	55,868
	Method 1 75% F_{msy} = 25.63 kt/kg		45,093	55,278	41,901
	Method 2 25th percentile of OFL		32,350	67,541	37,790
	Method 3 56% of F_{msy} = 19.05 kt/kg		33,518	41,089	31,146

Table 20. Example relationship between **red hake** OFL and candidate ABC three methods described in Section 8.1 to account for scientific uncertainty.

ACL fishing year		**2009 catch (mt)**	**OFL and ABC (mt)**		
Survey years			**2008-2010**	**+1 Standard Deviation**	**-1 Standard Deviation**
Northern stock	Survey biomass (kg/tow)	180	2.419	2.231	1.628
	OFL F_{msy} = 0.163 kt/kg		394.3	363.6	265.3
	Method 1 75% F_{msy} = 0.122 kt/kg		295.7	272.7	199.0
	Method 2 25th percentile of OFL		271.7	251.1	180.9
	Method 3 70.5% of F_{msy} = 0.115 kt/kg		278.7	257.0	187.5
Southern stock	Survey biomass (kg/tow)	1,444	0.954	1.603	0.494
	OFL F_{msy} = 3.038 kt/kg		2,899	4,870	1,502
	Method 1 75% F_{msy} = 2.279 kt/kg		2,173	3,653	1,127
	Method 2 25th percentile of OFL		2,435	4,185	1,129
	Method 3 85.2% of F_{msy} = 2.588 kt/kg		2,538	4,263	1,315

8.4 Offshore hake

During the benchmark assessment (NEFSC 2011), it was determined that both estimated catch of offshore hake and the survey indices were unreliable indicators of trends for the purposes of managing the stock and fishery.

And since these indicators are unreliable and a model-based estimate of catch (averaging a percentage of total silver and offshore hake catches derived from the length or depth based model estimators in the benchmark assessment report), the PDT recommends including offshore hake into a combined offshore and silver hake southern stock ABC, the silver hake ABC increased by an appropriate amount to account for the average catches of offshore hake.

This procedure would a) not have a significant impact on silver hake status, b) account for the usual additional contribution of offshore hake in landings and discards, and c) would not require fishermen to separate offshore hake from large catches of silver hake, which is rarely done at present.

9.0 Summary

After reviewing the results and discussing the performance of the models, the Whiting PDT agreed on the following conclusions:

- Method 1 (75% of F_{msy}) accounts only for uncertainty in F_{msy}, but to varying degrees for each stock. Choosing a level may be somewhat arbitrary based on unquantified risk.

- Methods 2 and 3 use a robust statistical approach to assess of risk arising from scientific uncertainty. However Method 2 is more desirable because it considers variability in uncertainty about stock size. Method 3 may be easier to understand because the ABC would be a constant fraction of F_{msy}.

- Method 2 (setting ABC to continuously achieve a constant level of overfishing risk by accounting for estimated scientific uncertainty in both F_{msy} and survey biomass) would mean that ABC as a fraction of OFL would continuously vary with time. It would also require a continuous re-evaluation of scientific uncertainty for every specification cycle. This approach has some advantages, but is more complex and therefore may be difficult for the public to understand.

- Method 3 (setting ABC as a constant fraction of F_{msy}, accounting for uncertainty in F_{msy} but not for changes in variance of survey biomass) would vary by stock. The risk of causing overfishing may however change from initial estimates due to variation in the survey biomass indices, e.g. decreases in the precision of the mean biomass increases scientific uncertainty and the risk of overfishing, and vice versa.

- Offshore hake catch should be added to the ABC for the southern stock of silver hake and catches should be monitored with the total catch of both species.

- The sensitivity analyses estimate lower ABCs for the decreased biomass and higher ABCs for the higher biomass in contrast with the 2011 observed ABC, as expected. The variances of the +1 SD was equivalent to the -1 SD, however , the variance was from the observed Bigelow estimates, which are higher than have been observed in the Albatross surveys. These variances are thus informative, incorporating uncertainty that might be expected in the future.

- The risk analysis incorporates the uncertainty in both the FMSY and survey biomass estimates and thus provides a robust means for estimating the probability of overfishing for the various ABC estimates.

Table 21. Description of and comments on the potential approaches for setting hake stock ABCs.

Basis for ABC OFL = F_{msy}*B_t MSY = F_{msy}*B_{msy}	Relationship to OFL	Estimated value	Rationale	Advantages	Disadvantages
Silver hake – sources of scientific uncertainty derived from 10-year F_{msy} variance and interannual variability in survey biomass					
75% of $F_{threshold}$*3year ma survey	% of F_{msy} proxy = 2.78*75 north; 34.18*.75 south	23,596*0.75 mt north; 60,127*0.75 mt south	Constant buffer for unquantified scientific uncertainty	Consistent with groundfish stocks with index based assessments	Does not explicitly account for vary levels of uncertainty and risk
ABC variable fraction of OFL to account for interannual variation	Calculated probability level (e.g. 25th percentile of F_{msy} estimate)	Varies with 3 year moving average of survey biomass and uncertainty about stock size	Applies explicit estimate of scientific uncertainty, varies through time.	Incorporates level of acceptable risk, accounting for trends in scientific uncertainty and survey precision.	Requires annual re-estimation of uncertainty
Constant fraction of OFL based on relative estimates of scientific uncertainty	Constant for each stock (e.g. 25th percentile of OFL/median OFL).	Varies with 3 year moving average of survey biomass	Applies constant scientific uncertainty of F_{msy} by stock	Simpler to calculate and easier to understand that ABC is a constant fraction of OFL	Assumes that scientific uncertainty doesn't change, or there is no information about changes in scientific uncertainty
Red hake - sources of scientific uncertainty derived from AIM bootstrap distribution of F_{msy} and interannual variability in survey biomass					
75% of $F_{threshold}$*3year ma survey	% of F_{msy} proxy = 0.163*.75 north; 3.04*.75 south	394*0.75 mt north; 2,897*0.75 mt south	Constant buffer for unquantified scientific uncertainty	Consistent with groundfish stocks with index based assessments	Does not explicitly account for vary levels of uncertainty and risk
ABC variable fraction of OFL to account for interannual variation	Calculated probability level (e.g. 25th percentile of F_{msy} estimate)	Varies with 3 year moving average of survey biomass and uncertainty about stock size	Applies explicit estimate of scientific uncertainty, varies through time.	Incorporates level of acceptable risk, accounting for trends in scientific uncertainty and survey precision.	Requires annual re-estimation of uncertainty

Basis for ABC OFL = $F_{msy}*B_t$ MSY = $F_{msy}*B_{msy}$	Relationship to OFL	Estimated value	Rationale	Advantages	Disadvantages
Constant fraction of OFL based on relative estimates of scientific uncertainty	Constant for each stock (e.g. 25th percentile of OFL/median OFL).	Varies with 3 year moving average of survey biomass	Applies constant scientific uncertainty of Fmsy by stock	Simpler to calculate and easier to understand that ABC is a constant fraction of OFL	Assumes that scientific uncertainty doesn't change, or there is no information about changes in scientific uncertainty
Offshore hake					
Recent catch	Unknown	Wasn't calculated – not preferred method	Maintain status quo until more information is available	Prevents offshore hake catches from escalating	Monitoring or reporting costs may be unrealistic
Added to combined silver/offshore ABC for southern stock	Unknown	~10% of southern hake catches	'Basket' ABC consistent with fishery practices	Basket ABC does not require separation of the catch	May not adequately protect offshore hake from overfishing

10.0 References

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Section 7.1.4 EFH Assessment

According to the EFH Final Rule, "Federal agencies are not required to provide NMFS with assessments regarding actions that they have determined would not adversely affect EFH." The action proposed under this framework will not have an adverse effect on EFH of federally managed species, and, therefore, no EFH Assessment is required or provided.

Section 7.2 National Environmental Policy Act (NEPA), including FONSI Statement

This section evaluates the proposed action in the context of NEPA, for determining the significance of Federal actions, in this case the establishment of ACLs and AMs for the small-mesh multispecies fishery through Secretarial Amendment.

Section 7.2.1 Finding of No Significant Impact

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

These include:

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

The proposed action is not expected to jeopardize the sustainability of the target species affected by this action – silver, red, and offshore hake. The intent of this action is to control the total amount of silver, red, and offshore hake that may be harvested at a level determined to be sustainable by the best available science and recommended by the Council's SSC (see Appendix B). The impacts of the proposed action on the small-mesh multispecies resource are discussed in Section 5.1 of the EA.

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

The proposed action is not expected to jeopardize the sustainability of any non-target species, as noted in Section 5.2 of the EA. The level of fishing effort resulting from the proposed action is the same as, or below the current levels. Although information about bycatch is limited and inconclusive with respect to fishery-wide impacts, the impact of the small-mesh multispecies fishery on non-target species is not significant, primarily because small-mesh multispecies are landed incidentally in a number of fisheries and are less often the target species themselves.

(3) Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Fishery Conservation and Management Act and identified in FMPs?

The alternatives under consideration in this action will not increase small-mesh multispecies effort in either stock area over the baseline effort level. The overall effect of the fishery on EFH was discussed and mitigated for in Northeast Multispecies Amendments 11, 12, and 13, and the alternatives under consideration do not change those findings. As discussed in Section 5.3 the EA, the action proposed in this amendment would not have an adverse impact on EFH for any federally managed species in the region.

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

This action is not expected to have substantial adverse impacts on public health because it would not significantly alter fishing effort, location, or other aspects of fishing behavior.

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

Impacts of this action on endangered and threatened species and marine mammals were assessed in Section 5.4 of the EA. The activities to be conducted under the proposed action are within the scope of the FMP and do not change the basis for the determinations made in previous consultations because it would not significantly alter fishing effort, location, or other aspects of fishing behavior. Further, as discussed in Section 5.4.1, the limited scope of the proposed action and the overall low effort in the small-mesh multispecies fishery, the proposed action is not expected to result in adverse impacts to the recently listed Atlantic sturgeon DPSs. An updated Biological Opinion for the small-mesh multispecies fishery must be completed to fully evaluate the impacts of the fishery on Atlantic sturgeon, and will detail any necessary measures, terms, and conditions to reduce the impact of the fishery on Atlantic sturgeon populations.

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

The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While the role of small-mesh multispecies within the ecosystem is not well understood, SAW 51 observed that the primary source of silver and red hake removals has been consumption since the 1980s. The maintenance of this prey at historical and sustainable levels is likely to promote biodiversity and ecosystem function over the long term.

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

The proposed action is designed to maintain a sustainable population of small-mesh multispecies. Neutral to positive impacts on the physical and biological environment are expected to result from this action. The action's potential social and economic impacts are expected to be neutral (ranging from short-term negative to long-term positive), as discussed in the EA (Section 5.5) and in the Executive Order 12866 review (Section 7.10). Under the proposed action, some vessels may experience a slight decrease in revenue, if certain measures are triggered (i.e., the in-season accountability measure), but that decrease may be offset by redirecting on other species. There are no significant natural or physical environmental effects resulting from the proposed action that may have an impact on communities or the human environment in the context of NEPA. Furthermore, the proposed action is expected to provide long-term benefits of a stable and sustainable fishery through the achievement of optimum yield and prevention of overfishing.

(8) To what degree are the effects on the quality of human environment expected to be highly controversial?

The effects of the proposed action are not expected to be highly controversial. They are consistent with the effects determined in the Amendments under which the small-mesh multispecies were regulated within the FMP (primarily Amendments 4, 7, 11, and 12) which have not been challenged.

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

The small-mesh multispecies fishery is not known to take place in any unique areas such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. Therefore, the proposed action is not expected to have a substantial impact on any of these areas.

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

The impacts of the proposed action on the human environment are described in Section 5.0 of the EA. This action is not expected to significantly alter fishing methods or activities that would have a significant impact on the human environment. The types of actions proposed in this amendment to the Northeast Multispecies FMP are consistent with previous actions and similar to types of management measures used widely in federally-managed fisheries. Therefore, the measures contained in this action are not expected to have highly uncertain, unique, or unknown risks on the human environment.

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

The proposed action, together with past and future actions, is not expected to result in significant cumulative impacts on the biological and physical components of the environment or on human communities (See Cumulative Effects Summary in Section 6.0.)

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

The small-mesh multispecies fishery is not known to be take place in any areas that might affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of significant scientific, cultural or historical resources. Therefore, this action is not expected to affect any of these areas.

(13) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

There is no evidence or indication that the small-mesh multispecies fishery has ever resulted in the introduction or spread of non-indigenous species. The proposed action is not expected to significantly alter fishing methods or activities in a way that would be expected to result in the introduction or spread of a non-indigenous species.

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

This action is not likely to establish any precedents for future actions with significant effects, nor does it represent a decision in principle about a future consideration. This action is taken under an existing fishery management program. The future management regime for the small-mesh multispecies fishery, should changes become necessary, has not been defined, and will depend on the advancements made in the scientific understanding of the species and population dynamics, or shifts in management philosophy. The impact of any future changes will be analyzed as to their significance in the process of developing and implementing them.

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

This 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. This action is not expected to alter fishing methods in any way except to change the level of catch or landings that are permitted for the fishery as a whole.

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

The impacts of the proposed action on the biological, physical, and human environment are described in Section 5.0. The cumulative effects of this action on target and non-target species

are detailed in Section 6.0. The proposed action is not expected to have a substantial effect on either the target or any non-target 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 action in this Secretarial amendment 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.

Regional Administrator, Northeast Region, NMFS

3/1/12
Date

Section 7.3 Marine Mammal Protection Act (MMPA)

NMFS has reviewed the impacts of the action on marine mammals and has concluded that the management actions are consistent with the provisions of the MMPA, and will not alter existing measures to protect the species likely to inhabit the areas in which the small-mesh multispecies fishery occurs. For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see the relevant part of Section 5.0 of this document.

Section 7.4 Endangered Species Act (ESA)

Formal consultation on the small-mesh multispecies fishery was reinitiated on February 9, 2012. NMFS have determined that there will not be any irreversible or irretrievable commitment of resources under section 7(d) of the ESA during the consultation period that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures. NMFS has also determined that the continued authorization of the small-mesh multispecies fishery during the consultation period, including the authorization of those fisheries to operate under the measures proposed in the Secretarial Amendment, is not likely to jeopardize the continued existence of ESA-listed species or result in the destructive or adverse modification of critical habitat. No takes of ESA-listed marine mammals are expected or authorized during the consultation period.

Section 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 amendment document and will

Section 7.1.4 EFH Assessment

According to the EFH Final Rule, "Federal agencies are not required to provide NMFS with assessments regarding actions that they have determined would not adversely affect EFH." The action proposed under this framework will not have an adverse effect on EFH of federally managed species, and, therefore, no EFH Assessment is required or provided.

Section 7.2 National Environmental Policy Act (NEPA), including FONSI Statement

This section evaluates the proposed action in the context of NEPA, for determining the significance of Federal actions, in this case the establishment of ACLs and AMs for the small-mesh multispecies fishery through Secretarial Amendment.

Section 7.2.1 Finding of No Significant Impact

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

These include:

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

The proposed action is not expected to jeopardize the sustainability of the target species affected by this action – silver, red, and offshore hake. The intent of this action is to control the total amount of silver, red, and offshore hake that may be harvested at a level determined to be sustainable by the best available science and recommended by the Council's SSC (see Appendix B). The impacts of the proposed action on the small-mesh multispecies resource are discussed in Section 5.1 of the EA.

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

The proposed action is not expected to jeopardize the sustainability of any non-target species, as noted in Section 5.2 of the EA. The level of fishing effort resulting from the proposed action is the same as, or below the current levels. Although information about bycatch is limited and inconclusive with respect to fishery-wide impacts, the impact of the small-mesh multispecies fishery on non-target species is not significant, primarily because small-mesh multispecies are landed incidentally in a number of fisheries and are less often the target species themselves.

(3) Can the proposed action be reasonably expected to allow substantial damage to the ocean and coastal habitats and/or EFH as defined under the Magnuson-Stevens Fishery Conservation and Management Act and identified in FMPs?

The alternatives under consideration in this action will not increase small-mesh multispecies effort in either stock area over the baseline effort level. The overall effect of the fishery on EFH was discussed and mitigated for in Northeast Multispecies Amendments 11, 12, and 13, and the alternatives under consideration do not change those findings. As discussed in Section 5.3 the EA, the action proposed in this amendment would not have an adverse impact on EFH for any federally managed species in the region.

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

This action is not expected to have substantial adverse impacts on public health because it would not significantly alter fishing effort, location, or other aspects of fishing behavior.

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

Impacts of this action on endangered and threatened species and marine mammals were assessed in Section 5.4 of the EA. The activities to be conducted under the proposed action are within the scope of the FMP and do not change the basis for the determinations made in previous consultations because it would not significantly alter fishing effort, location, or other aspects of fishing behavior. Further, as discussed in Section 5.4.1, the limited scope of the proposed action and the overall low effort in the small-mesh multispecies fishery, the proposed action is not expected to result in adverse impacts to the recently listed Atlantic sturgeon DPSs. An updated Biological Opinion for the small-mesh multispecies fishery must be completed to fully evaluate the impacts of the fishery on Atlantic sturgeon, and will detail any necessary measures, terms, and conditions to reduce the impact of the fishery on Atlantic sturgeon populations.

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

The proposed action is not expected to have a substantial impact on biodiversity and ecosystem function within the affected area. While the role of small-mesh multispecies within the ecosystem is not well understood, SAW 51 observed that the primary source of silver and red hake removals has been consumption since the 1980s. The maintenance of this prey at historical and sustainable levels is likely to promote biodiversity and ecosystem function over the long term.

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

The proposed action is designed to maintain a sustainable population of small-mesh multispecies. Neutral to positive impacts on the physical and biological environment are expected to result from this action. The action's potential social and economic impacts are expected to be neutral (ranging from short-term negative to long-term positive), as discussed in the EA (Section 5.5) and in the Executive Order 12866 review (Section 7.10). Under the proposed action, some vessels may experience a slight decrease in revenue, if certain measures are triggered (i.e., the in-season accountability measure), but that decrease may be offset by redirecting on other species. There are no significant natural or physical environmental effects resulting from the proposed action that may have an impact on communities or the human environment in the context of NEPA. Furthermore, the proposed action is expected to provide long-term benefits of a stable and sustainable fishery through the achievement of optimum yield and prevention of overfishing.

(8) To what degree are the effects on the quality of human environment expected to be highly controversial?

The effects of the proposed action are not expected to be highly controversial. They are consistent with the effects determined in the Amendments under which the small-mesh multispecies were regulated within the FMP (primarily Amendments 4, 7, 11, and 12) which have not been challenged.

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

The small-mesh multispecies fishery is not known to take place in any unique areas such as historic or cultural resources, park land, prime farmlands, wetlands, wild and scenic rivers or ecologically critical areas. Therefore, the proposed action is not expected to have a substantial impact on any of these areas.

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

The impacts of the proposed action on the human environment are described in Section 5.0 of the EA. This action is not expected to significantly alter fishing methods or activities that would have a significant impact on the human environment. The types of actions proposed in this amendment to the Northeast Multispecies FMP are consistent with previous actions and similar to types of management measures used widely in federally-managed fisheries. Therefore, the measures contained in this action are not expected to have highly uncertain, unique, or unknown risks on the human environment.

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

The proposed action, together with past and future actions, is not expected to result in significant cumulative impacts on the biological and physical components of the environment or on human communities (See Cumulative Effects Summary in Section 6.0.)

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

The small-mesh multispecies fishery is not known to be take place in any areas that might affect districts, sites, highways, structures, or objects listed in or eligible for listing in the National Register of Historic Places or cause the loss or destruction of significant scientific, cultural or historical resources. Therefore, this action is not expected to affect any of these areas.

(13) Can the proposed action reasonably be expected to result in the introduction or spread of a non-indigenous species?

There is no evidence or indication that the small-mesh multispecies fishery has ever resulted in the introduction or spread of non-indigenous species. The proposed action is not expected to significantly alter fishing methods or activities in a way that would be expected to result in the introduction or spread of a non-indigenous species.

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

This action is not likely to establish any precedents for future actions with significant effects, nor does it represent a decision in principle about a future consideration. This action is taken under an existing fishery management program. The future management regime for the small-mesh multispecies fishery, should changes become necessary, has not been defined, and will depend on the advancements made in the scientific understanding of the species and population dynamics, or shifts in management philosophy. The impact of any future changes will be analyzed as to their significance in the process of developing and implementing them.

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

This 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. This action is not expected to alter fishing methods in any way except to change the level of catch or landings that are permitted for the fishery as a whole.

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

The impacts of the proposed action on the biological, physical, and human environment are described in Section 5.0. The cumulative effects of this action on target and non-target species

are detailed in Section 6.0. The proposed action is not expected to have a substantial effect on either the target or any non-target 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 action in this Secretarial amendment 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.

3/1/12

Regional Administrator, Northeast Region, NMFS — Date

Section 7.3 Marine Mammal Protection Act (MMPA)

NMFS has reviewed the impacts of the action on marine mammals and has concluded that the management actions are consistent with the provisions of the MMPA, and will not alter existing measures to protect the species likely to inhabit the areas in which the small-mesh multispecies fishery occurs. For further information on the potential impacts of the fishery and the proposed management action on marine mammals, see the relevant part of Section 5.0 of this document.

Section 7.4 Endangered Species Act (ESA)

Formal consultation on the small-mesh multispecies fishery was reinitiated on February 9, 2012. NMFS have determined that there will not be any irreversible or irretrievable commitment of resources under section 7(d) of the ESA during the consultation period that would have the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures. NMFS has also determined that the continued authorization of the small-mesh multispecies fishery during the consultation period, including the authorization of those fisheries to operate under the measures proposed in the Secretarial Amendment, is not likely to jeopardize the continued existence of ESA-listed species or result in the destructive or adverse modification of critical habitat. No takes of ESA-listed marine mammals are expected or authorized during the consultation period.

Section 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 amendment document and will