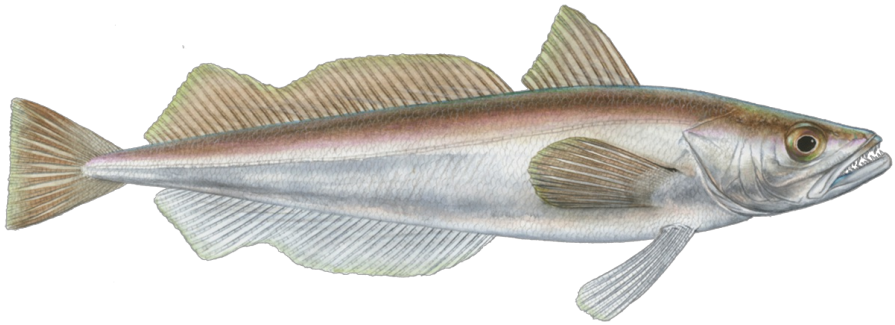
# Offshore, Red & Silver hake

*Merluccius bilinearis, Urophycis chuss,* and *Merluccius albidus*



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## United States of America: Northwest Atlantic

## Bottom trawls

*Seafood Watch Consulting Researcher*

Published February 12, 2016, Updated March 1, 2021 – see appendix for more details



Seafood Watch Standard used in this assessment: Fisheries Standard v2

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## About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the ecological sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. Seafood Watch makes its science-based recommendations available to the public in the form of regional pocket guides that can be downloaded from www.seafoodwatch.org. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

Each sustainability recommendation on the regional pocket guides is supported by a Seafood Watch Assessment. Each assessment synthesizes and analyzes the most current ecological, fisheries and ecosystem science on a species, then evaluates this information against the program's conservation ethic to arrive at a recommendation of "Best Choices," "Good Alternatives" or "Avoid." This ethic is operationalized in the Seafood Watch standards, available on our website here. In producing the assessments, Seafood Watch seeks out research published in academic, peer-reviewed journals whenever possible. Other sources of information include government technical publications, fishery management plans and supporting documents, and other scientific reviews of ecological sustainability. Seafood Watch Research Analysts also communicate regularly with ecologists, fisheries and aquaculture scientists, and members of industry and conservation organizations when evaluating fisheries and aquaculture practices. Capture fisheries and aquaculture practices are highly dynamic; as the scientific information on each species changes, Seafood Watch's sustainability recommendations and the underlying assessments will be updated to reflect these changes.

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Watch assessments in any way they find useful.

## Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished[1] or farmed that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

The following guiding principles illustrate the qualities that fisheries must possess to be considered sustainable by the Seafood Watch program (these are explained further in the Seafood Watch Standard for Fisheries):

- Follow the principles of ecosystem-based fisheries management.
- Ensure all affected stocks are healthy and abundant.
- Fish all affected stocks at sustainable levels.
- Minimize bycatch.
- Have no more than a negligible impact on any threatened, endangered or protected species.
- Managed to sustain the long-term productivity of all affected species.
- Avoid negative impacts on the structure, function or associated biota of aquatic habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.

These guiding principles are operationalized in the four criteria in this standard. Each criterion includes:

- Factors to evaluate and score
- Guidelines for integrating these factors to produce a numerical score and rating

Once a rating has been assigned to each criterion, we develop an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guide and online guide:

**Best Choice/Green:** Are well managed and caught in ways that cause little harm to habitats or other wildlife.

**Good Alternative/Yellow:** Buy, but be aware there are concerns with how they're caught.

**Avoid/Red** Take a pass on these for now. These items are overfished or caught in ways that harm other marine life or the environment.

[1] "Fish" is used throughout this document to refer to finfish, shellfish and other invertebrates

## Summary

This report update provides recommendations for three hake species caught in the small-mesh multispecies fishery in U.S. Atlantic waters: silver hake, red hake, and offshore hake (*Merluccius bilinearis, Urophycis chuss,* and *Merluccius albidus*). There are two stocks of silver hake and red hake, and a single stock of offshore hake in U.S. Atlantic waters. Both stocks of silver not overfished and overfishing is not occurring. The Mid-Atlantic stock is overfished and undergoing overfishing, but the New England stock is considered healthy. The stock status of offshore hake is unknown.

Small-mesh trawl fisheries in the Northeast and Mid-Atlantic have some bycatch, mostly species that are also targeted with small-mesh: squids, Atlantic butterfish, and Atlantic mackerel. The small-mesh multispecies fishery is combined with the Northeast bottom trawl fishery and is classified as a Category II fishery for marine mammal takes due to interactions with the western North Atlantic stock of Atlantic white-sided dolphins, bottlenose dolphin, short-beaked common dolphin, and harbor porpoise. The lowest-scoring species under Criterion 2 are Atlantic mackerel and red hake in the mid-Atlantic area and long-finned pilot whale in the New England area. Thus, these species' scores drive the Criterion 2 rankings. Bycatch within the fishery is a high conservation concern.

The small-mesh multispecies fishery is managed under a series of exemptions to the Northeast Multispecies Fishery Management Plan because the fishing industry was able to demonstrate that it could keep bycatch levels low enough so as not to negatively affect groundfish stocks. Managers follow scientific advice and work is ongoing to obtain better information on all of these species. Management of retained species is considered moderately effective, while management of bycatch within the fishery is considered highly effective.

The small-mesh multispecies trawlers use modified gear in some areas with the intention of greatly reducing contact with the bottom. Furthermore, silver hake, red hake, and offshore hake are found over sand and mud bottom, which some studies have found are not heavily impacted by bottom trawls. The New England Fishery Management Council is in the process of developing ecosystem based fishery management strategies for exceptional species caught in this fishery.

## Final Seafood Recommendations

| SPECIES \| FISHERY | CRITERION 1 TARGET SPECIES | CRITERION 2 OTHER SPECIES | CRITERION 3 MANAGEMENT | CRITERION 4 HABITAT | OVERALL RECOMMENDATION |
|---|---|---|---|---|---|
| Offshore silver hake \| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 2.644 | 1.343 | 3.464 | 2.739 | **Good Alternative (2.409)** |
| Offshore silver hake \| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.644 | 2.051 | 3.464 | 2.739 | **Good Alternative (2.678)** |
| Red hake \| Northwest Atlantic \| Bottom trawls \| United States \| New England | 3.831 | 2.051 | 3.464 | 2.739 | **Good Alternative (2.938)** |
| Red hake \| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 1.414 | 1.343 | 3.464 | 2.739 | **Avoid (2.060)** |
| Silver hake \| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 3.831 | 1.343 | 3.464 | 2.739 | **Good Alternative (2.643)** |
| Silver hake \| Northwest Atlantic \| Bottom trawls \| United States \| New England | 4.284 | 2.051 | 3.464 | 2.739 | **Good Alternative (3.021)** |

**Summary**

The poor stock statuses of red hake and Atlantic mackerel, as well as the high vulnerability of long-finned pilot whales; and the potential of the trawl gear used to negatively impact habitat prevent these three species from being a green "best choice" and so all but one are considered a yellow "good alternative". The red hake recommendation for the Mid-Atlantic is "avoid" because of high concerns with the target species (red hake) and other incidentally caught species (Atlantic mackerel and short-beaked common dolphin).

**Scoring Guide**

Scores range from zero to five where zero indicates very poor performance and five indicates the fishing operations have no significant impact.

Final Score = geometric mean of the four Scores (Criterion 1, Criterion 2, Criterion 3, Criterion 4).

**Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores

**Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern2, and no more than one Red Criterion, and no Critical scores

**Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

[2] Because effective management is an essential component of sustainable fisheries, Seafood Watch issues an Avoid recommendation for any fishery scored as a Very High Concern for either factor under Management (Criterion 3).

# Introduction

**Scope of the analysis and ensuing recommendation**

This report update covers silver hake, offshore hake, and red hake. These species are caught in a small-mesh, multispecies otter trawl fishery in the Northeast and Mid-Atlantic regions. Two stock units are evaluated for red hake and silver hake; the Gulf of Maine/Northern Georges Bank stock for Silver hake and Red hake are landed in the New England fishery. The Southern Georges Bank/ Mid-Atlantic stock for Silver hake and Red hake are landed in the US Mid-Atlantic fishery. Prior to 1991, offshore hake were landed as silver hake in the southern region of the stock {Garcia-Vazquez et al. 2009}. However, since then, the extent to which the catches of both species are separated is unknown and therefore their numbers are combined for purposes like assigning catch limits. This report covers the majority of silver, offshore and red hake caught in the U.S. Atlantic with over 95% of landings coming from the small-mesh otter trawl fishery.

**Species Overview**

Silver hake and offshore hake are collectively referred to as whiting while red hake is referred to as ling (NEFMC 2012). The fishery for all three species is often referred to as the 'whiting fishery'; however in order to prevent confusion, for the purposes of this report the fishery is referred to as the small-mesh multispecies fishery.

Silver hake *(Merluccius bilinearis)* in the Northwest Atlantic is found from Newfoundland to South Carolina (NEFMC 2014b). The northern stock inhabits the Gulf of Maine to northern Georges Bank and the southern stock inhabits southern Georges Bank to the Mid-Atlantic Bight waters. Although no scientific evidence can be found to support a single or separate biological stock structure, the two stocks are used for scientific and management purposes. Silver hake is a nocturnal, semi-pelagic predator that migrates seasonally with the changes in water temperature. It can be found in warmer, shallower waters in spring, where it spawns through early summer. It returns to deeper, cooler water in the fall. Silver hake are almost all sexually mature by age 3. The maximum size is 70 cm (28 in) and maximum age found is 14 years (NEFMC 2014b).

Red hake *(Urophycis chuss)* is found from the Gulf of St. Lawrence to North Carolina with the highest abundance from northern Georges Bank to southern New England waters (NEFMC 2014b). There are northern and southern stocks of red hake, with the same boundaries as those of silver hake's. This split is for management purposes. Red hake is a gadoid species that also migrates seasonally. Like silver hake, it can be found in warmer, shallower waters in spring, where it spawns from May to November. It returns to deeper, cooler water in the winter. Half of the red hake population is sexually mature before age 2. The maximum size is 50 cm (20 in) and maximum age found is also 14 years (NEFMC 2014b).

Not as much is known about the biology and population dynamics of offshore hake *(Merluccius albidus)*. This species is found in the Northwest Atlantic to the Caribbean and Gulf of Mexico (NOAA Fisheries 1999). Spawning likely occurs from April through July in New England and June through September in the Mid-Atlantic Bight. It is not known whether or not offshore hakes migrate-- they have been found at constant depths, around 200 m, and may migrate vertically in the water column at night.

**Production Statistics**

Silver and offshore hake landings decreased from a high in 1965 of 351,000 mt to a low point of 16,100 mt in 1981 (NEFMC 2000). After this, landings remained relatively stable with a slight decline in the 1990s, and then have declined by about half since 2000 (NOAA Office of Science and Technology 2015).

Red hake landings decreased from a high in 1956 of 4.746 mt to a low point of 429.4 mt in 2005 and have been under 1,000 mt since 2002 (NOAA Office of Science and Technology 2015).

Small-mesh multispecies directed trip landings are primarily from MA, NY, and RI (top five ports landing silver hake are Gloucester, MA, Provincetown, MA, Point Judith, RI, Montauk, NY, and New Bedford, MA). Landings are relatively stable throughout the year, with a slight increase in July, August, and September, and a low in November and December.

**Importance to the US/North American market.**

About half of the silver hake landed is exported, and the other half is consumed domestically (NEFMC 2000). Of the silver hake consumed domestically, most goes to the fresh market, where it is sold to restaurants and supermarkets for use in fried fish sandwiches, corned (salted) hake traditionally in New England, or other whitefish dishes. The U.S. West Coast Pacific whiting fishery supplies cheaper frozen whiting, which may be part of the reason the frozen market for silver hake declined in the past few decades.

Offshore hake is caught in deeper waters than silver hake, but is usually sold with and as whiting (NEFMC 2000). It is usually larger than silver hake, however, and people prefer smaller sizes. Its meat is generally softer than that of silver hake, and where it is separated, it is usually sold for a lower price. Point Judith is one of the only ports that separates offshore hake from silver hake.

Red hake meat does not last long, and cannot be frozen or successfully stored for very long or transported very far (NEFMC 2000). Because of this, there is no developed market for it, either domestically or internationally. There is a small fillet market in New York, Philadelphia, and Baltimore, and a small domestic whole ling market.

**Common and market names.**

Silver and offshore hake are commonly referred to as whiting. Offshore hake can also commonly be referred to as black whiting. Red hake is most commonly referred to as ling, also sometimes as squirrel or mud hake. (NEFMC 2012)

**Primary product forms**

Whiting is found in the marketplace filleted, whole, and smoked. Bigger red hake is sold filleted and smaller red hake whole.

# Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Standard for Fisheries, available at www.seafoodwatch.org. The specific standard used is referenced on the title page of all Seafood Watch assessments.

## Criterion 1: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. When abundance is unknown, abundance is scored based on the species' inherent vulnerability, which is calculated using a Productivity-Susceptibility Analysis. The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

Rating is Critical if Factor 1.3 (Fishing Mortality) is Critical.

**Guiding Principles**

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level*

# Criterion 1 Summary

| OFFSHORE SILVER HAKE | | | | |
|---|---|---|---|---|
| **REGION / METHOD** | **INHERENT VULNERABILITY** | **ABUNDANCE** | **FISHING MORTALITY** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 3.000: Low | 3.000: Moderate Concern | 2.330: Moderate Concern | Good Alternative (2.644) |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 3.000: Low | 3.000: Moderate Concern | 2.330: Moderate Concern | Good Alternative (2.644) |

| RED HAKE | | | | |
|---|---|---|---|---|
| **REGION / METHOD** | **INHERENT VULNERABILITY** | **ABUNDANCE** | **FISHING MORTALITY** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.000: Medium | 4.000: Low Concern | 3.670: Low Concern | Best Choice (3.831) |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 2.000: Medium | 2.000: High Concern | 1.000: High Concern | Avoid (1.414) |

| SILVER HAKE | | | | |
|---|---|---|---|---|
| **REGION / METHOD** | **INHERENT VULNERABILITY** | **ABUNDANCE** | **FISHING MORTALITY** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 2.000: Medium | 4.000: Low Concern | 3.670: Low Concern | Best Choice (3.831) |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.000: Medium | 5.000: Very Low Concern | 3.670: Low Concern | Best Choice (4.284) |

# Criterion 1 Assessments

SCORING GUIDELINES

**Factor 1.1 - Abundance**

Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

- *5 (Very Low Concern) — Strong evidence exists that the population is above an appropriate target abundance level (given the species' ecological role), or near virgin biomass.*
- *3.67 (Low Concern) — Population may be below target abundance level, but is at least 75% of the target level, OR data-limited assessments suggest population is healthy and species is not highly vulnerable.*
- *2.33 (Moderate Concern) — Population is not overfished but may be below 75% of the target abundance level, OR abundance is unknown and the species is not highly vulnerable.*
- *1 (High Concern) — Population is considered overfished/depleted, a species of concern, threatened or endangered, OR abundance is unknown and species is highly vulnerable.*

**Factor 1.2 - Fishing Mortality**

Goal: Fishing mortality is appropriate for current state of the stock.

- *5 (Low Concern) — Probable (>50%) that fishing mortality from all sources is at or below a sustainable level, given the species ecological role, OR fishery does not target species and fishing mortality is low enough to not adversely affect its population.*
- *3 (Moderate Concern) — Fishing mortality is fluctuating around sustainable levels, OR fishing mortality relative to a sustainable level is uncertain.*
- *1 (High Concern) — Probable that fishing mortality from all source is above a sustainable level.*

## Offshore silver hake

**Factor 1.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Low**
Offshore hake is found on the outer part and upper slope of the continental shelf from Georges Bank to Suriname and French Guiana. This species has been found to be mature at 28 cm and have a maximum length of 70 cm, but is commonly found at 30-45 cm. These and other life history parameters give offshore hake a low inherent vulnerability with a Fishbase vulnerability score of 30 out of 100 (FishBase 2015b).
**Justification:**
FishBase uses a paper by Cheung et al. to generate inherent vulnerability scores based on life history parameters {Cheung et al. 2005}. The life history parameters used are maximum length, age at first maturity, longevity, von Bertalanffy growth parameter *K*, natural mortality rate, fecundity, strength of spatial behavior, and geographic range {Cheung et al.}.

**Factor 1.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Concern**
Stock status is unknown. According to the latest stock assessment (2011), there are insufficient fishery data to determine offshore hake stock status and survey trends cannot be relied upon to reflect the stock status (NEFSC 2011). The 2014 stock status update supports this and reiterates that the data are insufficient and the survey trends are unreliable (NEFSC 2014). As stock status is unknown and inherent vulnerability is low, Seafood Watch considers offshore hake abundance to be of moderate conservation concern.
**Justification:**
"The SARC-51 Review Panel concluded that sufficient information is not available to determine offshore hake stock status with confidence, because fishery data are insufficient and one cannot assume that survey data reflect stock trends. The Panel concluded that it is not possible at this time to provide a reliable definition for overfished and overfishing for this stock." (NEFSC 2011) In the 2014 stock status update, this status remains unchanged ("stock status determination remains undetermined because the fishery data were not sufficient and the survey trends did not reflect the stock trends" (NEFSC 2014)).

**Factor 1.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Concern**
The rate of fishing mortality on offshore hake is unknown. According to the latest stock assessment (2011), there are insufficient fishery data to determine fishing mortality on offshore hake and survey trends cannot be relied upon (NEFSC 2011). The 2014 stock status update supports this and reiterates that the data are insufficient and the survey trends are unreliable (NEFSC 2014). As fishing mortality is unknown relative to a sustainable level, Seafood Watch considers fishing mortality of offshore hake to be a moderate conservation concern.
**Justification:**
"The SARC-51 Review Panel concluded that sufficient information is not available to determine offshore hake stock status with confidence, because fishery data are insufficient and one cannot assume that survey data reflect stock trends. The Panel concluded that it is not possible at this time to provide a reliable definition for overfished and overfishing for this stock." (NEFSC 2011) In the 2014 stock status update, this status remains unchanged ("stock status determination remains undetermined because the fishery data were not sufficient and the survey trends did not reflect the stock trends" (NEFSC 2014)).

## Red hake

**Factor 1.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | New England**
**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Medium**
Red hake is found from the Gulf of St. Lawrence to North Carolina and has a maximum tail length of 63 cm for females and a maximum age of 14 years, but few are found older than 8 years and more than 50 cm TL (Steimle et al. 1999). This species grows and matures quickly, between ages 1 and 2, after which the growth rate declines. These and other characteristics give red hake a medium inherent vulnerability with a Fishbase vulnerability score of 51 out of 100 (FishBase 2015c).

**Factor 1.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**
Southern stock red hake abundance has been declining since 2012. This stock is overfished according to the most recent stock assessment update (NEFSC 2018). The NMFS Stock Status for FSSI stocks in the 4th Quarter of 2019 also lists red hake as overfished (NMFS 2019). This is an update of the existing 2010 benchmark assessment and 2015 stock status update. The three-year average survey biomass (2015 to 2017) for the southern stock of red hake is estimated at 0.38 kg/tow, which is below the proxy biomass threshold of 0.508 kg/tow and target level of 1.02 kg/tow (NEFSC 2011). Because the stock is listed as overfished. Seafood Watch considers red hake abundance a high concern.

**Justification:**
Red hake is declared overfished when the three year moving average of the spring weight per tow is less 50% of $B_{MSY}$. This $B_{MSY}$ proxy is based on the average observed from 1980 to 2010 (NEFSC 2018).

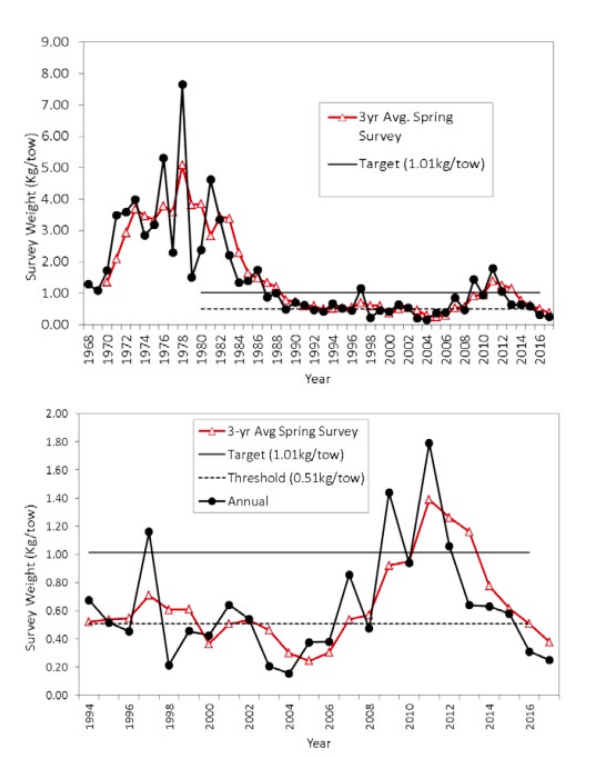



Figure 1: Southern red hake NEFSC spring bottom-trawl survey biomass and associated 3-year moving averages (red lines). The horizontal dashed lines represent the biomass threshold and the solid line represents the biomass target (NEFSC 2018)

**Northwest Atlantic | Bottom trawls | United States | New England**

**Low Concern**
The northern stock of red hake is not overfished according to the most recent benchmark assessment in 2011 and the 2017 update assessment (NEFSC 2011) (NEFSC 2018). This means that the average spring trawl survey biomass index of the three most recent years for which the index is available is over the threshold level of 1.27 kg/tow. In the 2017 update, the average index for 2015-2017 is higher, at approximately 5.13 kg/tow {GARFO & NEFSC 2015}. In the stock assessment, catches are a major source of uncertainty because of misidentification with white hake and possible hybridization of the two species, and natural mortality is unknown. Because the biomass is estimated to be above both the threshold level and the target level but there are uncertainties with the stock assessment, Seafood Watch considers abundance of northern red hake a low concern instead of a very low concern.
**Justification:**
Based on new recommended biological reference points from SAW/SARC-51, the northern stock of red hake is not overfished. The three year arithmetic mean biomass index, based on NEFSC spring bottom trawl survey data in Albatross units for 2008-2010 (2.42 kg/tow), was above the proposed management threshold (1.27 kg/tow)

and close to the target (2.53 kg/tow)." (NEFSC 2011)

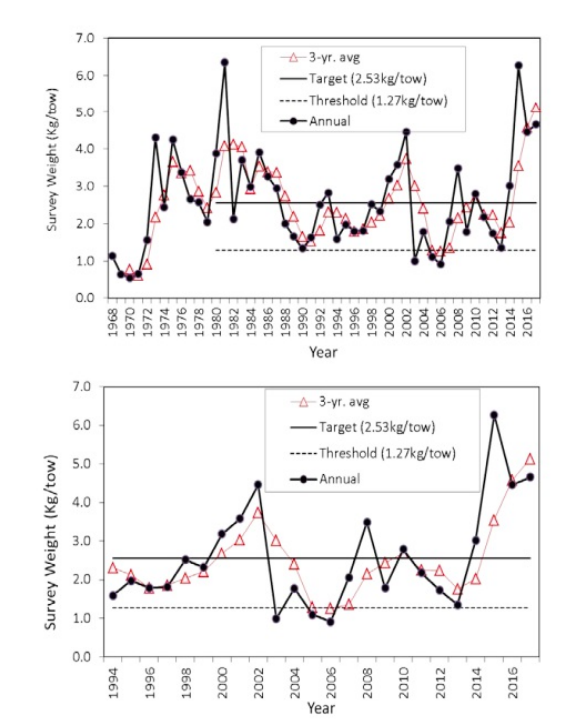



Figure 2: Northern red hake NEFSC spring bottom-trawl survey biomass and associated 3-year moving averages (red lines). The horizontal dashed lines represent the biomass threshold and the solid line represents the biomass target (NEFSC 2018)

**Factor 1.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**

Overfishing occurs for red hake when the ratio between the catch and spring survey biomass exceeds 3.038 kg/tow. The exploitation index for the last three years is 4.13 kt/kg, which is above the management threshold of 3.038 kt/kg, indicating the this stock is undergoing overfishing (NEFSC 2018). Therefore, Seafood Watch deems fishing mortality as high concern.

**Justification:**

The biomass index used in the exploitation index is from the 1980-2009 spring survey numbers, based on an index method (AIM) analysis. AIM estimates a relative level of fishing mortality at which the population will likely remain stable. The threshold exploitation index is 3.038 kt/kg (NEFSC 2018).

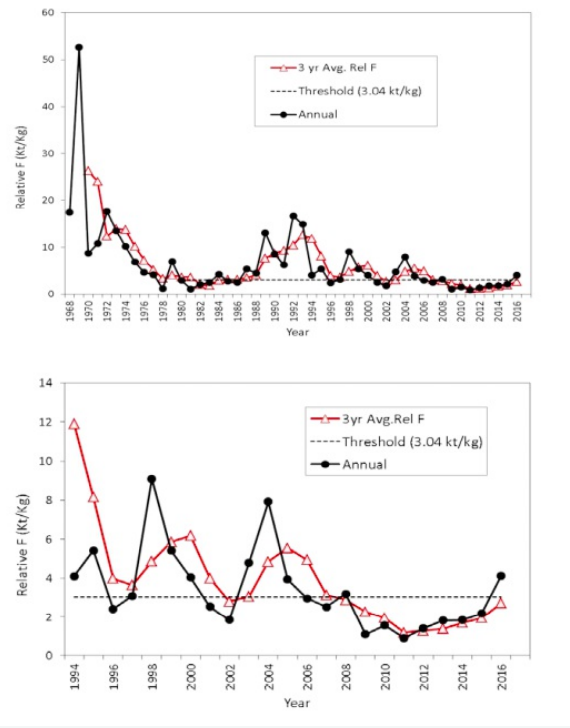



Figure 3: Southern red hake relative exploitation ratios of the total catch to the spring survey indices, and associated 3-year moving averages (red lines). The horizontal dashed lines represent the overfishing thresholds (NEFSC 2018).

**Northwest Atlantic | Bottom trawls | United States | New England**

**Low Concern**

Overfishing is not occurring on the northern stock of red hake {GARFO 2015 & NEFSC 2018}. This means that the exploitation index for the last of the three years, which is the ratio of catch to the spring survey index, was below the threshold level. It was 0.09 kt/kg and the threshold level is 0.16 kt/kg {GARFO & NEFSC 2018}. Because it is probable that overfishing is not occurring but there is some uncertainty with estimating fishing mortality, Seafood Watch considers this a low concern instead of a very low concern.

**Justification:**

The red hake assessment update indicates that overfishing is not occurring on the northern stock. The terminal year (2017) exploitation index based on the ratio of catch to the spring survey index for the northern stock (0.09 kt/kg) was below the management threshold (0.163 kt/kg in the north {GARFO & NEFSC 2018}.

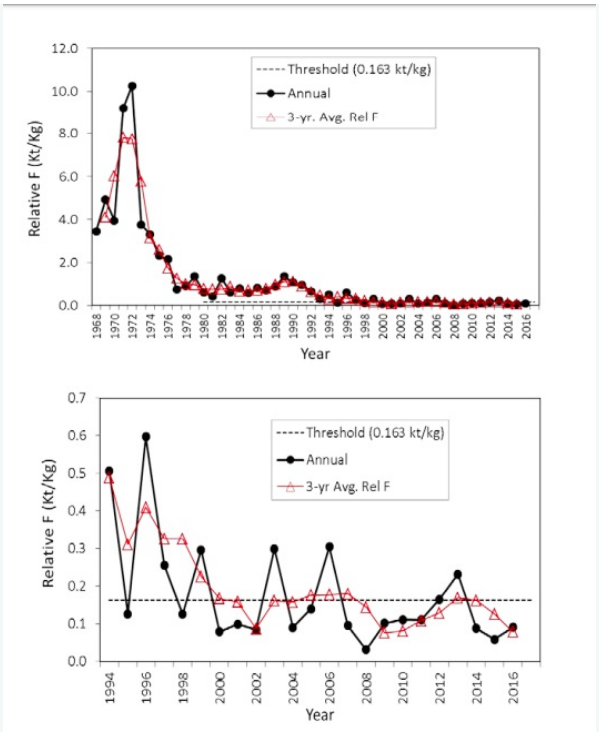



Figure 4: Northern red hake relative exploitation ratios of the total catch to the spring survey indices, and associated 3-year moving averages (red lines). The horizontal dashed lines represent the overfishing thresholds (NEFSC 2018).

## Silver hake

**Factor 1.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Medium**
Silver hake is found in the western Atlantic Ocean from Newfoundland to the Bahamas, but commonly from Newfoundland to South Carolina. It has a maximum reported length of 76 cm and age of 12 years. Silver hake matures between 1.5 years and 2 years of age. Its FishBase "vulnerability" score is moderate (54 out of 100) (FishBase 2015a), which makes it a medium vulnerability score according to Seafood Watch assessment criteria.

**Factor 1.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low Concern**
In the 2017 stock status update, the stock status remains unchanged from the 2011 stock assessment and the 2015 assessment update: the southern stock of silver hake is not overfished {NEFMC 2018}. This means that the average fall trawl survey biomass index of the three most recent years for which the index is available is over the threshold level of 0.83 kg/tow. In the 2011 stock assessment, the 2007-2009 average index was 1.11 kg/tow, which is over the threshold level and close to the target level of 1.65 kg/tow (NEFSC 2011). In the 2017 update, the average index for 2015-2017 is over the threshold at approximately 1.05 kg/tow {NEFMC 2018}. Recruitment remains poor for this stock and the index is declining and nearing the management threshold.

Biomass is above threshold levels, but below target levels. Therefore, Seafood Watch considers abundance of southern silver hake a low concern instead of a very low concern.

**Justification:**
In the south, silver hake is also not overfished. The three year average arithmetic mean biomass, also based on the NESFC fall bottom trawl survey data for 2007-2009 in Albatross units (1.11 kg/tow), was above the biomass threshold (0.83 kg/tow) but below the target (1.65 kg/tow)." (NEFSC 2011). According to the 2018 stock status update, the southern stock of silver hake is slightly above threshold and well below target levels.

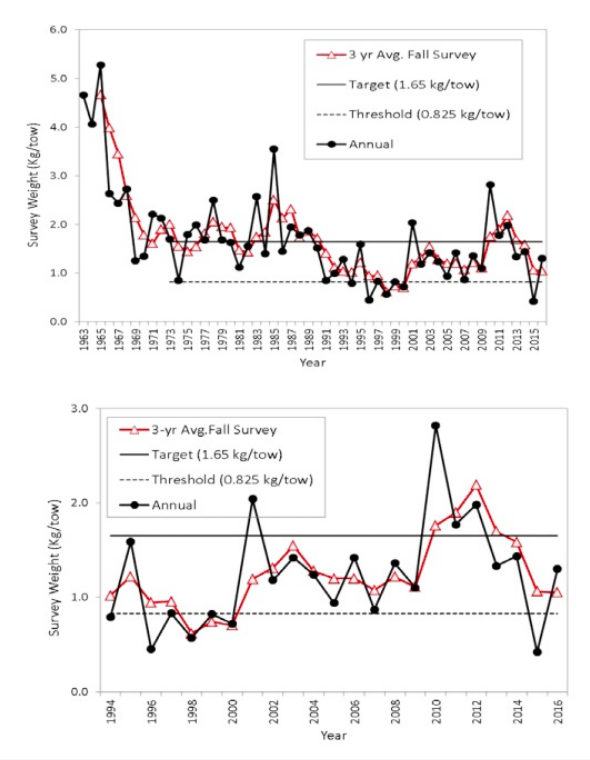



Figure 5: Southern silver hake NEFSC spring bottom-trawl survey biomass and associated 3-year moving averages (red lines). The horizontal dashed lines represent the biomass threshold and the solid line represents the biomass target (NEFSC 2018).

**Northwest Atlantic | Bottom trawls | United States | New England**

**Very Low Concern**
The northern stock of silver hake is not overfished according to the latest stock assessment (NEFSC 2011) and the stock status remains unchanged in the 2017 stock assessment update {NEFMC 2018}. This means that the average fall trawl survey biomass index of the three most recent years for which the index is available is over the threshold level of 3.21 kg/tow. In the 2011 stock assessment, the 2007-2009 average index was 6.20 kg/tow, which is over the threshold level and close to the target level of 6.42 kg/tow (NEFSC 2011). In the 2017 update, the average index for 2015-2017 is higher than previous estimates, way over the threshold and target levels at approximately 19.92 kg/tow {NEFMC 2018}. Abundance of the northern silver hake stock continues to increase due to several strong recent year classes. Therefore,

Seafood Watch scores abundance as very low concern.

**Justification:**
"Based on the updated and accepted reference points from SAW/SARC-51 in 2010, the northern stock of silver hake is not overfished.... The three year arithmetic mean fall biomass index for 2007-2009 in Albatross units (6.20 kg/tow), was above the management threshold (3.21 kg/tow) but below the target (6.42 kg/tow)." (NEFSC 2011)

The 2017 update shows a steady increase since then, with the 2017 average index at approximately 19.92 kg/tow.

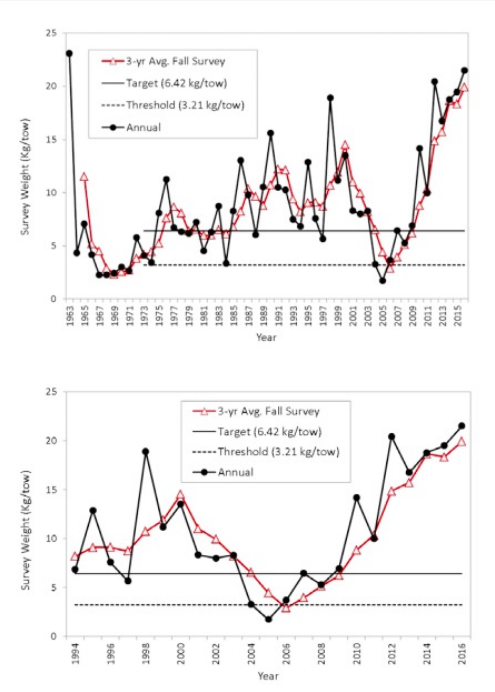



Figure 6: Northern silver hake NEFSC spring bottom-trawl survey biomass and associated 3-year moving averages (red lines). The horizontal dashed lines represent the biomass threshold and the solid line represents the biomass target (NEFSC 2018).

**Factor 1.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low Concern**
Overfishing is not occurring on the southern stock of silver hake (NEFSC 2018). This means that the average index for the three most recent years (2015-2018) used to measure fishing mortality is below the threshold level of 34.17 kt/kg (NEFSC 2014); it is considerably lower, at approximately 3.86 kt/kg (NEFSC 2018). Because it is probable that overfishing is not occurring but there is some uncertainty with estimating fishing mortality, Seafood Watch considers this a low concern instead of a very low concern.

**Justification:**

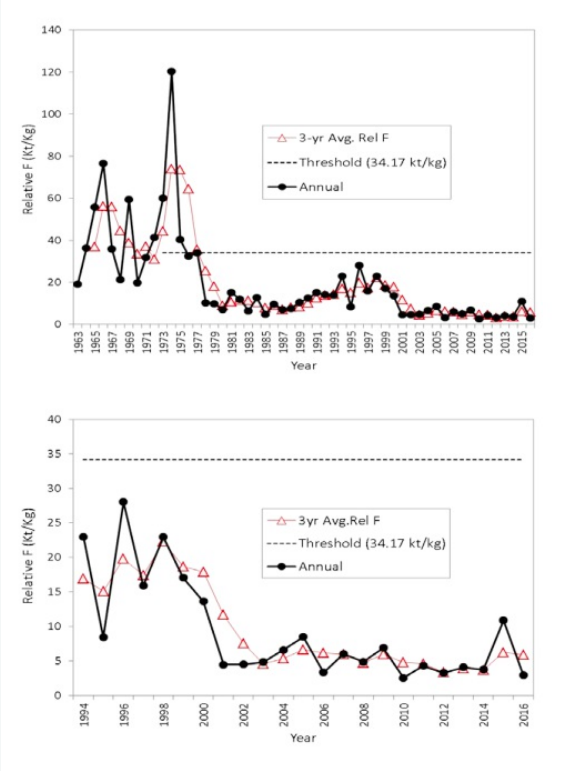



Figure 7: Southern silver hake relative exploitation ratios of the total catch to the spring survey indices, and associated 3-year moving averages (red lines). The horizontal dashed lines represent the overfishing thresholds (NEFSC 2018).

**Northwest Atlantic | Bottom trawls | United States | New England**

**Low Concern**

Overfishing is not occurring on the northern stock of silver hake (NOAA Fisheries 2015). This means that the average index for the three most recent years (2012-2014) used to measure fishing mortality is below the threshold level of 2.77 kt/kg (NEFMC 2014b). It is considerably lower, at approximately 0.15 kt/kg. Because it is probable that overfishing is not occurring but there is some uncertainty with estimating fishing mortality, Seafood Watch considers this a low concern instead of a very low concern.

**Justification:**

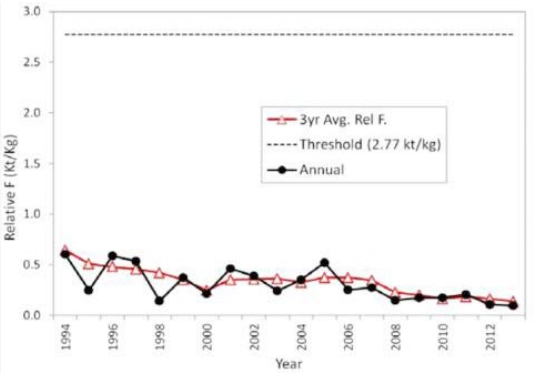



Figure 8: Exploitation index for northern silver hake according to the 2014 update

According to the 2014 stock status update, silver hake population trends continue to increase and the proposed overfishing limit suggests that silver hake can withstand higher catches without exceeding the $F_{MSY}$ proxy. However, catches are a major source of uncertainty when assessing the silver hake stocks. (NEFMC 2014b).

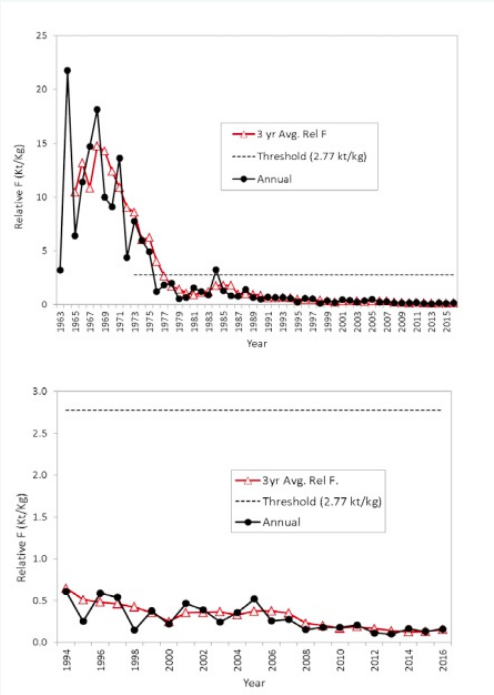



Figure 9: Northern silver hake relative exploitation ratios of the total catch to the spring survey indices, and associated 3-year moving averages (red lines). The horizontal dashed lines represent the overfishing thresholds (NEFSC 2018).

## Criterion 2: Impacts on Other Species

*All main retained and bycatch species in the fishery are evaluated under Criterion 2. Seafood Watch defines bycatch as all fisheries-related mortality or injury to species other than the retained catch. Examples include discards, endangered or threatened species catch, and ghost fishing. Species are evaluated using the same guidelines as in Criterion 1. When information on other species caught in the fishery is unavailable, the fishery's potential impacts on other species is scored according to the Unknown Bycatch Matrices, which are based on a synthesis of peer-reviewed literature and expert opinion on the bycatch impacts of each gear type. The fishery is also scored for the amount of non-retained catch (discards) and bait use relative to the retained catch. To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard/bait score. The Criterion 2 rating is determined as follows:*

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

*Rating is Critical if Factor 2.3 (Fishing Mortality) is Crtitical*

**Guiding Principles**

- *Ensure all affected stocks are healthy and abundant.*
- *Fish all affected stocks at sustainable level.*
- *Minimize bycatch.*

## Criterion 2 Summary

**Criterion 2 score(s) overview**

This table(s) provides an overview of the Criterion 2 subscore, discards+bait modifier, and final Criterion 2 score for each fishery. A separate table is provided for each species/stock that we want an overall rating for.

| OFFSHORE SILVER HAKE | | | |
|---|---|---|---|
| **REGION / METHOD** | **SUB SCORE** | **DISCARDS+BAIT / LANDINGS** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 1.414 | 0.950: 20-40% | Red (1.343) |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.159 | 0.950: 20-40% | Red (2.051) |

| RED HAKE | | | |
|---|---|---|---|
| **REGION / METHOD** | **SUB SCORE** | **DISCARDS+BAIT / LANDINGS** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.159 | 0.950: 20-40% | Red (2.051) |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 1.414 | 0.950: 20-40% | Red (1.343) |

| SILVER HAKE | | | |
|---|---|---|---|
| **REGION / METHOD** | **SUB SCORE** | **DISCARDS+BAIT / LANDINGS** | **SCORE** |
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 1.414 | 0.950: 20-40% | Red (1.343) |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 2.159 | 0.950: 20-40% | Red (2.051) |

**Criterion 2 main assessed species/stocks table(s)**

This table(s) provides a list of all species/stocks included in this assessment for each 'fishery' (as defined by a region/method combination). The text following this table(s) provides an explanation of the reasons the listed species were selected for inclusion in the assessment.

| NORTHWEST ATLANTIC \| BOTTOM TRAWLS \| UNITED STATES \| MID ATLANTIC | | | | |
|---|---|---|---|---|
| SUB SCORE: 1.414 | DISCARD RATE: 0.950 | | **SCORE: 1.343** | |
| **SPECIES** | **INHERENT VULNERABILITY** | **ABUNDANCE** | **FISHING MORTALITY** | **SCORE** |
| Atlantic mackerel | 2.000: Medium | 2.000: High Concern | 1.000: High Concern | Red (1.414) |
| Red hake | 2.000: Medium | 2.000: High Concern | 1.000: High Concern | Red (1.414) |
| Short-beaked common dolphin | 1.000: High | 2.000: High Concern | 2.330: Moderate Concern | Red (2.159) |
| Northern shortfin squid | 3.000: Low | 3.000: Moderate Concern | 2.330: Moderate Concern | Yellow (2.644) |
| Offshore silver hake | 3.000: Low | 3.000: Moderate Concern | 2.330: Moderate Concern | Yellow (2.644) |
| Bottlenose dolphin | 1.000: High | 2.000: High Concern | 3.670: Low Concern | Yellow (2.709) |
| Risso's dolphin | 1.000: High | 2.000: High Concern | 3.670: Low Concern | Yellow (2.709) |
| Longfin squid | 3.000: Low | 4.000: Low Concern | 2.330: Moderate Concern | Yellow (3.053) |
| Atlantic white-sided dolphin | 1.000: High | 2.000: High Concern | 5.000: Very Low Concern | Yellow (3.162) |
| Silver hake | 2.000: Medium | 4.000: Low Concern | 3.670: Low Concern | Green (3.831) |
| Butterfish | 3.000: Low | 5.000: Very Low Concern | 5.000: Very Low Concern | Green (5.000) |

| NORTHWEST ATLANTIC \| BOTTOM TRAWLS \| UNITED STATES \| NEW ENGLAND | | | | |
|---|---|---|---|---|
| SUB SCORE: 2.159 | DISCARD RATE: 0.950 | | **SCORE: 2.051** | |
| **SPECIES** | **INHERENT VULNERABILITY** | **ABUNDANCE** | **FISHING MORTALITY** | **SCORE** |
| Long-finned pilot whale | 1.000: High | 2.000: High Concern | 2.330: Moderate Concern | Red (2.159) |
| Offshore silver hake | 3.000: Low | 3.000: Moderate Concern | 2.330: Moderate Concern | Yellow (2.644) |
| Atlantic white-sided dolphin | 1.000: High | 2.000: High Concern | 3.670: Low Concern | Yellow (2.709) |
| Bottlenose dolphin | 1.000: High | 2.000: High Concern | 5.000: Very Low Concern | Yellow (3.162) |
| Harbor porpoise | 1.000: High | 2.000: High Concern | 5.000: Very Low Concern | Yellow (3.162) |
| Short-beaked common dolphin | 1.000: High | 2.000: High Concern | 5.000: Very Low Concern | Yellow (3.162) |
| Red hake | 2.000: Medium | 4.000: Low Concern | 3.670: Low Concern | Green (3.831) |
| Silver hake | 2.000: Medium | 5.000: Very Low Concern | 3.670: Low Concern | Green (4.284) |

The finfish and invertebrate species included in this section were chosen because they averaged more than 5% of total observed catch (both kept and discarded) from the years 2009-2014 or were part of a complex of species that averaged more than 5% of observed bycatch in the small-mesh multispecies fishery (pers. comm., L. Alade). The data used to determine the percentages were provided by Dr. Larry Alade, Research Fishery Biologist, Population Dynamics Branch, Northeast Fishery Science Center.

The mammal species were included because they were listed in NOAA's 2020 List of Fisheries under Northeast bottom trawl or Mid-Atlantic bottom trawl fisheries (the small-mesh multispecies fishery was not separated out from these fisheries) *and* these trawl fisheries were potentially responsible for more than 5% of total mortality to these species according to the marine mammal stock assessments.

The lowest-scoring species under Criterion 2 for the Mid-Atlantic fishery are Atlantic mackerel and red hake. The lowest-scoring species for the New England fishery is long-finned pilot whales. Thus, these species' scores drive the Criterion 2 rankings.

## Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
*(same as Factor 1.1 above)*

Factor 2.2 - Fishing Mortality
*(same as Factor 1.2 above)*

Factor 2.3 - Modifying Factor: Discards and Bait Use
Goal: Fishery optimizes the utilization of marine and freshwater resources by minimizing post-harvest loss. For fisheries that use bait, bait is used efficiently.

*Scoring Guidelines: The discard rate is the sum of all dead discards (i.e. non-retained catch) plus bait use divided by the total retained catch.*

| Ratio of bait + discards/landings | Factor 2.3 score |
|---|---|
| <100% | 1 |
| >=100 | 0.75 |

## Atlantic mackerel

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Medium**
Atlantic mackerel is found in cold and temperate shelf and coastal waters in the North Atlantic Ocean and the Mediterranean Ocean {Fishbase 2015e}. It is a pelagic species that forms schools near the surface and lives for a maximum of 17 years. In the US, this species matures before age 2. Atlantic mackerel has a moderate inherent vulnerability score (40 out of 100) according to FishBase {Fishbase 2015e}. A FishBase moderate inherent vulnerability score results in a Seafood Watch medium inherent vulnerability score.
**Justification:**
FishBase uses a paper by Cheung et al. to generate inherent vulnerability scores based on life history parameters {Cheung et al. 2005}. The life history parameters used are maximum length, age at first maturity, longevity, von Bertalanffy growth parameter *K*, natural mortality rate, fecundity, strength of spatial behavior, and geographic range {Cheung et al.}.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**
Recent assessments of Atlantic mackerel state that biomass is near historic lows (DFO 2017a) {DFO 2019a} (NEFSC 2018) at approximately 5% of levels observed in the 1980s (DFO 2019). Because it appears that the Atlantic mackerel stock is currently depleted, abundance is deemed high concern. Atlantic mackerel in the US and Canada are believed to be part of one stock and are thus scored using the same justification.

**Justification:**
The most recent analytical assessments for US Atlantic mackerel were conducted by the NEFSC in 2017 and published in 2018 (NEFSC 2018) and by the DFO for 2018 {DFO 2019a}. The US stock assessment addresses the concerns that came out of the first joint US/Canadian stock report in 2010 by the Transboundary Resource Assessment Committee (TRAC), which were centered around uncertainty in abundance trends (TRAC 2010). In August 2018, the MAFMC approved a rebuilding plan that includes slight increases in commercial quotas over five years and an anticipated stock assessment update in 2020 to evaluate rebuilding progress (MAFMC 2018).

Stock assessments of the northwest Atlantic mackerel population assume one stock with two spawning contingents. The northern contingent primarily spawns in the southern Gulf of St. Lawrence and the southern contingent spawns in the Mid-Atlantic Bight, southern New England, and the western Gulf of Maine. The spawning contingents mix during winter (NEFSC 2018).

The latest NEFSC assessment developed a statistical catch-as age model (ASAP) to estimate abundance from 1968 to 2016. In order to model uncertainty in the ASAP model, a state-space stock assessment model (SAM) and a censored catch assessment model (CCAM) were also developed. Estimates from these models did not show a significant retrospective bias, as was the case with previous models (NEFSC 2018). The Northeast Regional Stock Assessment Workshop reviewers determined that the results are robust, the model choice was appropriate, and that retro-adjustments were unnecessary (NEFSC 2018). This stock assessment resulted in similar SSB estimates to the 2016 DFO assessment (NEFSC 2018) (DFO 2017a). The assessment showed a decline in SSB from 103,390 MT in 2007 to a low of 16,889 MT and 16,837 MT in 2011 and 2012, respectively. The 2016 SSB is estimated to be 43,519 MT, similar to 2009 levels (NEFSC 2018).

The most recent DFO stock assessment states that SSB has been in decline since the mid-2000s and reached historic lows in 2015 and 2016 and remained very low through 2018 (DFO 2019a). Abundance reached a historical low in 2015 and 2016 (59% of the 103,000 t LRP), increasing in 2017 and 2018 (73% and 77% of LRP, respectively) due to the average sized 2015 year-class recruiting in 2016 (DFO 2019a). For comparison, abundance levels in the 1980s were estimated over 750,000 t (DFO 2017a). Since 2000, the age structure of the Atlantic mackerel fishery has contracted and fish older than 7 years have disappeared (DFO 2017a). Recruitment has also declined; in the last decade of the historical series (2009 to 2018) there were only two years of even near-average recruitment (2009 and 2016); 2017 and 2018 recruitment were at all-time lows (DFO 2019a).

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**
The most recent DFO and NEFSC stock assessments recommend $F_{40\%}$ as proxy for $F_{MSY}$ {DFO 2019a} (NEFSC 2018). Both assessments indicate that fishing mortality is above sustainable levels, with the 2017 NEFSC assessment estimating 2016 fishing mortality to be 0.47. Thus, NOAA-NMFS considers the Atlantic mackerel stock overfished and currently undergoing overfishing (NEFSC 2018), and DFO considers the stock in the Critical Zone (i.e., below the LRP) (DFO 2017a). Therefore, fishing mortality is deemed "high" concern.
**Justification:**
The 2017 NEFSC stock assessment estimates fishing morality (F) from 1968 to 2016. In the early portion of this time series, F peaked in 1976 just below 0.80, then declined to around 0.10 in 1978, then remained near or below 0.40 (current LRP) until 1996. From 1996 to 2016, F remained over the $F_{40\%}$ in all but three years (2001 to 2003), drastically increasing to approximately five times F in 2010 (F=2.1) before declining to 0.47 in 2016 (NEFSC 2018). Recreational and bait fisheries also contribute to overall fishing mortality and are not considered in TAC, with a recent informal survey indicating that bait fishing may constitute 20% of catch (Van Beveren et al. 2017). DFO uses this and summary of bait needs to estimate that total mackerel catches may be between 150% and 200% of reported catches (DFO 2017a).

## Atlantic white-sided dolphin

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**High Concern**
According to the most current marine mammal stock assessment report, the best estimate of abundance for the North Atlantic white-sided dolphin stock was 48,819 (CV=0.61), with a minimum population size of 30,403 (NOAA 2018e). However, this estimate actually only covers the Gulf of Maine population, not the entire western North Atlantic stock, and since it was generated from a shipboard and aerial survey conducted from between June and August 2011, this estimate is unlikely to accurately represent the present population size (ibid). The status of this population, relative to the optimum sustainable population (OSP), in the US Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (ibid). Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Very Low Concern**
The small-mesh multispecies fishery is included with the Mid-Atlantic bottom trawl fishery, which is a Category II fishery, according to the 2020 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). This categorization is due to the fishery's interactions with the Western North Atlantic stock of white-sided dolphins. According to the latest stock assessment (2017), white-sided dolphins are not endangered or threatened, nor are they a strategic stock under the MMPA (NOAA 2018e). Total annual estimated average fishery-related mortality or serious injury to the western North Atlantic white-sided dolphin stock during 2011 to 2015 was 56 (CV=0.15), with a Potential Biological Removal (PBR) of 304 (NOAA 2018e)

The Mid-Atlantic bottom trawl is a minor contributor to fishing mortality, accounting for 3.4% (1.9/56 individuals) of the total bycatch across all fisheries (ibid). Because this is a Category II fishery, PBR is not exceeded, and this bottom trawl fishery takes less than 1% of the PBR, fishing mortality is considered a very low concern.

**Northwest Atlantic | Bottom trawls | United States | New England**

**Low Concern**
The small-mesh multispecies fishery is included with the Northeast bottom trawl fishery, which is a Category II fishery, according to the 2015 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). This categorization is due to the fishery's interactions with the Western North Atlantic stock of white-sided dolphins. According to the latest stock assessment (2017), white-sided dolphins are not endangered or threatened, nor are they a strategic stock under the MMPA (NOAA 2018e). Total annual estimated average fishery-related mortality or serious injury to the western North Atlantic white-sided dolphin stock during 2011 to 2015 was 56 (CV=0.15), with a Potential Biological Removal (PBR) of 304 (NOAA 2018e)

The Northeast bottom trawl is by far the primary contributor, accounting for 82% (46/56 individuals) of the total bycatch across all fisheries (ibid). Because this is a Category II fishery, PBR is not exceeded, and the bottom trawl fishery takes less than 50% of the PBR, fishing mortality is considered a low concern.

## Bottlenose dolphin

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**High Concern**
The best available estimate for the offshore stock of common bottlenose dolphins in the western North Atlantic offshore stock is 77,532 (CV=0.40), with a minimum population size of 56,053 (Hayes et al. 2017). This estimate is from summer 2011 surveys covering waters from central Florida to the lower Bay of Fundy. The status of this stock relative to the OSP in the US Atlantic EEZ is unknown, as are population trends (ibid). Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low Concern**
The small-mesh multispecies fishery is included with the Mid-Atlantic bottom trawl fishery, which is a Category II fishery, according to the 2020 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). This categorization is due to the fishery's interactions with the Western North Atlantic Offshore stock of bottlenose dolphins. According to the latest stock assessment (2017), bottlenose dolphins are not endangered or threatened, nor are they a strategic stock under the MMPA. Total annual estimated average fishery-related mortality or serious injury to this stock during 2010 to 2014 was 39.4 (CV=0.29), with a Potential Biological Removal (PBR) of 561 (NOAA 2017a). The Mid-Atlantic bottom trawl is a major contributor, accounting for 48% (19/39.4 individuals) of the total bycatch across all fisheries (ibid). Because this is a Category II fishery, PBR is not exceeded, and the bottom trawl fishery takes less than 50% of the PBR, fishing mortality is considered a "low" concern.

**Northwest Atlantic | Bottom trawls | United States | New England**

**Very Low Concern**
The small-mesh multispecies fishery is included with the Northeast bottom trawl fishery, which is a Category II fishery, according to the 2020 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). This categorization is due to the fishery's interactions with the Western North Atlantic Offshore stock of bottlenose dolphins. According to the latest stock assessment (2017), bottlenose dolphins are not endangered or threatened, nor are they a strategic stock under the MMPA. Total annual estimated average fishery-related mortality or serious injury to this stock during 2010 to 2014 was 39.4 (CV=0.29), with a Potential Biological Removal (PBR) of 561 (NOAA 2017a). The Northeast bottom trawl is a minor contributor, accounting for 7%% (2.8/39.4 individuals) of the total bycatch across all fisheries (ibid). Because this is a Category II fishery, PBR is not exceeded, and the bottom trawl fishery takes less than 10% of the PBR, fishing mortality is considered a "very low" concern.

## Butterfish

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low**
Atlantic butterfish is found in the western Atlantic Ocean from Newfoundland to Palm Beach, FL and in the Gulf of Mexico (FishBase 2015d). Butterfish matures early, before age 1 (0.9), and has been found to have a maximum length of 30 cm. These and other life history characteristics give it a low inherent vulnerability (30 out of 100), according to FishBase (FishBase 2015d), which means Seafood Watch considers this a low concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Very Low Concern**
Butterfish is not overfished. According to the latest stock assessment update, the spawning stock biomass is estimated to be 64,376 mt (CV=0.25) which is greater than biomass at maximum sustainable yield ($SSB_{MSY}$), 45,616 mt (Adams 2017). SSB is the biomass level where 50% of the individuals are mature, so $SSB_{MSY}$ is the level of SSB needed to produce MSY. The threshold level is half of that, or 22,808 mt. Abundance of butterfish is a very low concern for Seafood Watch.
**Justification:**
"The accepted biomass reference point $SSB_{MSY}$ proxy is 45,616 mt (100.6 million lb); CV = 0.25. $SSB_{threshold}$ is one half the $SSB_{MSY}$ proxy, or 22,808 mt (50.3 million lb). [$SSB_{2016}$ ] is estimated to be [64,376 mt (141.9 million lb)], which is well above the $SSB_{threshold}$." (NEFSC 2014b)(Adams 2017).

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Very Low Concern**
Overfishing is not occurring on butterfish. The accepted overfishing reference point is 0.81, which means that if fishing is occurring at a lower rate, overfishing is not occurring. According to the latest stock assessment update, the 2016 fishing mortality is 0.05, which is well below the reference point (Adams 2017). Because of this, the fishing mortality on Atlantic butterfish is considered a very low concern by Seafood Watch.
**Justification:**
"The current fishing mortality [($F_{2016}$ = 0.05)] is well below the accepted overfishing reference point....[of 0.81]." (NEFSC 2014b)(Adams 2017).

## Harbor porpoise

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | New England**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | New England**

**High Concern**
The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 79,883 (CV=0.32), with a minimum population size of 61,415, which is from a 2011 survey (NOAA 2019c). However, the surveyed area may not have covered the entire area of the stock's habitat at the appropriate time of the year, and the current abundance estimate did not account for availability bias due to submergence of animals.

Without a correction for availability bias, the abundance estimate is expected to be biased low (ibid). The status of this population, relative to the optimum sustainable population (OSP), in the US Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (ibid). Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | New England**

**Very Low Concern**
Total annual estimated average fishery-related mortality or serious injury to the harbor porpoise stock during 2012 to 2016 was 256 harbor porpoise per year (CV=0.18) from US fisheries, with a PBR of 706 (NOAA 2019c). The Northeast bottom trawl fishery accounted for 1.25% (3.2/256 individuals) of the total bycatch across all fisheries (ibid). Because PBR is not exceeded, and the bottom trawl fishery accounts for less than 10% of the PBR, fishing mortality is considered a "very low" concern.

## Longfin squid

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low**

Longfin squid has been found with a maximum mantle length of 50 cm, but is commonly found at sizes of 10-20 cm (NEFSC 2005). It matures very rapidly, with a lifespan of less than one year, is highly fecund (150-200 eggs per capsule, with each female laying 20-30 capsules per spawning event), is a demersal egg layer, and its population likely does not exhibit compensatory or depensatory dynamics (NEFSC 2005).

Table 2.1: Determining vulnerability of longfin squid

| Factor | Longfin Squid | Score | Source |
|---|---|---|---|
| Average age at maturity | ~3 months | 3 | (SeaLifeBase2015a); Hatfield and Cadrin 2002) |
| Average maximum age | < 9 months | 3 | (SeaLifeBase 2015a); Macy and Brodziak 2001) |
| Reproductive strategy | Demersal egg layer | 2 | (SeaLifeBase 2015a) |
| Density dependence | No depensatory or compensatory dynamics demonstrated or likely | 2 | (SeaLifeBase 2015a) |
| **Score (mean of factor scores)** | | **2.5, Low** | |

These characteristics give it a low inherent vulnerability (Seafood Watch Criteria doc., p. 5), which means it is a low concern for Seafood Watch.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low Concern**

From the latest stock assessment update of longfin squid (2017), the stock is not overfished. The stock is considered overfished when the biomass (B) is < $^1/_2$ of the biomass level estimated to produce the maximum sustainable yield ($B_{MSY}$). The 2015-2016 B estimate was 73,762 mt, and the $B_{MSY}$ proxy level is 42,405 mt ($B_{threshold}$ is 21,203 mt) {Hendrickson 207}. Although the status is "not overfished", it is worth noting that multiple generations of longfin squid have turned over since the latest stock assessment. Additionally, there was some scientific dissent about the appropriateness of the approach used in the stock assessment. Therefore, Seafood Watch considers the abundance of longfin squid a low concern instead of a very low concern.

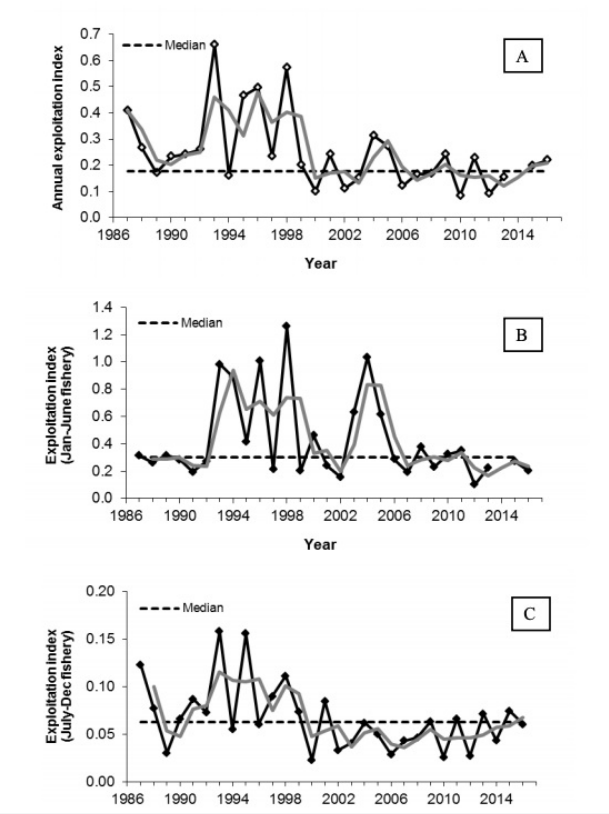
**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Moderate Concern**

Longfin squid fishing mortality (F) cannot be determined because new reference points could not be recommended, but the fishing mortality was low, and it is unlikely that overfishing is occurring (NEFSC 2011)(Hendrickson 2017). The stock is believed to be lightly exploited since annual catches from 1987 to 2016 has not resulted in a multi-year decrease in biomass (Hendrickson 2017). Total landings (18,379 mt) of longfin squid were at their highest levels in 2016, but remained below the quota (22,445 mt) (Hendrickson 2017). Recent annual exploitation indices (catch in year *t* / average of biomass in year *t* and *t*-1) have been at or slightly above long-term median values (see figure below) and total catches have been below the TAC (Hendrickson 2017). Since the overfishing status is unknown and the stock is not highly susceptible to the fishery, Seafood Watch rates the fishing mortality a moderate concern.

**Justification:**




Annual exploitation indices (annual catch/average of the annual spring and fall survey biomass) for longfin squid (A), seasonal exploitation indices for the January-June fishery (January-June catch/March-April biomass for NEFSC spring surveys) (B) and the July-December fishery (July-December catch/September-October biomass for NEFSC and NEAMAP fall surveys; (C)). The grey line represents the catch in year t divided by the two-year moving average of biomass. Figure from Hendrickson (2017).

"Based on the current fishing mortality reference point threshold, overfishing was not occurring because the 2009 exploitation index (estimated using the method from SARC 34, Oct-Dec. catch over q-adjusted fall survey swept-area biomass) was 0.063 compared to the $F_{threshold}$ (i.e., 75th percentile of the exploitation indices during 1987-2009) which is 0.277). However, the current F reference point is inappropriate for the lightly exploited Loligo stock. In addition, the new exploitation indices used in the current assessment are not comparable to the existing fishing mortality reference points because of differences in computation methods and input data. The overfishing status during 2009 is unknown because new fishing mortality reference points could not be recommended in the current assessment due to the lack of evidence that fishing impacted annual biomass levels during 1975-2009." (NEFSC 2011). The 2016 exploitation index of 0.258 (catch in 2016 divided by the average of the spring and fall survey biomass during 2015-2016; 80% CI = 0.124-0.232) was 45% greater than the 1987-2015 median of 0.178 (Hendrickson 2017).

## Long-finned pilot whale

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | New England**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | New England**

**High Concern**
The small-mesh multispecies fishery is included with the Northeast bottom trawl fishery, which is a Category II fishery, according to the 2015 List of Fisheries (NOAA Fisheries Office of Protected Resources 2015). The best available estimate for long-finned pilot whales in the western North Atlantic is 5,636 (CV=0.63), with a minimum population size of 3,464 {Palka 2012} (NOAA 2018a). This estimate is from summer 2011 surveys covering waters from central Virginia to the lower Bay of Fundy, but these surveys did not include areas of the Scotian Shelf where the highest densities of pilot whales were observed in the summer of 2006; therefore, they represent an underestimate of the overall abundance of this stock (Hayes et al. 2017). The status of this stock relative to OSP in the US Atlantic EEZ is unknown, and there are insufficient data to determine population trends. Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Concern**
The small-mesh multispecies fishery is included with the Northeast bottom trawl fishery, which is a Category II fishery, according to the 2020 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). The total mortality to long-finned pilot whales caused by human activity likely does not exceed the PBR level of 35 (NOAA 2019a). The most recent stock assessment (2019) reports that the number of fishery-related mortalities during 2012–2016 was 27 long-finned pilot whales (CV=0.18, ibid). The Northeast bottom trawl fishery is by far the primary contributor, accounting for 81% (22/27 individuals) of the total bycatch across all fisheries (ibid).

Northeast bottom trawl fishery is a Category II fishery and it accounts for between 50-100% of PBR. However, since the and the Western North Atlantic stock of long-finned pilot whales is not considered a strategic stock under the Marine Mammal Protection Act (MMPA), Seafood Watch considers this a moderate concern rather than high concern.

## Northern shortfin squid

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low**
Shortfin squid is found in the Atlantic Ocean from Greenland and Iceland to the British Isles in the east and from Newfoundland to Florida in the west. It has a maximum length of 27-31 cm in the northern part of its range but is smaller in the south (SeaLifeBase 2015b). This species, like other squid species, lives for less than one year and has a high natural mortality rate (NEFSC 2004). It is highly fecund, with females able to produce multiple egg balloons, each of which may contain 10,000-100,000 eggs. The population likely does not exhibit compensatory or depensatory dynamics.

Table 2.2: Determining vulnerability for shortfin squid

| Factor | Shortfin Squid | Score | Source |
|---|---|---|---|
| Average age at maturity | <1 year | 3 | (Hendrickson 2004) |
| Average maximum age | 1 year | 3 | (Hendrickson 2006) |
| Reproductive strategy | Open substrate spawner | 2 | (Hendrickson 2004) |
| Density dependence | No depensatory or compensatory dynamics demonstrated or likely | 2 | (Dawe et al. 2000) |
| **Score (mean of factor scores)** | | **2.5, Low** | |

These life history parameters give this species a low inherent vulnerability (Seafood Watch Criteria doc., p. 5), which makes it a low concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Moderate Concern**
The stock status of shortfin squid is unknown. According to the latest stock assessment (2006), not enough reliable information exists to accurately assess the stock, and even though fisheries data and biological data from research projects in the past can be used, the lack of data on attributes like seasonal age, growth, and maturity limits the model and prevents determination of stock status. Despite the unknown stock status, Seafood Watch considers this a moderate concern because of the low inherent vulnerability of shortfin squid.
**Justification:**
"This is a data-poor stock, and because there are no reliable research survey indices for Illex inhabiting the U.S. Shelf, the assessment relies on fisheries data, in particular, catch per unit effort (CPUE) indices and biological data collected during prior cooperative research projects. Due to its short lifespan and the short fishing season, Illex was assessed using an in-season (weekly) model. Estimates of natural mortality were included in the in-season model and in a weekly per-recruit model. Although the Working Groups felt the model formulations were sound, it was decided that the use of the results from the three models was premature, mainly due to a lack of seasonal age, growth and maturity data which greatly affect the model results. Due to the lack of adequate data regarding fishing mortality rates and absolute biomass, stock status could not be determined for 2003 or 2004." (NEFSC 2006)

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Moderate Concern**
The fishing mortality rate on shortfin squid is unknown. According to the latest stock assessment (2006), not enough reliable information exists to accurately assess the stock, and even though fisheries data and biological data from research projects in the past can be used, the lack of data on attributes like seasonal age, growth, and maturity limits the model and prevents determination of stock status. Because the fishing mortality rate and stock status are unknown, but there is management in place, Seafood Watch considers this a moderate concern.
**Justification:**
"This is a data-poor stock, and because there are no reliable research survey indices for Illex inhabiting the U.S. Shelf, the assessment relies on fisheries data, in particular, catch per unit effort (CPUE) indices and biological data collected during prior cooperative research projects. Due to its short lifespan and the short fishing season, Illex was assessed using an in-season (weekly) model. Estimates of natural mortality were included in the in-season model and in a weekly per-recruit model. Although the Working Groups felt the model formulations were sound, it was decided that the use of the results from the three models was premature, mainly due to a lack of seasonal age, growth and maturity data which greatly affect the model results. Due to the lack of adequate data regarding fishing mortality rates and absolute biomass, stock status could not be determined for 2003 or 2004." (NEFSC 2006)

## Risso's dolphin

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**
The best abundance estimate for Risso's dolphins is the sum of the estimates from the 2011 surveys: 18,250 (CV = 0.46), with a minimum population estimate of 12,619; however, this estimate did not account for availability bias due to submergence of animals and is likely biased low (NOAA 2018c). The status of this stock relative to OSP in the US Atlantic EEZ is unknown, and there are insufficient data to determine population trends (ibid). Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Low Concern**
The small-mesh multispecies fishery is included with the Mid-Atlantic and Northeast bottom trawl fisheries, which are Category II fisheries, according to the 2020 List of Fisheries (NOAA Fisheries Office of Protected Resources 2020). This categorization is due to the fishery's interactions with the Western North Atlantic stock of Risso's dolphins. According to the latest stock assessment (2018), Risso's are not endangered or threatened, nor are they a strategic stock under the MMPA. Total annual estimated average fishery-related mortality or serious injury to the Risso's dolphin stock during 2011 to 2015 was 43.2 individuals (43 from fisheries), with a PBR of 126 (NOAA 2018c). The Mid-Atlantic fishery accounts for only 65.1% of the total US fishery-related serious injury and mortality (28/43 individuals; ibid). Because PBR is not exceeded, and the fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

## Short-beaked common dolphin

**Factor 2.1 - Inherent Vulnerability**

**Northwest Atlantic | Bottom trawls | United States | New England**
**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High**
Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (SFW criteria document, p. 9), which is a high concern.

**Factor 2.2 - Abundance**

**Northwest Atlantic | Bottom trawls | United States | New England**
**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**High Concern**
The current best abundance estimate for short-beaked common dolphins off the US Atlantic coast is 70,184 (CV=0.28), with a minimum population size of 55,690 (NOAA 2018d). This estimate is derived from 2011 shipboard and aerial surveys, and is the only current estimate available (ibid). Although this estimate is considerably lower than the 2015 estimate, it is not an indication of population decline because it does not include data from the 2007 TNASS survey from Canadian waters upon the recommendation in GAMMS II Workshop (Wade and Angliss 1997); as such, it is not comparable to the previous assessment's estimate (NOAA 2018d). The status of common dolphins, relative to OSP, in the US Atlantic EEZ is unknown, and population trends have not been investigated (ibid). Because the stock status is unknown and inherent vulnerability for this stock is high (as scored in factor 2.1), Seafood Watch considers this a high concern.

**Factor 2.3 - Fishing Mortality**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**

**Moderate Concern**
Total annual estimated average fishery-related mortality or serious injury to the short-beaked common dolphin stock during 2011 to 2015 was 437 (CV=0.10), with a PBR of 557 (NOAA 2018d). The Mid-Atlantic bottom trawl fishery accounted for 65.2% (285/437 individuals; ibid). Because PBR is not exceeded, but the Mid-Atlantic bottom trawl fishery accounts for more than 50% of the PBR, fishing mortality is considered a "moderate" concern.

**Northwest Atlantic | Bottom trawls | United States | New England**

**Very Low Concern**
Total annual estimated average fishery-related mortality or serious injury to the short-beaked common dolphin stock during 2011 to 2015 was 437 (CV=0.10), with a PBR of 557 (NOAA 2018d). The Northeast bottom trawl fishery accounted for only 7.8% of the total US fishery-related serious injury and mortality (34/437 individuals; ibid). Because this is a Category II fishery, PBR is not exceeded, and the Northeast bottom trawl fishery takes less than 10% of the PBR, fishing mortality is considered a "very low" concern.

**Factor 2.3 - Modifying Factor: Discards and Bait Use**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**20-40%**
In the National Bycatch Report, which used data from 2005, the New England small-mesh trawl fishery bycatch ratio was 0.32 and the Mid-Atlantic small-mesh trawl fishery bycatch ratio was 0.23 (NMFS 2011). In comparison, the report showed a national average of 0.17 (NMFS 2011).

Using the data from observed small mesh trawl trips, the average ratio of discards to landings from 2009-2014 was 39%. However, the data used for this ratio were only from observed trips, which may not be an accurate portrayal of the whole fishery. Additionally, the vast majority of landings of silver, offshore, and red hake is from small-mesh trawl vessel trips, so data from trips made by vessels using other gear types were not used. Therefore, the ratios from these data should not be considered a reliable estimate of the optimization of marine resource utilization in this fishery, and use different data than the data used in the National Bycatch Report, but the range of 20-40% is likely to be a near estimate, given the ratios in that report.

## Criterion 3: Management Effectiveness

*Seven subfactors are evaluated: Management Strategy, Recovery of Species of Concern, Scientific Research/Monitoring, Following of Scientific Advice, Enforcement of Regulations, Management Track Record, and Inclusion of Stakeholders. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.'*

- *5 (Very Low Concern)—Rated as 'highly effective' for all seven subfactors considered*
- *4 (Low Concern)—Management Strategy and Recovery of Species of Concern rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*
- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy and Recovery of Species of Concern, but at least one other subfactor rated 'ineffective.'*
- *1 (Very High Concern)—Management exists, but Management Strategy and/or Recovery of Species of Concern rated 'ineffective.'*
- *0 (Critical)—No management exists when there is a clear need for management (i.e., fishery catches threatened, endangered, or high concern species), OR there is a high level of Illegal, unregulated, and unreported fishing occurring.*

The Criterion 3 rating is determined as follows:

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

**Criterion 3 Summary**

| FISHERY | HARVEST STRATEGY | BYCATCH MANAGEMENT STRATEGY | SCORE |
|---|---|---|---|
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | 3.000 | 4.000 | **Green (3.464)** |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | 3.000 | 4.000 | **Green (3.464)** |

**Factor 3.1 Summary**

| FISHERY | STRATEGY | RECOVERY | RESEARCH | ADVICE | ENFORCE | TRACK | INCLUSION |
|---|---|---|---|---|---|---|---|
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | Moderately Effective | Highly effective | Moderately Effective | Highly effective | Highly effective | Moderately Effective | Highly effective |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | Moderately Effective | Highly effective | Moderately Effective | Highly effective | Highly effective | Moderately Effective | Highly effective |

**Factor 3.2 Summary**

| FISHERY | ALL SPECIES RETAINED? | CRITICAL? | STRATEGY | RESEARCH | ADVICE | ENFORCE |
|---|---|---|---|---|---|---|
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | No | No | Highly effective | Moderately Effective | Highly effective | Highly effective |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | No | No | Highly effective | Moderately Effective | Highly effective | Highly effective |

The New England Fisheries Management Council manages silver hake, red hake, and offshore hake with a series of exemptions from the Northeast Multispecies FMP. The vessels that fish for these three species are allowed to do so by being exempt from complying with the minimum mesh size while fishing in designated areas. These designated areas fall in the Gulf of Maine, Georges Bank, Southern New England, and Mid-Atlantic regulated mesh areas (for maps of these areas, see section 3.1.1).

**Criterion 3 Assessment**

SCORING GUIDELINES

Subfactor 3.1.1 – Management Strategy and Implementation
*Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? To achieve a highly effective rating, there must be appropriate management goals, and evidence that the measures in place have been successful at maintaining/rebuilding species.*

Subfactor 3.1.2 – Recovery of Species of Concern
*Considerations: When needed, are recovery strategies/management measures in place to rebuild overfished/threatened/ endangered species or to limit fishery's impact on these species and what is their likelihood of success? To achieve a rating of Highly Effective, rebuilding strategies that have a high likelihood of success in an appropriate timeframe must be in place when needed, as well as measures to minimize mortality for any overfished/threatened/endangered species.*

Subfactor 3.1.3 – Scientific Research and Monitoring
*Considerations: How much and what types of data are collected to evaluate the health of the population and the fishery's impact on the species? To achieve a Highly Effective rating, population assessments must be conducted regularly and they must be robust enough to reliably determine the population status.*

Subfactor 3.1.4 – Management Record of Following Scientific Advice
*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g. do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.*

Subfactor 3.1.5 – Enforcement of Management Regulations

*Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.*

Subfactor 3.1.6 – Management Track Record
*Considerations: Does management have a history of successfully maintaining populations at sustainable levels or a history of failing to maintain populations at sustainable levels? A Highly Effective rating is given if measures enacted by management have been shown to result in the long-term maintenance of species overtime.*

Subfactor 3.1.7 – Stakeholder Inclusion
*Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent and includes stakeholder input.*

Subfactor 3.2.2 – Management Strategy and Implementation
*Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and how successful are these management measures? To achieve a Highly Effective rating, the primary bycatch species must be known and there must be clear goals and measures in place to minimize the impacts on bycatch species (e.g., catch limits, use of proven mitigation measures, etc.)*

Subfactor 3.2.3 – Scientific Research and Monitoring
*Considerations: Is bycatch in the fishery recorded/documented and is there adequate monitoring of bycatch to measure fishery's impact on bycatch species? To achieve a Highly Effective rating, assessments must be conducted to determine the impact of the fishery on species of concern, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are being met*

Subfactor 3.2.4 – Management Record of Following Scientific Advice
*Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g., do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.*

Subfactor 3.2.5 – Enforcement of Management Regulations
*Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations? To achieve a Highly Effective rating, there must be consistent enforcement of regulations and verification of compliance.*

**Factor 3.1.1 - Critical?**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**No**

**Factor 3.1.2 - Mgmt Strategy / Implement**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderately Effective**
The small-mesh multispecies fishery (targeting silver hake, offshore hake, and red hake) is managed by the New England Fisheries Management Council. A comprehensive approach to the management of these species was first adopted in early 2000 with the implementation of Amendment 12 to the Northeast Multispecies Fishery Management Plan (FMP). These three species compose the Northeast small-mesh multispecies complex within this FMP. Because vessels participating in this fishery use small-mesh nets, they are regulated through a series of exemptions from the Northeast Multispecies FMP. They are allowed to fish for these species using small-mesh only within the designated areas in the Gulf of Maine and Georges Bank regulated mesh areas and in the entire Southern New England and Mid-Atlantic regulated mesh areas (see maps of whiting exemption areas below, and possession limits and fishing seasons by area in Table 1). These vessels may fish for the small-mesh multispecies complex in these areas provided they comply with all the other requirements and conditions. They must possess either an open access or limited access Northeast Multispecies permit to land species that make up the small-mesh multispecies complex, and the appropriate permits to retain any other species that are allowed (see Table 1).

Since Amendment 12, Amendment 19 (2012) to the plan established catch limits in the small mesh fishery where there previously were none and created a process and framework for setting small-mesh multispecies catch specifications (NEFMC 2012). Additionally, this amendment set the ACLs for all four stocks at 95% of the ABCs to allow for a 5% buffer for uncertainty, which the Council finds adequate due to the stable catches over the last ten years. If catches exceed the ACL, the fishery will be subject to a post-season accountability measure.

Landings of the northern stock of red hake have exceeded catch limits and this final rule also lowered the possession limit and implemented an additional possession limit trigger reduction to ensure that catches will not exceed the ACL in the future (NOAA Fisheries 2015).

This management strategy is considered to be only moderately effective because although most stocks are not subject to overfishing, red hake is.

**Justification:**
"As in other NEFMC managed stocks, including NE Multispecies, the ACLs for all four stocks or stock groups are equal to 95 percent of the corresponding ABC to allow a buffer for management uncertainty.... The fishery is and will be relatively heavily regulated and monitored and subject to a post-season accountability measure if catches exceed the ACL. Catches in the fishery have also demonstrated remarkable stability over the last decade or so, related to trip limits, the unique fishing characteristics, limited market demand, and prices. Although some of these factors may change, the Council believes that there is and will be sufficient safeguards that a 5% buffer to

account for management uncertainty will be adequate. Setting the ACL at 95% of ABC is also being used to account for management uncertainty in other large mesh groundfish stocks, which have similar monitoring procedures. The Council may revisit this buffer in a future specification if it is found to be inadequate." (NEFMC 2012)

The southern whiting ABC is raised by 4% to include offshore hake, as this is the average percentage of the catch that has been found to be offshore hake. Not enough information exists to set distinct catch limits for offshore hake, and it is also not feasible for fishermen to separate out the two species from one another (NEFMC 2012).

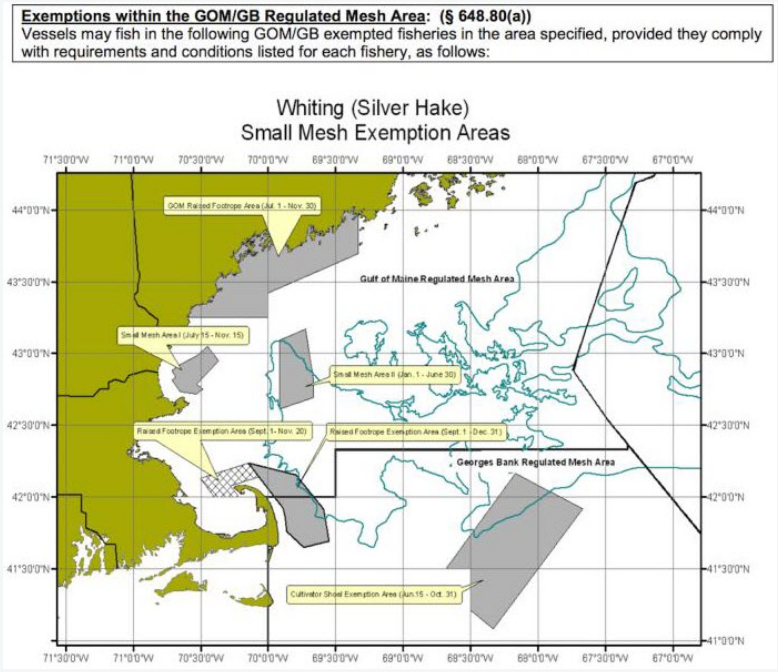



Figure 10: Map of designated areas where whiting fishing is allowed in the Gulf of Maine (GOM) and Georges Bank (GB) regulated mesh areas (RMA)

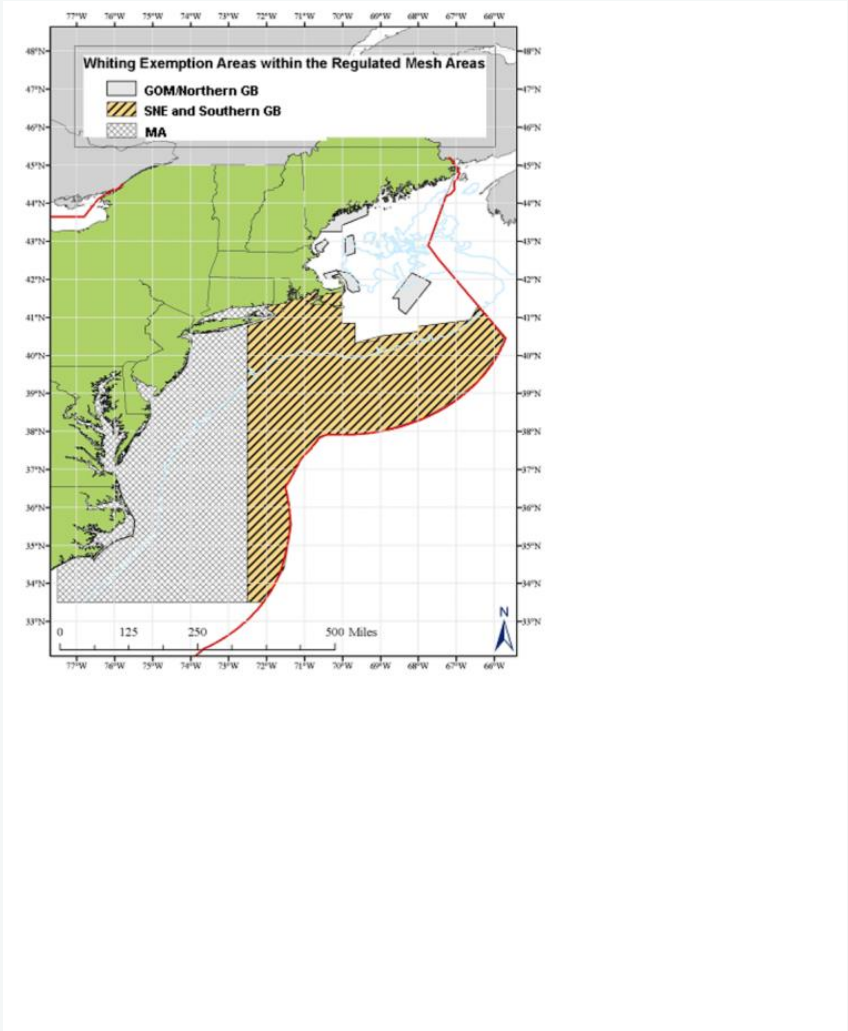



Figure 11: Map of all designated areas where vessels with the appropriate permits may fish for whiting

Table 1. Small-mesh Multispecies Exemption Areas and Corresponding Possession Limits, Fishing Seasons, and Additional Permitted Retained Species (NOAA Fisheries

2014d)

| Small-mesh Multispecies Exemption Area | | Combined Silver Hake and Offshore Hake Possession Limits* | Red Hake Possession Limit* | Season** | Additional Species Permitted for Retention*** |
|---|---|---|---|---|---|
| GOM Grate Raised Footrope Trawl | | up to 7,500 lb | 5,000 lb | July 1 – November 30 | Butterfish, Atlantic herring, squid, alewife, Atlantic mackerel |
| Cultivator Shoal | | up to 30,000 lb | 5,000 lb | June 15 – October 31, unless otherwise specified by notification in the Federal Register | Atlantic herring, longhorn sculpin, squid, butterfish, Atlantic mackerel, spiny dogfish, monkfish and monkfish parts up to 10% by weight of all other species onboard or 50 lb tail weight (146 lb whole weight), whichever is less, American lobster up to 10% by weight of all other species on board up to 200 lobsters, whichever is less, unless otherwise restricted. |
| Small Mesh Area 1 & 2 | Codend mesh size <2.5" | 3,500 lb | 5,000 lb | SMA 1: July 15 – November 15; SMA 2: January 1 – June 30 | Butterfish, spiny dogfish, Atlantic herring, Atlantic mackerel, scup, squid |
| | Codend mesh size 2.5">3.0" | 7,500 lb | | | |
| | Codend mesh size ≥3.0" | 30,000 lb | | | |
| SNE | Codend mesh size <2.5" | 3,500 lb | 5,000 lb | Open continually (year round) | Butterfish, spiny dogfish (trawl), Atlantic herring, Atlantic mackerel, scup, shrimp, squid, summer flounder, weakfish, Conger eels, searobins, black sea bass, tautog (blackfish), blowfish, cunner, John Dory, mullet, bluefish, tilefish, longhorn sculpin, fourspot flounder, alewife, hickory shad, American shad, blueback herring, sea ravens, Atlantic croaker, spot, swordfish, monkfish and monkfish parts up to 10% by weight of all other species on board, or 50 lb tail-weight (146 lb wholeweight), whichever is less, American lobster up to 10% by weight of all other species on board, up to 100 lobsters for trips of 24 hours or less, or 200 lobsters for trips longer than 24 hours, whichever is less, skate and skate parts up to 10% by weight of all other species on board |
| | Codend mesh size 2.5">3.0" | 7,500 lb | | | |
| | Codend mesh size ≥3.0" | 40,000 lb | | | |
| MA | Codend mesh size <2.5" | 3,500 lb | 5,000 lb | Open continually (year round) | |
| | Codend mesh size 2.5">3.0" | 7,500 lb | | | |
| | Codend mesh size ≥3.0" | 30,000 lb | | | |
| *Possession limits may be reduced to 2,000 lb for whiting and 400 lb for red hake if the in-season possession limit trigger is reached. | | | | | |
| **Vessels are subject to any state regulations when fishing in state waters. | | | | | |
| ***Vessels must have the appropriate permit(s) to retain additional species | | | | | |

As of May 28, 2015, the specifications for all five stocks for fishing years 2015-2017 were set (NOAA Fisheries 2015). They are summarized in Table 2, below.

Table 2. (NOAA Fisheries 2015)

| Summary of the Small-Mesh Multispecies Specifications for 2015-2017 | | | | | | | |
|---|---|---|---|---|---|---|---|
| Stock | Overfishing limit (OFL) (mt) | ABC (mt) | ACL (mt) | Percent change from 2012-2014 | Discard rate (percent) | TAL | Percent change from 2012-2014 |
| N. Silver Hake | 43,608 | 24,383 | 23,161 | 85 | 11.2 | 19,948.7 | 122.3 |
| N. Red Hake | 331 | 287 | 273 | 2.6 | 60.6 | 104.2 | 15.4 |
| S. Whiting * | 60,148 | 31,180 | 29,621 | −8.2 | 17.1 | 23,833.4 | −12.6 |
| S. Red Hake | 3,400 | 3,179 | 3,021 | −2.4 | 55.3 | 1,309.4 | −2.0 |
| * Southern whiting includes southern silver hake and offshore hake | | | | | | | |

**Factor 3.1.3 - Recovery of Stock Concerns**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
None of the hake stocks targeted in the small-mesh multispecies fishery are overfished, depleted, endangered, or threatened.

**Factor 3.1.4 - Scientific Research / Monitoring**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderately Effective**
Data are collected on all five stocks of these three species in order to perform science-based stock assessments. However, there are some uncertainties and insufficient data (in the case of offshore hake) that make it challenging for managers to maintain stock levels with confidence. Because of this, Seafood Watch considers scientific research and monitoring of this fishery to be moderately effective.

**Justification:**
"The SARC-51 Review Panel concluded that sufficient information is not available to determine offshore hake stock status with confidence, because fishery data are insufficient and one cannot assume that survey data reflect stock trends." (NEFSC 2011) This is upheld in the 2014 stock status update for offshore hake. Additionally, uncertainties around the red hake stock structure and catches of silver hake are laid out in this update (NEFMC 2014b).

**Factor 3.1.5 - Scientific Advice**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
The NEFMC takes scientific advice into account when setting quotas and developing management strategies for small-mesh species. With the exception of red hake, landings of these species do not come near their quotas, so there is little reason to expect the NEFMC to stop incorporating scientific advice into management of this fishery. Because of this, scientific advice is considered highly effective.

**Factor 3.1.6 - Enforce**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
A variety of enforcement measures are in place in the small-mesh multispecies fishery. Small-mesh trawl vessels targeting whiting and red hake must possess a permit for the Northeast multispecies fishery and all vessels fishing in the multispecies fishery are required to be fitted with a vessel monitoring system (VMS) (Federal Register 2006). However, these vessels are not required to use VMS when fishing for whiting and red hake, but they must send the "Declare Out of Fishery" code from their VMS unit, which is monitored by the OLE and Coast Guard (GARFO 2015). Additionally, the whiting fishing areas were developed where the traditional whiting grounds are, so there is little reason to suspect much fishing outside of these areas. OLE officers conduct dockside inspections and inspect fish processing plants (OLE webpage), while the Coast Guard occasionally inspects vessels at sea. OLE enforces fisheries legislation including retention of prohibited species and gear restrictions. Violation of such management measures can result in criminal or civil actions and fines or imprisonment for more serious cases. Under Amendment 16 of the Multispecies Fishery Management Plan, accountability measures (AM) were established for the large mesh groundfish fleet (Federal Register 2010). A secretarial amendment and then Amendment 19 extended AM to the small-mesh multispecies fleet. AM are required to ensure accountability within the fishery and to prevent overfishing. Proactive AM are designed to prevent allowable catch limits (ACL) from being exceeded, whereas reactive AM are designed to correct any overages if they occur (Federal Register 2012). In 2012 and 2013 overfishing occurred on the northern stock of red hake, and catches exceeded the ACL and ABC. As a result, the Council reduced the northern red hake possession trip limit (from 5,000 lb to 3,000 lb) and created a new trigger point so that when landings reach 45% of the TAL, the possession limit is further reduced to 1,500 lb (NOAA Fisheries 2015). Overfishing did not occur on the northern stock of red hake in FY 2014 {GARFO & NEFSC 2015}. These measures were finalized and implemented in May 2015. Because this monitoring and resulting revisions of management measures can be viewed as proof that regulations are enforced, Seafood Watch considers enforcement in this fishery to be highly effective.

**Factor 3.1.7 - Track Record**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderately Effective**
The NEFMC began to separately and comprehensively manage small-mesh multispecies in 2000. Since then, the stocks have rebuilt, but overfishing occurred on the northern stock of red hake in 2012 and 2013. Management measures ended overfishing on this stock in 2014. However, the stock status of offshore hake is unknown. Because of this, the track record is uncertain and the management strategy is therefore considered moderately effective in this regard.

**Factor 3.1.8 - Stakeholder Inclusion**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
The NEFMC has an open and transparent policy that allows stakeholder participation and feedback through meetings and scoping hearings throughout their affected areas. Also, the Council utilizes industry advisory panels that provide information during the development of FMPs. Public meeting schedules for the NEFMC are online at http://www.nefmc.org/calendar/index.html. Because the management process is transparent and includes stakeholder input, it is considered to be highly effective.

**Factor 3.2.1 - All Species Retained?**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**No**

**Factor 3.2.2 - Critical?**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**No**

**Factor 3.2.3 - Mgmt Strategy / Implement**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
Small-mesh fisheries are managed through a series of exemptions and "exemption programs must have demonstrated that incidental catch of regulated species is less than 5 percent of the total catch, by weight, and that the exemption will not jeopardize fishing mortality objectives." (NOAA Fisheries 2014d) Small-mesh multispecies fishery vessels are allowed to retain some of the following species, depending on the area, but they must possess the appropriate permits:

- Butterfish, spiny dogfish, Atlantic herring, Atlantic mackerel, scup, shrimp, squid, summer flounder, weakfish, Conger eels, searobins, black sea bass, tautog (blackfish), blowfish, cunner, John Dory, mullet, bluefish, tilefish, longhorn sculpin, fourspot flounder, alewife, hickory shad, American shad, blueback herring, sea ravens, Atlantic croaker, spot, swordfish;
- monkfish and monkfish parts;
- American lobster;
- skate and skate parts.

They must also comply with any corresponding FMP and state regulations (if fishing in state waters) for these retained species. In general, when targeting whiting and red hake, vessels do not have many bycatch issues. The fishery is categorized with the Northeast bottom trawl fishery as a Category II fishery for marine mammal takes, and therefore vessel owners or operators must report all marine mammal incidental injuries and mortalities, register with the marine mammal authorization program, carry a fisheries observer upon request, and comply with the marine mammal take reduction plan.

This strategy is considered to be highly effective as the fishery has a track record of low bycatch, and must continue to, in order to continue operating.

**Factor 3.2.3 - Scientific Research / Monitoring**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderately Effective**
Observers are trained biologists who collect data on fishing activities onboard commercial vessels to provide robust data to support science and management programs. Observers in the Northeast Fisheries Observer Program (NEFOP) record weights of kept and discarded fish and invertebrate species on observed hauls, as well as biological information (length, age, sex, and tags) from all species caught, including marine mammals and seabirds. When figuring out how much observer coverage is needed to estimate bycatch levels, the goal is usually to achieve a desired level of precision {Babcock & Pikitch 2003}. In the Greater Atlantic Region, this level of precision is measured as the coefficient of variation (CV), or the ratio of the square root of the variance of the bycatch estimate (i.e., standard error) to the estimate itself. It is useful for comparing the degree of variation from one data series to another, even when the averages vary by a lot.

In 2014, the councils in this region adopted a revised Standardized Bycatch Reporting Methodology (SBRM) amendment, which replaced the previous one that was remanded by the courts in 2011. This amendment was accepted by NMFS in March 2015 and implemented by final rule on June 30, 2015. According to this revised SBRM amendment, it "...proposes to ensure that the data collected under the SBRM are sufficient to produce a coefficient of variation (CV) of the discard estimate of no more than 30 percent, in order to ensure that the effectiveness of the SBRM can be measured, tracked, and utilized to effectively allocate the appropriate number of observer sea days. Each year, the Regional Administrator and the Science and Research Director would, subject to available resources, allocate at-sea observer coverage to the applicable fisheries of the Greater Atlantic Region sufficient to achieve a level of precision (measured as the CV) no greater than 30 percent for each applicable species and/ or species group..." (Federal Register 2015) This means that a CV of 0.30 is necessary.

In 2012, observer coverage was reported to be close to 30% (NMFS 2013); which is higher than in 2006-2008, when the average was below 10% for the small-mesh multispecies trawl fishery (NMFS 2011). In FY 2015, the number of observed sea days needed for a CV of 0.30 of total discards was determined to be 11,204 days.

Electronic monitoring research has been underway to replace human observers but would come at a high cost {Archipelago Marine Research Ltd., 2014}. Funding for the observer program in 2015 and 2016 is lacking and it is unclear how the necessary number of sea days will be covered with current funding allocations running out. In a memo dated April 23, 2015, adequate funding for fishing year 2015 was not yet secure (Karp 2015). In June 2015, however, NOAA regional administrator John Bullard suggested using federal fisheries disaster aid for the $2.5 million needed to fund the observer program for the remainder of FY 2015.

In the 2013 National Bycatch Report Edition 1 update, NMFS says, "the Northeast Cooperative Research Program (NCRP) has continued to support collaborative projects aimed at reducing the bycatch and discard mortality of finfish," (NMFS 2013b) and "Additional work is focused on the technology transfer of gear designs to reduce bycatch in the whiting and Northern shrimp fisheries. With the implementation of quota-based catch shares management in the Northeast Multispecies fishery in 2010, managing the bycatch of non-target and undersized fish has become even more critical. Thus, the NCRP has developed extensive network groups of researchers, fishermen, net makers, and managers to help fishermen develop modified gear and fishing strategies to fish more selectively. Some projects are focusing primarily on modifications for trawl and gillnet gear to target species based on fish behavior, body type, and size. Other projects are taking a temporal-spatial approach and studying the environmental and oceanographic variables that influence species distribution. These projects are providing data and mapping tools to help fishermen fish more strategically based on factors such as water temperature and other species-specific habitat markers." (NMFS 2013b)

Because of the questions surrounding the observer program and the appropriate level of coverage, the management system does not achieve the highest score for scientific research and monitoring.

**Justification:**
"For fish/invertebrate species groups, the number of sea days needed to achieve a 30% CV of total discards for each species group was derived for 56 fleets by using data collected during July 2013 through June 2014 (Wigley et al. 2015). Based on that sample size analysis, a total of 11,204 sea days is needed for the 14 fish and invertebrate species groups." (NEFSC 2015)

**Factor 3.2.5 - Scientific Advice**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
Scientific advice appears to be followed in minimizing bycatch levels. The fleet has to prove that bycatch levels are minimal in order to continue to be exempt from the minimum mesh size regulations, so bycatch has always been low in the fishery, but managers follow scientific advice to try to prevent overfishing of species caught with small-mesh trawl nets and keep bycatch levels low. The gear modifications required in some areas reduce contact with the seafloor, which helps minimize capture of flatfish and other groundfish, and restricting the fishing to designated areas also helps keep bycatch levels low. Because of this, Seafood Watch considers scientific advice in this fishery to be highly effective.

**Factor 3.2.6 - Enforce**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Highly effective**
A variety of enforcement measures are in place in the small-mesh multispecies fishery. Small-mesh trawl vessels targeting whiting and red hake must possess a permit for the Northeast multispecies fishery and all vessels fishing in the multispecies fishery are required to be fitted with a vessel monitoring system (VMS) (Federal Register 2006). However, these vessels are not required to use VMS when fishing for whiting, but they must send the "Declare Out of Fishery" code from their VMS unit, which is monitored by the OLE and Coast Guard (GARFO 2015). Additionally, the whiting fishing areas were developed where the traditional whiting grounds are, so there is little reason to suspect much fishing outside of these areas. OLE officers conduct dockside inspections and inspect fish processing plants (OLE webpage), while the Coast Guard occasionally inspects vessels at sea. OLE enforces fisheries legislation including retention of prohibited species and gear restrictions. Violation of such management measures can result in criminal or civil actions and fines or imprisonment for more serious cases. Under Amendment 16 of the Multispecies Fishery Management Plan, accountability measures (AM) were established (Federal Register 2010). AM are required to ensure accountability within the fishery and to prevent overfishing. Proactive AM are designed to prevent allowable catch limits (ACL) from being exceeded, whereas reactive AM are designed to correct any overages if they occur (Federal Register 2012).

These measures are viewed as highly effective by Seafood Watch.

## Criterion 4: Impacts on the Habitat and Ecosystem

*This Criterion assesses the impact of the fishery on seafloor habitats, and increases that base score if there are measures in place to mitigate any impacts. The fishery's overall impact on the ecosystem and food web and the use of ecosystem-based fisheries management (EBFM) principles is also evaluated. Ecosystem Based Fisheries Management aims to consider the interconnections among species and all natural and human stressors on the environment. The final score is the geometric mean of the impact of fishing gear on habitat score (factor 4.1 + factor 4.2) and the Ecosystem Based Fishery Management score. The Criterion 4 rating is determined as follows:*

- ***Score >3.2=Green or Low Concern***
- ***Score >2.2 and ≤3.2=Yellow or Moderate Concern***
- ***Score ≤2.2 = Red or High Concern***

GUIDING PRINCIPLES

- Avoid negative impacts on the structure, function or associated biota of marine habitats where fishing occurs.
- Maintain the trophic role of all aquatic life.
- Do not result in harmful ecological changes such as reduction of dependent predator populations, trophic cascades, or phase shifts.
- Ensure that any enhancement activities and fishing activities on enhanced stocks do not negatively affect the diversity, abundance, productivity, or genetic integrity of wild stocks.
- Follow the principles of ecosystem-based fisheries management.

*Rating cannot be Critical for Criterion 4.*

**Criterion 4 Summary**

| FISHERY | FISHING GEAR ON THE SUBSTRATE | MITIGATION OF GEAR IMPACTS | ECOSYSTEM-BASED FISHERIES MGMT | SCORE |
|---|---|---|---|---|
| Northwest Atlantic \| Bottom trawls \| United States \| Mid Atlantic | Moderate Concern | Moderate Mitigation | Moderate Concern | **Yellow (2.739)** |
| Northwest Atlantic \| Bottom trawls \| United States \| New England | Moderate Concern | Moderate Mitigation | Moderate Concern | **Yellow (2.739)** |

**Criterion 4 Assessment**

SCORING GUIDELINES

Factor 4.1 - Physical Impact of Fishing Gear on the Habitat/Substrate
Goal: The fishery does not adversely impact the physical structure of the ocean habitat, seafloor or associated biological communities.

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.*
- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  *Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.*

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts
Goal: Damage to the seafloor is mitigated through protection of sensitive or vulnerable seafloor habitats, and limits on the spatial footprint of fishing on fishing effort.

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

Factor 4.3 - Ecosystem-Based Fisheries Management
Goal: All stocks are maintained at levels that allow them to fulfill their ecological role and to maintain a functioning ecosystem and food web. Fishing activities should not seriously reduce ecosystem services provided by any retained species or result in harmful changes such as trophic cascades, phase shifts or reduction of genetic diversity. Even non-native species should be considered with respect to ecosystem impacts. If a fishery is managed in order to eradicate a non-native, the potential impacts of that strategy on native species in the ecosystem should be considered and rated below.

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*
- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

**Factor 4.1 - Impact of Fishing Gear on the Habitat/Substrate**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Concern**
Silver hake is found over all substrates from gravel to fine silt and clay, but most commonly over silt and clay (Morse et al. 1999), which are more resilient to disturbance from fishing activities. It can be inferred from this that whiting and red hake are mostly caught with gear that is fishing on these types of substrate. Studies on the effects of trawling on the seabed have found no evidence of impact on sandy areas on Georges Bank that are 60 m or shallower (Lindholm et al. 2015). Seafood Watch considers the effects of bottom trawls on sand, gravel, and mud habitats to be of moderate conservation concern.
**Justification:**
Concern over the effects of trawling on benthic ecosystems grew during the 1990s, and a host of scientific papers have since documented the damage to benthic communities from these fishing methods. (For reviews, see Watling and Norse 1998, and Thrush and Dayton 2002.) Bottom trawls not only remove an extensive amount of biomass, they destroy biogenic habitat structures such as sponges and tubes (Schwinghamer et al. 1988)(Thrush and Dayton 2002)(Watling and Norse 1998)(Dinmore et al. 2003). These impacts led to the comparison of dredging with forest clearcutting (Watling and Norse 1998)(Zeller and Russ 2004). As with forest clearing, benthic ecosystems can be slow to recover, and recovery times will vary with the exact species, habitat, and depth considered (Watling and Norse 1998)(Dinmore et al. 2003). The Georges Bank has been trawled for decades, and the effects on the benthic megafauna on gravel habitat have been studied by Collie et al. (1997). At nontrawl sites, the authors found an abundance of organisms, and that biomass and species diversity were 104 significantly greater than at trawled sites (Collie et al. 1997). Besides removing biomass and biogenic structures, mobile fishing gear (i.e., trawls) alter physical habitat. Even in sandy areas, where dredge impacts are expected to be minimal, experimental dredging has revealed significant changes to the physical habitat, such as the loss of topographic relief (Schwinghamer et al. 1988). The whiting fishery utilizes a gear modification in exemption areas that fall in the Gulf of Maine and on Georges Bank. These modifications are designed to prevent bottom contact. Even if contact still occurs, it is reduced in these areas (NEFMC 2012).

**Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Mitigation**
The alteration of marine habitats by fishing gear can be lessened through the reduction of fishing effort, implementation of spatial closures that protect vulnerable habitats, or modifications to the gear that reduce bottom contact or severity of contact.

A number of permanent and temporary spatial closures are in place in the Gulf of Maine and Georges Bank. Under Amendment 13 of the multispecies FMP, seven permanent closures are established to protect essential fish habitat (EFH) from the impacts of bottom trawling (Federal Register 2004). Five additional year-round closures are designated through the multispecies FMP, along with five rolling closures in the Gulf of Maine and a seasonal closure in Georges Bank. These closures are designed primarily to protect important spawning grounds and juvenile fish. Additionally, the gear modifications required in the whiting exemption areas in the Gulf of Maine and Georges Bank are in place to prevent contact with the bottom (NOAA Fisheries 2014d).

The gear used in the small-mesh multispecies fishery is otter trawl gear, like groundfish trawls, which have contact with the seafloor. However, the modifications to the gear that allow vessels to target whiting and red hake are considered moderately effective at reducing impacts on the seafloor (SFW Criteria, p. 73). A raised footrope trawl is required in several of the exempted fishing programs. "Vessels fishing in the Raised Footrope Trawl Exempted Whiting Fishery (GOM or adjacent to Cape Cod), Small Mesh Area 1, or Small Mesh Area 2 must configure the trawl gear in such a way that, when towed, the footrope is not in contact with the ocean bottom." (NOAA Fisheries 2014d) And from Amendment 19: "The raised footrope trawl has less impact on habitat than a traditional otter trawl. 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." (NEFMC 2012) (p. 8-205) Additionally, for the vessels fishing in the southern areas where these gear modifications are not required, many do modify their gear based on experience to better target whiting and avoid bycatch of other species. For example, they may use a larger mesh belly panel to reduce flounder bycatch (pers. comm., M. Kelly, May 2015).

**Justification:**
According to the NEFMC website (www.nefmc.org), "Prior efforts to minimize the adverse effects of Council-managed fisheries on essential fish habitat (EFH) were largely developed and implemented plan by plan, although fishery effects on EFH are cumulative across fishery management plans because fish and fishery distributions overlap across both species and plans. In 1999, NOAA Fisheries implemented the first Habitat Omnibus Amendment that addressed new Magnuson Fishery Conservation and Management Act mandates in most New England Council FMPs. The amendment also identified and described EFH for the 18 species managed by the Council, major threats to EFH from both fishing and non-fishing related activities, and proposed conservation and enhancement measures and designated Habitat Areas of Particular Concern for Atlantic salmon and Atlantic cod. EFH Omnibus Amendment 2 is currently in development...." As of July 2015, EFH Omnibus Amendment 2 has been finalized and is awaiting approval from NOAA, for implementation sometime in 2016.

To mitigate and minimize potential damage to EFH, NEFMC has implemented spatial closures, introduced limited permit schemes, and placed restrictions on the gear that can be used when trawling (Orphanides and Magnusson 2007). Besides the year-round and rolling closures mentioned above, there are restricted gear areas (RGA) (e.g., the Inshore Restricted Roller Gear Area) that provide protection from particular gear types. Approximately 20% of the Georges Bank and Gulf of Maine seabed is protected from trawling activities through the variety of closures, although only 9.7% of the seabed is permanently protected through EFH closures (NOAA Fisheries 2013). In June 2015, the NEFMC voted on Habitat Omnibus Amendment 2 to reduce closed areas on Georges Bank from 7,000 $mi^2$ to 2,000 $mi^2$ (NEFMC 2015b). These closures generally are supposed to cover more complex seafloor habitat than existing closures do and at the same time give the groundfish fleet more access to healthy stocks and the scallop fleet access to areas with scallops that have not been fished since 1994. These changes have not undergone final approval by NMFS, but if they are approved, they will be implemented sometime in 2016. Framework Adjustment (FA) 48 to the MSFMP prevents an exemption to year-round fishing mortality area closures from being made to areas that overlap with closures created to protect essential fish habitat (Federal Register 2013).

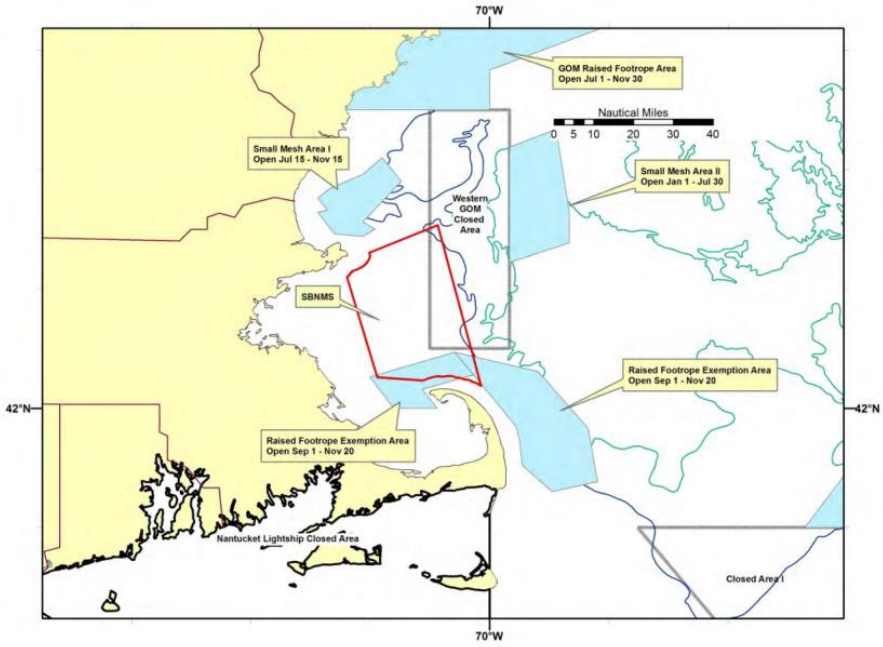



Figure 12: Map of whiting fishing areas in relation to Stellwagen Bank National Marine Sanctuary (NEFMC 2014)
(NEFMC 2012)

**Factor 4.3 - Ecosystem-based Fisheries Management**

**Northwest Atlantic | Bottom trawls | United States | Mid Atlantic**
**Northwest Atlantic | Bottom trawls | United States | New England**

**Moderate Concern**
Ecosystem-based management in the United States has been given recent attention with the new National Ocean Policy, established under presidential order on July 19, 2010 (White House 2010). The New England Fishery Management Council (NEFMC) is beginning implementation of a 5-year strategy of transitioning to ecosystem-based management of fisheries. Such management is expected to replace individual management plans with holistic, integrated plans for defined ecological regions, with predator-prey relationships, competition, habitat status and gear impacts, and protected species all taken into account under the umbrella plan. Efforts are underway by the New England Fishery Management Council to develop ecosystem-based fishery management (EBFM) in three phases: establish goals and objectives, identify management and scientific requirements to implement EBFM in the region, and implement EBFM using quota-based management in all ecosystem production units (NEFMC 2011). As of May 2015, policy development is still underway.

According to the MAFMC website (www.mafmc.org/eafm), "The Council is currently developing an Ecosystem Approach to Fisheries Management (EAFM) Guidance Document. Rather than drastically change the Council's management approach, the final product will serve as a non-regulatory umbrella document to guide policy decisions as the Council transitions from single-species management toward an ecosystem-based approach. The Council defines EAFM as a fishery management approach which recognizes the biological, economic, social, and physical interactions among the components of ecosystems and attempts to manage fisheries to achieve optimum yield taking those interactions into account." As of May 2015, development of the guidance document is still underway.

Additionally, the small-mesh multispecies fishery catches Atlantic mackerel, longfin squid, and shortfin squid, all of which are considered by Seafood Watch as 'exceptional species', which means they are important forage species. Despite their role in the ecosystem, there is still much to be learned about their roles in regional food webs. The MAFMC commissioned a white paper to help them manage the forage fisheries in the mid-Atlantic region, including Atlantic mackerel, shortfin squid, and longfin squid {Houde, Guichas, and Seagraves 2014}. The white paper sheds light on the role of forage fish in marine ecosystems, identifies those in the mid-Atlantic region and their predators, and determines their importance in the food web based on this information. The purpose of this white paper (and others) is to give managers the information and advice they need to effectively implement ecosystem management. Because Atlantic mackerel, longfin squid, and shortfin squid are caught in the small-mesh multispecies fishery and ecosystem-based management policy development is underway, Seafood Watch considers this to be of moderate conservation concern.

*Scientific review does not constitute an endorsement of the Seafood Watch® program, or its seafood recommendations, on the part of the reviewing scientists. Seafood Watch® is solely responsible for the conclusions reached in this report.*

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Atlantic+mackerel

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## Appendix

Updates to Hake, Silver, Red, Offshore (US) Report : **Updates to the February 12, 2016 U.S. Hake report were made on September 23, 2020:**

**Overall Recommendations for red hake** caught with bottom trawls in the Mid-Atlantic downgraded from "Good Alternative" to "Avoid." Changes are due to recent stock changes for both targeted (red hake) and incidentally caught (Atlantic mackerel) species.

**Overall Recommendations for silver, red and offshore hake** caught by bottom trawls in New England remained unchanged but there were updates to individual criteria as described below.

**Overall Recommendations for silver and offshore hake** caught by bottom trawls in the Mid-Atlantic remained unchanged but there were updates to individual criteria as described below.

**Mid-Atlantic Bottom Trawl Fishery:**

- C1: Red hake (Southern stock): Abundance (C1.2) downgraded from "Low" Concern to "High" Concern because the stock is now overfished. Fishing mortality (C1.3) downgraded from "Low" Concern to "High" Concern because the stock is experiencing overfishing.
- C2: Atlantic mackerel: Abundance downgraded from "Moderate" Concern to "High" Concern because the stock is depleted and at near historic lows. Fishing mortality downgraded from "Moderate" Concern to "High" Concern because Atlantic mackerel is undergoing overfishing.
- C2: The following marine mammal species were added to C2 of this report due to their updated (2020) NOAA List of Fisheries: bottlenose dolphin, short-beaked common dolphin, and Risso's dolphin.
- C2.3: Atlantic white-sided dolphin upgraded from "Moderate" Concern to "Very Low" Concern for the Mid-Atlantic fishery it accounts for less than 1% of PBR and because PBR is not exceeded.
- C2: Red hake (Southern stock): Abundance (C2.2) downgraded from "Low" Concern to "High" Concern because the stock is now overfished. Fishing mortality (C2.3) downgraded from "Low" Concern to "High" Concern because the stock is experiencing overfishing.

**New England Bottom Trawl Fishery:**

- C2: The following marine mammal species were added to C2 of this report due to their updated (2020) NOAA List of Fisheries: bottlenose dolphin, short-beaked common dolphin, and harbor porpoise.
- C2: Atlantic mackerel: Abundance downgraded from "Moderate" Concern to "High" Concern because the stock is depleted and at near historic lows. Fishing mortality downgraded from "Moderate" Concern to "High" Concern because Atlantic mackerel is undergoing overfishing.
- C2.3 Long-finned pilot whale downgraded from "Low" Concern to "Moderate" Concern because total fishing mortality is less than PBR, but the fishery under assessment accounts for >50% of PBR.