Monterey Bay Aquarium Seafood Watch

Environmental sustainability assessment of wild-caught cod, haddock, and pollock from the United States caught using bottom trawls, handlines and hand-operated pole-and-lines, set gillnets, and set longlines

Species:	Atlantic cod (*Gadus morhua*), Haddock (*Melanogrammus aeglefinus*), Pollock (*Pollachius virens*)
Location:	United States: Northwest Atlantic
Gear:	Bottom trawls, Handlines and hand-operated pole-and-lines, Set gillnets, Set longlines
Type:	Wild Caught
Author:	Seafood Watch
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Assessed using Seafood Watch Fisheries Standard v3

Table of Contents

About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental 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. 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.

Seafood Watch's science-based ratings are available at www.SeafoodWatch.org. Each rating is supported by a Seafood Watch assessment, in which the fishery or aquaculture operation is evaluated using the Seafood Watch standard.

Seafood Watch standards are built on our guiding principles, which outline the necessary environmental sustainability elements for fisheries and aquaculture operations. The guiding principles differ across standards, reflecting the different impacts of fisheries and aquaculture.

- Seafood rated Best Choice comes from sources that operate in a manner that's consistent with our guiding principles. The seafood is caught or farmed in ways that cause little or no harm to other wildlife or the environment.

- Seafood rated Good Alternative comes from sources that align with most of our guiding principles. However, one issue needs substantial improvement, or there's significant uncertainty about the impacts on wildlife or the environment.

- Seafood rated Avoid comes from sources that don't align with our guiding principles. The seafood is caught or farmed in ways that have a high risk of causing harm to wildlife or the environment. There's a critical conservation concern or many issues need substantial improvement.

Each assessment follows an eight-step process, which prioritizes rigor, impartiality, transparency and accessibility. They are conducted by Seafood Watch scientists, in collaboration with scientific, government, industry and conservation experts and are open for public comment prior to publication. Conditions in wild capture fisheries and aquaculture operations can change over time; as such assessments and ratings are updated regularly to reflect current practice.

More information on Seafood Watch guiding principles, standards, assessments and ratings are available at www.SeafoodWatch.org.

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, Seafood Watch develops an overall recommendation. Criteria ratings and the overall recommendation are color coded to correspond to the categories on the Seafood Watch pocket guides and online guide:

Best Choice/Green: Buy first; they're well managed and caught or farmed responsibly.

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

Avoid/Red: Take a pass on these for now; they're caught or farmed 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 Seafood Watch report provides recommendations for Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), and pollock (*Pollachius virens*) caught in the Northwest Atlantic by U.S. fishing vessels. The three species live in similar habitats, have similar natural ranges, and are caught in mixed fisheries using a variety of methods, including bottom trawls, sink gillnets, bottom longlines, and rod and line, that will be covered by this report. The fisheries that capture cod, haddock, and pollock in the Northwest Atlantic are managed by the New England Fisheries Management Council (NEFMC) under the Multispecies Fishery Management Plan.

There are two separate stocks of cod and haddock in the U.S. Northwest Atlantic: Georges Bank and the Gulf of Maine. Cod abundances on Georges Bank and in the Gulf of Maine are in an overfished state and of high conservation concern. Cumulative fishing pressure on both stocks is too high. Haddock stocks are healthier and have been fully rebuilt on Georges Bank and in the Gulf of Maine. Georges Bank haddock is fished at a sustainable level, and fishing pressure in the Gulf of Maine has reduced to sustainable levels. Pollock abundance in the Northwest Atlantic is healthy and is being fished at a sustainable level.

The handline fisheries in the Northwest Atlantic are relatively selective, with no species of concern caught other than the target species (typically cod). Bottom trawl fisheries in the Northwest Atlantic catch a variety of species, including commercially important fish and marine mammals. The species of greatest concern in the bottom trawl fisheries for cod, haddock, and pollock is the by-catch of yellowtail flounder, which is overfished and experiencing overfishing on Georges Bank and in the Gulf of Maine. Bottom gillnet fisheries catch a variety of species, including a number of marine mammals; of greatest concern is the North Atlantic right whale, which is listed as "Critically Endangered" by the International Union for the Conservation of Nature (IUCN) and is being negatively affected by fishing activities in the region. Bottom longline fisheries are relatively selective compared to the trawl and gillnet fisheries, but there is still a high level of concern regarding by-catch of skate species. Bottom trawls have a discard rate of roughly 47% in the region, while gillnets and longlines have a discard rate of 29% and 18%, respectively. Handlines have a discard rate of roughly 6% (most of which is undersized cod).

The NEFMC manages the groundfish fishery through a collective Fishery Management Plan (FMP) that covers 20 stocks from 13 species. Grouping species together allows NEFMC to manage these mixed fisheries more effectively than if individual species FMPs were used. Because of the historical exploitation that the stocks have been exposed to, a number of stocks are depleted or in a state of rebuilding. NEFMC's current management system should improve the rate of recovery of stocks. There is a considerable effort to collect data in these fisheries through logbooks and observer coverage; the data (along with fishery-independent data) guide stock assessments. NEFMC takes into account the scientific information provided by stock assessments on the majority of occasions; however, in some instances, total allowable catches (TACs) have been set too high in response to social and economic needs. Various regulations are in place that require fisheries managers to reduce the impacts of fishing activities on nontarget populations. Reporting of by-catch creates an incentive for reduction efforts while providing data for scientific research and stock assessments. The observer program provides considerable data to aid in stock assessments of target and by-catch species, although gaps in monitoring may still be a concern. There are serious concerns regarding the effectiveness of the Atlantic Large Whale Take Reduction Plan and the impact of gillnet and pot/trap fisheries on North Atlantic right whale in this

region.

Most of the activity in the groundfish fishery takes place in water less than 100 m deep over sand and mud-silt habitats; gravel habitats affected by the fishery occur in waters 20 to 40 m deep. Habitat impacts are a moderate conservation concern for bottom trawl fisheries, a low conservation concern for bottom gillnet and bottom longline fisheries, and a very low concern for handline fisheries. A minimal level of mitigation measures is in place, in the form of a number of permanently closed areas to protect essential fish habitat from bottom trawls and in other temporary and permanent closures that offer some protection from all gears (but these are not designated specifically for habitat protection and may not protect the most vulnerable habitats). Ecosystem-based management is currently being developed for the groundfish fishery in the Northwest Atlantic and this process is expected to take a minimum of 5 years. Management of the ecosystem in this region is a "moderate" conservation concern.

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Atlantic cod | Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000	3.000	2.449	**Avoid (1.646)**
Atlantic cod | Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000	3.000	2.449	**Avoid (1.646)**
Atlantic cod | Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	3.413	3.000	3.464	**Good Alternative (2.440)**
Atlantic cod | Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	3.413	3.000	3.464	**Good Alternative (2.440)**
Atlantic cod | Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000	1.000	3.000	**Avoid (1.316)**
Atlantic cod | Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000	1.000	3.000	**Avoid (1.316)**
Atlantic cod | Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	1.000	2.236	3.000	3.000	**Avoid (2.118)**
Atlantic cod | Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	1.000	2.236	3.000	3.000	**Avoid (2.118)**
Haddock | Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	5.000	1.000	3.000	2.449	**Good Alternative (2.462)**
Haddock | Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	5.000	1.000	3.000	2.449	**Good Alternative (2.462)**
Haddock | Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000	1.000	3.000	3.464	**Good Alternative (2.685)**
Haddock | Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000	1.000	3.000	3.464	**Good Alternative (2.685)**
Haddock | Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	5.000	1.000	3.000	3.000	**Good Alternative (2.590)**
Haddock | Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	5.000	1.000	3.000	3.000	**Good Alternative (2.590)**
Pollock | Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	5.000	1.000	3.000	2.449	**Good Alternative (2.462)**
Pollock | Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	5.000	1.000	3.000	2.449	**Good Alternative (2.462)**

Pollock | Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000	1.000	3.000	3.464	**Good Alternative (2.685)**
Pollock | Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000	1.000	3.000	3.464	**Good Alternative (2.685)**
Pollock | Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	5.000	1.000	1.000	3.000	**Avoid (1.968)**
Pollock | Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	5.000	1.000	1.000	3.000	**Avoid (1.968)**

Summary

Overall, handline fisheries for cod and haddock from Georges Bank and the Gulf of Maine are considered a Good Alternative, due in part to the selective nature of the fishing gear. Haddock and pollock caught in the Georges Bank and Gulf of Maine regions with handlines, trawls, and longlines gears are considered a Good Alternative, because stocks are healthy but there are moderate to high concerns over by-catch of other species. Cod caught from Georges Bank and the Gulf of Maine using bottom trawls and bottom longlines receive an Avoid rating, due to concerns about the target stock and by-catch species. Cod and pollock caught with set gillnets are considered an Avoid, due to the potential impact on North Atlantic right whale and the failure of the Atlantic Large Whale Take Reduction Plan to effectively reduce the impact of fisheries on this critically endangered species.

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 Seafood Watch report provides recommendations for Atlantic cod (*Gadus morhua*), haddock (*Melanogrammus aeglefinus*), and pollock (*Pollachius virens*) caught in the Northwest Atlantic by U.S. fishing vessels. The three species are caught in mixed fisheries using a variety of methods, including bottom trawls, sink gillnets, bottom longlines, and rod and line, that will be covered by this report. Recommendations are provided for the gears that catch a significant volume of each species or offer a more sustainable option.

Species Overview

Atlantic cod is widely distributed throughout the North Atlantic and Arctic Oceans. In the Northwest Atlantic, it can be found from Cape Hatteras, North Carolina to Greenland. It is found to depths of 600 m, although it typically inhabits depths of less than 200 m (Froese and Pauly 2017). Atlantic cod is an extremely important commercial species that has been targeted throughout its range for many years, making it culturally and socially significant.

Haddock is found in both the Northwest and Northeast Atlantic in water temperatures between 4 °C and 10 °C. In the Northwest Atlantic, it is found between Cape May, New Jersey and the Strait of Belle Isle, Newfoundland. Typically found at depths between 10 m and 200 m, it is demersal, living above rocky, sand, gravel, or shell-based seabeds and feeding on crustaceans, echinoderms, mollusks, worms, and fish (Froese and Pauly 2017). Pollock is closely related to both cod and haddock and is part of the Gadoid family of fish. It is found throughout a range similar to both cod and haddock: throughout the coastal and continental shelf region of the North Atlantic. In the Northwest Atlantic, it ranges from Greenland to North Carolina, in both inshore and offshore areas, typically forming shoals (Froese and Pauly 2017).

The groundfish fishery in New England has been in existence for 400 years and provided the first major industry for early settlers, with a number of associated businesses arising to support the fishing industry. Thus, the groundfish fishery of New England is of great social and economic importance to the local communities. Over the centuries, capture methods have changed dramatically with improvements in technology and efficiency of the fishery. As a result of the increased efficiency, overfishing occurred, resulting in the depletion of many of the Northwest Atlantic groundfish stocks. Concerns with overfishing were raised in the early 1900s, and in the 1930s the overcapacity of the industry became evident {NEFSC 2017}. The introduction of factory trawlers in the 1960s from overseas (including the USSR, Poland, Spain, and Japan) led to the virtual collapse of stocks of groundfish, some of which have yet to recover after continued fishing pressure through the 1980s and 1990s. In recent years, fishers have been using more selective fishing gears, particularly in the trawl fishery, where separator trawls and Ruhle trawls have been developed and adopted to reduce by-catch and discarding of nontarget and/or low abundance species. Because of quota restrictions on low abundance species, fishers have also started to target more abundant species and stocks, such as haddock and redfish.

The U.S. fisheries that target the above species are managed by the New England Fisheries Management Council (NEFMC) under the Northeast Multispecies Fishery Management Plan (NE Multispecies FMP; "the Plan"), which was enacted in 1986. Since its inception, it has been amended several times to account for

changes in fishing activity and abundance of the 20 stocks (13 different species) managed under the plan {NEFSC 2012a}.

Production Statistics

Cod, haddock, and pollock are all globally important commercial species and three of the United States' main export commodities (FAO 2017). In 2015, total global landings of Atlantic cod were 1,304,433 mt; haddock and pollock global landings were 307,978 mt and 293,698 mt, respectively (FAO 2017).

In 2016, Atlantic cod commercial landings in the Gulf of Maine were 320 mt (Palmer 2017a) and on Georges Bank were 1,009 mt {Legault 2017}. Atlantic haddock commercial landings in the Gulf of Maine were 1,342 mt (Palmer 2017b) and on Georges Bank were 3,682 mt (Brooks 2017), while pollock commercial landings totaled 2,582 mt {Linton 2017}.

Figure 1 shows the trends in landings for the three species from New England from 1977 to 2016. Landings for cod, haddock, and pollock have been fluctuating between 3,000 mt and 10,000 mt since 2003 (NMFS 2018a). For cod, this represents the historical low, whereas haddock and pollock landings have fluctuated since historical lows in the mid-1990s.

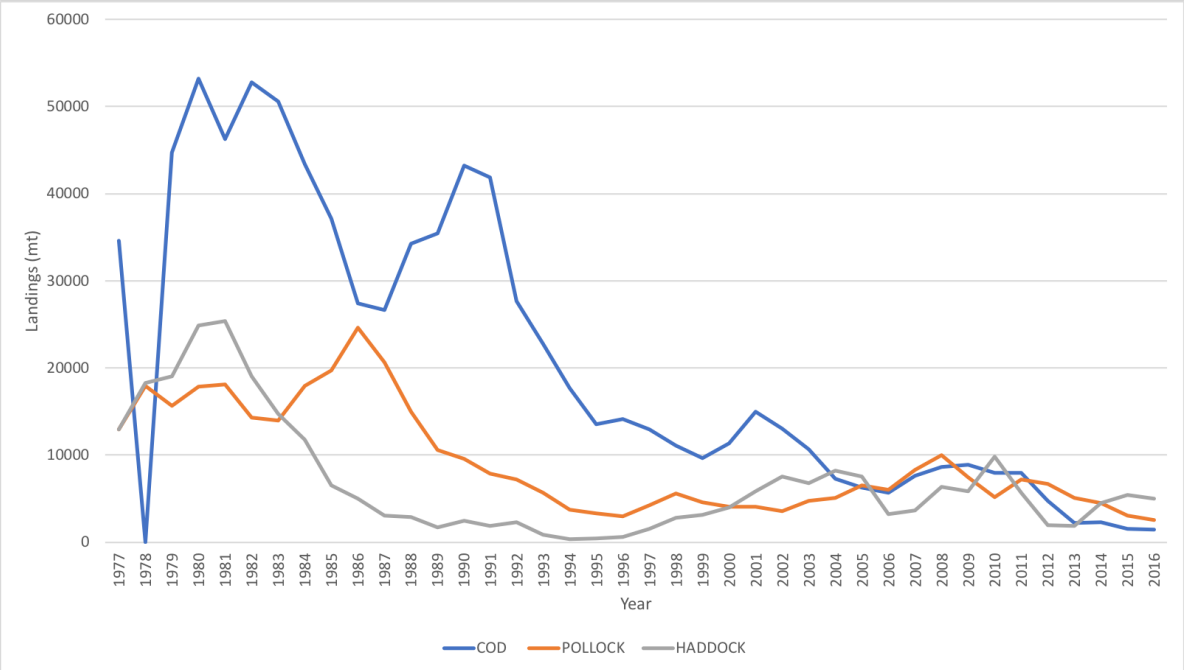

Figure 1: Landings (mt) of Atlantic cod, haddock, and pollock from New England between 1977 and 2016; extrapolated from (NMFS 2018a).

Importance to the US/North American market.

All three species of groundfish considered in this report are imported into the United States. In 2016, 70,669 mt of Atlantic cod (with a value of $466 million), 27,746 mt of haddock ($139 million), and

36,369 mt of pollock ($9.48 million) were imported into the U.S. (NMFS 2018b). Figures 2, 3, and 4 show the sources of the imports for each species. The main countries of importance are Canada, Iceland, and China, with Norway being an important source of haddock. It should be noted that imports from China are likely caught in other countries (including the United States) and sent to China for processing before being imported to U.S. markets. There is confusion over the original source of cod from China, and concerns over the volume of illegal, unregulated, and unreported landings (IUU) of fish entering Chinese (and other Asian) processors (Album 2010).

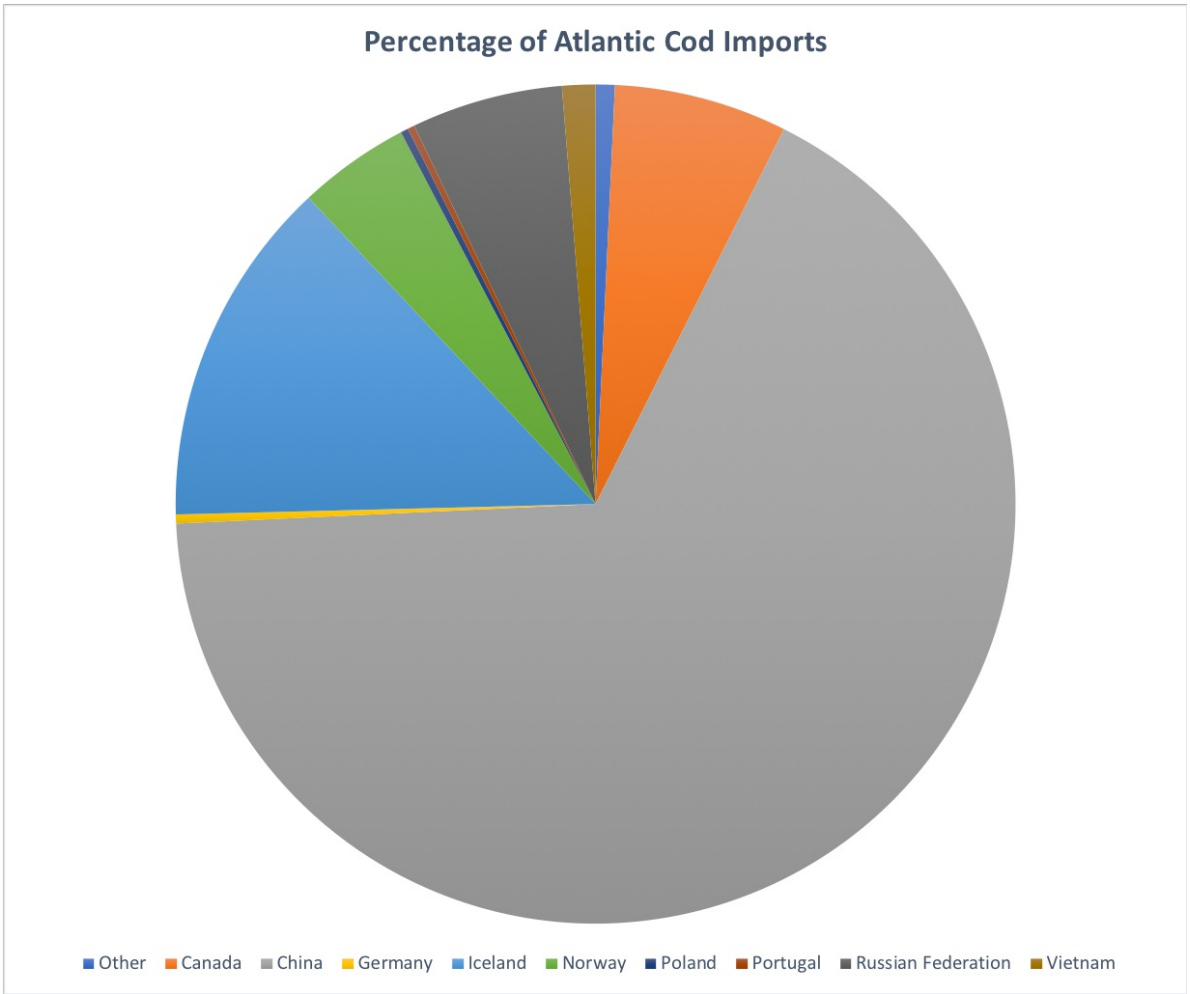

Figure 2: Source of imports for Atlantic cod into the U.S. in 2016; extrapolated from (NMFS 2018b).

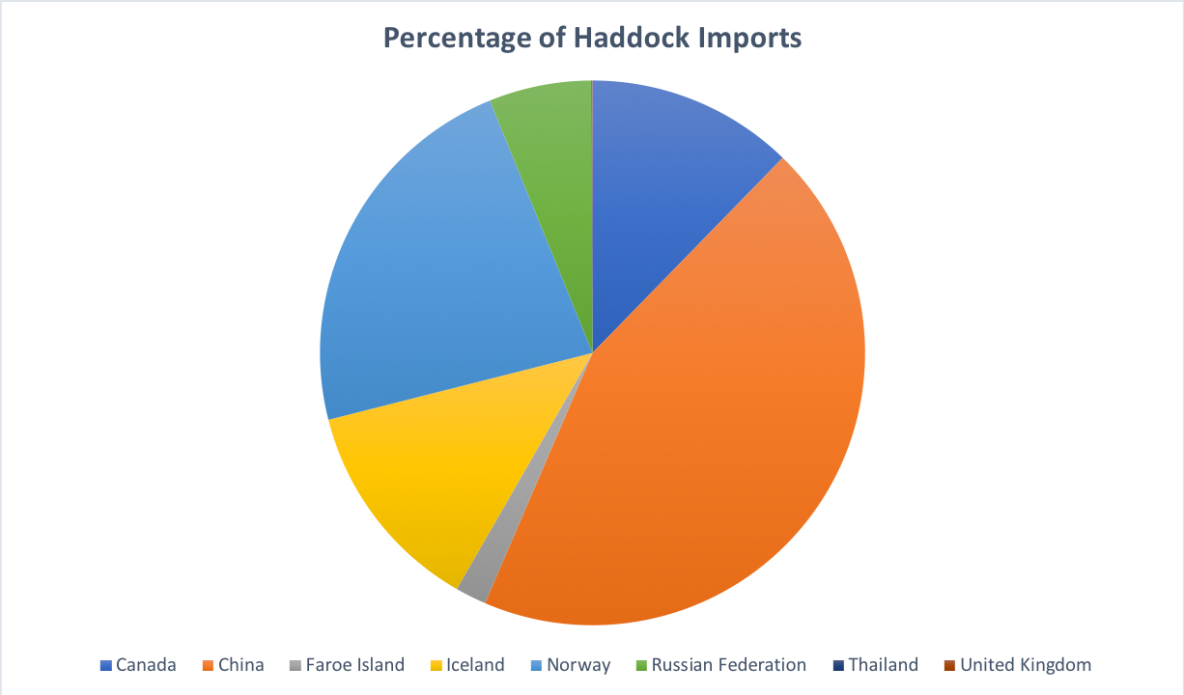

Figure 3: Source of imports for haddock into the U.S. in 2016; extrapolated from (NMFS 2018b).

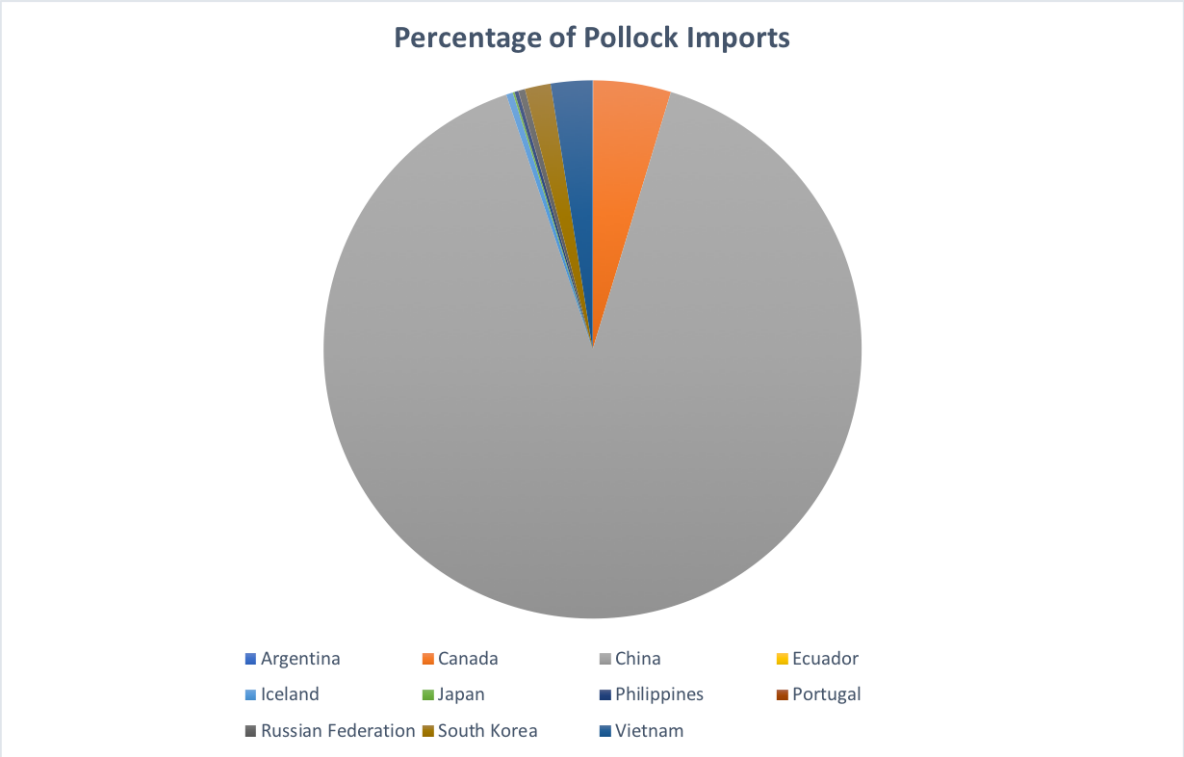

Figure 4: Source of imports for pollock into the U.S. in 2016; extrapolated from (NMFS 2018b).

Common and market names.

Atlantic cod is generally labeled simply as cod, but is also known as true cod, and smaller cod is referred to as scrod. Haddock is marketed as haddock, and smaller haddock is also known as scrod. Pollock is the only known common name in use in the United States; however, this species is referred to as saithe or coley in Europe, where a closely related species, *Pollachius pollachius*, is given the name pollock. This species should not be confused with walleye (Alaskan) pollock, which is caught in the Pacific Ocean. All the species considered in this report can be found under the name whitefish, a generic term used for firm, white-fleshed fish.

Primary product forms

Cod, haddock, and pollock from the New England region are primarily available fresh in the form of whole fish and fillets. Other forms of cod, haddock, and pollock that may be available on the market include frozen fillets, breaded/battered, smoked, salted, or block (typically used for fish sticks, etc.).

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

ATLANTIC COD			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	1.000: High Concern	1.000: High Concern	Red (1.000)

HADDOCK			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

POLLOCK			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

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.*

Atlantic cod

Factor 1.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States

High Concern

Based on the 2017 Georges Bank Atlantic cod stock assessment, stock status cannot be quantitatively determined due to a lack of biological reference points associated with the "Plan B smooth" approach (Legault 2017a). But, Atlantic cod is considered to be overfished due to poor stock condition (Legault 2017a). The survey biomass in 2017 (the arithmetic average of the 2017 NEFSC spring and 2016 NEFSC fall surveys, smoothed using a loess) was estimated to be 7.237 kg/tow (see Figure 5) (Legault 2017a). According to the NMFS first quarter 2018 update, Georges Bank Atlantic cod is overfished and in year 14 of a 23-year rebuilding plan (NMFS 2018c). Because the stock is considered overfished, abundance is scored a high concern.

Justification:

The NMFS fourth quarter 2017 update stock status determinations are a holdover according to NOAA's policy, where the agency decided after the 2015 assessment that the Georges Bank Atlantic cod stock status would remain as "overfishing occurring" and "overfished," based on an earlier benchmark assessment (the SAW55 benchmark assessment in 2011) {O'Brien 2015}.

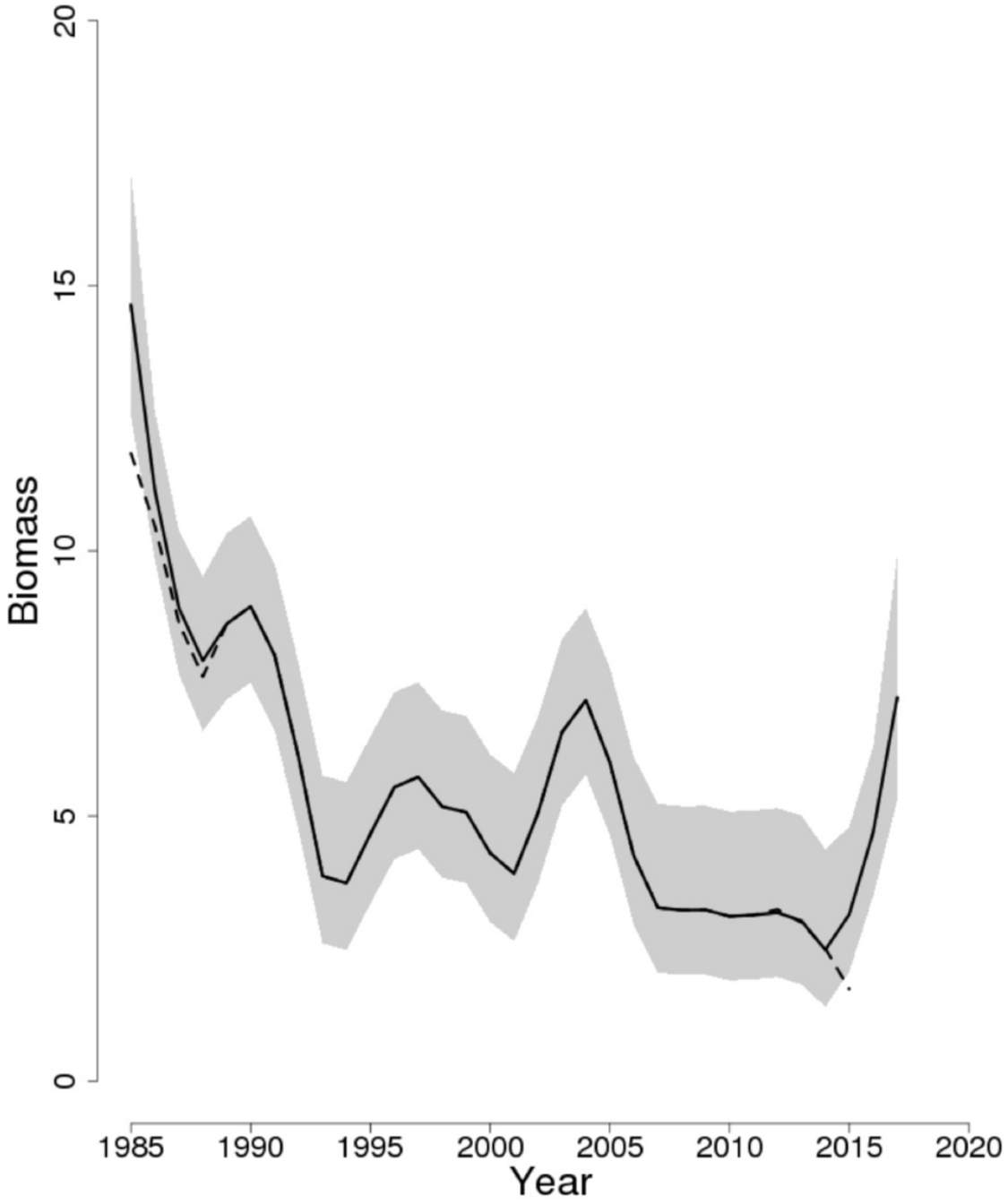

Figure 5: Trends in smoothed survey biomass (kg/tow) of Georges Bank Atlantic cod between 1985 and 2017 from the current (solid line) and previous (dashed line) assessment, based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown {Legault 2017}.

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

High Concern

Based on the 2017 Gulf of Maine Atlantic cod stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 3,046 mt under the M = 0.2 model and 3,262 mt under the M-ramp model scenario, which is 8% and 5%, respectively, of the biomass target, SSB_{MSY} proxy (40,604 mt and 59,714 mt) (see Figure 6) (Palmer 2017a). According to the NMFS first quarter 2018 update, Gulf of Maine Atlantic cod is overfished and in year 4 of a 10-year rebuilding plan (NMFS 2018c). Because the stock is overfished, abundance is considered a high concern.

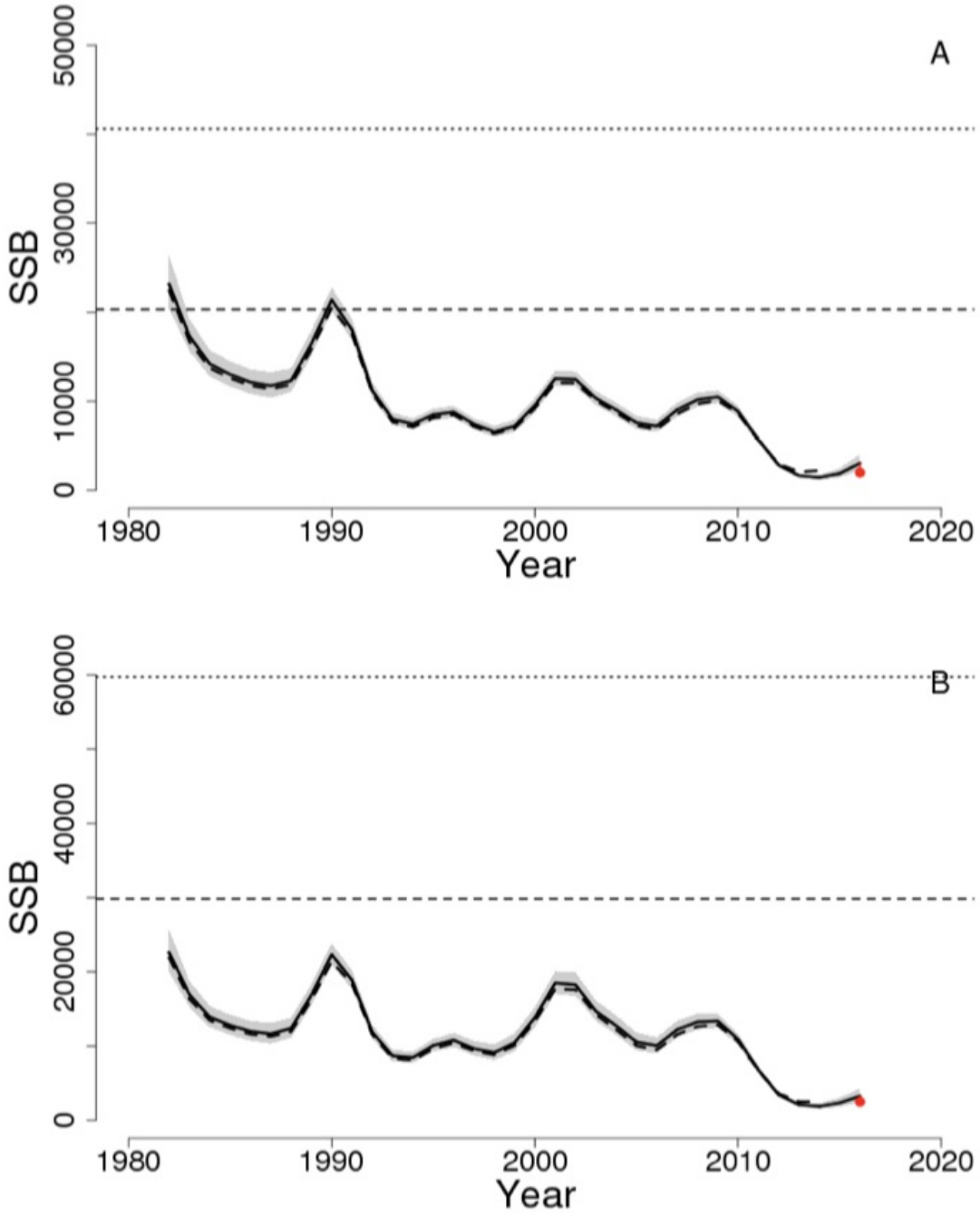

Figure 6: Estimated trends in the spawning stock biomass (SSB) of Gulf of Maine Atlantic cod between 1982 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY}; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY}; horizontal dotted line) based on the 2017 M = 0.2 (A) and M-ramp (B) assessment models {Palmer 2017}.

Factor 1.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States

High Concern

Based on the 2017 Georges Bank Atlantic cod stock assessment, the 2016 relative exploitation rate (2016 catch divided by 2016 smoothed survey biomass) was estimated to be 0.174 (see Figure 7) (Legault 2017a). But, the recommended fishing level is unknown. According to the NMFS first quarter 2018 update, Georges Bank Atlantic cod is undergoing overfishing and in year 14 of a 23-year rebuilding plan, where the management action is focusing on reducing mortality (NMFS 2018c). Due to the above, fishing mortality is scored a high concern.

Justification:

The NMFS first quarter 2018 update stock status determinations are a holdover according to NOAA's policy, where the agency decided after the 2015 assessment that the Georges Bank Atlantic cod stock status would remain as "overfishing occurring" and "overfished," based on an earlier benchmark assessment (the SAW55 benchmark assessment in 2011) {O'Brien 2015}.

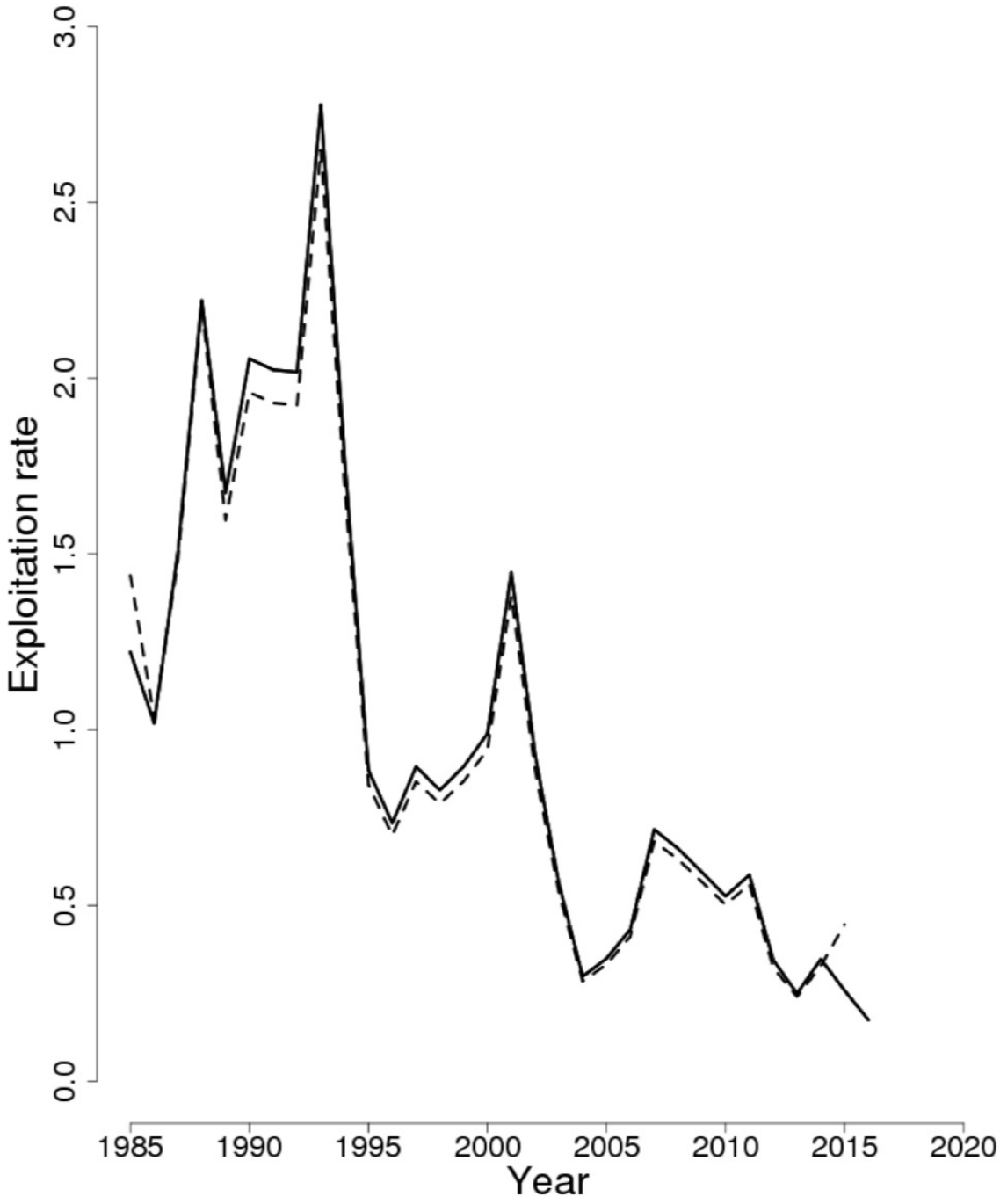

Figure 7: Trends in the relative exploitation rate (catch/smoothed survey) of Georges Bank Atlantic cod between 1985 and 2017 from the current (solid line) and previous (dashed line) assessment based on the 2017 assessment {Legault 2017}.

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

High Concern

Based on the 2017 Gulf of Maine Atlantic cod stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.228 and 0.237, which is 131% and 134% of the F_{MSY} proxy ($F_{40\%}$; 0.174 and 0.177) under the M = 0.2 model and the M-ramp model scenarios, respectively (see Figure 8) (Palmer 2017a). Because the stock is undergoing overfishing, fishing mortality is considered a high concern.

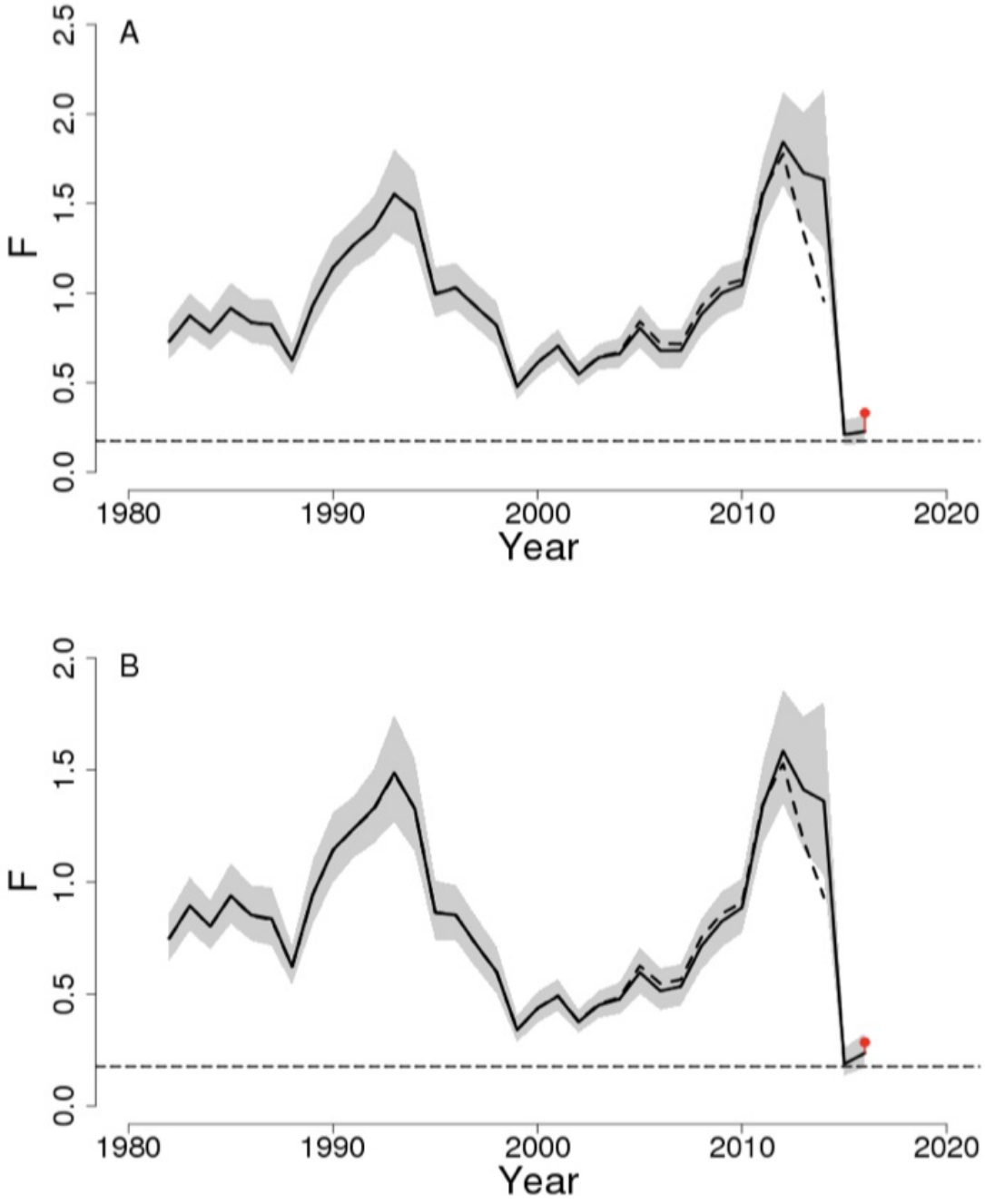

Figure 8: Estimated trends in the fully selected fishing mortality (F) of Gulf of Maine Atlantic cod between 1982 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (0.174 (M = 0.2), 0.177 (M-ramp); dashed line) based on the 2017 M = 0.2 (A) and M-ramp (B) assessment models. The 90% lognormal confidence intervals are shown {Palmer 2017}.

Haddock

Factor 1.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States

Very Low Concern

Based on the 2017 Georges Bank haddock stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 290,324 mt, which is 278% of the biomass target (SSB_{MSY} proxy = 104,312; see Figure 9) (Brooks 2017). Because the stock is not overfished and SSB is above the biomass target, abundance is scored a very low concern.

Justification:

A retrospective adjustment was made for both the determination of stock status and projections of catch in 2018, which changed the 2016 SSB from 549,938 to 290,324 (Brooks 2017).

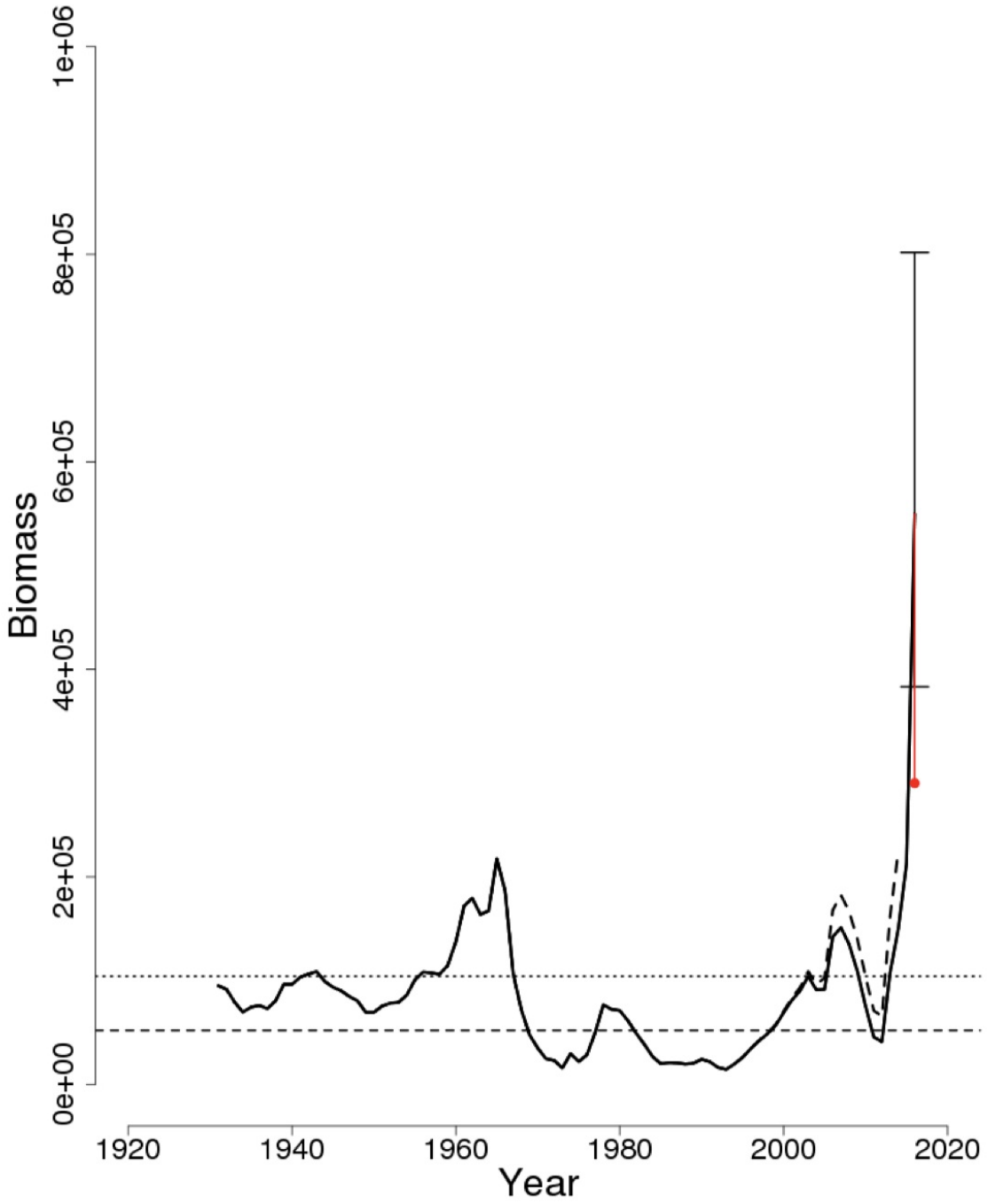

Figure 9: Trends in spawning stock biomass of Georges Bank haddock between 1931 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2015 assessment (Brooks 2017).

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Very Low Concern

Based on the 2017 Gulf of Maine haddock stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 47,821 mt, which is 706% of the biomass target (SSB_{MSY} proxy = 6,769; see Figure 10) (Palmer 2017b). Because the stock is not overfished and SSB is above the biomass target, abundance is scored a very low concern.

Justification:

The M = 0.2 model has a major retrospective pattern (7-year Mohn's rho SSB = 0.53, F = –0.31) and the M-ramp model has a minor retrospective pattern (7-year Mohn's rho SSB = 0.30, F = –0.17) (Palmer 2017b). But, following the recommendations of the SARC 55 and 2014 assessment review panels, no retrospective adjustments were made to the terminal model results or in the base catch projections (NEFSC 2013a)(Palmer 2014)(Palmer 2017b). The 2015 assessment review panel (NEFSC 2015b) supported this decision, noting that an adjustment using the 7-year average may not be appropriate.

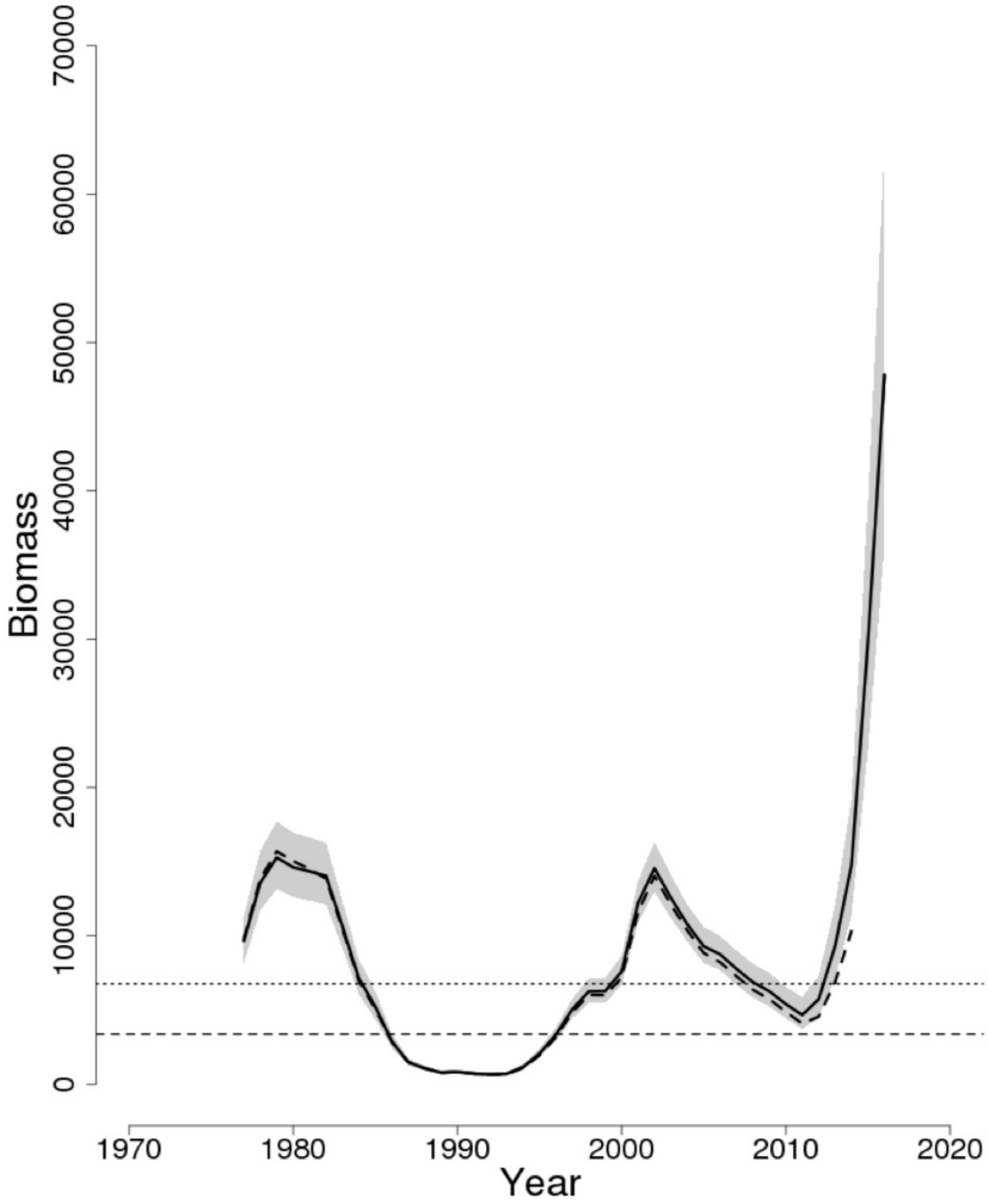

Figure 10: Trends in spawning stock biomass (SSB) of Gulf of Maine haddock between 1977 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown (Palmer 2017b).

Factor 1.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

Based on the 2017 Georges Bank haddock stock assessment, the 2016 numbers-weighted average fishing mortality on ages 5 to 7 was estimated to be 0.309, which is 88% of the overfishing threshold proxy (F_{MSY} proxy = 0.353; see Figure 11) (Brooks 2017). Because the stock is not undergoing overfishing, fishing mortality is scored a low concern.

Justification:

The F_{MSY} proxy is expressed as a numbers-weighted average F on ages 5 to 7 for comparability with the VPA estimated F. The retrospective adjustment changed the 2016 F_{5-7} from 0.113 to 0.309 (Brooks 2017).

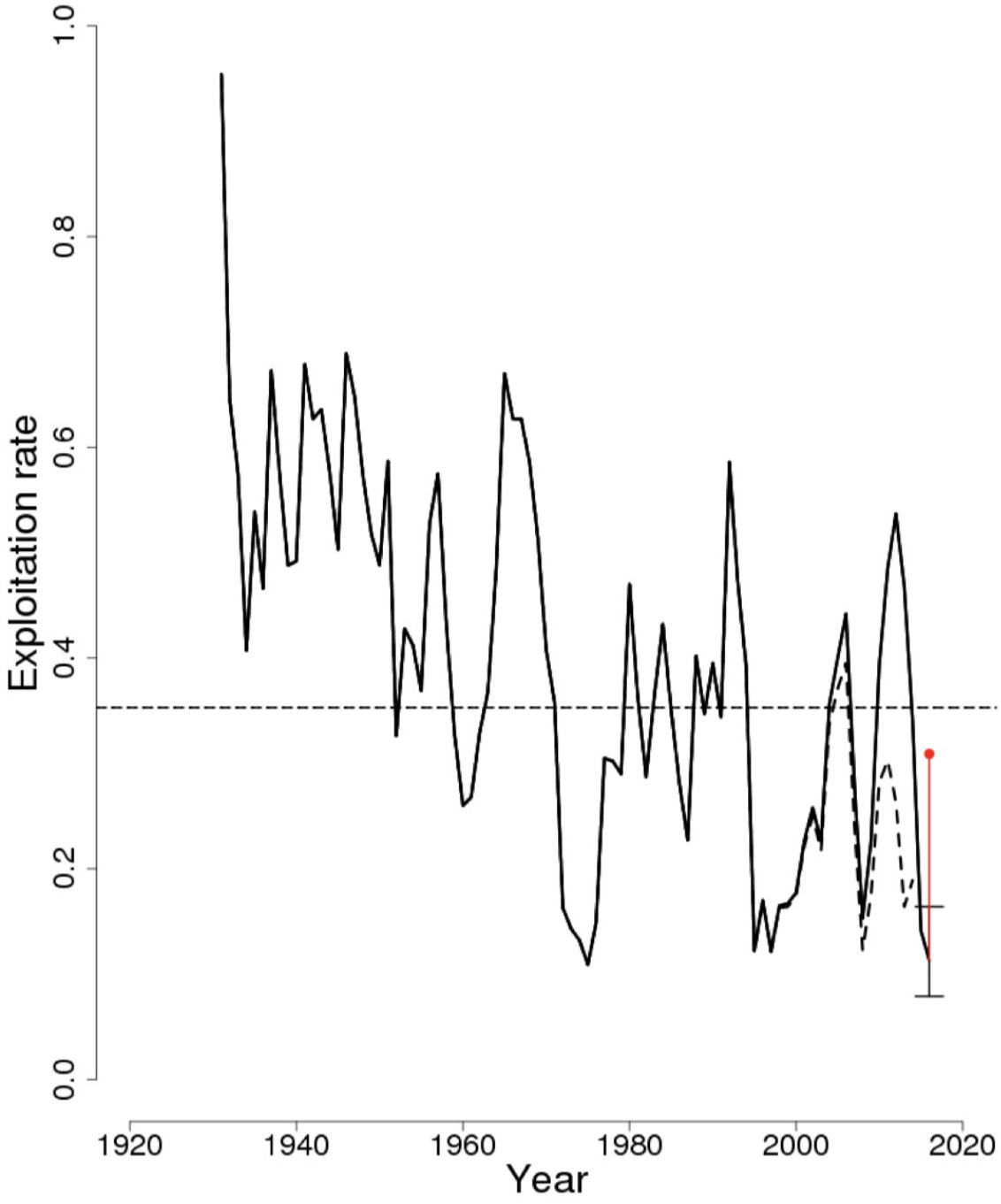

Figure 11: Trends in the numbers weighted fishing mortality (F_{5-7}) of Georges Bank haddock between 1931 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.353; horizontal dashed line) based on the 2015 assessment (Brooks 2017).

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

Based on the 2017 Gulf of Maine haddock stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.137, which is 30% of the overfishing threshold proxy (F_{MSY} proxy = $F_{40\%}$ = 0.455; see Figure 12) (Palmer 2017b). Because the stock is not undergoing overfishing, fishing mortality is scored a low concern.

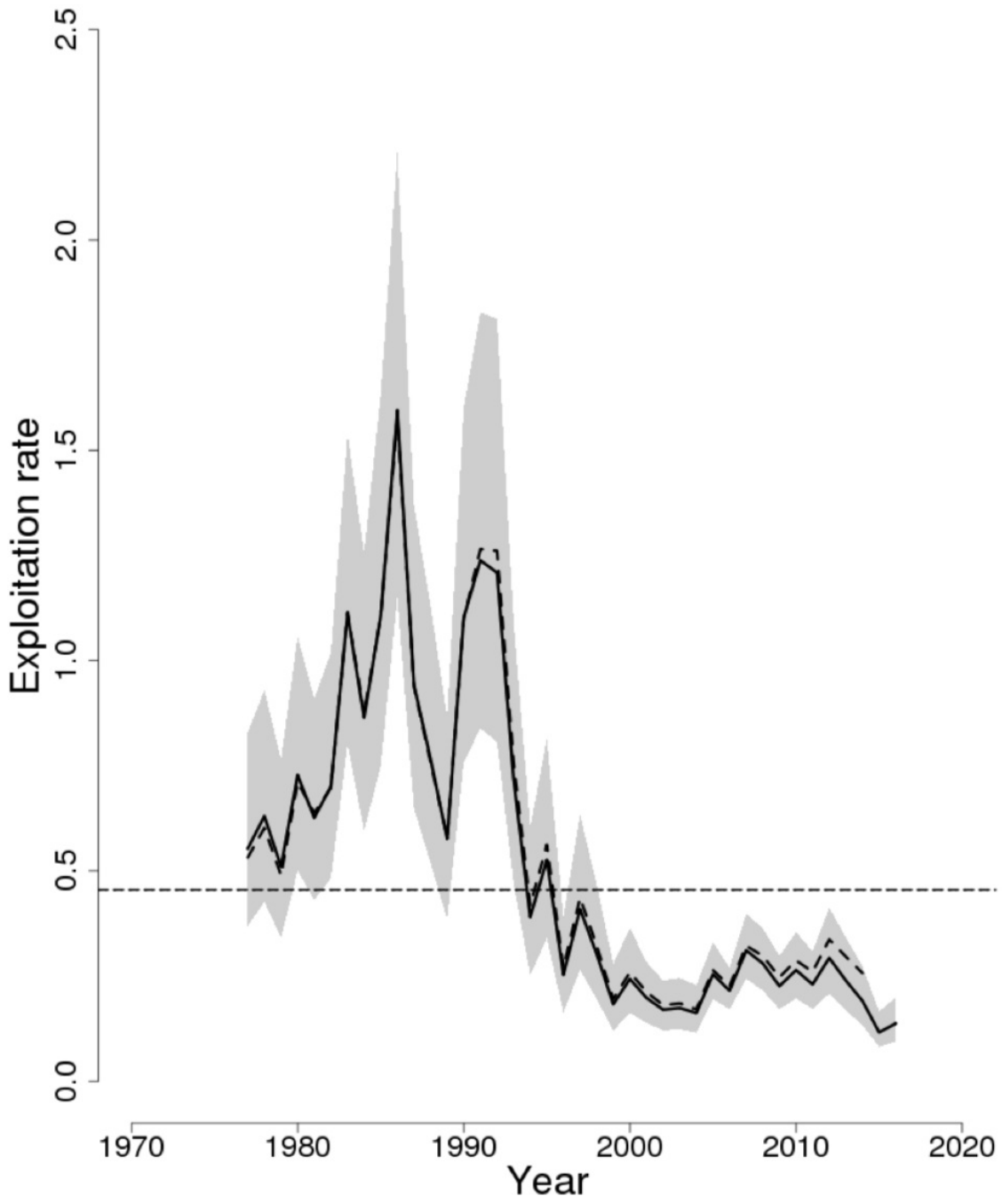

Figure 12: Trends in the fully selected fishing mortality (F) of Gulf of Maine haddock between 1977 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.455; horizontal dashed line) from the 2017 assessment model. The approximate 90% lognormal confidence intervals are shown (Palmer 2017b).

Pollock

Factor 1.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Very Low Concern

Based on the 2017 pollock stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 183,907 mt under the base model and 72,889 mt under the flat sel sensitivity model, which is 174% and 120%, respectively, of the biomass target, an SSB_{MSY} proxy of SSB at $F_{40\%}$ (105,510 and 60,738 mt; see Figure 13) (Linton 2017a). Because pollock is not overfished and SSB is above the biomass target, abundance is scored a very low concern. **:**

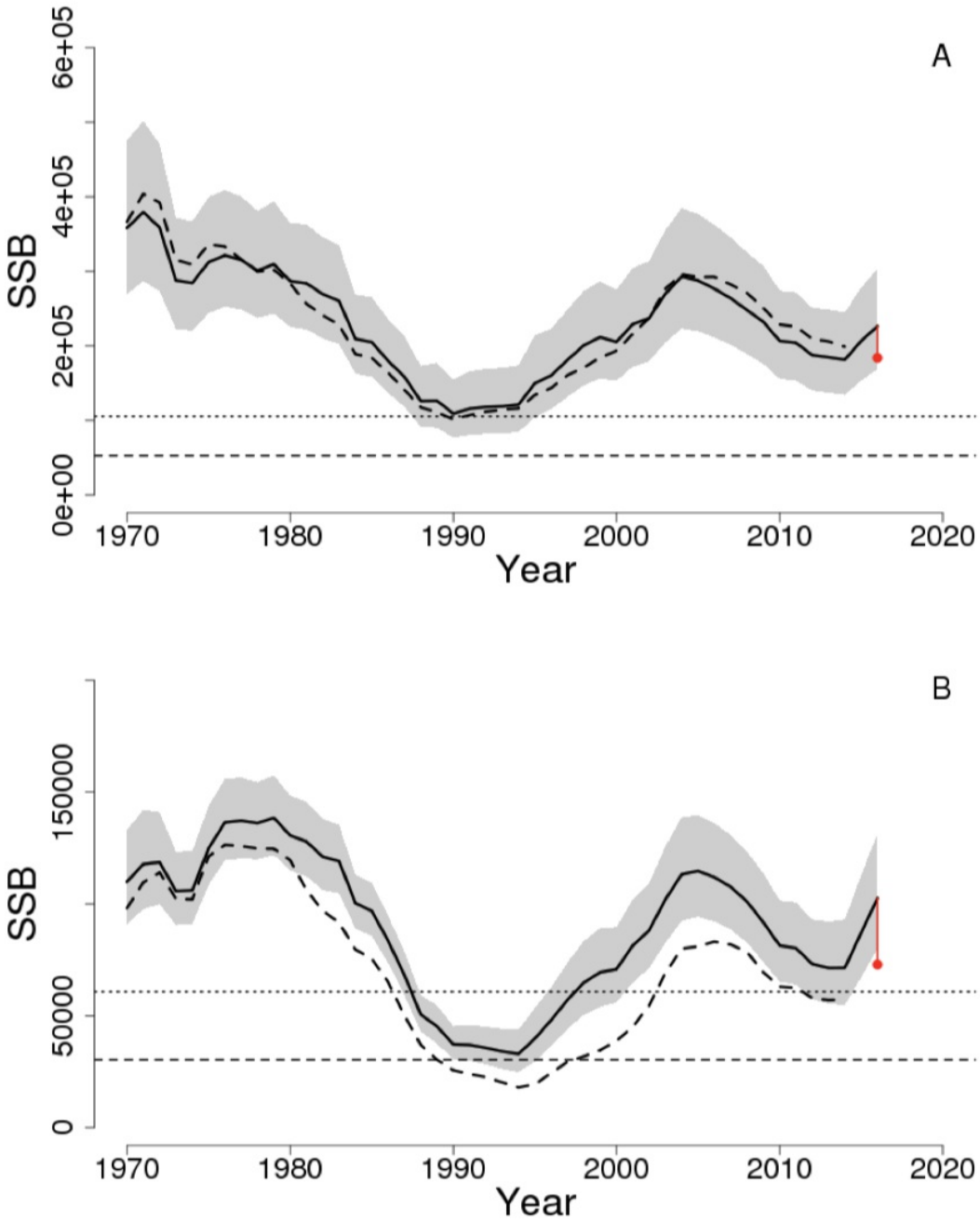

Figure 13: Estimated trends in the spawning stock biomass of pollock between 1970 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (0.5 × SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment models base (A) and flat sel sensitivity (B). The approximate 90% lognormal confidence intervals are shown (Linton 2017a).

Factor 1.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

Based on the 2017 pollock stock assessment, 2016 age 5–7 average fishing mortality (F) was estimated to be 0.036 under the base model and 0.079 under the flat sel sensitivity model, which is 14% and 32%, respectively, of the overfishing threshold, an F_{MSY} proxy of $F_{40\%}$ (0.26 and 0.249; see Figure 14) (Linton 2017a). Because pollock is not undergoing overfishing, fishing mortality is scored a low concern.

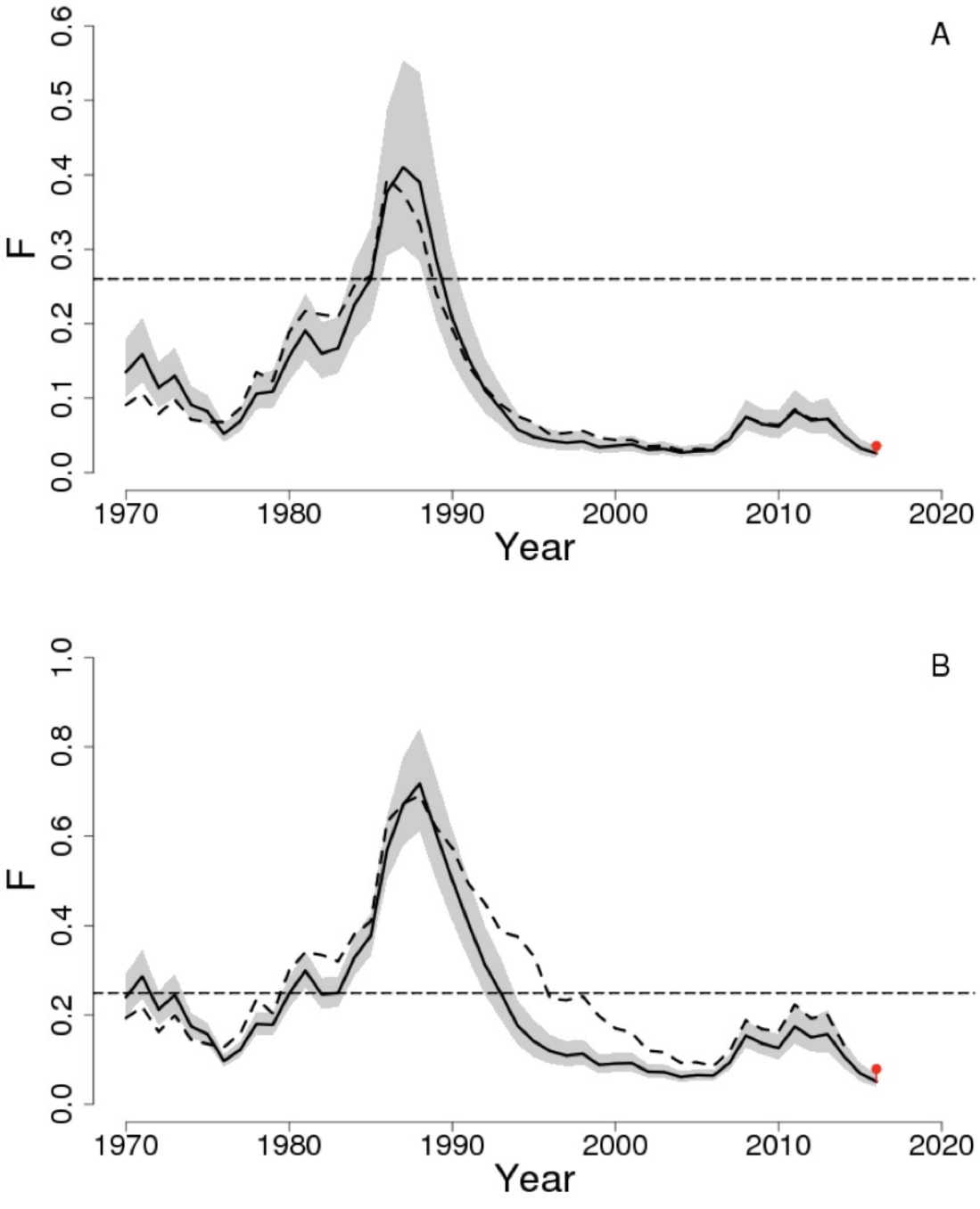

Figure 14: Estimated trends in age 5–7 average F (F_{AVG}) of pollock between 1970 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy; dashed line) based on the 2017 assessment models base (A) and flat sel sensitivity (B). The approximate 90% lognormal confidence intervals are shown (Linton 2017a).

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.

ATLANTIC COD			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	3.413	1.000: < 100%	Green (3.413)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	3.413	1.000: < 100%	Green (3.413)
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	2.236	1.000: < 100%	Yellow (2.236)
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	2.236	1.000: < 100%	Yellow (2.236)

HADDOCK			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	1.000	1.000: < 100%	Red (1.000)

POLLOCK			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	1.000	1.000: < 100%	Red (1.000)
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000: < 100%	Red (1.000)
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	1.000	1.000: < 100%	Red (1.000)

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.

GEORGES BANK | ATLANTIC, NORTHWEST | BOTTOM TRAWLS | UNITED STATES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Yellowtail flounder	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic halibut	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Ocean pout	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Witch flounder	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Goosefish	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Minke whale	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Long-finned pilot whale	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Gray seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)

Blackback	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Atlantic white-sided dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor porpoise	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Little skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Summer flounder	3.670: Low Concern	5.000: Low Concern	Green (4.284)
American plaice	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Scup	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Acadian redfish	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GEORGES BANK | ATLANTIC, NORTHWEST | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES

SUB SCORE: 3.413 DISCARD RATE: 1.000 **SCORE: 3.413**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Scup	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GEORGES BANK | ATLANTIC, NORTHWEST | SET GILLNETS | UNITED STATES

SUB SCORE: 1.000 DISCARD RATE: 1.000 **SCORE: 1.000**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE

Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic halibut	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Hooded seal	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Fin whale	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Gray seal	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Humpback whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harp seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Risso's dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Bottlenose dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Atlantic white-sided dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor porpoise	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Barndoor skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Acadian redfish	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GEORGES BANK | ATLANTIC, NORTHWEST | SET LONGLINES | UNITED STATES			
SUB SCORE: 2.236	DISCARD RATE: 1.000		**SCORE: 2.236**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Cusk	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Barndoor skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Little skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GULF OF MAINE | ATLANTIC, NORTHWEST | BOTTOM TRAWLS | UNITED STATES			
SUB SCORE: 1.000	DISCARD RATE: 1.000		**SCORE: 1.000**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Yellowtail flounder	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Atlantic halibut	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Ocean pout	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Witch flounder	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Goosefish	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Minke whale	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)

Long-finned pilot whale	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Gray seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Blackback	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Atlantic white-sided dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor porpoise	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Little skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Summer flounder	3.670: Low Concern	5.000: Low Concern	Green (4.284)
American plaice	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Scup	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Acadian redfish	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GULF OF MAINE | ATLANTIC, NORTHWEST | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES

SUB SCORE: 3.413 | DISCARD RATE: 1.000 | **SCORE: 3.413**

SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Scup	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GULF OF MAINE | ATLANTIC, NORTHWEST | SET GILLNETS | UNITED STATES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Hooded seal	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic halibut	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Fin whale	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Humpback whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Gray seal	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Risso's dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor porpoise	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Bottlenose dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Atlantic white-sided dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Barndoor skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Pollock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Acadian redfish	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

GULF OF MAINE | ATLANTIC, NORTHWEST | SET LONGLINES | UNITED STATES			
SUB SCORE: 2.236	DISCARD RATE: 1.000	**SCORE: 2.236**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic cod	1.000: High Concern	1.000: High Concern	Red (1.000)
Thorny skate	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Cusk	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
White hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Barndoor skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Clearnose skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Little skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Rosette skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Smooth skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Winter skate	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Haddock	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

Criterion 2 species that made up >5% of the total catch from the U.S. Atlantic cod, haddock, and pollock fisheries were determined using NOAA's Northeast Fisheries Observer Program (NEFOP) observer data from 2016 (pers. comm., G. Shield 7 April 2018). Species that are endangered, threatened, or protected (ETP) were also included where catch occurs regularly and may significantly contribute to the conservation concern.

The lowest-scoring species for both the Georges Bank and the Gulf of Maine bottom trawl fisheries are the long-finned pilot whale, due to its high inherent vulnerability, and yellowtail flounder, due to its overfished and overfishing status. For the handline fisheries, spiny dogfish limits the score although this is still within the green scoring band. The fin whale and the North Atlantic right whale, which is critically endangered, scored the lowest for the Georges Bank and the Gulf of Maine large mesh gillnet fishery. For the Georges Bank and the Gulf of Maine set longline fisheries, thorny skate was the lowest-scoring species, due to its overfished status. These species limit the scoring for Criterion 2.

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

Acadian redfish

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Very Low Concern

Based on the 2017 Acadian redfish stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 359,970 mt, which is 145% of the biomass target (SSB_{MSY} proxy of SSB at $F_{50\%}$ = 247,918; see Figure 15) (Linton 2017b). Because Acadian redfish is not overfished and SSB is above the biomass target, abundance is scored a very low concern.

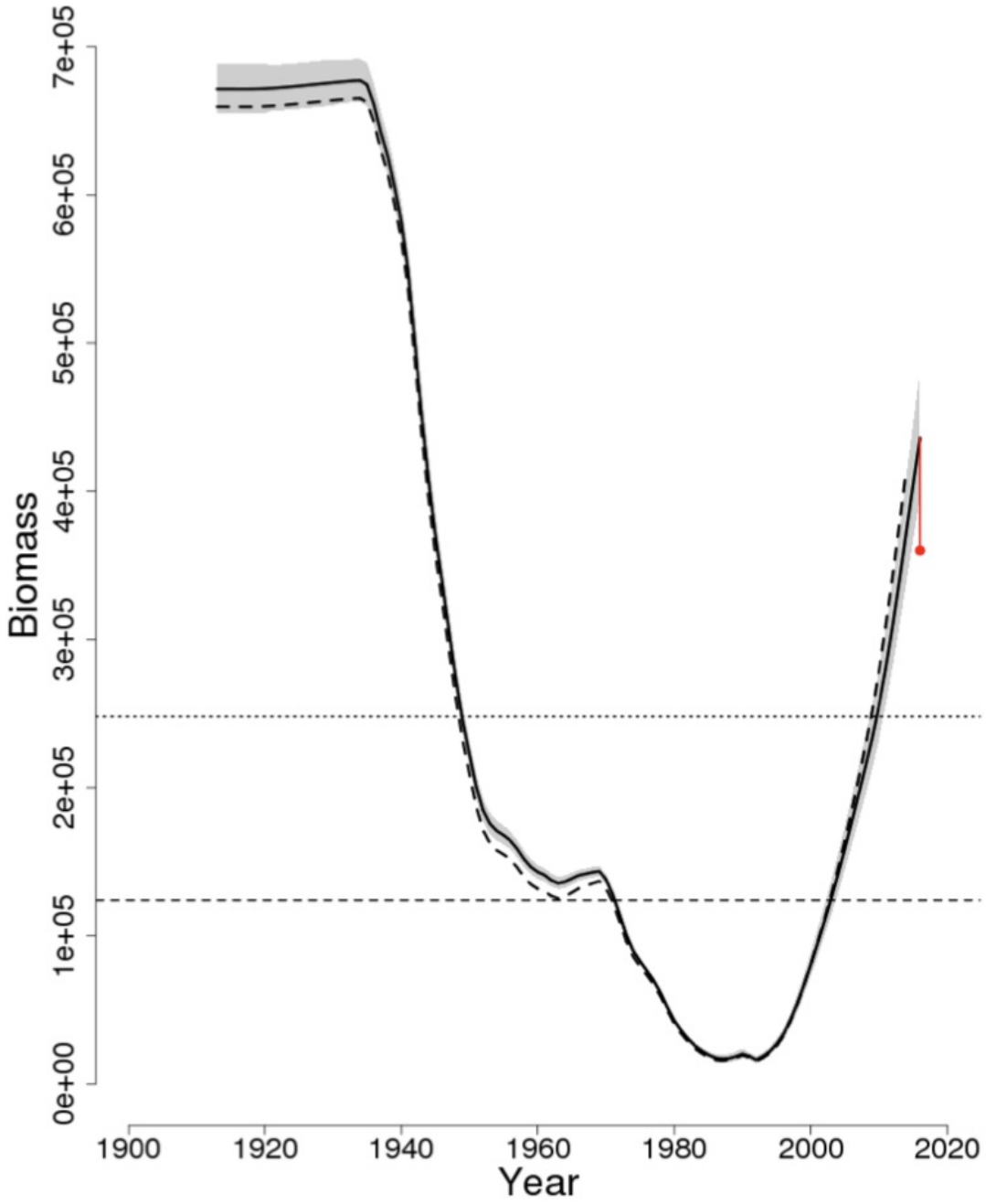

Figure 15: Trends in spawning stock biomass of Acadian redfish between 1913 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (0.5 × SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown (Linton 2017b).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

Based on the 2017 Acadian redfish stock assessment, the 2016 fully selected fishing mortality (F) was estimated to be 0.011, which is 29% of the overfishing threshold (F_{MSY} proxy of $F_{50\%}$ = 0.038; see Figure 16) (Linton 2017b). Because Acadian redfish is not undergoing overfishing, fishing mortality is scored a low concern.

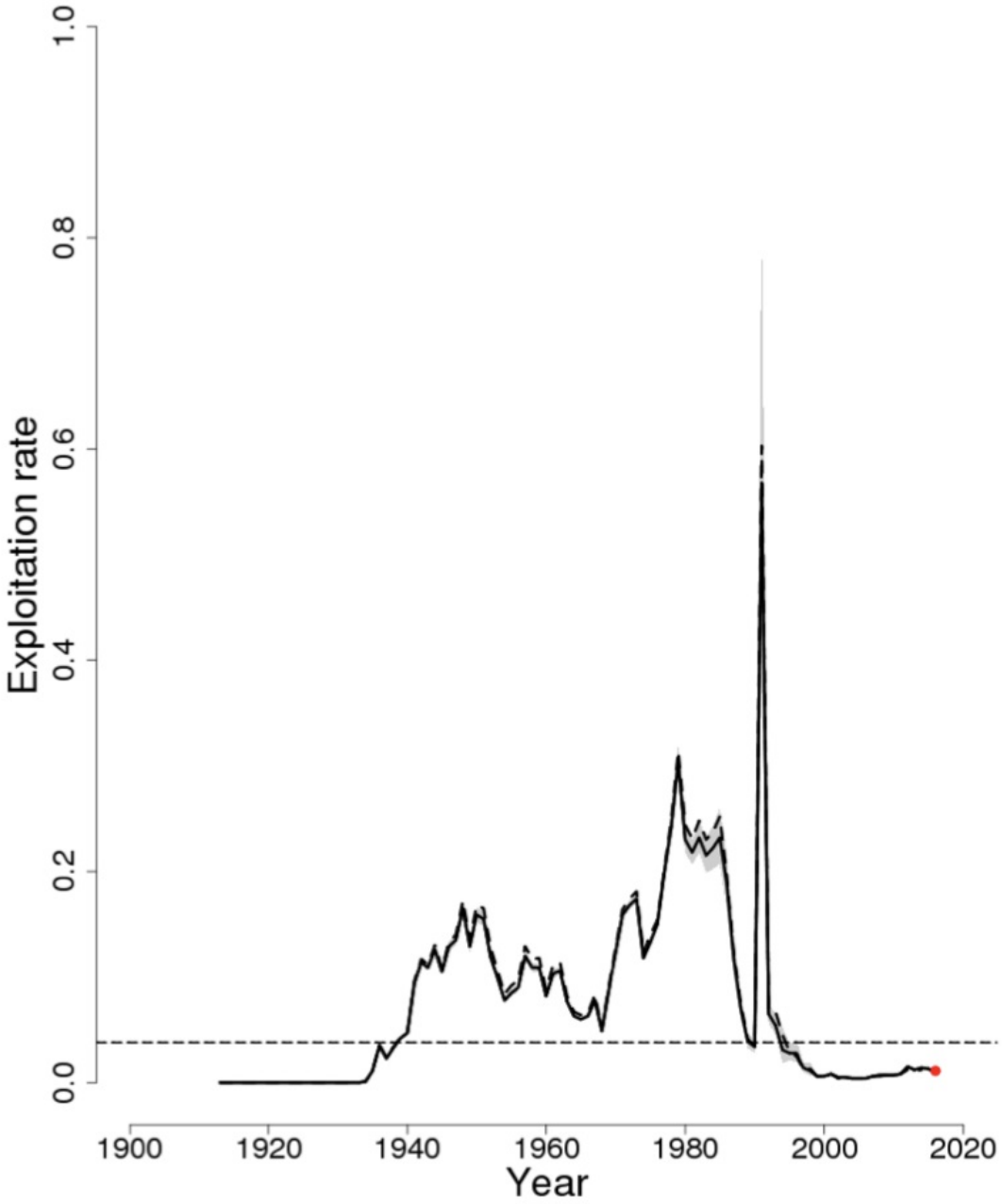

Figure 16: Trends in the fully selected fishing mortality (F_{FULL}) of Acadian redfish between 1913 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.038; horizontal dashed line) based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown (Linton 2017b).

American plaice

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Based on the 2017 American plaice stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 13,351 mt, which is 99% of the biomass target for this stock (SSB_{MSY} proxy = 13,503; see Figure 17) {Terceiro 2017}. According to the NMFS first quarter 2018 update, Georges Bank American plaice is not overfished and in year 4 of a 10-year rebuilding plan (NMFS 2018c). Because the stock is not overfished, and abundance is more than 75% above the biomass target, abundance is considered a low concern.

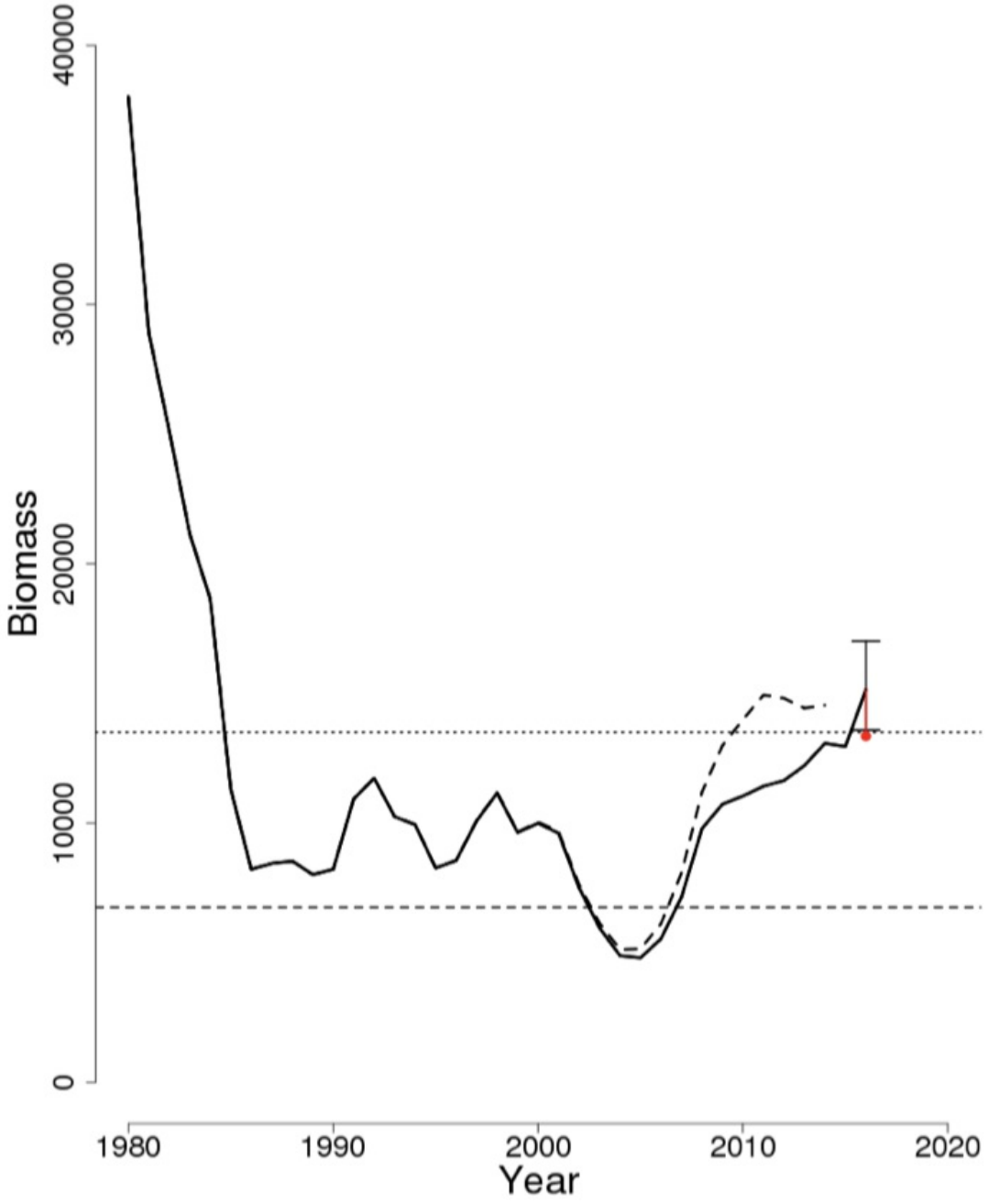

Figure 17: Trends in SSB of Gulf of Maine–Georges Bank American plaice between 1980 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment (Terceiro 2017).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Based on the 2017 American plaice stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.111, which is 51% of the overfishing threshold proxy (F_{MSY} proxy = 0.216; see Figure 18) {Terceiro 2017}. Therefore, the stock is not undergoing overfishing and fishing mortality is considered a low concern.

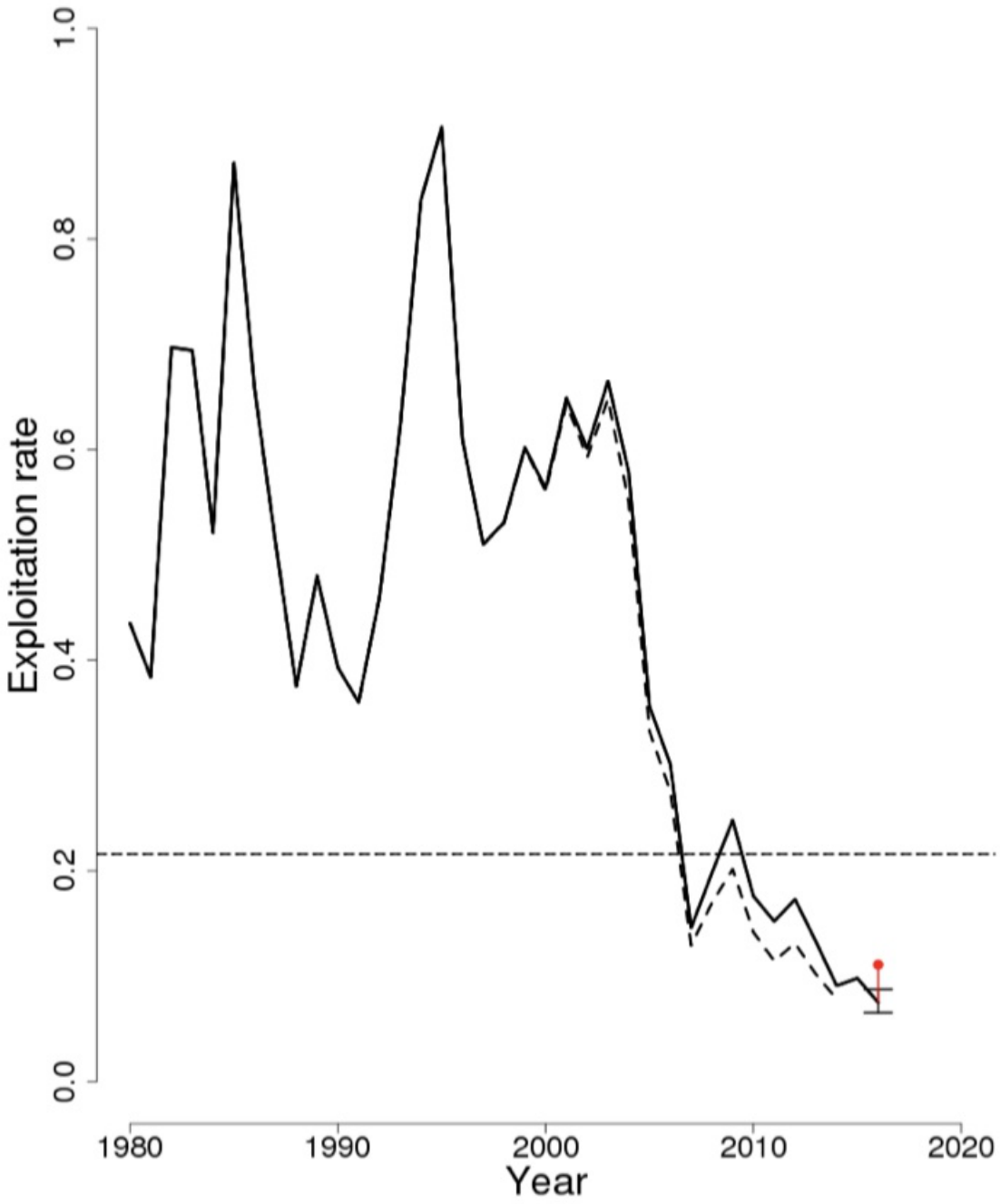

Figure 18: Trends in the fully selected fishing mortality (F_{FULL}) of Gulf of Maine–Georges Bank American plaice between 1980 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.216; horizontal dashed line) (Terceiro 2017).

Atlantic halibut

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

High Concern

Based on the 2015 Atlantic halibut stock assessment, spawning stock biomass (SSB) in 2014 was estimated to be 96,464 mt, which is 199% of the biomass target (SSB_{MSY} proxy = 48,509; see Figure 19) (NEFSC 2015a). But, the assessment indicated that the model used was highly uncertain due to the high sensitivity to initial biomass, and that the survey data used were "noisy" due to the low number of animals caught in the surveys (NEFSC 2015a). Therefore, stock status for this species cannot be determined based on the current assessment and is unknown (NEFSC 2015a). According to the NMFS first quarter 2018 update, Atlantic halibut is overfished and in year 14 of a 52-year rebuilding plan (NMFS 2018c). This factor is considered a high concern, because Atlantic halibut is also listed as a species of concern under the Endangered Species Act (ESA) (NMFS 2017a).

Justification:

Catch has been very low for at least 100 years relative to landings reported early in the time series, despite a strong market and high value relative to other groundfish {NEFSC 2015}. The low catch throughout the century implies that the Atlantic halibut stock is very likely depleted relative to its unfished condition and is therefore likely to be overfished, even if its current biomass is unknown {NEFSC 2015}.

NMFS fourth quarter 2017 update stock determinations are from the GARMIII benchmark assessment and the 2012 updated assessment, which concluded that the stock was overfished but overfishing was not occurring; information available in the updated assessment indicates that stock size has not substantially increased. Hence, it was concluded that the stock is still overfished, and the overfishing status is unknown.

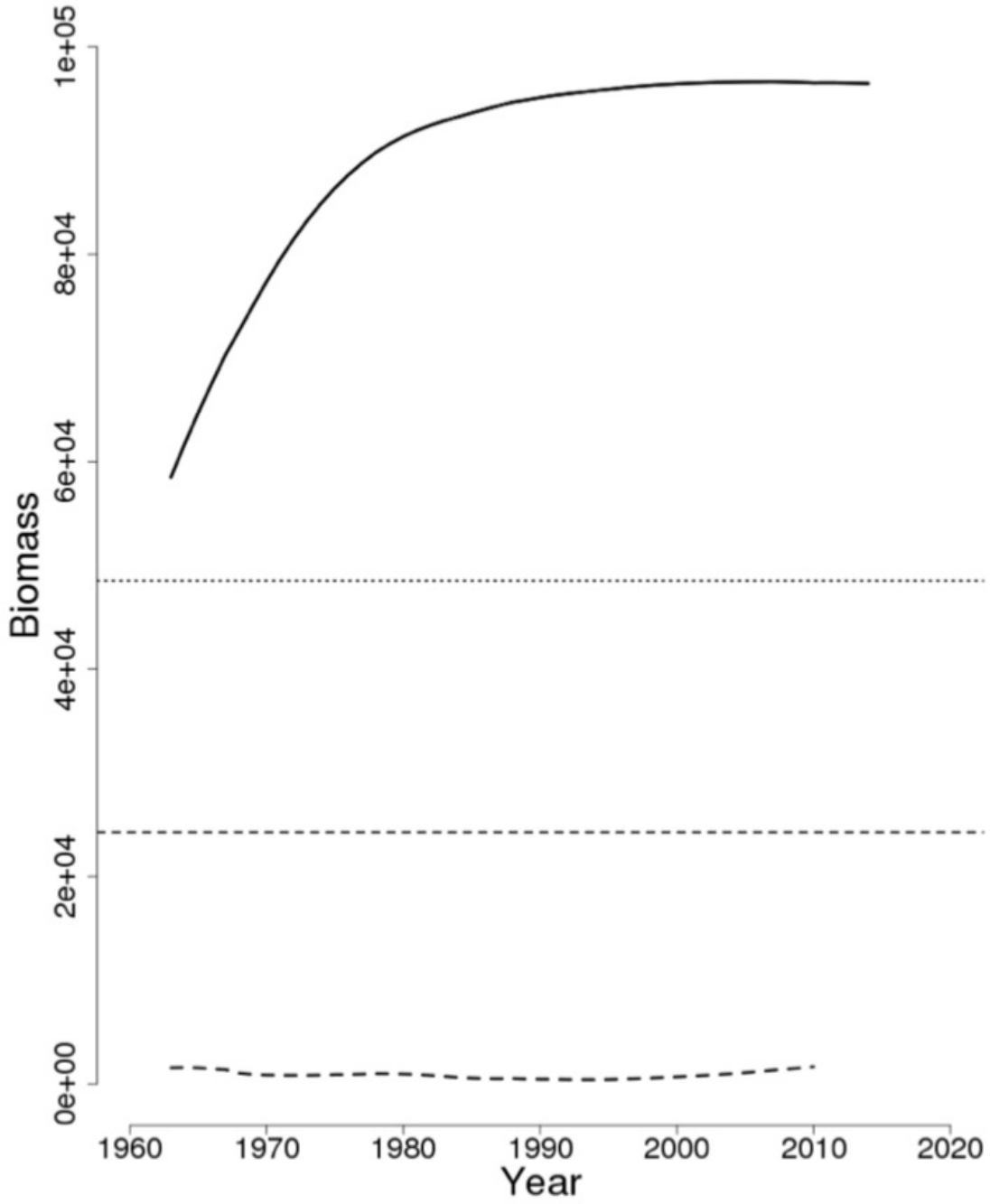

Figure 19: Estimated trends in the biomass of Atlantic halibut between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $B_{THRESHOLD}$ = 1/2 B_{MSY} proxy (horizontal dashed line) as well as B_{TARGET} (B_{MSY} proxy; horizontal dotted line) based on the 2015 assessment {NEFSC 2015}.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

Based on the 2015 Atlantic halibut stock assessment, the 2014 fully selected fishing mortality was estimated to be 0.001, which is 1% of the overfishing threshold proxy (F_{MSY} proxy = 0.073; see Figure 20) (NEFSC 2015a). According to the NMFS first quarter 2018 update, Atlantic halibut is not undergoing overfishing (NMFS 2018c). Because there is no 2017/2018 stock assessment update to support the NMFS FSSI listing, the Atlantic halibut stock is likely severely depleted, and the model used in the 2015 stock assessment has been deemed unreliable, this factor is scored a moderate concern.

Justification:

NMFS fourth quarter 2017 update stock determinations are from the GARMIII benchmark assessment and the 2012 updated assessment, which concluded that the stock was overfished but overfishing was not occurring; information available in the updated assessment indicates that stock size has not substantially increased. Hence, it was concluded that the stock is still overfished, and the overfishing status is unknown.

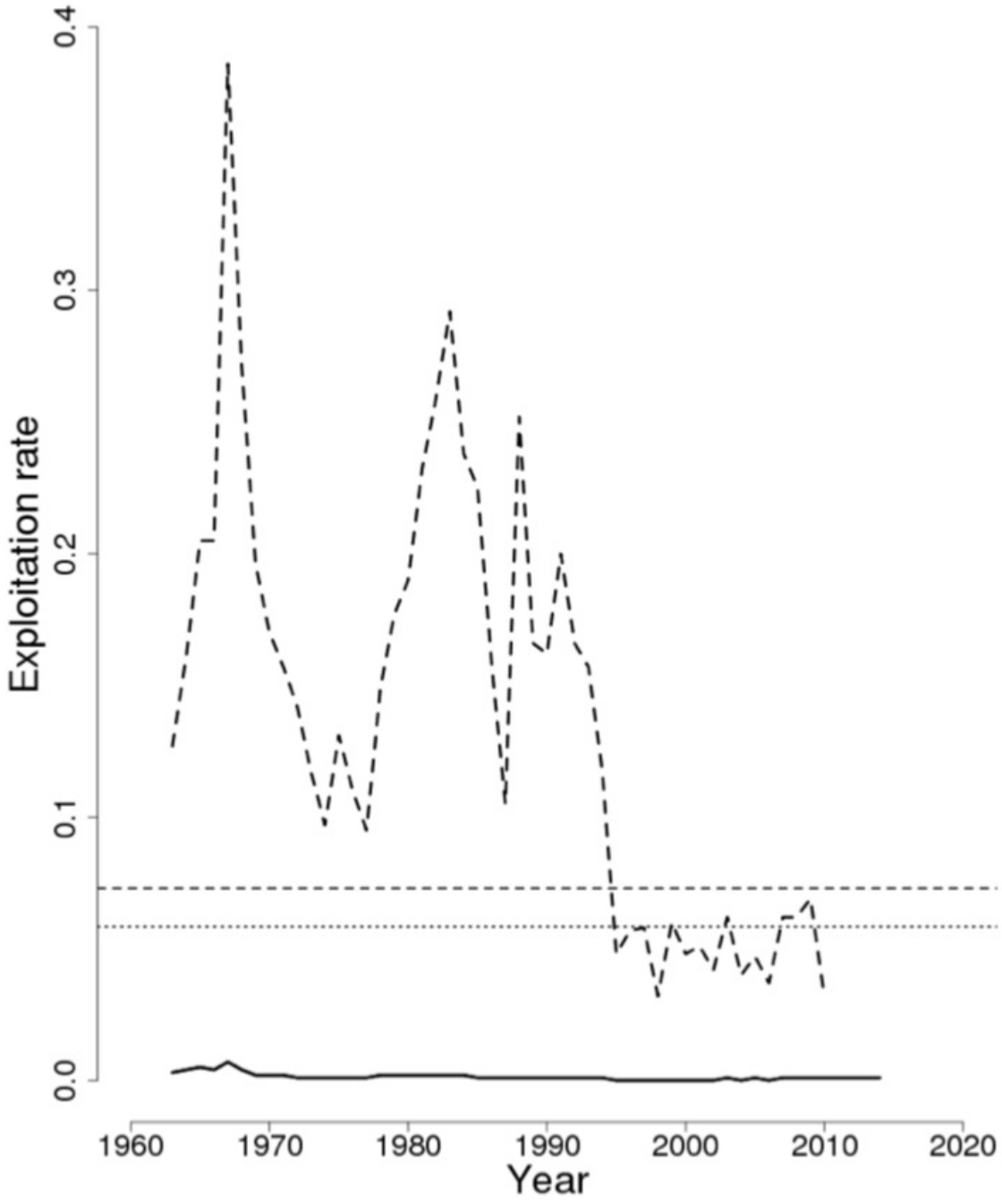

Figure 20: Estimated trends in the fully selected fishing mortality (F_{FULL}) of Atlantic halibut between 1963 and 2014 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (0.073; horizontal dashed line) as well as F_{TARGET} (0.8 × F_{MSY} proxy; dotted line) based on the 2015 assessment {NEFSC 2015}.

Atlantic white-sided dolphin

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate 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 93,233 (CV = 0.71), with a minimum population size of 54,443 (Hayes et al. 2020). The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (Hayes et al. 2020). The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" (Hammond et al. 2008a), and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Total annual estimated average fishery-related mortality or serious injury to the western North Atlantic white-sided dolphin stock during 2013 to 2017 was 26 (CV = 0.20), with a potential biological removal (PBR) of 544 (Hayes et al. 2020). The Northeast bottom trawl is by far the primary contributor, accounting for 81% (21/26 individuals) of the total by-catch across all fisheries, with the Northeast sink gillnet fishery accounting for 11% (2.8/26 individuals) (Hayes et al. 2020). Because PBR is not exceeded, and the bottom trawl fishery takes less than 50% of the PBR, fishing mortality is considered a low concern.

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

Total annual estimated average fishery-related mortality or serious injury to the western North Atlantic white-sided dolphin stock during 2013 to 2017 was 26 (CV = 0.20), with a potential biological removal (PBR) of 544 (Hayes et al. 2020). The Northeast bottom trawl is by far the primary contributor, accounting for 81% (21/26 individuals) of the total by-catch across all fisheries, with the Northeast sink gillnet fishery accounting for 11% (2.8/26 individuals) (Hayes et al. 2020). Because mortality or serious injury is only 5% of the PBR, and the sink gillnet fishery takes less than 50% of the PBR, fishing mortality is considered a low concern.

Barndoor skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For barndoor skate, the 2017 to 2019 NEFSC autumn average survey biomass index of 2.02 kg/tow is above the biomass threshold reference point (0.78 kg/tow) and 102% above the B_{MSY} proxy (1.57 kg/tow; see Figure 21) (Sosebee 2020). Because the stock is not overfished, but there is uncertainty associated with using the survey index as a proxy for abundance, a score of low concern is given (rather than a score of very low concern).

Justification:

For barndoor skate, the B_{MSY} proxy is defined as the average of 1963 to 1966 autumn survey biomass indices, because the survey did not catch barndoor skate for a protracted period (Sosebee 2020).

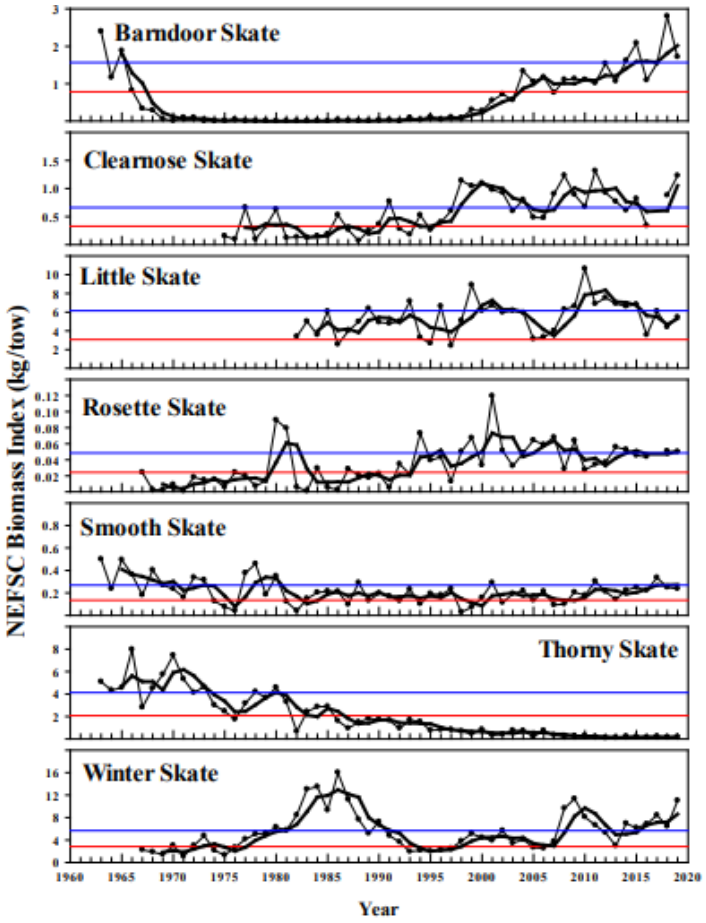

Figure 21: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For barndoor skate, the 2017 to 2019 average index is above the 2016 to 2018 index by 11.4% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is considered a low concern.

Justification:

The fishing mortality reference points are based on changes in the 3-year survey biomass indices. If there is a decline in the 3-year moving average of the survey biomass index that is greater than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY}, and overfishing is occurring for that skate species (Sosebee 2020).

Blackback

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

Based on the 2017 Georges Bank blackback/winter flounder stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 3,946 mt, which is 52% of the biomass target for an overfished stock (SSB_{MSY} = 7,600 with a threshold of 50% of SSB_{MSY}; see Figure 22) (Hendrickson 2017). According to the NMFS first quarter 2018 update, Georges Bank blackback/winter flounder is not overfished and is in year 8 of a 7-year rebuilding plan (NMFS 2018c). Because the stock is not overfished, and biomass is less than 75% of the target biomass, abundance is scored a moderate concern.

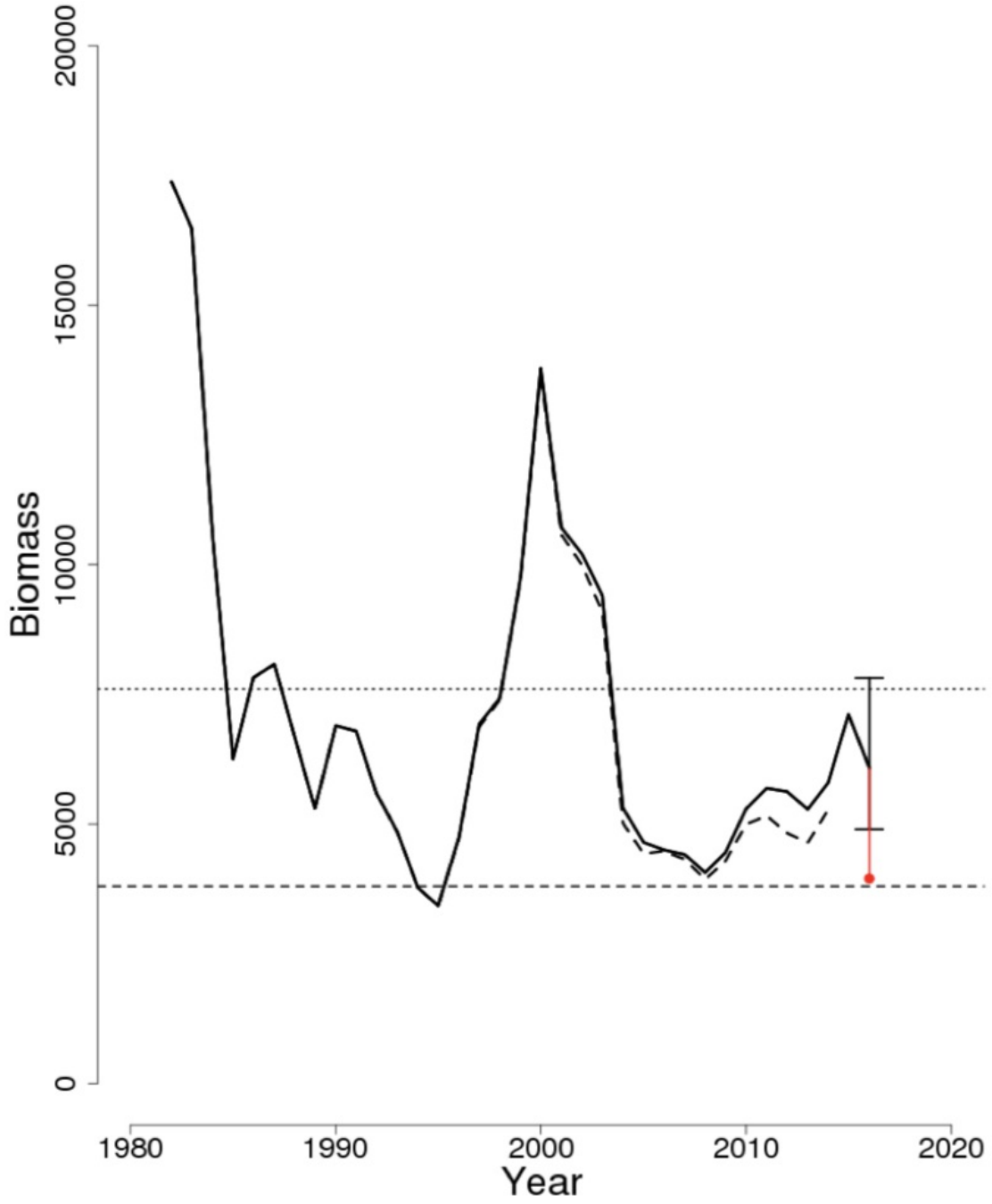

Figure 22: Trends in spawning stock biomass (mt) of Georges Bank blackback/winter flounder between 1982 and 2016 from the current (solid line) and previous (dashed line) assessments and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY}; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY}; horizontal dotted line) based on the 2017 assessment. The 90% normal confidence interval is shown for 2016 (Hendrickson 2017).

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

Based on the 2020 Gulf of Maine blackback/winter flounder stock assessment update, biomass (30+ cm mt) in 2019 was estimated to be 2,862 mt (see Figure 23), and biomass status is unknown (NOAA 2020c). Biomass is estimated from survey area-swept for non-overlapping strata from three different fall trawl surveys: Maine New Hampshire (MENH), Massachusetts Division of Marine Fisheries (MDMF), and Northeast Fisheries Science Center (NEFSC), using an updated survey gear catchability (q) estimate of 0.87 (on the wing spread) from the sweep study (Miller et al. 2017) (Nitschke 2017), but biomass-based reference points cannot be determined from this method. According to the NMFS first quarter 2022 update, Gulf of Maine blackback/winter flounder overfishing status is also unknown (NMFS 2022).

A productivity-susceptibility analysis (PSA) was calculated to determine the inherent vulnerability of blackback, because biomass relative to a reference point is unknown. The PSA score = 2.84 (detailed scoring of each PSA attribute is shown below), and blackback is deemed to have medium vulnerability. Due to the medium vulnerability of blackback, Seafood Watch considers abundance a moderate concern.

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1. Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2. Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: S = [(S1 × S2 × S3 × S4) – 1 ÷ 40] + 1.

3. Vulnerability score (V) = the Euclidean distance of P and S using the following formula: V = v(P^2 + S^2)

Productivity Attribute	Relevant Information	Risk (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	1.9–3.5 (Froese and Pauly 2018)	1
Average maximum age	14 years (Lux 1973)	2
Fecundity	200,000–1,400,100 (Buckley et al. 1991)	1
Average maximum size	64 cm (Froese and Pauly 2018)	1
Average size at maturity	27.4 cm (Buckley et al. 1991)	1
Reproductive strategy	Demersal (Scotten et al 1973)	2
Habitat quality	Moderately altered (default)	2
Productivity Score = 1.625		

Susceptibility Attribute	Relevant Information	Risk (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap	>30% overlap (default)	3
Vertical overlap	High overlap with demersal fishing gears	3
Selectivity of fishery	Species is targeted and is not likely to escape gear, but conditions under "high risk" do not apply	2
Post-capture mortality	Retained species (default)	3
Susceptibility Score = 2.325		
Vulnerability Score = 2.84		

PSA score for blackback in GoM bottom trawl fisheries is calculated as follows:

Vulnerability (V) = $v(P^2 + S^2)$

(V) = $v(1.625^2 + 2.325^2)$

V = 2.84

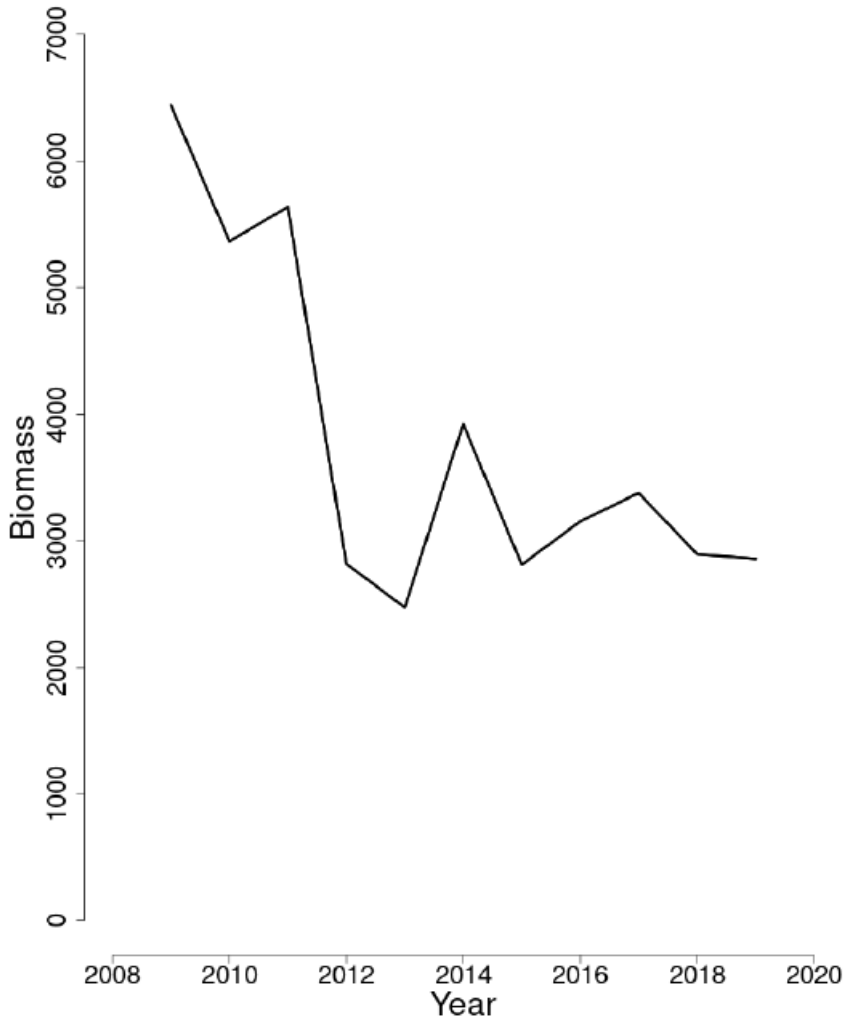

Figure 23: Trends in 30+ cm area-swept biomass of Gulf of Maine winter flounder between 2009 and 2019 from the current assessment based on the fall (MENH, MDMF, NEFSC) surveys. From (NOAA 2020c).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Based on the 2017 Georges Bank blackback/winter flounder stock assessment, the 2016 fully selected fishing mortality (F) was estimated to be 0.117, which is 22% of the overfishing threshold (F_{MSY} = 0.522; see Figure 24) (Hendrickson 2017). According to the NMFS first quarter 2018 update, Georges Bank blackback/winter flounder is in year 8 of a 7-year rebuilding plan (NMFS 2018c). Because blackback/winter flounder is not undergoing overfishing, fishing mortality is scored a low concern.

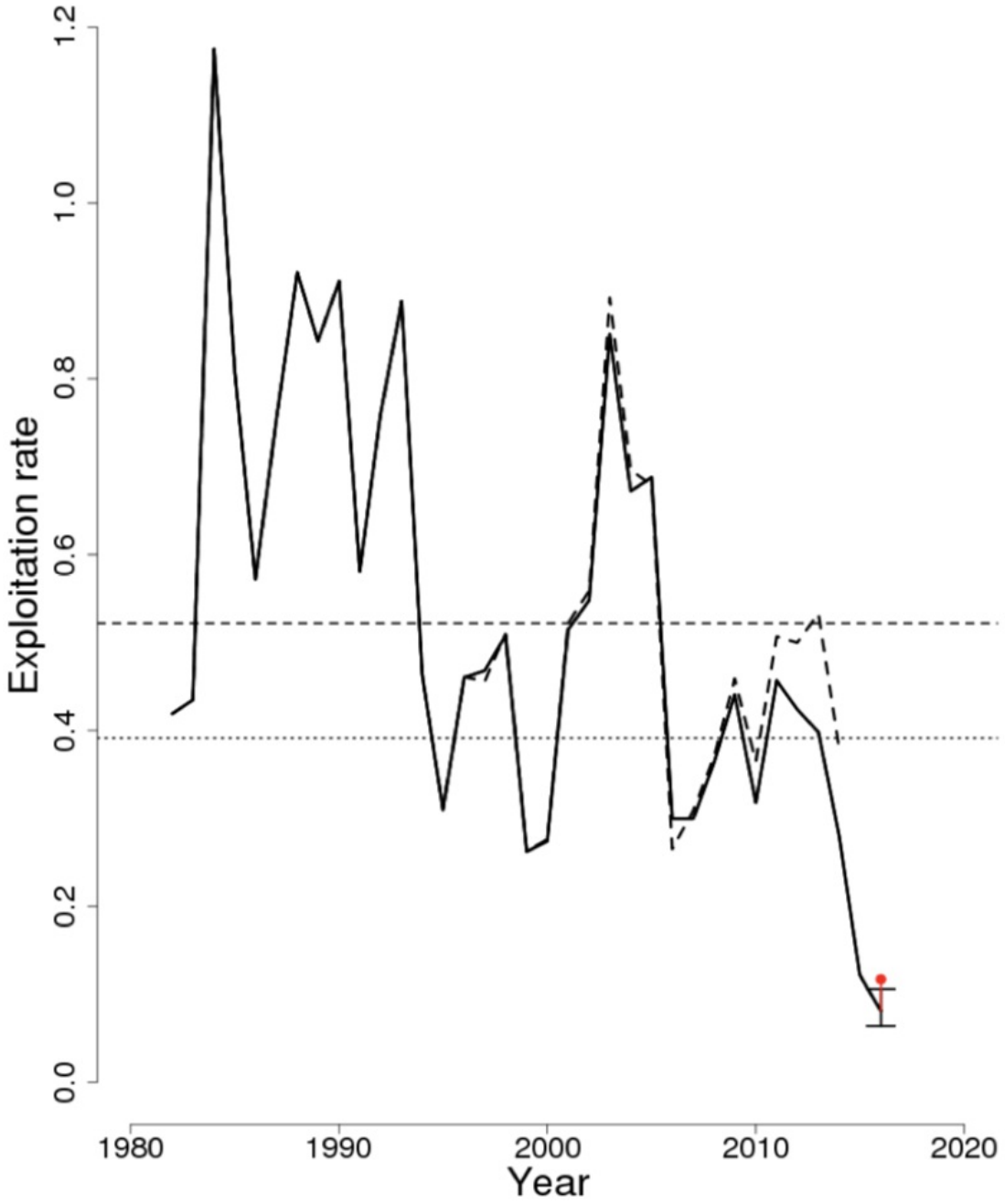

Figure 24: Trends in fully selected fishing mortality (F_{FULL}) of Georges Bank Winter Flounder between 1982 and 2016 from the current (solid line) and previous (dashed line) assessments and the corresponding $F_{THRESHOLD}$ (F_{MSY} = 0.522; horizontal dashed line) as well as F_{TARGET} (75% of F_{MSY} = 0.392; horizontal dotted line). The 90% normal confidence interval is shown for 2016 (Hendrickson 2017).

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Based on the 2020 Gulf of Maine blackback/winter flounder stock assessment update, the 2019 30+ cm exploitation rate was estimated to be 0.052, which is 23% of the overfishing exploitation threshold proxy (E_{MSY} proxy = 0.23; see Figure 25) (NOAA 2020c). Therefore, fishing mortality is scored a low concern.

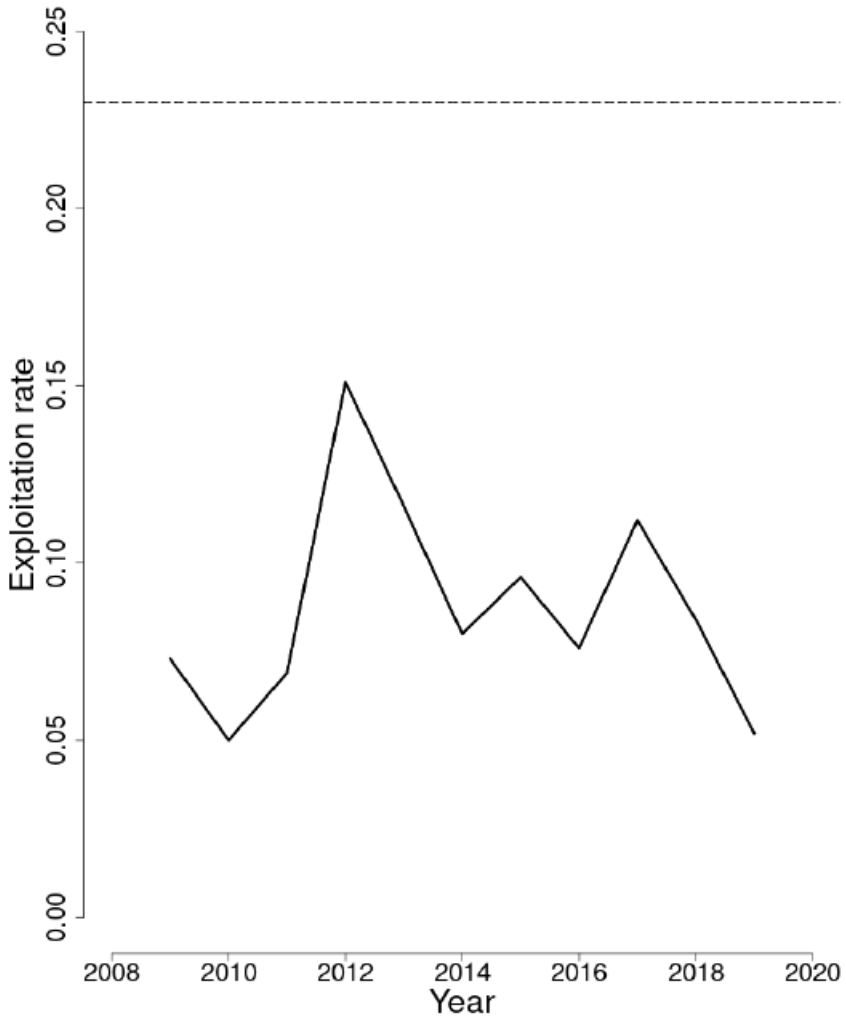

Figure 25: Trends in the exploitation rates (E_{FULL}) of Gulf of Maine winter flounder between 2009 and 2019 from the current assessment and the corresponding $F_{THRESHOLD}$ (E_{MSY} proxy = 0.23; horizontal dashed line). From (NOAA 2020c).

Bottlenose dolphin

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The best available estimate for the offshore stock of common bottlenose dolphin in the western North Atlantic is 62,851 (CV = 0.23), with a minimum population size of 51,914 (Hayes et al. 2020). This estimate is from surveys covering waters from central Florida to the lower Bay of Fundy in 2011 and 2016. The status of this stock relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, as are population trends (Hayes et al. 2020). The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" (Hammond et al. 2012), and because status and trend analyses are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total annual estimated mean fishery-related mortality or serious injury to the western North Atlantic offshore bottlenose dolphin stock during 2013 to 2017 was 28, with a potential biological removal (PBR) of 519 (Hayes et al. 2020). In addition to observed takes, there was a self-reported take in the unobserved mid-Atlantic tuna hook and line fishery during 2010 (Hayes et al. 2017), but total take is still estimated to be well below PBR, even taking this into account. The Northeast bottom gillnet fishery accounted for 25% (7/28 individuals) of the total by-catch across all fisheries (Hayes et al. 2020). Because PBR is not exceeded, and the sink gillnet fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

Justification:

The 2017 List of Fisheries lists the Northeast sink gillnet fishery as a Category I fishery for bottlenose dolphin in the western North Atlantic, which means that there are frequent interactions (NMFS 2017b).

Clearnose skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For clearnose skate, the 2017 to 2019 NEFSC autumn average biomass index of 1.05 kg/tow is above the biomass threshold reference point (0.33 kg/tow) and the B_{MSY} proxy (0.66 kg/tow; see Figure 26) (Sosebee 2020). Because the stock is not overfished, but there is uncertainty in using a survey index as a proxy for biomass relative to MSY, abundance is scored a low concern (rather than very low concern).

Justification:

For clearnose skate, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (Sosebee 2020).

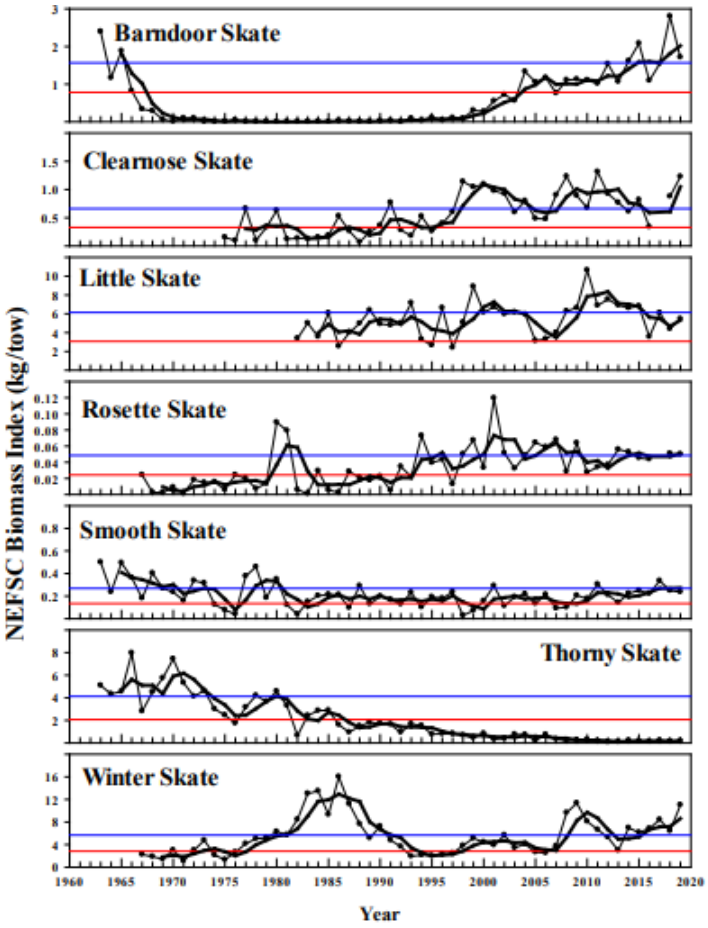

Figure 26: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For clearnose skate, the 2017 to 2019 index is above the 2016 to 2018 index by 73.1% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is scored a low concern.

Justification:

The fishing mortality reference points are based on changes in the 3-year survey biomass indices. If there is a decline in the 3-year moving average of the survey biomass index that is greater than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY}, and overfishing is occurring for that skate species (Sosebee 2020).

Cusk

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Moderate Concern

Cusk (*Brosme brosme*) is not a managed species, and is caught primarily as by-catch in the Gulf of Maine lobster pot fishery (NEFSC 2015d) (Zhang and Chen 2015). The stock was first assessed in 2009 in response to a request to provide an estimate of cusk biomass for status determination under NOAA ESA (NEFSC 2015d). The length-based model, SCALE, was applied and the assessment reviewed internally by the Population Dynamics Branch, because cusk is not a managed species. The model was not accepted because of poor diagnostics, partly due to the conflict of lower catches in the fishery with the slow truncation of older fish in the commercial fishery, and to the low survey abundance indices (NEFSC 2015d).

Cusk has medium inherent vulnerability according to the productivity-susceptibility analysis (PSA = 2.99; see detailed scoring below); and because stock status is unknown, abundance is scored a moderate concern.

Justification:

Productivity-Susceptibility Analysis (if Applicable):

Scoring Guidelines

1. Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2. Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: S = [(S1 × S2 × S3 × S4) – 1/40] + 1.

3. Vulnerability score (V) = the Euclidean distance of P and S using the following formula: V = v(P^2 + S^2)

Productivity Attributes	Value	Score (1 = low risk; 2 = medium risk; 3 = high risk)	Reference(s)
Average age at maturity (years)	6	2	(O'Brien 2006)
Average maximum age (years)	17	2	(O'Brien 2006)
Fecundity (eggs/yr)	2,500,000	1	(Froese and Pauly 2017)
Average maximum size (cm)	120	2	(Froese and Pauly 2017)

Average size at maturity (cm)	53.3	2	(Froese and Pauly 2017)
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2017)
Trophic level	3.9	3	(Froese and Pauly 2017)
Quality of habitat	Moderately altered	2	SFW default
Productivity Subscore		**1.875**	

Susceptibility Attributes	**Information**	**Score (1 = low risk; 2 = medium risk; 3 = high risk)**	**Reference(s)**
Areal overlap	Cusk is concentrated off the U.S. coast; occurs in the central part of the Gulf of Maine and extends onto the Western Scotian shelf.	3	(Harris et al. 2002)(Sosebee and Cadrin 2006)
Vertical overlap	Cusk occurs between 18 to 600 m; the groundfish fishery operates between 10 and 200 m.	3	(O'Brien 2006) (Froese and Pauly 2017)
Selectivity of fishery	Cusk is incidentally encountered and is not likely to escape the gear, but conditions under "high risk" do not apply.	2	SFW default
Post-capture mortality	Unknown	3	SFW default
Susceptibility Subscore		**2.325**	

PSA score for cusk in Gulf of Maine set longline fisheries is calculated as follows:

Vulnerability (V) = $v(P^2 + S^2)$

$V = v(1.875^2 + 2.325^2)$

$V = 2.99$

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Moderate Concern

There is no formal stock assessment for cusk, so fishing mortality is unknown. Therefore, this factor is scored a moderate concern.

Fin whale

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

High Concern

The best abundance estimate available for the western North Atlantic fin whale stock is 6,802, with a minimum population size of 5,573 (Hayes et al. 2021). This is the estimate derived from the sum of the 2016 NOAA shipboard and aerial surveys and the 2016 Canadian Northwest Atlantic International Sightings Survey (NAISS) (Hayes et al. 2021). The surveys do not overlap, so the estimates from the two surveys were combined (Hayes et al. 2021), extending the range of the survey from Newfoundland to Florida and resulting in a significant increase in the population estimate relative to the 2011 NOAA survey (Hayes et al. 2021). The status of this stock relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, as are population trends (Hayes et al. 2021). The International Union for the Conservation of Nature (IUCN) Red List classifies fin whale as "Vulnerable" to extinction, the Endangered Species Act (ESA) lists it as "Endangered" (Cooke 2018b)(USFWS 2017), and it is listed on CITES Appendix I (NOAA 2017a) and as MMPA "Depleted" throughout its range (NOAA 2017b). Because of the IUCN, ESA, and MMPA listings, abundance is considered a high concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total annual estimated average fishery-related mortality or serious injury (SIM) to the western North Atlantic fin whale stock during 2014 to 2018 was 1.55, with a potential biological removal (PBR) of 11 (Hayes et al. 2021). This value includes incidental fishery interaction records, 0.95 (0 U.S./0.95 unknown but first reported in U.S. waters/0.6 Canadian waters); and records of vessel collisions, 0.8 (all U.S.; (Hayes et al. 2021)). But, the total level of human-caused mortality and serious injury is unknown, because NMFS records represent coverage of only a portion of the area surveyed for the population estimate for the stock (Hayes et al. 2021). The total U.S. fishery-related mortality and serious injury for this stock derived from the available records is likely biased low (Hayes et al. 2021).

According to the List of Fisheries, the Northeast sink gillnet fishery is a Category I fishery, because previous estimates suggested that fishery-specific annual mortality and serious injury to fin whale was greater than or equal to 50% of the PBR {LOF 2017b}. In addition, fin whale is a strategic stock because it is listed as "Endangered" under the Endangered Species Act (ESA). Because the PBR is not exceeded, and the gillnet fishery contributes SIMs that are less than 50% of PBR, a score of low concern is given.

Goosefish

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

According to the most recent operational assessment in 2016, which used survey indices to estimate abundance and biomass, there was a lack of current biological reference points that would allow for stock status determination (Richards 2016)(NMFS 2017a). The 2016 assessment does not include an update to the SAW 50 SCALE model used previously (in 2013) because the method for aging goosefish failed a validation test completed in 2016, thus invalidating the growth model (Richards 2016)(NMFS 2017a). In the 2016 assessment, survey indices were used as proxies for stock abundance, and relative exploitation rates were used as proxies for trends in fishing mortality rates, but neither of these quantities has been used as a basis for proxies for biological reference points (Richards 2016)(NMFS 2017a).

Therefore, the most current abundance estimates are from 2013, which determined that both the northern and southern stock biomass are above targets {NEFSC 2013}. But, because it appears that neither the 2013 stock assessment result nor the 2016 stock assessment result is appropriate for determining whether abundance is at a sustainable level, a productivity-susceptibility analysis (PSA) was calculated.

Goosefish has medium inherent vulnerability according to the productivity-susceptibility analysis (PSA = 2.91; see detailed scoring below); and because there are two positive data-limited indicators (NEFSC survey indices are either stable or increasing, landings have decreased substantially, and the size structure is reasonably stable), abundance is scored a low concern.

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1. Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2. Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: S = [(S1 × S2 × S3 × S4) – 1/40] + 1.

3. Vulnerability score (V) = the Euclidean distance of P and S using the following formula: V = $\sqrt{(P^2 + S^2)}$

Vulnerability (V) = $v(P^2 + S^2)$

V = $v(1.75^2 + 2.325^2)$

V = 2.91 (medium vulnerability)

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)	Reference(s)
Average age at maturity	4.5 years	1	(Steimle et al. 1999)
Average maximum age	10 years	2	(Steimle et al. 1999)
Fecundity	300,000 to 2,780,000 eggs/year	1	(Steimle et al. 1999)
Average maximum size (fish only)	100 cm	2	(Steimle et al. 1999)
Average size at maturity (fish only)	55 cm	2	(Steimle et al. 1999)
Reproductive strategy	Broadcast spawner	1	(Froese and Pauly 2018)
Trophic level	4.4	3	(Choi et al. 2008)
Density dependence (invertebrates only)	-	-	
Habitat quality	Moderately altered	2	SFW default value
Total Productivity (average)		**1.75**	

Susceptibility attribute	Relevant information	Score (1 = low risk, 2 = medium risk, 3 = high risk)	Reference(s)
Areal overlap (considers all fisheries)	The northern goosefish stock is concentrated in the GoM and Georges Bank cod, haddock, and pollock fishing areas.	3	(Richards 2013)
Vertical overlap (considers all fisheries)	Usual depth range of inshore to 900 m; groundfish fishery operates between 10 and 200 m.	3	(Richards 2013)
Selectivity of fishery (specific to fishery under assessment)	Goosefish is incidentally encountered and is not likely to escape the gear, but conditions under "high risk" do not apply.	2	SFW default
Post-capture mortality (specific to fishery under assessment)	Unknown	3	SFW default
Total Susceptibility (multiplicative)		**2.325**	

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

The 50th SAW Assessment Summary Report estimates fishing mortality at F = 0.10 per year in the NMA and F = 0.07 per year in the SMA; F is below $F_{THRESHOLD}$, which is currently set equal to F_{MAX} (F = 0.44 for NMA and F = 0.37 for SMA) {NEFSC 2013}. Nevertheless, there is high uncertainty surrounding these estimates, especially because the SCALE model from the 2013 operational assessment has since been rejected due to F BRPs (biological reference points) being considered inappropriate for this species (Richards 2016). And, although the most current assessment in 2016 used relative exploitation rates as proxies to estimate trends in fishing mortality rates, these have not been used as proxies for fishing mortality BRPs (Richards 2016). Because there is uncertainty surrounding these estimates, fishing mortality is considered a moderate concern.

Justification:
The relative exploitation rates cannot be compared with reference points at this stage, but they do indicate, particularly in the north, a clear decrease in recent years (Figures 27 and 28).

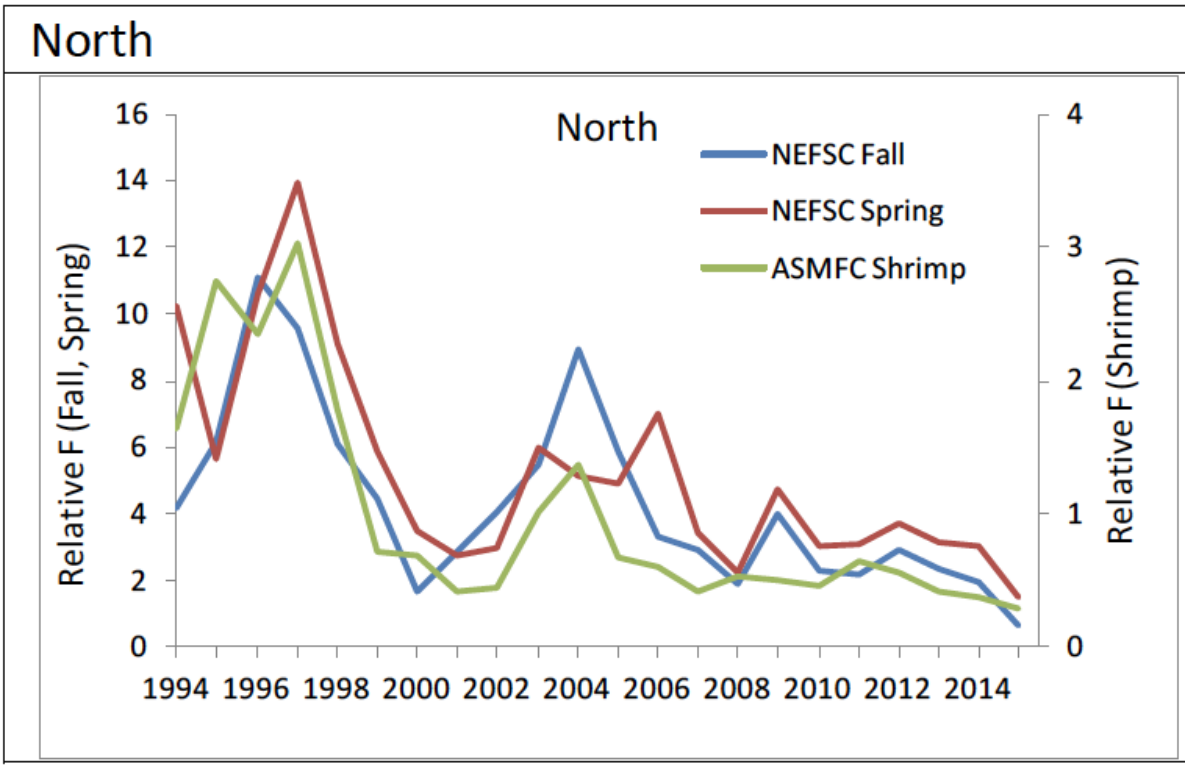

Figure 27: Relative exploitation rates (total catch in numbers/total abundance index) of goosefish in the northern management area (Richards 2016).

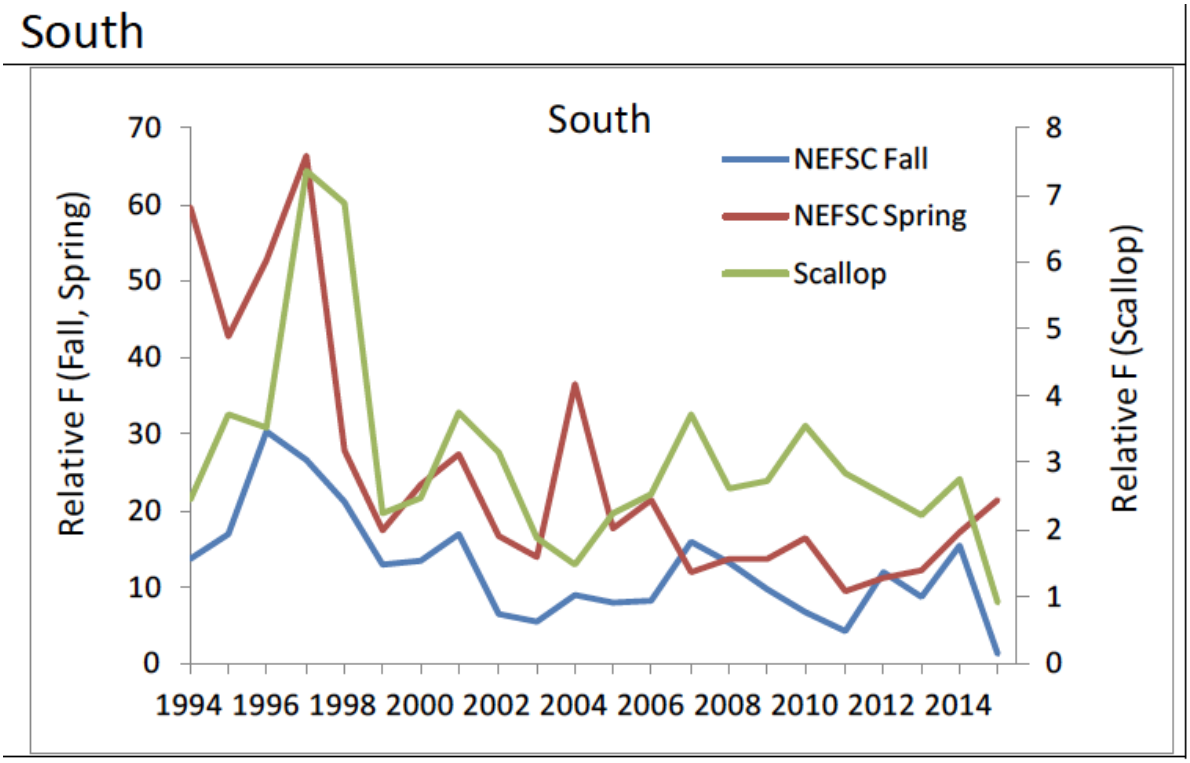

Figure 28: Relative exploitation rates (total catch in numbers/total abundance index) of goosefish in the southern management areas (Richards 2016).

Gray seal

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

There is a single population of gray seal in the Northwest Atlantic, found in both the United States and Canada. The size of the population is estimated separately for each country, and mainly reflects the size of the breeding population in each country (Hayes et al. 2021). Based on the 2016 estimate of 27,131 individuals in the U.S. portion of the population, the minimum population estimate is 23,153 (Hayes et al. 2021). Gray seal has recovered from persecution in previous years and is listed as "Least Concern" by the International Union for the Conservation of Nature (IUCN) (Bowen 2016). Based on the IUCN listing, a score of moderate concern is given.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

The average annual estimated human-caused mortality and serious injury to gray seal from 2014 to 2018 was 4,729 (Hayes et al. 2021). The U.S. observed fishery accounted for 20% (946/4,729) of the average annual estimated human-caused mortality and serious injury; the bottom trawl fishery accounted for 2% (18/946) of those deaths (Hayes et al. 2021). The potential biological removal (PBR) for this stock is 1,389 animals and, although this is exceeded by cumulative fishing impacts, the impact of the Northeast bottom trawl fishery is responsible for less than 10% of PBR and is considered a low concern.

Justification:

The human-caused mortality and serious injury average was derived from six components: 1) 946 (CV = 0.11) from the 2014 to 2018 U.S. observed fishery; 2) 6.2 from average 2014 to 2018 non-fishery-related, human interaction stranding mortalities; 3) 636 from the average 2014 to 2018 Canadian commercial harvest; 4) 62 from the average 2014 to 2018 DFO scientific collections; 5) 3,078 removals of nuisance animals in Canada; and 6) 1.2 from U.S. research mortalities (Hayes et al. 2021).

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The average annual estimated human-caused mortality and serious injury to gray seal during 2014 to 2018 was 4,729 per year, with a potential biological removal (PBR) of 1,389 (Hayes et al. 2021). The U.S. observed fishery accounted for 20% (946/4,729) of the average annual estimated human-caused mortality and serious injury; the sink gillnet fishery accounted for 95% of that percentage (896/946; (Hayes et al. 2021)). The most significant impact on this population comes from the cull of nuisance seals in Canadian waters (average of 3,737 per year from 2014 to 2018) (Hayes et al. 2021). Because PBR is exceeded (mostly due to culling nuisance seals in Canada) and the bottom gillnet fishery is a major contributor, but increasing abundance trends suggest that the population is not being depleted due to this mortality and the total U.S. impacts are below PBR, this factor is considered a moderate concern.

Harbor porpoise

Factor 2.1 - Abundance

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 95,543 individuals (CV = 0.31), with a minimum population size of 74,034, which is from a 2016 U.S. shipboard and aerial survey combined with a DFO aerial survey of the Bay of Fundy and Scotian Shelf {Hayes et al. 2021}. But, 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 the submergence of animals. Without a correction for availability bias, the abundance estimate is expected to be biased low {Hayes et al. 2021}. The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species {Hayes et al. 2021}. The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" (Hammond et al. 2008b), and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

Low Concern

The total annual estimated average fishery-related mortality or serious injury to the harbor porpoise stock during 2014 to 2018 was 150 harbor porpoises (CV = 0.14) from U.S. fisheries, with a potential biological removal (PBR) of 851 (Hayes et al. 2021). The Northeast bottom trawl fishery accounted for less than 1% (1.1/150 individuals) of the total by-catch across all fisheries {Hayes et al. 2021}. Because PBR is not exceeded, and the bottom trawl fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total annual estimated average fishery-related mortality or serious injury to the harbor porpoise stock during 2014 to 2018 was 150 harbor porpoise per year (CV = 0.14) from U.S. fisheries, with a potential biological removal (PBR) of 851 (Hayes et al. 2021). The Northeast sink gillnet fishery is by far the primary contributor, accounting for 88% (132/150 individuals) of the total by-catch across all fisheries {Hayes et al. 2021}. But, because total U.S. fisheries mortality or serious injury does not exceed PBR, and the mortality or serious injury for the bottom gillnet fishery specifically is less than 50% of the PBR, fishing mortality is considered a low concern.

Harbor seal

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The best current abundance estimate of the harbor seal stock is 75,834 (CV = 0.15), with a minimum population size of 66,884, which is from a 2012 survey {Waring et. al. 2015}(Hayes et al. 2021). The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (Waring et al. 2015)(Hayes et al. 2021). The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" (Lowry 2016), and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

The total human-caused mortality or serious injury to the harbor seal stock during 2014 to 2018 was 365.2 (351 harbor seals per year from U.S. fisheries), with a PBR of 2,006 (Hayes et al. 2021). The Northeast bottom trawl fishery accounts for 1% (3.8/351 individuals) of the total by-catch across all fisheries (Hayes et al. 2021). Because PBR is not exceeded, and the bottom trawl fishery is not a major contributor, fishing mortality is considered a low concern.

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total human-caused mortality or serious injury to the harbor seal stock during 2014 to 2018 was 365.2 (351 harbor seals per year from U.S. fisheries), with a potential biological removal (PBR) of 2,006 (Hayes et al. 2021). The Northeast sink gillnet fishery is by far the primary contributor, accounting for 91% (319/351 individuals) of the total by-catch across all fisheries (Hayes et al. 2021). Because PBR is not exceeded, and the sink gillnet fishery does not account for more than 50% of the PBR, fishing mortality is considered a low concern.

Harp seal

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The best current abundance estimate of the Northwest Atlantic harp seal stock in 2012 was estimated to be 7,445,000 (95% CI: 6.1 to 8.8 million), and projected to be 7,411,000 (95% CI: 6.1 to 8.7 million) in 2014 {Hammill et al. 2015}(NOAA 2018a). The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, but the IUCN considers this species as "Least Concern," with an increasing population trend (Kovacs 2015). Therefore, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

For the period 2013 to 2017, the total estimated human-caused annual mortality and serious injury to harp seals was 232,422 (Hayes et al. 2020). Estimated annual human-caused mortality in U.S. waters is 65 harp seals (CV = 0.21) from the observed U.S. fisheries (Hayes et al. 2020); the potential biological removal (PBR) is unknown. The Northeast sink gillnet fishery is by far the primary contributor, accounting for all the observed by-catch across all U.S. fisheries (Hayes et al. 2020). Although PBR is unknown, fishing mortality is considered a low concern, based on the very low proportion of mortality originating from this fishery along with a "Least Concern" status and a stable/increasing population trend (Kovacs 2015)(NOAA 2018a).

Justification:

The remaining mortality is derived from two components: 1) an average catch of 232,355 seals from 2013 to 2017 by Canada and Greenland, including by-catch in the lumpfish fishery; and 2) an average of 2 stranded seals from 2013 to 2017 that showed signs of nonfishing human interaction (Hayes et al. 2020).

Hooded seal

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

High Concern
The latest stock assessment of hooded seal in the western North Atlantic was conducted in 2007. This assessment produced a best population estimate abundance of 593,500 {Hayes et al. 2019}. An optimum sustainable population (OSP) was not derived; however, the population appeared to be increasing. Nevertheless, the International Union for the Conservation of Nature (IUCN) considers this species as "Vulnerable," with an unknown population trend (Kovacs 2016). Therefore, abundance is considered a high concern.

Justification:
Although the latest stock assessment for hooded seal in the western North Atlantic indicated that the population was likely increasing, there is good reason to believe that changing sea ice conditions will lead to declines in the future (Kovacs 2016). Assuming that the entire population will decline at 3.7% per year (which is the current West Ice rate of decline), the three-generation reduction would be 75%, which qualifies hooded seal for listing as "Endangered" under criterion A3c (Kovacs 2016). Even if the overall rate of decline were only 1% per year, the three-generation decline would be 32%, which would qualify hooded seal as "Vulnerable" (Kovacs 2016).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern
The total estimated human-caused annual mortality and serious injury to hooded seal from 2012 to 2016 is 1,680 {Hayes et al. 2019}. The estimated annual human-caused mortality in U.S. waters is 0.6 hooded seals (CV = 1.12) from the observed U.S. fisheries {Hayes et al. 2019}; the potential biological removal (PBR) is unknown. Therefore, less than 0.1% of the total estimated human-caused mortality is due to interactions with U.S. fishing gear. But, because hooded seal has an uncertain population trend, a stock status approaching endangered, and the fishing-related mortalities relative to the PBR are unknown, fishing mortality is considered a moderate concern.

Justification:
The total estimated human-caused annual mortality and serious injury derives from two components: 1) 1,679 from the 2012 to 2016 average catches of the Northwest Atlantic population of hooded seal by Canada and Greenland; and 2) 0.6 hooded seals (CV = 0.82) from the observed U.S. fisheries {Hayes et al. 2019}.

Humpback whale

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The humpback whale population in the Gulf of Maine stock is estimated to be 1,396 individuals (Hayes et al. 2020). Population trends and the status of the stock relative to the optimum sustainable population (OSP) are unknown. NMFS conducted a global status review of humpback whale (Bettridge et al. 2015) and recently revised the Endangered Species Act (ESA) listing of the species (Federal Register 2016). The final rule indicated that, until the stock delineations are reviewed in light of the Distinct Population Segment (DPS) designations, NMFS would consider stocks that do not fully or partly coincide with a listed DPS as not depleted, for management purposes. Hence, the Gulf of Maine stock (part of the West Indies DPS) is considered not depleted because it does not coincide with any ESA-listed DPS (NOAA 2018b). Globally, humpback whale is considered "Least Concern" by the IUCN {Cooke 2018}. Because humpback whale is not considered endangered or threatened in the Gulf of Maine and is classified as "Least Concern" by the IUCN, abundance is ranked a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

From 2013 to 2017, the average annual rate of human-caused mortality and serious injury for the Gulf of Maine humpback whale stock was 12.15 whales (7.75 for fishery interactions), which is considered negatively biased due to detection limitations (Hayes et al. 2020). Based on the inference of undetected mortality from annual population estimates, managers determined that it is likely that annual average mortality and serious injury exceeds the potential biological removal (PBR) (22 whales); however, this has yet to be formally determined, and the proportion by nationality or cause is unknown. There is an Unusual Mortality Event in effect (since January 2016) for Atlantic humpback whale due to coast-wide elevated mortality levels in the United States observed from strandings; however, it is likely that these are due to vessel strikes (NOAA 2021). It is estimated that 48–65% of the Gulf of Maine humpback stock have experienced a previous entanglement, based on scarring {Robbins & Mattila 2001}.

The majority of entanglements are not identifiable to fishery, so the proportion of entanglement due to the U.S. gillnet fisheries is unclear. Annual serious injury and mortality during 2013–2017 from unidentified U.S. gillnet interactions was 0.35 (1.6% of PBR), from unidentified gillnet interactions first seen in U.S. waters but unassigned to country was 0.75 (3.4% of PBR), while those not

attributable to gear type were 0.75 (3.4% of PBR) in the United States, 3.2 (14.5% of PBR) for those first seen in the United States but unassigned to country, and 0.15 (0.7% of PBR) for those first seen in Canada but unassigned to country (Hayes et al. 2020).

Of the mortalities documented from 1970 to 2009, 24.5% were attributed to entanglement, 0.8% were attributed to a combination of ship strikes and entanglement, and 57% were due to unknown causes {van der Hoop et al. 2013}. The majority of entanglements are not identifiable to fishery, so the proportion of entanglement due to gillnet fisheries is unclear. Data are lacking regarding fisheries' interactions with the other feeding groups in the Western Atlantic humpback whale population. Because known fisheries mortality does not exceed PBR, but with concern that total fishing mortality likely exceeds PBR and uncertainty in the proportion of contribution from the gillnet fisheries, fishing mortality is considered a moderate concern.

Little skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For little skate, the 2017 to 2019 NEFSC spring average biomass index of 5.32 kg/tow is above the biomass threshold reference point (3.07 kg/tow), but below the B_{MSY} proxy (6.15 kg/tow; see Figure 29) (Sosebee 2020). Because the stock is not overfished, and biomass is greater than 75% of the biomass target, abundance is considered a low concern.

Justification:

For little skate, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species.

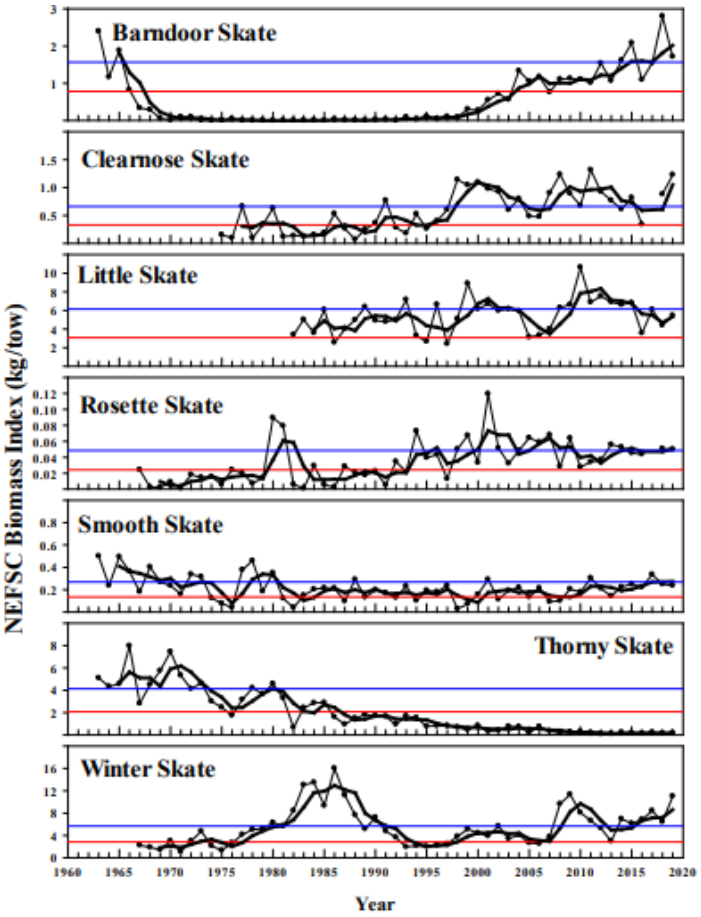

Figure 29: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For little skate, the 2017 to 2019 average index is above the 2016 to 2018 average by 13.4% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is considered a low concern.

Justification:

The fishing mortality reference points are based on changes in the 3-year survey biomass indices. If there is a decline in the 3-year moving average of the survey biomass index that is greater than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY}, and overfishing is occurring for that skate species (Sosebee 2020).

Long-finned pilot whale

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

The best available estimate for long-finned pilot whale in the western North Atlantic is 39,215 (CV = 0.30), with a minimum population size of 30,627 (Hayes et al. 2020). This estimate is from the U.S. summer 2016 surveys combined with the DFO Canada summer 2016 survey, providing coverage from Virginia to Labrador (Hayes et al. 2020). The status of this stock relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and there are insufficient data to determine population trends. The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" {Minton et al. 2018}, so abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

The total annual observed average fishery-related mortality or serious injury during 2013 to 2017 was 21 for long-finned pilot whale (CV = 0.15), with a potential biological removal (PBR) of 306 (Hayes et al. 2020). The Northeast bottom trawl fishery is the primary contributor, accounting for 71% (15/21 individuals) of the total by-catch across all fisheries (Hayes et al. 2020). Because the PBR is not exceeded, and the bottom trawl fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

Minke whale

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

The Canadian East Coast minke whale stock size is estimated to be 21,968 individuals (17,022 minimum population estimate) (Hayes et al. 2021). The abundance estimate is uncertain because it utilizes an availability bias correction for which accuracy and precision are unknown. Abundance relative to reference points is uncertain. But, this species is classified by the International Union for the Conservation of Nature (IUCN) as "Least Concern" {Cooke 2018}, so abundance is rated a moderate concern.

Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

The abundance estimate for the minke whale stock is 21,968 (CV = 0.30), with a minimum population estimate of 17,022 whales (Hayes et al. 2021). The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species (Hayes et al. 2021). The IUCN considers this species as "Least Concern" (Reilly et al. 2008b), and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

During 2014 to 2018, the average annual minimum detected human-caused mortality and serious injury was 10.55 minke whales, with a potential biological removal (PBR) of 170 (Hayes et al. 2021). The minimum detected average annual mortality and serious injury was 9.15 minke whales (3.15 United States; 2.85 Canada; 2.05 unassigned and first reported in the United States; 0.9 unassigned and first reported in Canada), and in most cases where gear was recovered and identified, it was not due to the bottom trawl fishery (Hayes et al. 2021). Because the PBR is not exceeded, and the bottom trawl fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

North Atlantic right whale

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

High Concern

The western Atlantic stock of North Atlantic right whale is listed as "Endangered" under the Endangered Species Act (ESA), and it is considered "Critically Endangered" by the International Union for the Conservation of Nature (IUCN) (Cooke 2020) because it is "considered to be facing an extremely high risk of extinction in the wild" (IUCN 2012). Minimum abundance from the most recent stock assessment was estimated at 364 individuals (best estimate 368) (Hayes et al. 2022), while the best estimate of the population from the North Atlantic Whale Consortium was 336 individuals at the end of 2020 {Pettis et al. 2022}. There are fewer reproductive females producing fewer calves each year, with experts estimating that there are 88 or fewer reproductively active females remaining {Pettis et al. 2022}(NOAA 2022c). The population has been declining since 2011 and calving rates have been low (2017–2019 calving rates averaged four per season, which is <33% of the previous annual average). But in 2020, calving increased (10 calves sighted; 1 involved in a vessel strike) (Pace et al. 2017)(NOAA 2020b). The cause of reduced productivity is unknown but several factors are likely contributing to the declining health of North Atlantic right whale, including climate-related shifts in prey distribution, anthropogenic noise, pollution, vessel strikes, and entanglement in fishing gear (Pace et al. 2017)(NOAA 2019c). Because the North Atlantic right whale is considered "Critically Endangered" by the IUCN, abundance is rated a high concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

High Concern

The western Atlantic stock of the North Atlantic right whale (NARW) is considered a strategic stock because annual serious injury and mortality (SIM) (7.7 from all sources; 5.7 attributed to fisheries entanglement from 2015 to 2019) exceeds the potential biological removal (PBR) (0.7 whales) (Hayes et al. 2022). Due to a lack of information, it is often not possible to assign entanglements to a specific fishery. Documented entanglements from 2015 to 2019 involving pot/trap gear or unidentified gear are all attributed to unknown fisheries, of which the Northeast sink gillnet fishery may be a part. Annual SIMs attributed to entanglements in pot/trap gear in Canadian fisheries were 1.95 (279% of PBR), while none were attributed to pot/trap gear in United States fisheries. Serious injuries and mortalities first seen in the United States but not attributable to country were 2.65 (379% of PBR), and those first seen in Canada but not attributable to country were 1.05 (150% of PBR) (Hayes et al. 2021). In 2014, there was one SIM (0.2 average annual serious injuries and mortality, 29% of PBR) that was first seen in the U.S. but not attributable to country, and it was

most likely caused by entanglement in netting gear {Sharp et al. 2019}{Sharp et al. 2019 Supplemental}.

Vessel strikes and entanglement (from pot/trap and anchored gillnet fisheries) are the two leading causes of mortality and serious injury to North Atlantic right whale, with entanglements increasing over the past decade (Moore 2019). Rope strengths have increased in recent decades (based on data from 1994 to 2010), leading to reduced escape success from entangling gear {Knowlton et al. 2016}. Sinking groundline (2009) and vertical line (2015) regulations have been implemented, resulting in gear configuration changes for which the effects on mitigation of whale entanglement have yet to be determined. Due to limited observation coverage, it is likely that the number of entanglements is severely underestimated {Kraus et al. 2019}. Based on mark-recapture studies through photo identification, <50% of entanglement-related mortality is estimated to be detected, with these same studies demonstrating that 59% of North Atlantic right whales have been entangled more than once (83% at least once), and new scars from entanglement are observed annually for at least 26% of the observed population {Knowlton et al. 2012}.

More than 90% of entanglements (based on 2010–2016 data and partial data for 2016/2017) are not linked to gear (7.8% of entangled NARW carry gear) and only 12% of those are linked to a location {Knowlton et al. 2012}{Knowlton et al. 2019}{Kraus et al. 2019}. Fisheries interactions with NARW have been documented with gillnet fisheries (15% of entanglements attributed to gillnets from 1984 to 2016) {Kraus et al. 2019}. An entanglement that results in gear remaining attached to the whale places an energetic strain that can compromise overall fitness and reproduction {van der Hoop et al. 2016}. Challenges in identifying the fishery involved in an entanglement occur due to ineffective gear marking (gear recovered from an entanglement does not carry a mark identifying the gear type, target species, and/or location) or the inability to recover gear from the entangled whale. A recent study estimated that, from 2010 to 2017, the carcass detection rate (how many whale deaths were identified) was 29% {Pace et al. 2021}. Pace et al. (2021) also concluded that, of the cryptic mortalities, the majority were likely caused by entanglement rather than blunt force trauma from vessel strikes.

An Unusual Mortality Event is in effect (since June 2017) for North Atlantic right whale, which includes 34 mortalities (21 in Canada and 13 in the United States, based on the location of stranding, not the location of mortality) through December 2021 (NOAA 2021). Mortalities are attributed to a combination of human interactions including vessel strikes and rope entanglement (final results are pending; however, preliminary investigations list 11 suspected as vessel strikes, 9 suspected as entanglement, 13 as pending or unknown causes, and 1 as perinatal mortality) (NOAA 2021) (see Figure 30).

The Northeast sink gillnet fishery is classified as a Category I fishery by NOAA (Federal Register 2018b). Cumulative SIMs far exceed PBR and entanglements due to unknown fisheries are considered a significant contributor. Until there is more specific information available regarding which fisheries are responsible for the unattributed entanglements, Seafood Watch considers that all relevant fisheries that may overlap with NARW pose risks. Based on the available information and the significant risks to NARW, the sink gillnet fishery cannot be considered sustainable, and fishing mortality is scored a high concern.

Justification:
Distributional shifts in the abundance of North Atlantic right whale (NARW) across its range may lead to shifts in regional fisheries interactions and entanglement risks. Based on data from passive acoustic monitoring (2004–2014), North Atlantic right whale is highly mobile and has a continuous year-round presence across its geographic range {Davis et al. 2017}. In recent years (2010–2014), there has been a distributional shift, with presence increased in the Southern New England and mid-Atlantic regions and decreased in the Scotian Shelf and greater Gulf of Maine. Visual surveys in Canadian waters reported increased presence farther north in the Gulf of St. Lawrence in Canada, which may be related to increased fisheries interactions with North Atlantic right whale in Canada {Meyer-Gutbrod et al. 2018}. A recent study of individual whales identified in the Gulf of St. Lawrence found that there was a high return rate from year to year, indicating that this is an important feeding area for a specific group of NARW (Crowe et al. 2021). The study also found that, in 2019, a total of 137 individual NARW were estimated to have visited the Gulf of St. Lawrence (Crowe et al. 2021), which was 38% of the estimated 356 NARW alive at the end of 2019 (Pettis et al. 2021). Although this identifies the Gulf of St. Lawrence as an important foraging area for a significant proportion of the population, it does raise uncertainty regarding the location of the remaining individuals and the concern that they may be in areas that are offered less protection (Crowe et al. 2021).

In 2017, an Unusual Mortality Event for North Atlantic right whale was observed in the region (NOAA 2020). It is unclear if distributional shifts are due to environmental or anthropogenic effects; however, warming temperatures and shifting prey distributions are thought to play a part in the change {Meyer-Gutbrod et al. 2018}. The primary prey (*Calanus finmarchicus*) of the North Atlantic right whale currently remains in highest abundance in the western Gulf of Maine {Record et al. 2019}.

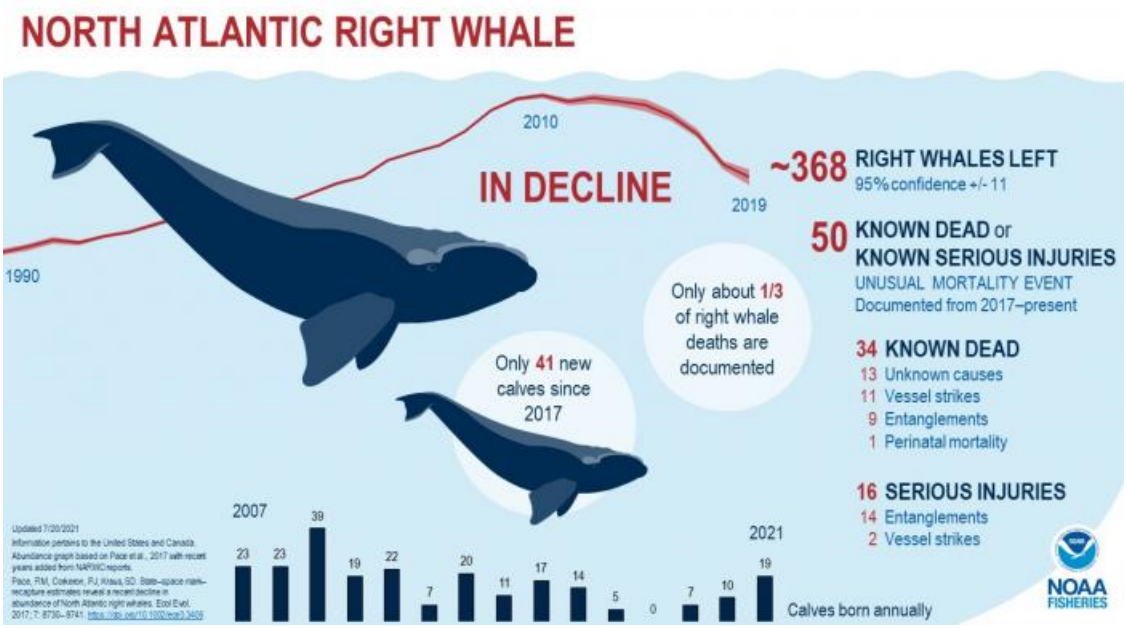

Figure 30: An infographic showing best estimates of current North Atlantic right whale population numbers and causes of death during the current Unusual Mortality Event, 2017 to present. (NOAA 2021)

Ocean pout

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

High Concern

Based on the 2017 ocean pout stock assessment, the biomass proxy (B) in 2016 was estimated to be 0.223 (kg/tow), which is 5% of the biomass target (B_{MSY} proxy = 4.94; see Figure 31) (Wigley 2017a). According to the NMFS first quarter 2018 update, ocean pout is overfished and in year 14 of a 10-year rebuilding plan (NMFS 2018c). Therefore, abundance is scored a high concern.

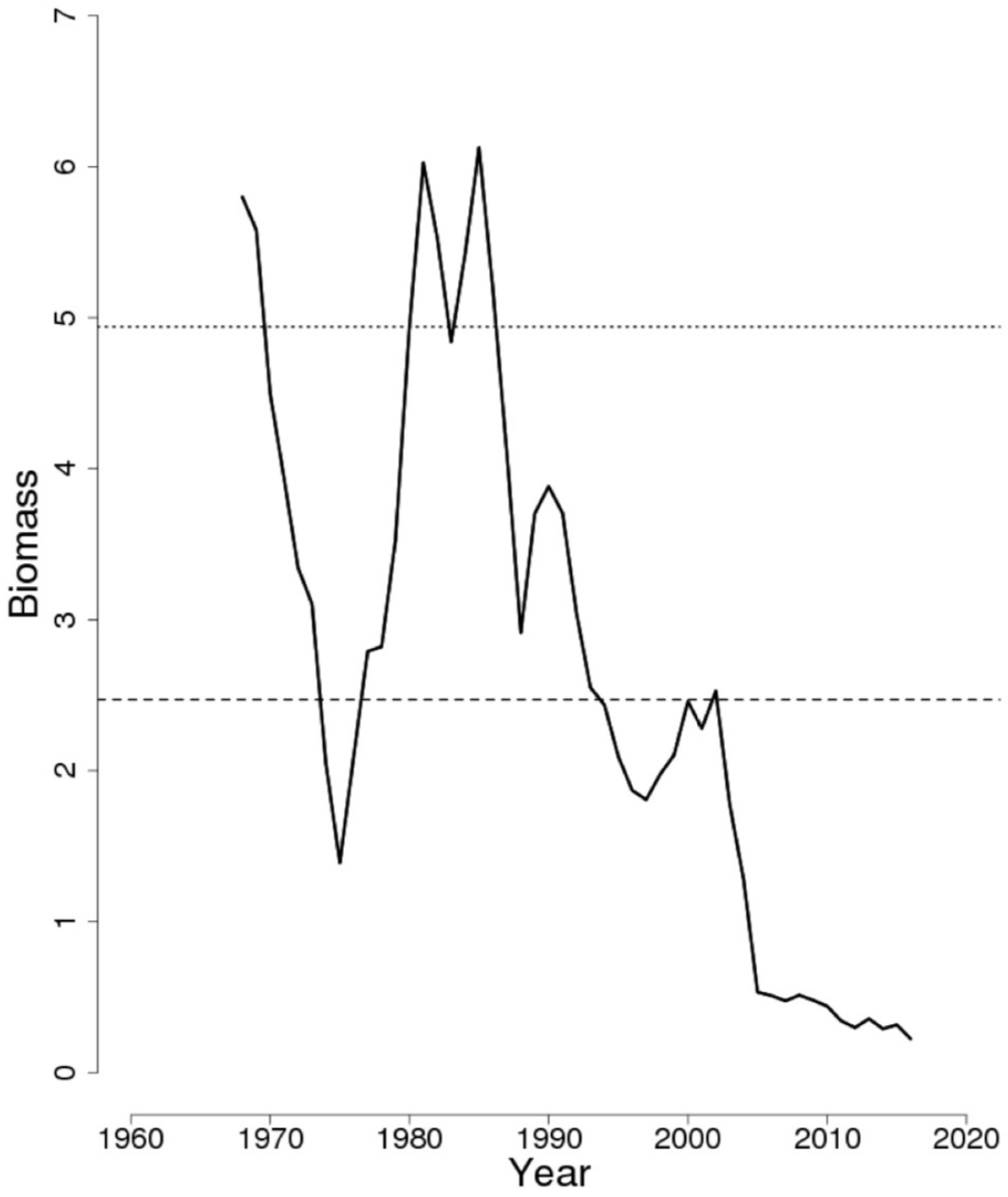

Figure 31: Trends in biomass (kg/tow) of ocean pout between 1968 and 2016 from the current (solid line) and previous (dashed line) assessment, and the corresponding $B_{THRESHOLD}$ (1/2 B_{MSY} proxy; horizontal dashed line) as well as B_{TARGET} (B_{MSY} proxy; horizontal dotted line) based on the current assessment {Wigley 2017}.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

Based on the 2017 ocean pout stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.221, which is 29% of the overfishing threshold proxy (F_{MSY} proxy = 0.76; see Figure 32) (Wigley 2017a). Nevertheless, biomass is still decreasing, and further studies have been suggested to explore why this stock is not rebuilding as expected. Because there is a possibility that fishing mortality is preventing rebuilding of the stock, fishing mortality is scored a moderate concern.

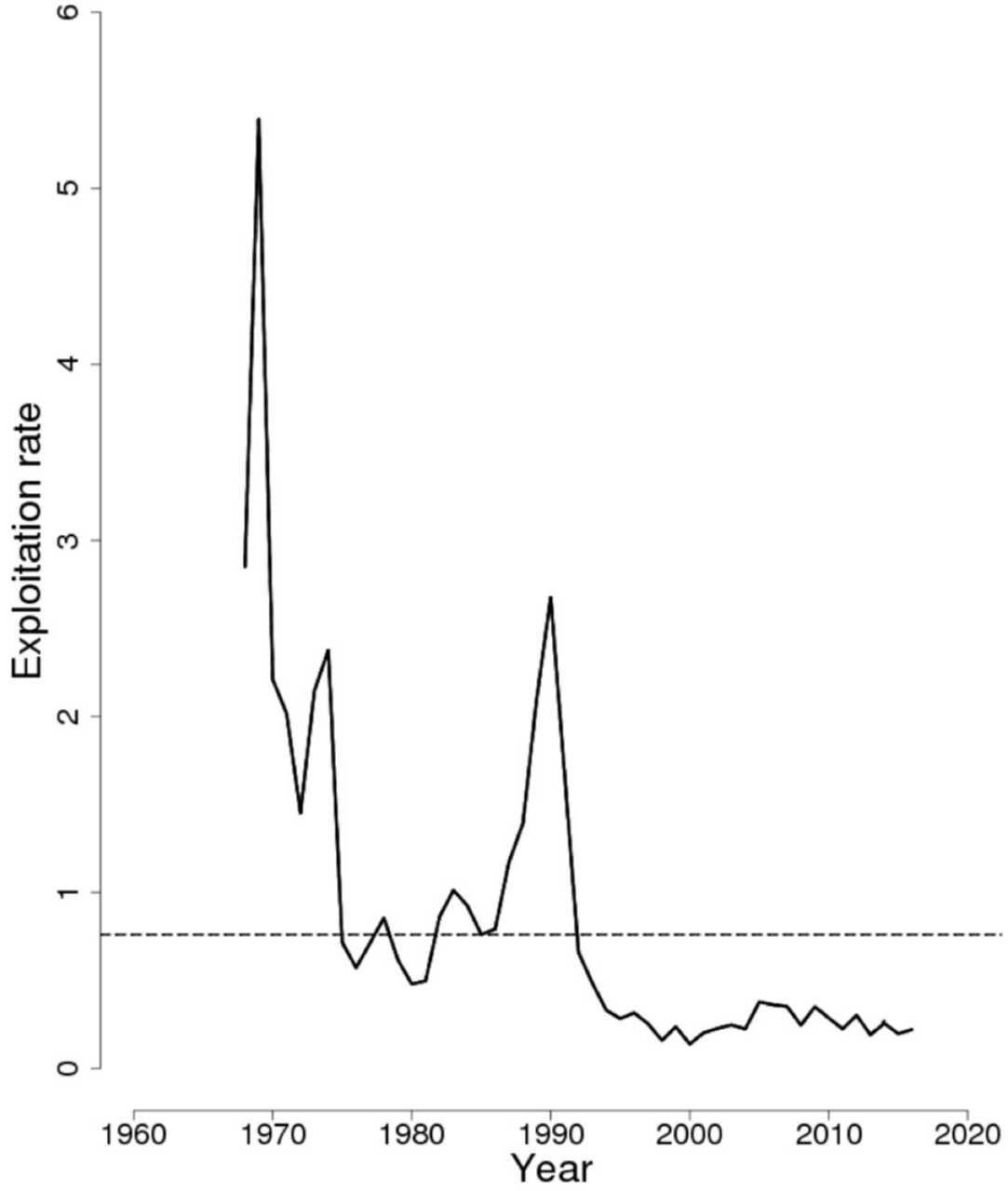

Figure 32: Trends in the exploitation rate of ocean pout between 1968 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.76; horizontal dashed line) based on the current assessment {Wigley 2017}.

Risso's dolphin

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The best abundance estimate for Risso's dolphin is the sum of the estimates from the 2016 surveys: 35,493 (CV = 0.19), with a minimum population estimate of 30,289 (Hayes et al. 2020). The status of this stock relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and there are insufficient data to determine population trends (Hayes et al. 2020). The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" (Taylor et al. 2012), and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total annual estimated average fishery-related mortality or serious injury to the Risso's dolphin stock from 2013 to 2017 was 54.3 individuals (53.9 from fisheries), with a potential biological removal (PBR) of 303 (Hayes et al. 2020). The Northeast sink gillnet fishery accounts for only 11% of the total U.S. fishery-related serious injury and mortality (5.8/53.9 individuals) (Hayes et al. 2020). Because PBR is not exceeded, and the sink gillnet fishery accounts for less than 50% of the PBR, fishing mortality is considered a low concern.

Rosette skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For rosette skate, the 2017 to 2019 NEFSC autumn average biomass index of 0.050 kg/tow is above the biomass threshold reference point (0.024 kg/tow) and the B_{MSY} proxy (0.048 kg/tow; see Figure 33) (Sosebee 2020). Because the stock is not overfished, but there is uncertainty associated with using the survey index as a proxy for abundance, a score of low concern is given (rather than very low concern).

Justification:

For rosette skate, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (Sosebee 2020).

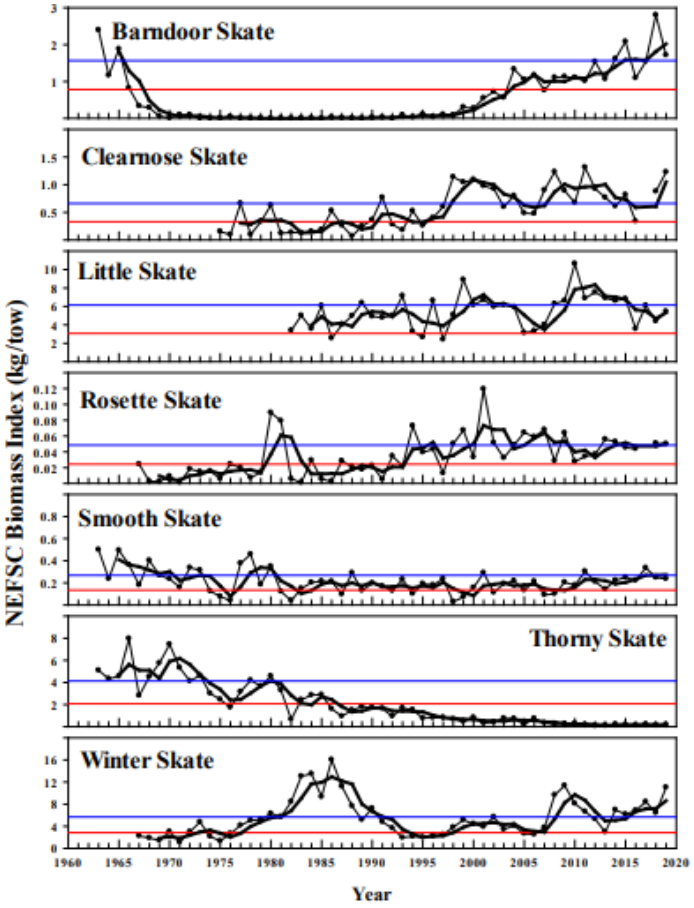

Figure 33: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For rosette skate, the 2017 to 2019 index is above the 2016 to 2018 index by 6.4% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is scored a low concern.

Justification:

The fishing mortality reference points are based on changes in the 3-year survey biomass indices. If there is a decline in the 3-year moving average of the survey biomass index that is greater than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY}, and overfishing is occurring for that skate species (Sosebee 2020).

Scup

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Very Low Concern

The most recent stock assessment update has been conducted in 2019, with data from 2018 {NEFSC 2020}. Abundance data have been consistently collected over the years {NMFS & NEFSC 2017}. Because there is a recent stock assessment and update for scup that has been published by the Northeast Fisheries Science Center, and spawning stock biomass (SSB) has been well above the target reference threshold set for the scup fishery, abundance has been scored a very low concern.

Justification:

In 2018, the SSB was 186,578 mt, which was higher than the updated SSB_{MSY} or $SSB_{40\%}$, indicating that the stock is not overfished {NEFSC 2020}. The fishing mortality on the fully selected age 3 fish was 0.158 in 2018, which is lower than the updated biological reference point of F_{MSY} or $F_{40\%}$, indicating that the stock is not being overfished {NEFSC 2020}. The fishery is being well managed by NOAA Fisheries, the Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission. Nevertheless, the fishery needs to be closely watched in the future because SSB is projected to further decrease unless recruitment to the stock increases {NEFSC 2020}.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Low Concern

The fishing mortality on the fully selected age 3 fish was 0.158 in 2018, which is lower than the updated biological reference point of F_{MSY} or $F_{40\%}$, indicating that the stock is currently not being overfished {NEFSC 2020}. The fishery is being well managed by NOAA Fisheries, the Mid-Atlantic Fishery Management Council, and the Atlantic States Marine Fisheries Commission. Nevertheless, fishing mortality needs to be closely monitored in the future because SSB is projected to further decrease unless recruitment to the stock increases {NEFSC 2020}. Because there is currently a probable chance that the fishing mortality from all sources is below the biological target reference point of F_{MSY} or $F_{40\%}$ that has been set specifically for the scup fishery, fishing mortality has been set a low concern.

Justification:

In the early 1990s, fishing pressure was high and the scup spawning stock biomass was low (Figure 4, {NMFS & NEFSC 2017}). Consequently, the stock was overfished and overfishing was occurring. Gradually, the fishing pressure on the stock was reduced from the mid-1990s to 2000 and beyond. The stock likely responded to the reduced fishing pressure due to management strategies put in place between 2005 and 2009.

Per the 2018 assessment, fishing mortality on the fully selected age 3 fish was 0.158, which is lower than the updated biological reference point of $F_{40\%}$, which was set to 0.215, indicating that the stock is not being overfished (Figure 5, {NEFSC 2020}). But, managers must be cautious in the future to ensure that fishing pressure does not increase.

Short-beaked common dolphin

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Moderate Concern

The current best abundance estimate for short-beaked common dolphin in the Northwest Atlantic is 172,947 (CV = 0.21), with a minimum population size of 145,216 (Hayes et al. 2021). This estimate is derived from 2016 shipboard and aerial surveys in the United States and Canada and covers most of the population's range. The status of common dolphin relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and population trends have not been investigated (Hayes et al. 2021). The International Union for the Conservation of Nature (IUCN) considers this species as "Least Concern" {Braulik et al. 2021}, and because status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

Low Concern

The total annual estimated average fishery-related mortality or serious injury to the short-beaked common dolphin stock during 2014 to 2018 was 399 (CV = 0.10), with a potential biological removal (PBR) of 1,452 (Hayes et al. 2021). The Northeast bottom trawl fishery accounted for only 4.3% of the total U.S. fishery-related serious injury and mortality (17/399 individuals), whereas the Northeast sink gillnet fishery accounted for 24.6% (98/399 individuals) (Hayes et al. 2021). Because PBR is not exceeded, and neither the bottom trawl fishery nor the set gillnet fishery accounts for more than 50% of the PBR, fishing mortality is considered a low concern.

Smooth skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For smooth skate, the 2017 to 2019 NEFSC autumn average biomass index of 0.27 kg/tow is above the biomass threshold reference point (0.134 kg/tow) and meets the B_{MSY} proxy (0.27 kg/tow; see Figure 34) (Sosebee 2020). Because the stock is not overfished and biomass meets the target biomass, but there is uncertainty in the use of survey indices, abundance is considered a low concern (rather than a very low concern).

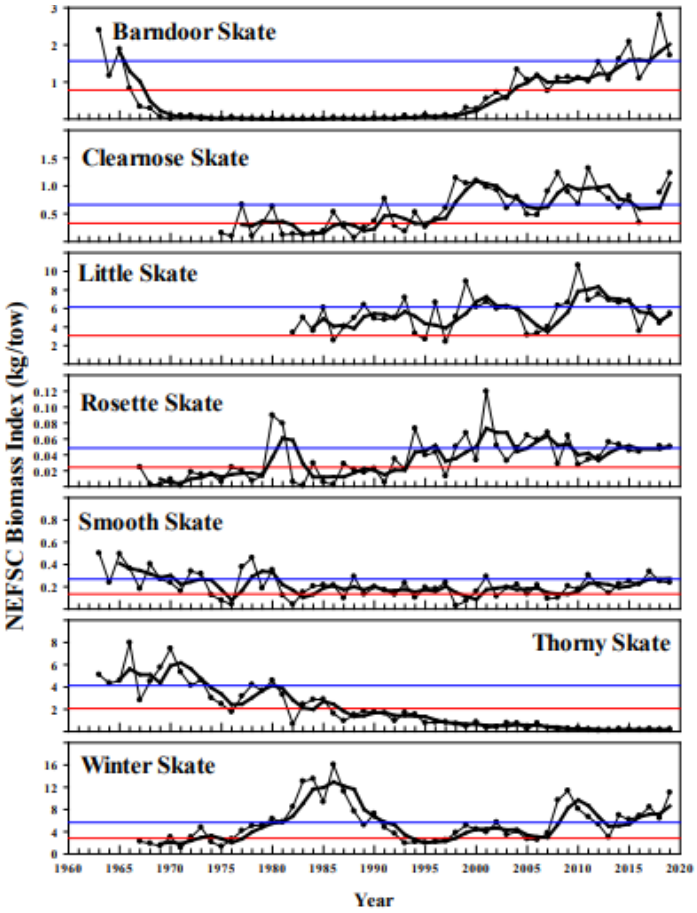

Figure 34: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For smooth skate, the 2017 to 2019 index is consistent with the 2016 to 2018 index (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is considered a low concern.

Justification:

The fishing mortality reference points are based on changes in survey biomass indices. If the 3-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species (Sosebee 2020).

Spiny dogfish

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Moderate Concern

The most recent estimate of spawning stock biomass (SSB) for spiny dogfish in the U.S. Atlantic is 106.8 kt, which is greater than the established limit reference point for the stock ($SSB_{THRESHOLD}$ = 79.6 kt) {Sosebee & Rago 2018}. But, SSB is less than 75% of the established target reference point (SSB_{TARGET} = 159.3 kt), so abundance is scored a moderate concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

The largest contributors to total fishing mortality of spiny dogfish are United States commercial fisheries, which landed 10,949 mt in 2017; recreational, Canadian, and foreign fleets landed 130 mt collectively in the same year {Sosebee & Rago 2018}. Fishing mortality in 2017 was estimated to be 0.202, which is lower than the established target reference point (F_{MSY} = 0.2439), so fishing mortality is scored a low concern.

Summer flounder

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

Summer flounder has been rated as "Least Concern" by the International Union for the Conservation of Nature (IUCN), and the second quarter 2021 update from the National Marine Fisheries Service notes that this stock is not overfished or nearing an overfished state (NMFS 2021). SSB was estimated to be 44,552 mt in 2017, 78% of the 2018 SAW-66 SSB_{MSY} target proxy = $SSB_{35\%}$ = 57,159 mt, and 56% above the 2018 SAW-66 ½ SSB_{MSY} threshold proxy = ½ $SSB_{35\%}$ = 28,580 mt (NOAA 2019). The stock was rebuilt in 2010 {GARFO 2017}, and is not considered overfished (NOAA 2019). Because the stock is not considered overfished and is at a level greater than 75% of SSB_{MSY}, abundance is scored a low concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Low Concern

The most recently updated assessment of summer flounder in the mid-Atlantic Ocean states that the fishing mortality rate has increased and was 0.334 in 2017, 75% of the 2018 SAW-66 F_{MSY} proxy = $F_{35\%}$ = 0.448 (NOAA 2019). Because overfishing of summer flounder is not occurring, we have awarded a score of low concern.

Thorny skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

High Concern

For thorny skate, the 2017 to 2019 NEFSC autumn average biomass index of 0.18 kg/tow is well below the biomass threshold reference point (2.06 kg/tow; see Figure 35) (Sosebee 2020). Because the stock is overfished, abundance is considered a high concern.

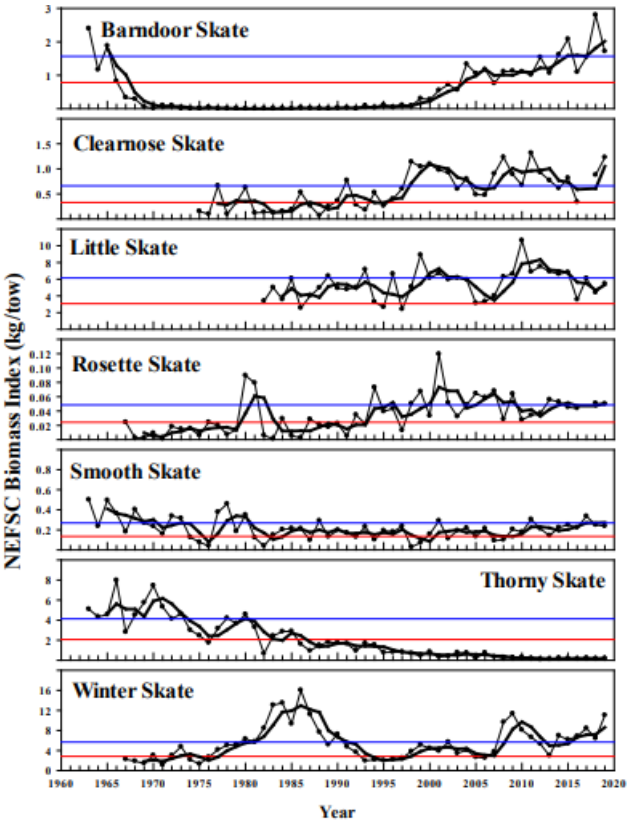

Figure 35: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Thorny skate is a data-poor species, and bottom trawls are known to have poor catchability for the species (Walsh 1992). Recent efforts to enhance fisheries surveys in the Northwest Atlantic by using benthic longline surveys on rough bottom show that the biomass of thorny skate may be higher than would have been expected from the trawl survey data (see Figure 36; presentation by Dave McElroy at NOAA's National Marine Fisheries Service 2018).

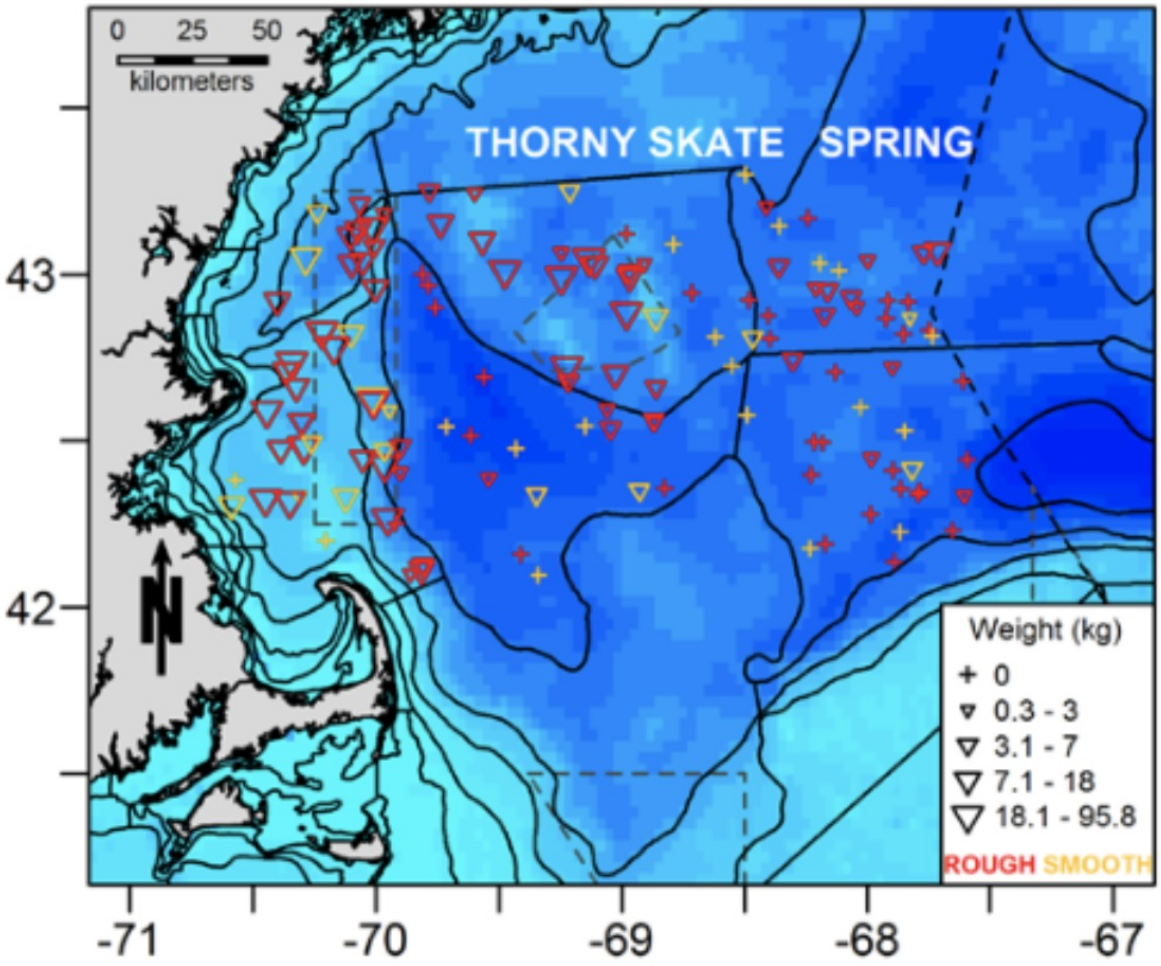

Figure 36: Benthic longline surveys of thorny skate on rough and smooth bottom in the Northwest Atlantic showing that the biomass of thorny skate may be higher than would have been expected from the trawl survey data. The red symbols represent survey efforts on rough bottom where the trawl survey does not reach. The yellow symbols represent survey efforts on smooth bottom where the trawl survey goes (presentation by Dave McElroy at NOAA's National Marine Fisheries Service 2018).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For thorny skate, the 2017 to 2019 index is higher than the 2016 to 2018 index by 11.4% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is considered a low concern.

Justification:

The fishing mortality reference points are based on changes in survey biomass indices. If the 3-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species (Sosebee 2020).

White hake

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Moderate Concern

Based on the 2017 white hake stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 21,276 mt, which is 69% of the biomass target (SSB_{MSY} proxy = 30,948; see Figure 37) (Sosebee 2017a). The white hake stock is not overfished, but because it is below 75% of the biomass target, abundance is scored a moderate concern.

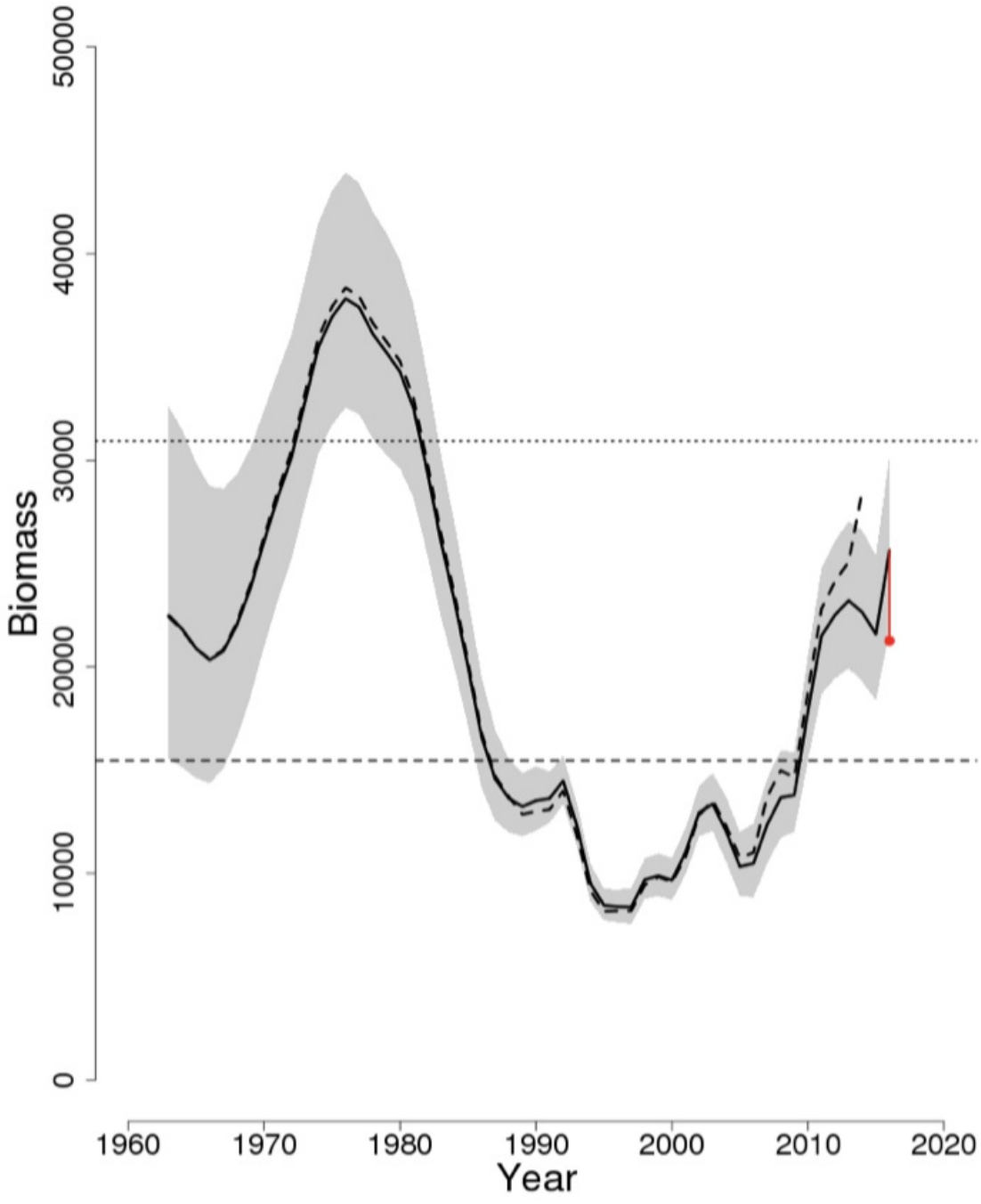

Figure 37: Trends in spawning stock biomass of white hake between 1963 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown {Sosebee 2017}.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

Based on the 2017 white hake stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.066, which is 36% of the overfishing threshold proxy (F_{MSY} proxy = 0.1839; see Figure 38) (Sosebee 2017a). The white hake stock is not undergoing overfishing, so fishing mortality is scored a low concern.

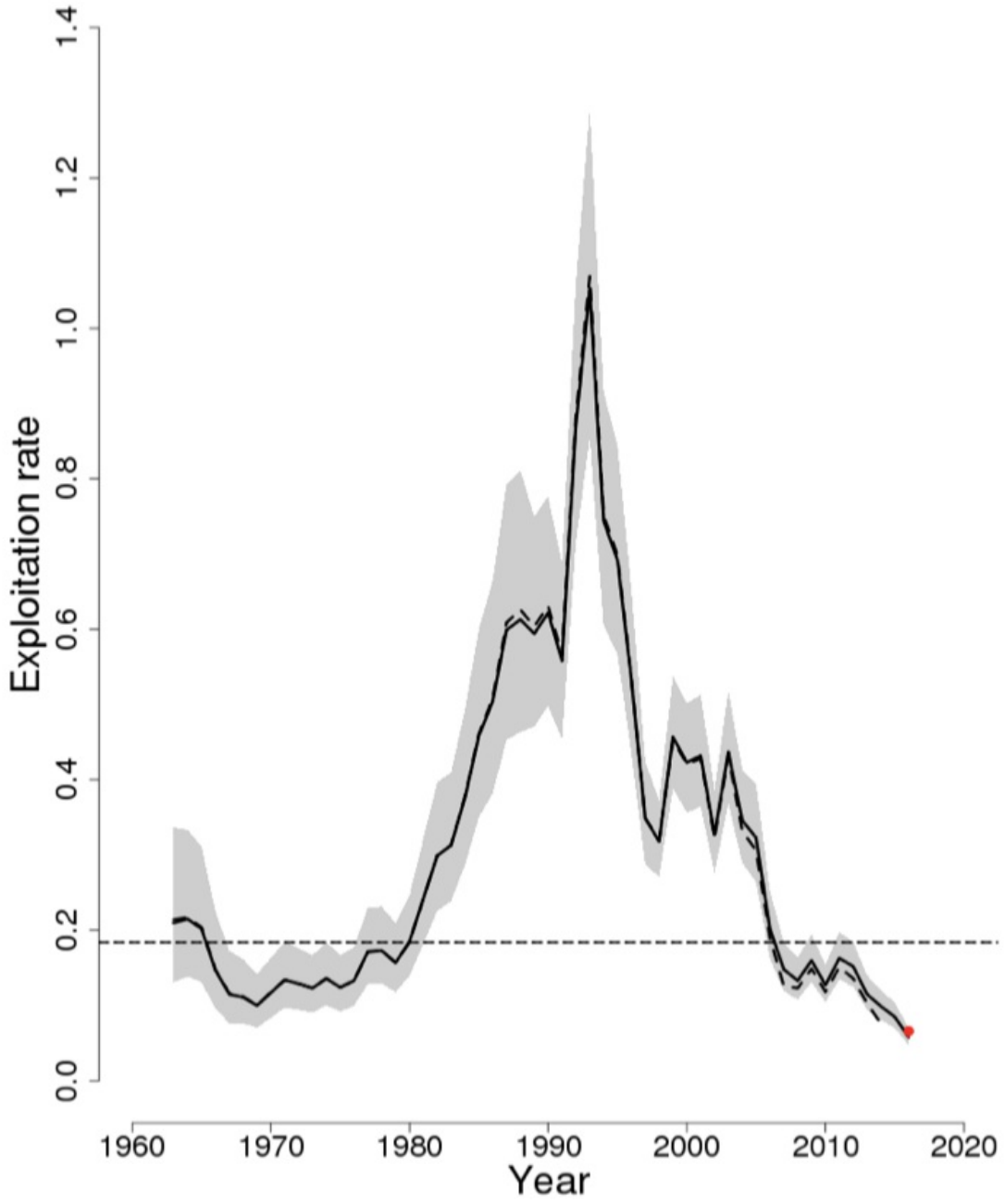

Figure 38: Trends in the fully selected fishing mortality (F_{FULL}) of white hake between 1963 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.1839; horizontal dashed line) based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown {Sosebee 2017}.

Winter skate

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For winter skate, the 2017 to 2019 NEFSC autumn average biomass index of 8.61 kg/tow is above the biomass threshold reference point (2.83 kg/tow) and above the B_{MSY} proxy (5.66 kg/tow; see Figure 39) (Sosebee 2020). Because the stock is not overfished, but there is uncertainty associated with using the survey index as a proxy for abundance, a score of low concern is given (rather than a score of very low concern).

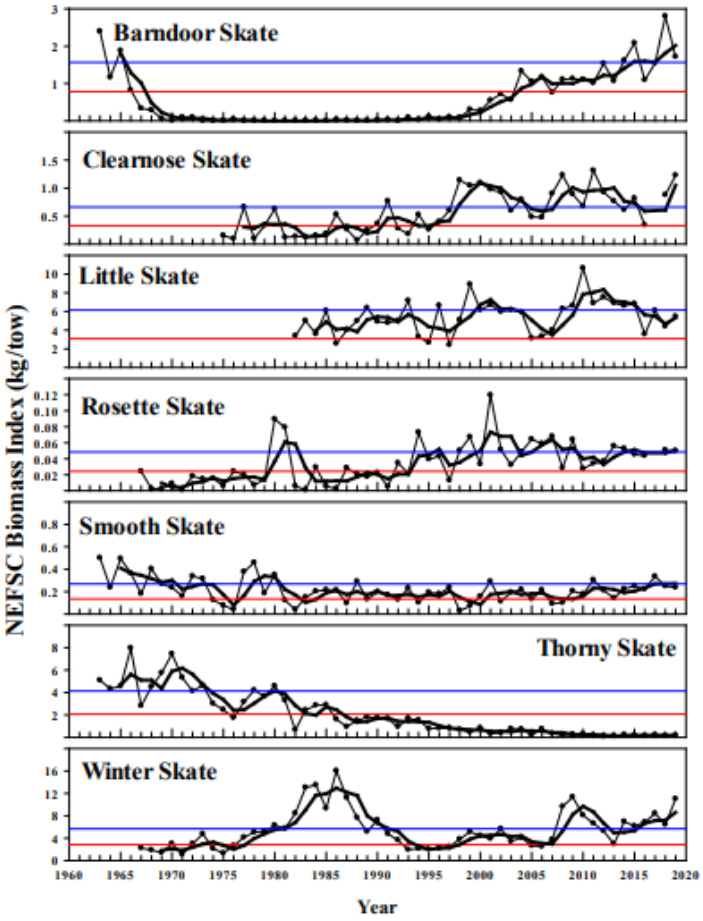

Figure 39: Northeast Fisheries Science Center survey biomass indices (kg/tow). Thin lines with symbols are annual indices, thick lines are 3-year moving averages, and the thin horizontal lines are the management biomass thresholds and targets. From (Sosebee 2020).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

Low Concern

For winter skate, the 2017 to 2019 average index is above the 2016 to 2018 index by 19.2% (Sosebee 2020). Because the stock is not undergoing overfishing, fishing mortality is considered a low concern.

Justification:

The fishing mortality reference points are based on changes in survey biomass indices. If the 3-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY}, and overfishing is occurring for that skate species (Sosebee 2020).

Witch flounder

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

High Concern

Based on the 2017 witch flounder stock assessment, the exploitable biomass in 2016 was estimated to be 14,563 mt (see Figure 40) (Wigley 2017b). The stock status is considered to be overfished, and stock condition remains poor (Wigley 2017b). According to the NMFS first quarter 2018 update, witch flounder is overfished and in year 8 of a 7-year rebuilding plan (NMFS 2018c). Although there is no biomass reference point defined, the stock is in poor condition and considered to be overfished; therefore, abundance is scored a high concern.

Justification:

Exploitable biomass is defined as the arithmetic average of the 2016 NEFSC spring and 2015 NEFSC fall surveys population biomass estimates and converted to exploitable biomass using 0.9, based on examination of survey and fishery selectivity patterns (Wigley 2017b).

The overfished and overfishing occurring NMFS stock status determinations for witch flounder are based on the 2016 assessment. There are no biomass or fishing mortality reference points in this stock assessment; however, stock condition was and remains poor (Wigley 2017b).

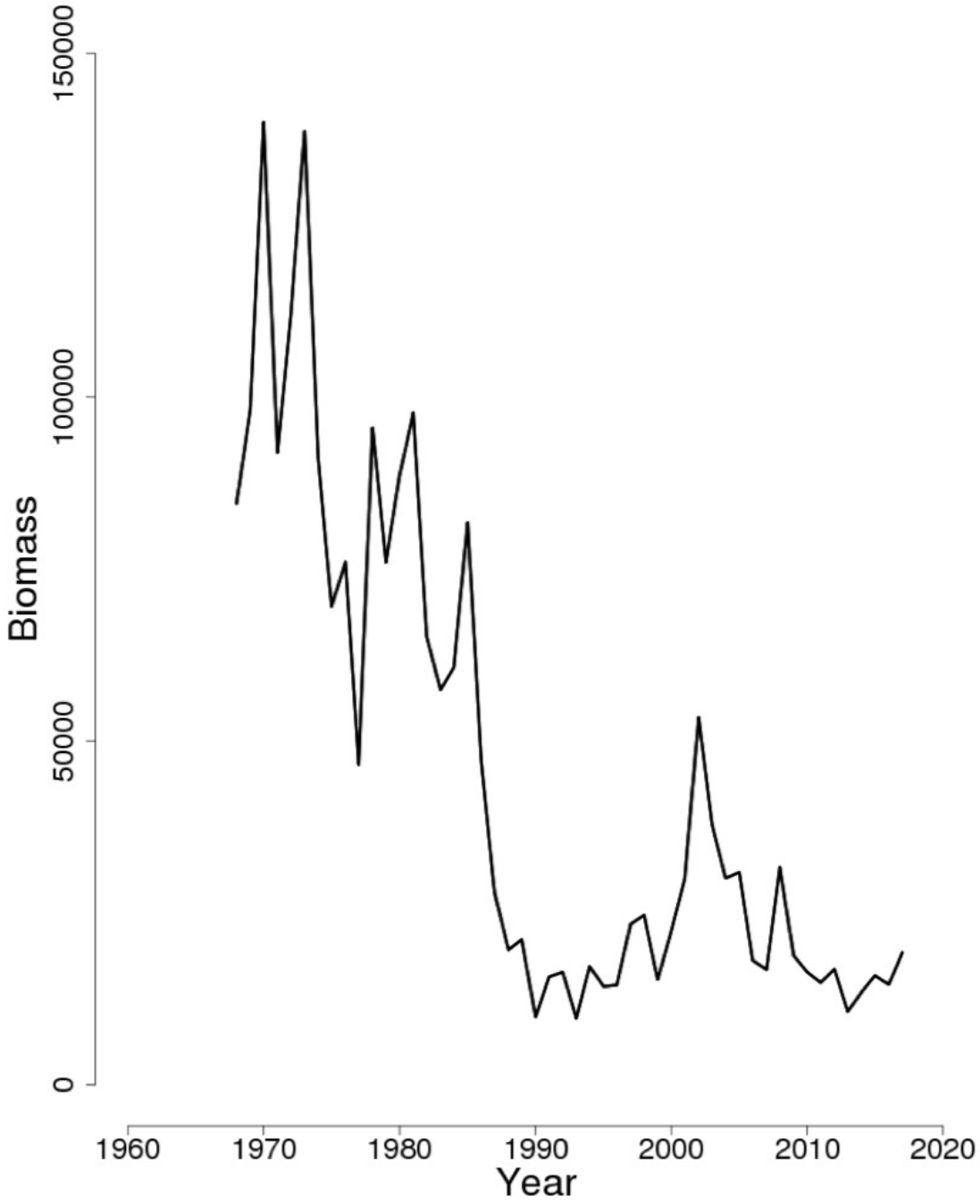

Figure 40: Trends in exploitable biomass (mt) of witch flounder between 1968 and 2017 from the current assessment (Wigley 2017b).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

Moderate Concern

Based on the 2017 witch flounder stock assessment, the 2016 exploitation rate was estimated to be 0.035 (see Figure 41) (Wigley 2017b). Overfishing is unknown due to a lack of biological reference points associated with the empirical approach, but the stock condition remains poor (Wigley 2017b). Because it is unclear whether the stock is undergoing overfishing, fishing mortality is scored a moderate concern.

Justification:

The exploitation rate is defined as the catch divided by the 2016 exploitable biomass (Wigley 2017b).

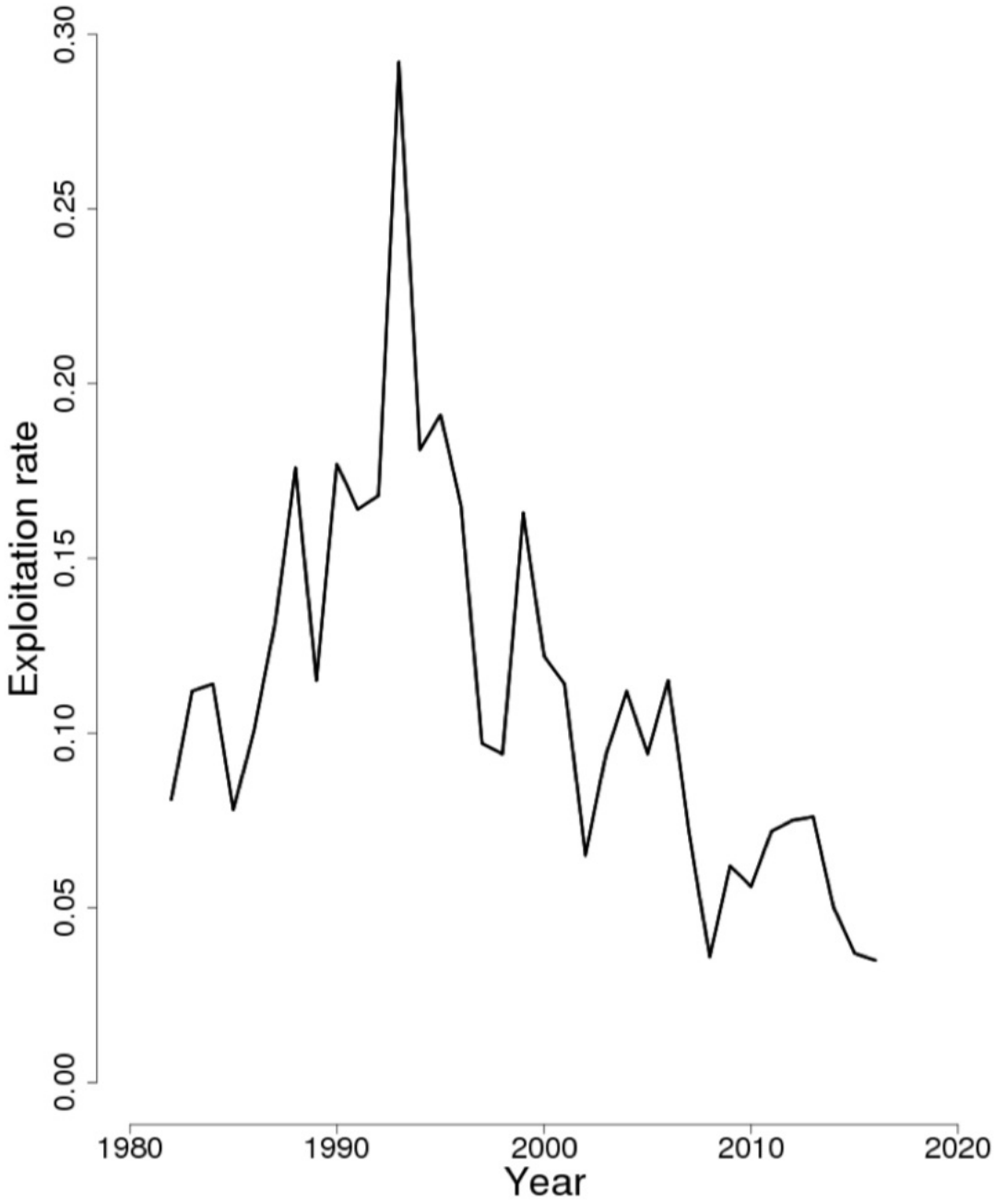

Figure 41: Trends in the exploitation rate (catch/exploitable biomass) of witch flounder between 1982 and 2016 from the current assessment (Wigley 2017b).

Yellowtail flounder

Factor 2.1 - Abundance

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States

High Concern

The most recent biomass estimate for Georges Bank yellowtail flounder is 2,077 mt, based on the 2019 NMFS fall bottom trawl survey and the 2020 DFO spring survey (the 2020 NMFS spring bottom trawl survey was not conducted due to the COVID-19 pandemic) (TRAC 2020). There is no biological reference point available for the biomass of Georges Bank yellowtail flounder; however, the current biomass reflects a 97% decrease in survey abundance since 2010 (TRAC 2020). According to the NMFS second quarter 2021 update, Georges Bank yellowtail flounder is overfished and in year 15 of a 26-year rebuilding plan (NMFS 2021). Because the stock is considered overfished, abundance is scored a high concern.

Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

High Concern

Based on the 2017 Cape Cod–Gulf of Maine yellowtail flounder stock assessment, spawning stock biomass (SSB) in 2016 was estimated to be 1,191 mt, which is 26% of the biomass target (SSB_{MSY} proxy = 4,640; see Figure 42) (Alade 2017). According to the NMFS fourth quarter 2017 update, Cape Cod–Gulf of Maine yellowtail flounder is overfished and in year 14 of a 19-year rebuilding plan {NMFS 2017}. Because the stock is overfished, abundance is scored a high concern.

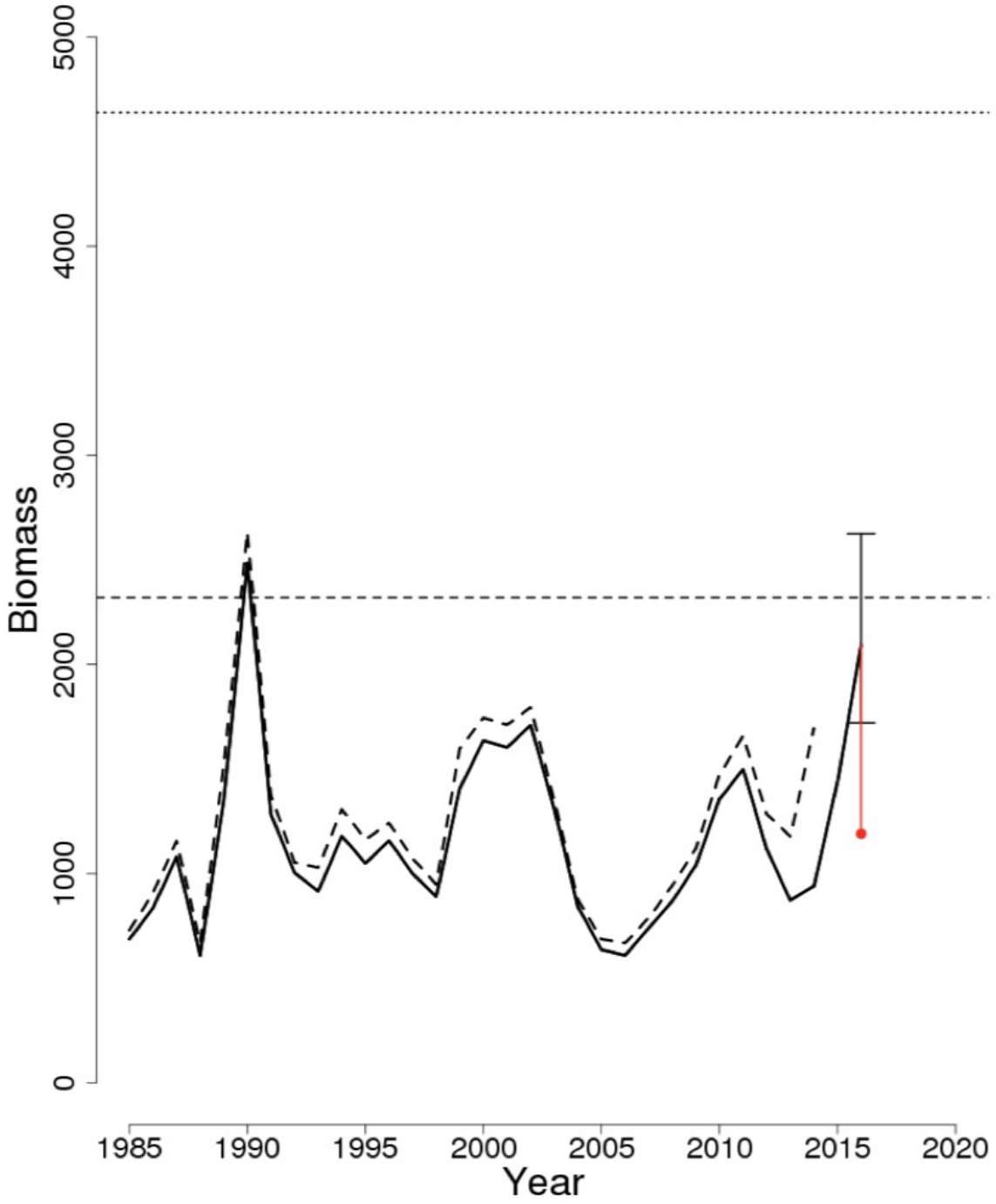

Figure 42: Trends in spawning stock biomass of Cape Cod–Gulf of Maine yellowtail flounder between 1985 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY} proxy; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY} proxy; horizontal dotted line) based on the 2017 assessment. The 90% bootstrap probability intervals are shown (Alade 2017).

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States

High Concern

The Transboundary Management Guidance Committee (TMGC) has implemented a strategy that seeks to minimize the risk of exceeding the fishing mortality reference, F_{REF} = 0.25 (TRAC 2020).

Currently, there is no assessment model, and as a result, current fishing mortality cannot be determined. The current catch is low relative to the estimated biomass from surveys, resulting in a low relative F; fishing is not believed to be a major contributor to current stock status (TRAC 2020). But, total catches are uncertain because some elements are poorly understood (e.g., research catch is not included, and fisher behavior has been found to change on observed trips). This uncertainty makes it difficult to estimate fishing mortality and total mortality (TRAC 2020).

According to the NMFS second quarter 2021 update, Georges Bank yellowtail flounder is undergoing overfishing and in year 15 of a 26-year rebuilding plan (NMFS 2021). Because there is significant uncertainty regarding the impact of fishing on Georges Bank yellowtail flounder and NMFS considers overfishing to be occurring, a score of high concern is given.

Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

High Concern

Based on the 2017 Cape Cod–Gulf of Maine yellowtail flounder stock assessment, the 2016 fully selected fishing mortality was estimated to be 0.314, which is 115% of the overfishing threshold proxy (F_{MSY} proxy = 0.273; see Figure 43) (Alade 2017). The stock is undergoing overfishing, so fishing mortality is scored a high concern.

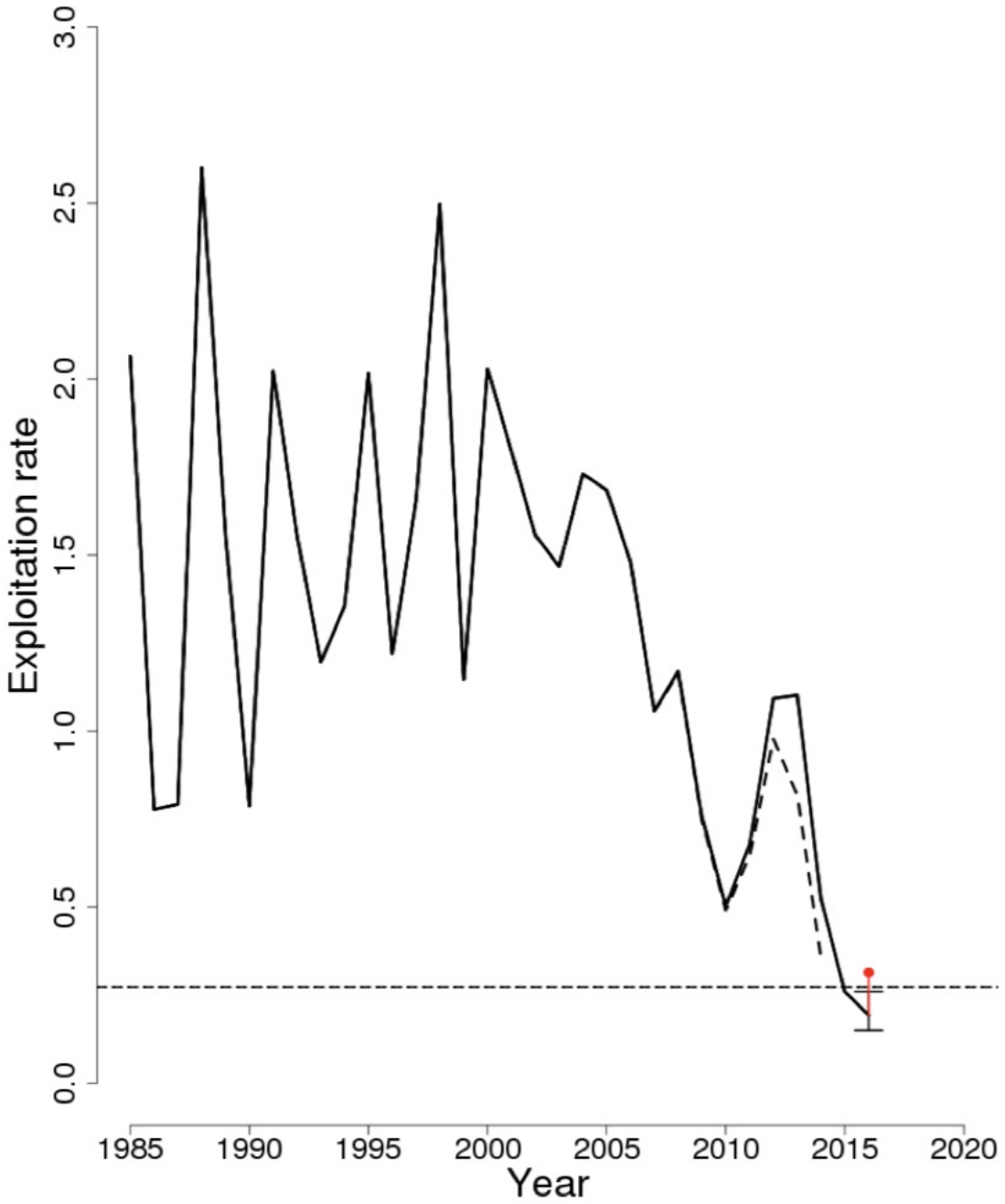

Figure 43: Trends in the fully selected fishing mortality (F_{FULL}) of Cape Cod–Gulf of Maine yellowtail flounder between 1985 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $F_{THRESHOLD}$ (F_{MSY} proxy = 0.273; horizontal dashed line). The 90% bootstrap probability intervals are shown (Alade 2017).

Factor 2.3 - Discard Rate/Landings

Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States

< 100%
A 2017 report estimated discards of 14 federally managed fish and invertebrate species groups during the July 2015 through June 2016 period (Wigley and Tholke 2017). This report found that, in the NE large mesh otter trawl fishery, 76% of skate complex catch and 90% of spiny dogfish catch were discarded, mostly because there is no market for them (Wigley and Tholke 2017). Of all 14 Standardized By-catch Reporting Methodology (SBRM) species groups combined, roughly 43% were discarded. In total (including non-SBRM species), 47% of landed species were discarded. These comprised species in the skate complex (67%), non-SBRM species (14%), dogfish (8%), large mesh groundfish (5%), goosefish/monkfish (3%), and small mesh groundfish (2%) (Wigley and Tholke 2017). Because total discards in this fishery are less than 100%, a multiplying factor of 1 is given.

Justification:
Each year, the majority of fish and invertebrate by-catch by weight in the Greater Atlantic comprises three species: skate complex, spiny dogfish (*Squalus acanthias*), and sea scallop (*Placopecten magellanicus*), with skate complex having the highest by-catch estimates (NMFS 2016). Skate species are believed to have a higher post-release survival rate than other fish species.

The data sets used include July 2015 through June 2016 data from the Northeast Fisheries Observer Program (NEFOP) database, the Vessel Trip Report (VTR) database, the Northeast Fisheries Science Center (NEFSC) commercial landings database, and the National Oceanic and Atmospheric Administration Marine Recreational Information Program (MRIP) database (Wigley and Tholke 2017).

It is worth noting that, in recent years, fishers have been adopting more selective gears in an attempt to reduce by-catch of nontarget, low abundance species. Separator trawls and Ruhle trawls are designed to take advantage of the different behaviors of different species: catching species that tend to swim upward, such as haddock, and allowing the release of species that tend to swim down during capture, such as cod and flatfish.

Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

< 100%
A 2017 report, which estimated discards of 14 federally managed fish and invertebrate species groups during the July 2015 through June 2016 period, found that, in the NE handline fishery, no species of the skate complex were discarded and only 0.08% of spiny dogfish catch was discarded, mostly because there is no market for them (Wigley and Tholke 2017). Of all 14 Standardized By-catch Reporting Methodology (SBRM) species groups combined, 3.3% were discarded. In total (including non-SBRM species), 6% of caught species were discarded. These comprised both SBRM and non-SBRM species (50% each) (Wigley and Tholke 2017). Because total discards in this fishery are less than 100%, a multiplying factor of 1 is given.

Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States

< 100%

A 2017 report estimated discards of 14 federally managed fish and invertebrate species groups during the July 2015 through June 2016 period (Wigley and Tholke 2017). This report found that, in the NE large mesh gillnet fishery, 35% of skate complex catch and 36% of spiny dogfish catch were discarded, mostly because there is no market for them (Wigley and Tholke 2017). Of all 14 Standardized By-catch Reporting Methodology (SBRM) species groups combined, roughly 26% were discarded. In total (including non-SBRM species), 29% of caught species were discarded. These comprised dogfish (72%), non-SBRM species (17%), and other SBRM species (12%) (Wigley and Tholke 2017). Because total discards in this fishery are less than 100%, a multiplying factor of 1 is given.

Justification:

Each year, the majority of fish and invertebrate by-catch by weight in the Greater Atlantic comprises three species: skate complex, spiny dogfish (*Squalus acanthias*), and sea scallop (*Placopecten magellanicus*), with skate complex having the highest by-catch estimates (NMFS 2016). Skate species are believed to have a higher post-release survival rate than other fish species.

Georges Bank Stock | Atlantic, Northwest | Set longlines | United States
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States

< 100%

A 2017 report estimated discards of 14 federally managed fish and invertebrate species groups during the July 2015 through June 2016 period (Wigley and Tholke 2017). This report found that, in the NE longline fishery, 95% of skate complex catch and 14% of spiny dogfish catch were discarded, mostly because there is no market for them (Wigley and Tholke 2017). Of all 14 Standardized By-catch Reporting Methodology (SBRM) species groups combined, roughly 18% were discarded. These comprised dogfish (71%), other SBRM species (27%), and non-SBRM species (2%) (Wigley and Tholke 2017). Because total discards in this fishery are less than 100%, a multiplying factor of 1 is given.

Justification:

Each year, the majority of fish and invertebrate by-catch by weight in the Greater Atlantic comprises three species: skate complex, spiny dogfish (*Squalus acanthias*), and sea scallop (*Placopecten magellanicus*), with skate complex having the highest by-catch estimates (NMFS 2016). Skate species are believed to have a higher post-release survival rate than other fish species.

Criterion 3: Management Effectiveness

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

- *5 (Very Low Concern) — Meets the standards of 'highly effective' for all five factors considered.*
- *4 (Low Concern) — Meets the standards of 'highly effective' for 'management strategy and implementation' and at least 'moderately effective' for all other factors.*
- *3 (Moderate Concern) — Meets the standards for at least 'moderately effective' for all five factors.*
- *2 (High Concern) — At a minimum, meets standards for 'moderately effective' for Management Strategy and Implementation and Bycatch Strategy, but at least one other factor is rated 'ineffective.'*
- *1 (Very High Concern) — Management Strategy and Implementation and/or Bycatch Management are 'ineffective.'*
- *0 (Critical) — Management Strategy and Implementation is 'critical'.*

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***

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

- The fishery is managed to sustain the long-term productivity of all impacted species.

Five factors are evaluated in Criterion 3: Management Strategy and Implementation, Bycatch Strategy, Scientific Research/Monitoring, Enforcement of Regulations, and Inclusion of Stakeholders. Each is scored as either 'highly effective', 'moderately effective', 'ineffective,' or 'critical'. The final Criterion 3 score is determined as follows:

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Georges Bank | Atlantic, Northwest | Bottom trawls | United States	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	Moderately Effective	Highly effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**

Georges Bank | Atlantic, Northwest | Set gillnets | United States	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Georges Bank | Atlantic, Northwest | Set longlines | United States	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	Moderately Effective	Highly effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Gulf of Maine | Atlantic, Northwest | Set longlines | United States	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	**Yellow (3.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - 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? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - 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.

Factor 3.5 - 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, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.

Factor 3.1 - Management Strategy And Implementation

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States
Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Moderately Effective

The New England fisheries for cod, haddock, and pollock are managed by the New England Fisheries Management Council (NEFMC) through the Northeast Multispecies Fishery Management Plan (NE Multispecies FMP), alongside nine other species of flatfish and groundfish. Originally enacted in 1985, the NE Multispecies FMP has been amended a number of times to improve the management of the relevant fisheries, including the introduction of gear restrictions (e.g., mesh size, number of nets/hooks), seasonal closures, spatial closures, minimum landing sizes, trip limits on pounds of fish landed, limited access (a restriction on the number of vessels able to work within the fishery), effort limits based on a days-at-sea (DAS) system, and most recently, a system based on transferable quotas set against a hard annual catch limit (ACL) (this replaced the previous effort-based limitation of the DAS system in 2010).

In 2010, Amendment 16 to the NE Multispecies FMP greatly expanded catch share, or sector-based, management. The sectors function essentially as cooperatives because they are self-selecting and largely self-regulating (albeit within a framework designated and closely monitored by federal agencies). The sectors are exempt from many of the effort controls previously used to manage the fishery; instead, they adhere to an overall hard quota known as an annual catch limit (ACL), which is divided into annual catch entitlements (ACE) that are allocated to each sector. The shift to output management instead of effort management enables efficiency gains by allowing increased operational efficiency. Although it is optional to join the sectors, the majority of fishers have chosen to participate: sector vessels made 65% of all NE multispecies landings in 2010, including 98% of groundfish and 54% of nongroundfish (Kitts et al. 2011)(Labaree 2012)(Federal Register 2012). Under the Magnuson-Stevens Act, the ACL must be set as less than or equal to the acceptable biological catch (ABC) (to account for management uncertainty), which must be set as less than or equal to the overfishing level (OFL) (to account for any scientific uncertainty in the stock assessment; see Figure 44) (Federal Register 2009).

Fishing mortality targets are set for each stock independently, based on achieving the maximum sustainable yield (MSY) in the long term. Therefore, for stocks that are overfished (and may also be subject to overfishing), the target fishing mortality is set at a level that will have a reasonable probability (>50%) of ensuring the rebuilding of the stock within the timeline set within the relevant rebuilding program. But if a sector were to approach the ACE for one of the target stocks, then the area inhabited by that stock would be closed to all gears capable of catching that stock, resulting in a potential "underharvest" of more-abundant stocks. The sector system allows fishers to share, trade, or lease quota within a fishery, thus reducing the chance of overfishing depleted stocks while targeting more-abundant stocks; and if a sector is nearing its quota for a particular species, it may be possible to lease it from another sector.

There are a number of stocks of concern affected by the fisheries managed under the NE Multispecies FMP, and the management plan has had varying degrees of success in recovering these stocks. The most recent stock assessments have shown that a number of stocks of concern have not yet been rebuilt and that the targets set within the rebuilding programs have not been met (e.g., Georges Bank cod, Gulf of Maine cod, Gulf of Maine yellowtail flounder, Georges Bank yellowtail flounder, and witch flounder) (Palmer 2017a)(Legault 2017a)(Legault 2017b)(Alade 2017)(Wigley 2017b). But a number of stocks have rebuilt before the end of the rebuilding period (typically due to strong recruitment and good survival of abundant year-classes during periods of reduced exploitation). These stocks include Georges Bank haddock, Gulf of Maine haddock, Acadian redfish, and pollock (Brooks 2017)(Palmer 2017b)(Linton 2017a)(Linton 2017b). Although there is concern that some of the stocks have yet to meet their rebuilding targets, other stocks have rebuilt within the specified timelines, and the current management system is likely to improve rebuilding of stocks due to reduced levels of discarding (which was a result of Amendment 16).

There have been some concerns with the management strategy in the past, particularly with respect to depleted stocks. In addition, target total allowable catches (TACs) have been set too high because of errors in stock assessments (a retrospective pattern suggesting that the stock was in better shape than it was), and there has been a need for increased precaution. But the management system has substantially changed under Amendment 16, which is expected to reduce the race to fish and to improve conservation outcomes. For example, discarding appears to have been reduced, and the fishery now relies on hard ACLs (which include discards) rather than target TACs—all of which helps reduce the likelihood of exceeding sustainable fishing mortality rates for targeted stocks. In addition, sectors have not exceeded their ACEs, whereas in the past it was possible for target TACs to be exceeded because the regulations were based on effort control (DAS) rather than output control (Kitts et al. 2011){GARFO 2018} (pers. comm., J. Cournane 13 July 2018). But, the Groundfish Plan Development Team's preliminary analysis of observer data to explore potential discarding of legal-sized cod revealed evidence that suggests noncompliance may be occurring (NEFMC 2018a).

ACLs/AMs based on scientific input are in place for more than 70% of the stocks in the FMP. Amendment 16 has led to improvements in constraining harvest to ACLs and to reduced discarding, resulting in sectors not exceeding their ACEs. But, because rebuilding targets for certain species have not yet been met and there is potential underreporting of discarding, there is insufficient evidence that fishery management is being implemented successfully. Therefore, management strategy and implementation is scored moderately effective.

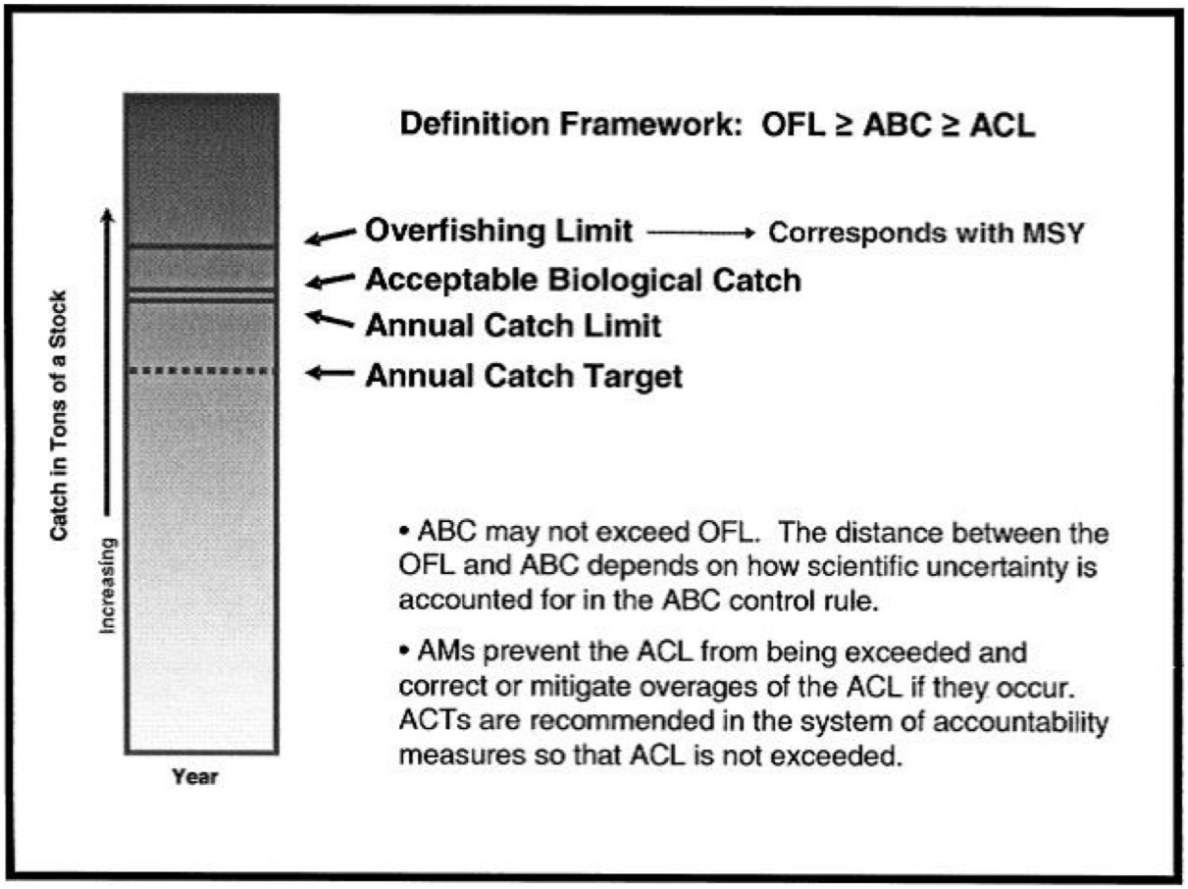

Figure 44: Relationship between OFL, ABC, ACL, and ACT as described by the National Marine Fisheries Service (NOAA 2009).

Factor 3.2 - Bycatch Strategy

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

Moderately Effective

The Magnuson-Stevens Act (MSA) requires fisheries management to prevent overfishing from occurring and for depleted and overfished stocks to be rebuilt. Marine mammals are further protected under the Marine Mammal Protection Act (MMPA) of 1972, which requires the maintenance of marine mammal populations above their optimum sustainable level and the rebuilding of depleted populations. The Endangered Species Act of 1973 provides protection for species that are endangered or threatened with extinction, including fish, marine mammals, turtles, and seabirds. These three pieces of legislation provide a framework directed at ensuring that FMPs are designed and implemented in a way that prevents overfishing and allows recovery of stocks caught within a fishery, whether the stocks are targeted or caught incidentally.

The MSA requires that all management measures must minimize by-catch to the extent practicable, and minimize mortality of by-catch when by-catch is unavoidable (Magnuson-Stevens Fishery Conservation and Management Act 1976). To comply with the MSA requirement of including a standardized by-catch reporting methodology (SBRM) in all FMPs, and prompted by successful lawsuits by Oceana, the Conservation Law Foundation, and the Natural Resources Defense Council, the NEFMC and the Mid-Atlantic Fisheries Management Council jointly developed an omnibus amendment, corresponding to Amendment 15 to the NE multispecies FMP. The SBRM amendment is meant to "establish, maintain, and utilize biological sampling programs designed to minimize bias to the extent practicable, thus promoting accuracy while maintaining sufficiently high levels of precision" (Federal Register 2008). The original SBRM was considered inadequate and was vacated by the courts in 2011. A revised SBRM Amendment was adopted by both the Mid-Atlantic and New England Councils in 2014, and approved by NMFS in March 2015; the final rule became effective in July 2015 (NEFMC 2015)(NEFSC 2018a). This action establishes standards of precision for by-catch estimation (selecting the combined ratio method using discard-to-kept pounds, using a coefficient of variation [CV] of 30%, deciphering the number of observed sea days [and trips] necessary to achieve a CV of 30% for each species, and conducting analyses to evaluate potential sources of bias in NEFOP data) for all Northeast Region fisheries, and serves to document the SBRM established for all fisheries managed through the two Councils (NEFMC 2015)(NEFSC 2018a).

To be approved to operate, sectors must submit an operations plan to the regional administrator (NMFS) that details (among other things) how by-catch of regulated species and ocean pout will be avoided to prevent allowable catch entitlement overages. Currently, two types of observers are associated with the NE multispecies fishery: Northeast Fishery Observer Program (NEFOP) observers, which is a federally funded program, and at-sea monitors (ASM), which are funded by a third party and managed by the Northeast Fisheries Science Center's Fisheries Sampling Branch (NEFSC 2018c).

Amendment 23 to the NE multispecies FMP has been proposed to adjust the groundfish monitoring program in order to improve reliability and accountability (NEFMC 2017). The Council plans to explore alternatives to at-sea observers, and may consider changes to any part of the monitoring and reporting system for groundfish (NEFMC 2017). At this point, there is adequate observer coverage (15%, which is the coverage requirement specified in the Standardized By-catch Reporting Methodology), and data collection and analysis are sufficient to ensure that goals are being met for both by-catch and retained species (NOAA 2018b).

In the bottom trawl fishery, large amounts of landed by-catch are being discarded in high quantities (refer to Criterion 2.3), such as skate complex species, spiny dogfish, and certain large mesh groundfish, mostly because of their lack of market value (Wigley and Tholke 2017). In addition, endangered, threatened, and protected (ETP) species (e.g., Atlantic halibut), marine mammals (e.g., Atlantic white-sided dolphin, gray seal, harp seal, harbor seal, harbor porpoise, long-finned pilot whale, minke whale, and short-beaked common dolphin), and overfished species (e.g., ocean pout, thorny skate, witch flounder, and yellowtail flounder) are being caught as by-catch.

A reduction in discarding is being actively addressed by both NMFS and fishery participants. The NMFS Saltonstall-Kennedy Grant Program, which funds projects that address the needs of fishing communities, sponsors gear research including trawls such as the Eliminator Trawl and the Haddock Separator Trawl, both of which have been recognized for use in fisheries regulations (DeAlteris and Allen 2018). In addition, NMFS has sponsored projects designed to help fishers avoid areas with catches of prohibited or overfished species (DeAlteris and Allen 2018). Finally, there are stock rebuilding plans for certain overfished species that are part of the FMP, and fishing mortality is controlled and closely monitored in the stock rebuilding process. Nevertheless, management measures that are currently in place have not been entirely effective, as evidenced by the continuing large amount of overfished and ETP by-catch.

Because there are by-catch reduction measures in place, but mitigation measures with respect to ETP species, marine mammals, and overfished species have not been fully successful, and there is potential underreporting of discarding (see Criterion 3.1), management strategy is scored moderately effective.

Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Highly effective

The Magnuson-Stevens Act (MSA) requires fisheries management to prevent overfishing from occurring, and for depleted and overfished stocks to be rebuilt. Marine mammals are further protected under the Marine Mammal Protection Act (MMPA) of 1972, which requires the maintenance of marine mammal populations above their optimum sustainable level and the rebuilding of depleted populations. The Endangered Species Act of 1973 provides protection for species that are endangered or threatened with extinction, including fish, marine mammals, turtles, and seabirds. These three pieces of legislation provide a framework directed at ensuring that FMPs are designed and implemented in a way that prevents overfishing and allows recovery of stocks caught within a fishery, whether the stocks are targeted or caught incidentally.

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England Councils in 2014, and approved by NMFS in March 2015; the final rule became effective in July 2015 (NEFMC 2015)(NEFSC 2018a). This action establishes standards of precision for by-catch estimation (selecting the combined ratio method using discard-to-kept pounds, using a coefficient of variation [CV] of 30%, deciphering the number of observed sea days [and trips] necessary to achieve a CV of 30% for each species, and conducting analyses to evaluate potential sources of bias in NEFOP data) for all Northeast Region fisheries; it also serves to document the SBRM established for all fisheries managed through the two Councils (NEFMC 2015)(NEFSC 2018a).

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The handline fishery has very little by-catch and no recorded interactions with marine mammals or endangered species, so there are no needed reduction measures in place, and management strategy is scored highly effective.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

Ineffective

The Magnuson-Stevens Act (MSA) requires fisheries management to prevent overfishing from occurring, and for depleted and overfished stocks to be rebuilt. Marine mammals are further protected under the Marine Mammal Protection Act (MMPA) of 1972, which requires the maintenance of marine mammal populations above their optimum sustainable level and the rebuilding of depleted populations. The Endangered Species Act of 1973 provides protection for species that are endangered or threatened with extinction, including fish, marine mammals, turtles, and seabirds. These three pieces of legislation provide a framework directed at ensuring that FMPs are designed and implemented in a way that prevents overfishing and allows recovery of stocks caught within a fishery, whether the stocks are targeted or caught incidentally.

The MSA requires that all management measures must minimize by-catch to the extent practicable, and minimize mortality of by-catch when by-catch is unavoidable (Magnuson-Stevens Fishery Conservation and Management Act 1976). To comply with the MSA requirement of including a

standardized by-catch reporting methodology (SBRM) in all FMPs, and prompted by successful lawsuits by Oceana, the Conservation Law Foundation, and the Natural Resources Defense Council, the NEFMC and the Mid-Atlantic Fisheries Management Council jointly developed an omnibus amendment, corresponding to Amendment 15 to the NE Multispecies FMP. The SBRM amendment is meant to "establish, maintain, and utilize biological sampling programs designed to minimize bias to the extent practicable, thus promoting accuracy while maintaining sufficiently high levels of precision" (Federal Register 2008). The original SBRM was considered inadequate and was vacated by the courts in 2011. A revised SBRM Amendment was adopted by both the Mid-Atlantic and New England Councils in 2014, and approved by NMFS in March 2015; the final rule became effective in July 2015 (NEFMC 2015)(NEFSC 2018a). This action establishes standards of precision for by-catch estimation (selecting the combined ratio method using discard-to-kept pounds, using a coefficient of variation [CV] of 30%, deciphering the number of observed sea days [and trips] necessary to achieve a CV of 30% for each species, and conducting analyses to evaluate potential sources of bias in NEFOP data) for all Northeast Region fisheries, and serves to document the SBRM established for all fisheries managed through the two Councils (NEFMC 2015)(NEFSC 2018a).

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The Atlantic Large Whale Take Reduction Plan (ALWTRP) was developed under the MMPA in 1997 to reduce mortality and serious injury (SIM) to whales due to incidental take in U.S. commercial fisheries that interact with strategic stocks (NOAA 2012)(NOAA 2018c). To achieve this goal, several measures have been implemented including requirements of sinking groundline, weak links, a vertical line rule, gear marking requirements, and area closures {Gouveia & Swails 2017}(NOAA 2018c). But, the Take Reduction Plans (TRPs) in the northeastern U.S. have been regarded as the least successful of the U.S. TRPs at reducing marine mammal by-catch (McDonald et al. 2016). To date, the ALWTRP has failed to meet its statutory goal of reducing SIM to a level below the potential biological removal (PBR), and to a level approaching zero (the Zero Mortality Rate Goal). Many management measures have been ineffective in reducing entanglement rates (based on data from 1999 to 2009, inclusive of entanglements attributed to unidentified fisheries) {Pace et al. 2014}, because annual mortality and serious injury due to entanglement continues to exceed PBR (NOAA 2019c). The impacts of introducing regulations such as the "sinking groundline rule" in 2009 and the

"vertical line rule" (50 Federal Register 2014) in 2015 are not fully understood due to limited data and analyses (the latest marine mammal stock assessments consider data from 2014 to 2018). But, for most entanglement interactions, gear is not recovered or is unidentifiable (77% of entanglements between 2000 and 2018) and, although the groundfish gillnet fishery has not been identified specifically in recent interactions, most interactions cannot be attributed to a specific fishery (NOAA 2019c). In 2014, a whale carcass was found south of Nantucket entangled in what was most likely gillnet gear {Sharp et al. 2019}{Sharp et al. 2019 Supplemental}.

A batched biological opinion published in May 2021 considers the impact of fisheries in U.S. federal waters on species listed under the Endangered Species Act (ESA) (NMFS 2021a). Although the biological opinion reached a determination that fisheries in U.S. federal waters will not jeopardize the continued existence of North Atlantic right whale, NOAA predicts that the Conservation Framework will take 9 years to reduce the impact of U.S. fisheries to below PBR (currently 0.8) (Table 1). NOAA's analysis indicates that the proposed management measures will fail to limit the impact of U.S. fisheries to below PBR within a reasonable time frame consistent with the Seafood Watch Fisheries Standard with respect to the Marine Mammal Protection Act. The impact of the Risk Reduction Rule is expected to reduce the impact of U.S. pot and trap fisheries from 4.57 SIMs per year to 2.56 SIMs, and 2.69 SIMs per year in federal waters inclusive of gillnet interactions.

Table 1: Actions to be taken under the ALWTRP Conservation Framework (Adapted from (NMFS 2021a)).

Phase	Year	Framework Action Description
	Annually	Provide updates, as appropriate, on the implementation of the Framework to the New England and Mid-Atlantic Fishery Management Councils, Atlantic States Marine Fisheries Commission, and ALWTRT.
1	2021	NMFS implements the MMPA ALWTRP rule-making, focused on 60% reduction in right whale M/SI incidental to American lobster and Jonah crab trap/pot fisheries. In federal waters, this action reduces M/SIs, on average annually, to 2.69. Implementation for certain measures will begin in 2021; others will be phased over time.
2	2023	NMFS implements rule-making to reduce M/SI in federal gillnet and other pot/trap (i.e., other than lobster and Jonah crab fisheries included in Phase 1) fisheries by 60%, reducing M/SI, on average annually, to 2.61. The ALWTRT will convene in 2021 to recommend modifications to the ALWTRP to address risk in the remaining fixed gear fisheries. This phase will consider how any changes to the ALWTRP contribute to achieving the target reduction under this Framework.
Evaluation	2023–2024	NMFS evaluates any updated or new data on right whale population and threats, to assess progress toward achieving the conservation goals of this Framework. At this time, we will also assess measures taken by Canada to address M/SI in Canadian waters.
3	2025	NMFS implements rule-making to further reduce M/SI by 60% in all federal fixed gear fisheries, reducing M/SI, on average annually, to 1.04.
Evaluation	2025–2026	NMFS evaluates measures implemented in 2025 action as well as new data on right whale population and threats, to assess progress toward achieving the conservation goals of this Framework. Based on the results of this evaluation, NMFS will determine the degree to which additional measures are needed to ensure the fisheries are not appreciably reducing the likelihood of survival and recovery. As described above, if actions outside the federal fisheries reduce risk to right whales by 0.5 M/SI on average annually (1 whale every 2 years), the M/SI reduction requirement in Phase 4 will be reduced from 87% to 39%. If M/SI from other sources is reduced by greater than one M/SI on average annually, we will evaluate whether further action in the federal fisheries is needed.
4	2030	In accordance with the goals identified in the 2025–2026 evaluation, NMFS implements regulations to further reduce M/SI (up to 87%) in fixed gear fisheries.

In July 2022, a District Court ruled that the 2021 Final Rule and 2021 Biological Opinion were invalid, in part due to the concerns noted above. Specifically, the court ruled that the Risk Reduction

Rule and 2021 Biological Opinion violated requirements of the Endangered Species Act and Marine Mammal Protection Act on two accounts: 1) "through its failure to satisfy the required antecedent in section 101 (a)(5)(E) of the MMPA before issuing an ITS"; and 2) "the Final Rule did not attempt to meet the take-reduction measures that it was obligated to under the MMPA within the required timeline" {US District Court 2022}.

To address harbor porpoise mortality in the sink gillnet fisheries, NMFS updated its Harbor Porpoise Take Reduction Plan (HPTRP) to reduce mortality below the PBR threshold level. Measures implemented in New England include new areas with acoustic deterrent ("pinger") requirements, as well as "consequence" closure areas that would seasonally close certain areas to gillnet fishing if the observed average by-catch rate exceeds the target by-catch rate for two consecutive management seasons. Acoustic deterrents, or "pingers," are highly effective in reducing harbor porpoise by-catch in gillnets when used properly, with a controlled scientific study showing a 92% reduction in harbor porpoise by-catch (Kraus et al. 1997). Area closures, if triggered and properly enforced, should be highly effective too. The latest annual report to the Take Reduction Team shows no pinger violations during 2016 (this report will be updated in November 2018) (Provencher 2017). The levels of harbor porpoise by-catch for both the bottom trawl and gillnet fisheries are now below 50% of the PBR level for the species (NOAA 2018a).

Ghost fishing impacts are a concern for gillnet gear, because they tend to have the highest risk of ghost fishing compared to other gears, such as traps/pots and trawls {GGGI 2018}. Because of the amount of fishing gear used in deepwater net fisheries, the length of the fleets, and that nets are unattended for a majority of the time, it is highly likely that large quantities of nets are lost and large quantities of by-catch are caught (Brown et al. 2005). But, there is no information available from this fishery to indicate how ghost fishing has been effectively addressed.

There are by-catch reduction measures in place for certain species, the harbor porpoise by-catch levels have been reduced below PBR, and there is an active take reduction team implementing measures in an effort to reduce large whale by-catch, but improvement is still needed. In particular, the ALWTRP has been ineffective at reducing the impact of fisheries on North Atlantic right whale (going below PBR may be extremely challenging to accomplish, given the PBR is so low for the large whales) (McDonald et al. 2016), and it is uncertain whether there are measures to mitigate ghost fishing; there is also potential underreporting of discarding (see Criterion 3.1). Due to the failure of the ALWTRP to reduce impacts on North Atlantic right whale, by-catch management is considered ineffective.

Justification:
There is a need for improved cooperation between United States and Canadian agencies in addressing the impact of fisheries on North Atlantic right whale. Since 2010, there has been a shift in North Atlantic right whale distribution, with whales migrating to the Gulf of St. Lawrence during the summer months {Davis et al. 2017}. The number of entanglements involving Canadian fisheries, including snow crab fisheries, increased starting in 2016 (NOAA 2021); during the ongoing Unusual Mortality Event, 21 of the 34 known mortalities have been attributed to Canadian waters (NOAA 2021). Although U.S. and Canadian agencies have introduced measures aimed at reducing the impact of, and the risk posed by, commercial fisheries (and other human activities) on North Atlantic

right whale, the effectiveness of these measures remains unproved, and the impact of these activities continues to exceed a sustainable level (Hayes et al. 2021). Cumulative impacts (average of 8.15 SIMs per year from 2014 to 2018), particularly on SIMs from unknown sources (5.1 SIMs), remain far above levels that would allow the population to recover (PBR = 0.8) (Hayes et al. 2021), and the Conservation Framework will allow continued impacts above PBR for the next 9 years. Cumulative impacts must be addressed through a comprehensive and coordinated management strategy to account for the transboundary nature of North Atlantic right whales that migrate between U.S. and Canadian waters.

New scientific data indicate additional risks that have not been addressed in the Conservation Framework: specifically, risks related to entanglements that do not result in SIMs {Steward et al. 2021}, and range shifts due to climate change and the impact this has on food availability {Meyer-Gutbrod et al. 2021}. There is a growing body of evidence indicating that entanglements that do not result in SIMs can still have a negative impact on North Atlantic right whale populations as a result of decreased growth {Steward et al. 2021}, increased energy consumption (van der Hoop et al. 2017), declining body condition (Pettis et al. 2017), and reduced reproductive output (Fauquier et al. 2020); as scientific understanding of these issues improves, there will likely be a need for improved management to ensure that negative impacts of entanglements are avoided.

In addition to the federal management measures described above, the Massachusetts Division of Marine Fisheries has implemented a suite of measures to reduce the risk to NARW in Massachusetts state waters effective from May 1, 2021(Massachusetts Register 2022). A seasonal closure has been implemented prohibiting the use of traps and gillnets within 53% of state waters from February 1 to May 15 (with the possibility of opening after April 30, or extending beyond May 15, dependent on the presence of NARW in the area). All buoy lines in the trap fisheries are required to have a 1,700 lb breaking strength contrivance, and buoy lines shall be no thicker than 3/8" in diameter. Further to the federally required gear marking, MDMF requires all trap fisheries in state waters to include a 3-ft red mark within the surface system, and four 2-ft red marks along the buoy line (two within the top 50%, and two within the bottom 50% of the line)(MDMF 2022).

Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Moderately Effective

The Magnuson-Stevens Act (MSA) requires fisheries management to prevent overfishing from occurring, and for depleted and overfished stocks to be rebuilt. Marine mammals are further protected under the Marine Mammal Protection Act (MMPA) of 1972, which requires the maintenance of marine mammal populations above their optimum sustainable level and the rebuilding of depleted populations. The Endangered Species Act of 1973 provides protection for species that are endangered or threatened with extinction, including fish, marine mammals, turtles, and seabirds. These three pieces of legislation provide a framework directed at ensuring that FMPs are designed and implemented in a way that prevents overfishing and allows recovery of stocks caught within a fishery, whether the stocks are targeted or caught incidentally.

The MSA requires that all management measures must minimize by-catch to the extent practicable, and minimize mortality of by-catch when by-catch is unavoidable (Magnuson-Stevens Fishery Conservation and Management Act 1976). To comply with the MSA requirement of including a standardized by-catch reporting methodology (SBRM) in all FMPs, and prompted by successful lawsuits by Oceana, the Conservation Law Foundation, and the Natural Resources Defense Council, the NEFMC and the Mid-Atlantic Fisheries Management Council jointly developed an omnibus amendment, corresponding to Amendment 15 to the NE Multispecies FMP. The SBRM amendment is meant to "establish, maintain, and utilize biological sampling programs designed to minimize bias to the extent practicable, thus promoting accuracy while maintaining sufficiently high levels of precision" (Federal Register 2008). The original SBRM was considered inadequate and was vacated by the courts in 2011. A revised SBRM Amendment was adopted by both the Mid-Atlantic and New England Councils in 2014, and approved by NMFS in March 2015; the final rule became effective in July 2015 (NEFMC 2015)(NEFSC 2018a). This action establishes standards of precision for by-catch estimation (selecting the combined ratio method using discard-to-kept pounds, using a coefficient of variation [CV] of 30%, deciphering the number of observed sea days [and trips] necessary to achieve a CV of 30% for each species, and conducting analyses to evaluate potential sources of bias in NEFOP data) for all Northeast Region fisheries, and serves to document the SBRM established for all fisheries managed through the two Councils (NEFMC 2015)(NEFSC 2018a).

To be approved to operate, sectors must submit an operations plan to the regional administrator (NEFMC) that details (among other things) how by-catch of regulated species and ocean pout will be avoided to prevent allowable catch entitlement overages. Currently, two types of observers are associated with the NE multispecies fishery: Northeast Fishery Observer Program (NEFOP) observers, which is a federally funded program, and at-sea monitors (ASM), funded by a third party and managed by the Northeast Fisheries Science Center's Fisheries Sampling Branch (NEFSC 2018c).

Amendment 23 to the NE Multispecies FMP has been proposed to adjust the groundfish monitoring program in order to improve reliability and accountability (NEFMC 2017). The Council plans to explore alternatives to at-sea observers, and may consider changes to any part of the monitoring and reporting system for groundfish (NEFMC 2017). At this point, there is adequate observer coverage (15%, which is the coverage requirement specified in the Standardized By-catch Reporting Methodology), and data collection and analysis are sufficient to ensure that goals are being met for both by-catch and retained species (NOAA 2018b).

The longline fishery has no recorded interactions with marine mammals (Federal Register 2018b). But, the majority of by-catch in this fishery are various species of skates, with one species, thorny skate, being overfished (and none undergoing overfishing). Cusk is also caught as by-catch in the longline fishery and is a data-poor species, but is believed to be more abundant than previously thought (NEFSC 2017b). Nevertheless, because the amount of by-catch in this fishery is not indicative of a highly selective fishery, the impact on skates is unknown, and there is no explicit strategy in place to reduce skate by-catch, management strategy is scored moderately effective.

Factor 3.3 - Scientific Research And Monitoring

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Moderately Effective

There is a high level of scientific research and monitoring associated with the Northeast U.S. fisheries, including regular stock assessments, fishery-dependent and -independent surveys, and gear modification trials (NMFS 2011a)(NEFSC 2017a). Much of the scientific research and monitoring is carried out by the Northeast Fisheries Science Center (NEFSC), which provides the NEFMC with scientific advice, including stock assessments, to guide the management of the fishery. A number of independent and academic institutions also conduct research in the region, including testing gear modifications and conducting tagging experiments to monitor fish populations.

Stock assessments account for all sources of fishing mortality, including commercial and recreational landings and discards (NEFSC 2008)(NEFSC 2012)(NEFSC 2017a), as well as environmental factors. Thus, there is a wealth of both fishery-dependent and fishery-independent data available to NEFMC and NMFS to ensure that the fishery is managed effectively. There are concerns about a continued retrospective pattern that overestimates biomass and underestimates fishing mortality in some stocks (for example, Georges Bank cod), and stock assessments are taking account of this pattern, which is thought to be caused partly by increased natural mortality rates (GARM 2008). Population projections for Georges Bank haddock and cod are uncertain due to the retrospective bias (Brooks 2017), while the Gulf of Maine haddock stock assessment shows a minor retrospective pattern (Palmer 2017b)(Legault 2017a), but no retrospective adjustments were made to the terminal model results or the short-term catch projections (Palmer 2017b). In the Gulf of Maine Atlantic cod stock assessment, retrospective adjustments were only made to the M = 0.2 model results, following the recommendations of the SARC 55 and 2014 assessment review panels (Palmer 2017a). For the pollock stock, retrospective adjustments were made to both the base model and the "flat sel" sensitivity model (Linton 2017a).

Amendment 23 to the NE multispecies FMP has been proposed to adjust the groundfish monitoring program in order to improve reliability and accountability (NEFMC 2017). The Council plans to explore alternatives to at-sea observers, and may consider changes to any part of the monitoring and reporting system for groundfish (NEFMC 2017). At this point, there is adequate observer coverage (15%, which is the coverage requirement specified in the Standardized By-catch Reporting Methodology), and data collection and analysis are sufficient to ensure that goals are being met for both by-catch and retained species (NOAA 2018b).

There is a recent quantitative assessment that is independently peer-reviewed, as well as fishery-dependent and -independent monitoring; however, because stock assessments have been inaccurate in the past, overestimating biomass and leading to harvest rates that are too high (due to a

retrospective pattern; see past and recent stock assessments) (NEFSC 2008)(NEFSC 2015b)(NEFSC 2017a), this factor is scored moderately effective.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

N/A
In cases where either Factor 3.1 or 3.2 scores ineffective, Factor 3.3 is not scored because the overall score for Criterion 3 is a very high concern (1), regardless of how a fishery performs against Factor 3.3.

Factor 3.4 - Enforcement Of Management Regulations

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Moderately Effective
A variety of enforcement measures are in place in the New England groundfish fishery. Enforcement of fishery legislation at sea is a cooperative operation between coastal states, the NOAA Office of Law Enforcement (OLE), and the United States Coast Guard. OLE officers conduct dockside inspections and inspect fish processing plants (OLE webpage), and the Coast Guard inspect vessels at sea (pers. comm., T. Nies, NEFMC 2013) (DeAlteris and Allen 2018). OLE enforces fisheries legislation, including minimum landing sizes, retention of prohibited species, and gear restrictions. Violation of such management measures can result in criminal or civil actions as well as fines, loss of quota, or imprisonment for more serious cases.

All vessels fishing in the multispecies fishery are required to be fitted with a vessel monitoring system (VMS) (Federal Register 2006)(DeAlteris and Allen 2018), which allows fishery officers to remotely monitor the location of each vessel. VMSs enable fishery managers not only to monitor where catches are being taken, but also to enforce spatial closures, of which there are a number in the Northwest Atlantic.

Under Amendment 16 of the Multispecies Fishery Management Plan, Accountability Measures (AMs) were established (Federal Register 2010). AMs are required to ensure accountability within the fishery and to prevent overfishing. Proactive AMs are designed to prevent allowable catch limits (ACLs) from being exceeded, whereas reactive AMs are designed to correct any overages if they occur (Federal Register 2012). AMs can result in a reduction or complete loss of quota for a sector that regularly or greatly exceeds its quota (Federal Register 2010). It is thought that loss of a

community pool will encourage a greater level of self-management, thus improving compliance throughout the fishery.

The most recent AM was triggered due to overages in the 2016 fishing year. The end of year showed that three stocks had overages: Gulf of Maine cod, Georges Bank cod, and witch flounder; a combination of catch from both recreational and state commercial vessels contributed to cod overages, and catch from state commercial vessels contributed to witch flounder overages (GARFO 2018a). Framework 57 was implemented to reduce the new trimester quota (to account for these overages) starting on May 1, 2018 (GARFO 2018a). But, there have been instances of significant overages that were undiscovered for substantial periods, indicating that gaps in monitoring may still be a concern (Federal Register 2018a), and NOAA OLE has been curtailed in the last decade. Therefore, this factor is scored moderately effective.

Justification:
The above agencies have land-based and seagoing enforcement officers and a complete system of monitoring, control, and surveillance (MCS) that includes: 1) at-sea surveillance by patrol vessels and fixed-wing aircraft; 2) prescribed onboard observer coverage with protocols to monitor catch, species, etc.; 3) unannounced dockside monitoring of landings; 4) submission of vessel fishing log books; 5) catch and effort database to track catch against allocations; 6) electronic vessel monitoring systems (VMS) on each vessel; and 7) potential catch seizure and significant fines and loss of fishing privileges for violations of regulations (DeAlteris and Allen 2018).

If fishery regulations are violated, there is an explicit and statutory sanction framework that is applied. Sanctions to deal with noncompliance are listed in the Code of Federal Regulations and can be severe, consisting of: 1) significant monetary penalties; 2) confiscation of catch; 3) permit cancellations or suspensions; and 4) permanent prohibitions on participation in the fishery (DeAlteris and Allen 2018). Sanctions are consistently applied and thought to provide effective deterrence (DeAlteris and Allen 2018).

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

N/A
In cases where either Factor 3.1 or 3.2 scores ineffective, Factor 3.4 is not scored because the overall score for Criterion 3 is a very high concern (1), regardless of how a fishery performs against Factor 3.4.

Factor 3.5 - Stakeholder Inclusion

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Highly effective

The New England Fisheries Management Council has a good track record of including stakeholders in the development of legislation, with oral and written comments being invited on each draft amendment or framework adjustment to the FMP (DeAlteris and Allen 2018). Comprehensive information on the fishery's performance and management action is available on request, via open meetings, mailed/emailed notices, written copies of relevant documents, and a comprehensive website through which interested parties can obtain most documents associated with fishery management. Explanations are also provided for any action/lack of action associated with findings and relevant recommendations as a result of research, monitoring, evaluation, and review activity (DeAlteris and Allen 2018). The NEFMC also responds to each comment in the Federal Register documents, to show transparency of process (Federal Register 2010)(Federal Register 2012) (DeAlteris and Allen 2018). The management system incorporates, or is subject by law to, a transparent mechanism for resolving legal disputes, which is considered to be appropriate to the context of the fishery and effective in dealing with most issues (DeAlteris and Allen 2018). Therefore, this factor is scored highly effective.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

N/A

In cases where either Factor 3.1 or 3.2 scores ineffective, Factor 3.5 is not scored because the overall score for Criterion 3 is a very high concern (1), regardless of how a fishery performs against Factor 3.5.

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

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Georges Bank Stock | Atlantic, Northwest | Bottom trawls | United States	Score: 2	Score: 0	Moderate Concern	Yellow (2.449)
Georges Bank Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	Score: 4	Score: 0	Moderate Concern	Green (3.464)
Georges Bank Stock | Atlantic, Northwest | Set gillnets | United States	Score: 3	Score: 0	Moderate Concern	Yellow (3.000)
Georges Bank Stock | Atlantic, Northwest | Set longlines | United States	Score: 3	Score: 0	Moderate Concern	Yellow (3.000)
Gulf of Maine Stock | Atlantic, Northwest | Bottom trawls | United States	Score: 2	Score: 0	Moderate Concern	Yellow (2.449)
Gulf of Maine Stock | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States	Score: 4	Score: 0	Moderate Concern	Green (3.464)
Gulf of Maine Stock | Atlantic, Northwest | Set gillnets | United States	Score: 3	Score: 0	Moderate Concern	Yellow (3.000)
Gulf of Maine Stock | Atlantic, Northwest | Set longlines | United States	Score: 3	Score: 0	Moderate Concern	Yellow (3.000)

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

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

Score: 2

Otter trawls, along with other forms of bottom trawl, are known to have a detrimental impact on some seabed habitats, particularly low energy environments and biogenic reef habitats. The majority of fishing activity for cod, haddock, and pollock takes place in Gulf of Maine statistical areas 464, 465, and 511–515, and Georges Bank statistical areas 521, 522, 525, 526, 561, and 562 (see Figure 45) (DeAlteris and Allen 2018). These areas contain a number of seabed/sediment types (including bedrock, rocky outcrops, mud, silt, gravel, and sand), but the predominant types of sediment in the Gulf of Maine are mud-silt and sand; in the Georges Bank, they are sand and gravel, in waters less than 100 m deep; gravel and bedrock habitats affected by trawling in this region are most abundant at depths of 20 to 40 m (see Figure 46) (DeAlteris and Allen 2018). These seabed types and the communities they support are generally more resilient to trawling than deep-water biogenic reef habitats. Hence, this factor is scored a 2 out of 5, based on Seafood Watch Criteria.

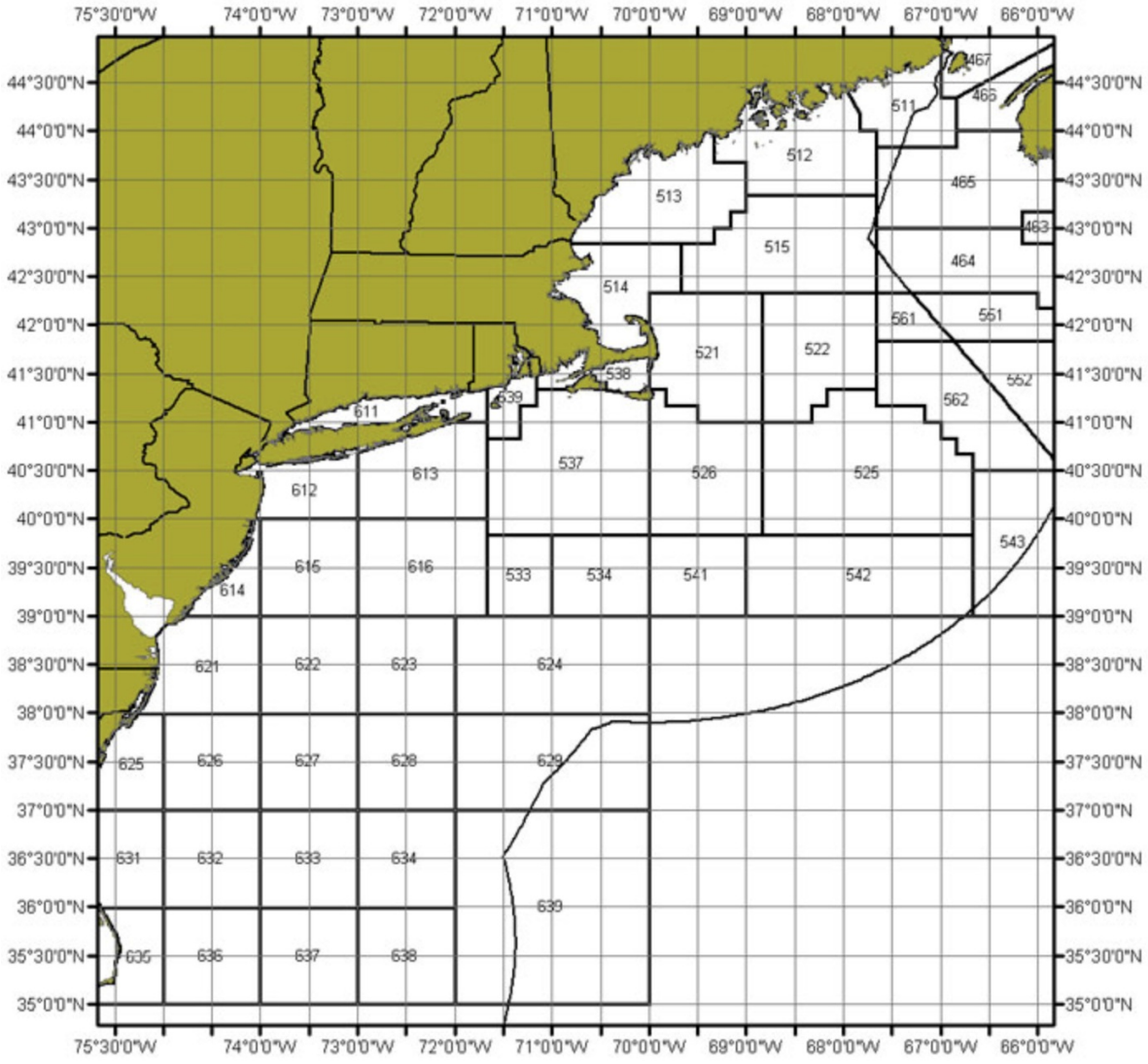

Figure 45: Northeast Fisheries Science Center Statistical Areas (GARFO 2017b).

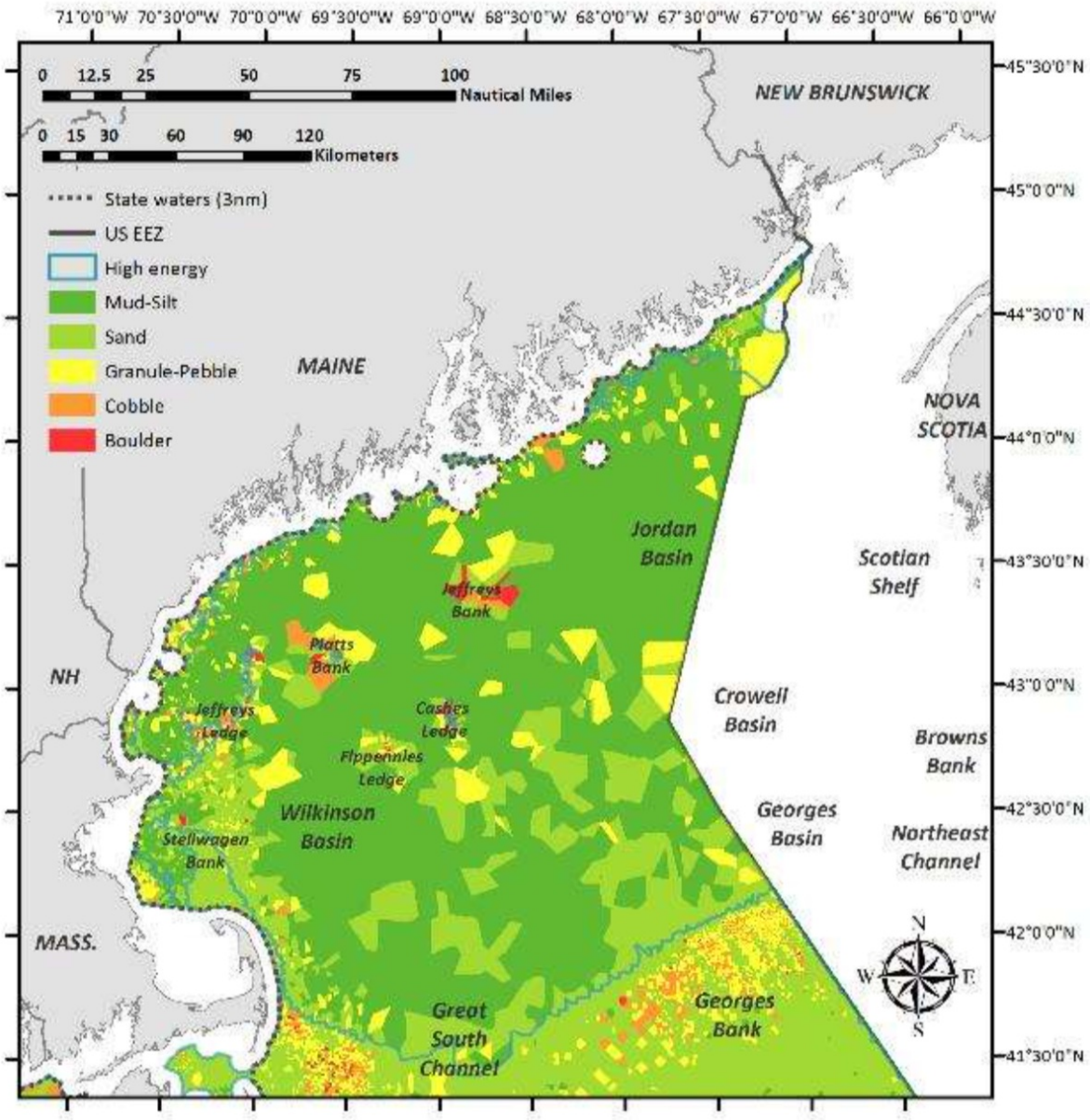

Figure 46: Seabed/sediment types in the Gulf of Maine and Georges Bank region (DeAlteris and Allen 2018).

Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Score: 4

Handline or rod and reel fisheries have minimal contact with the seabed, and any negative impacts are expected to be minimal. Vertical line fished in contact with the bottom is scored a 4 out of 5, according to Seafood Watch Criteria.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

Score: 3

Gillnets are used to target cod and pollock, predominantly over gravel, sand, and silt habitats in inshore areas of the Northwest Atlantic. Impacts on the seabed are expected to be limited to the impact of anchors on the substrate and minimal amounts of scouring during setting and hauling nets. Set gillnets over soft substrates are scored a 3 out of 5, according to Seafood Watch Criteria.

Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Score: 3

Bottom longline fisheries for cod and haddock take place over sand and gravel seabeds in the Gulf of Maine and Georges Bank region. According to Seafood Watch Criteria, this is scored a 3 out of 5.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States

Score: 0

The alteration of marine habitats by fishing gear can be lessened through the reduction of fishing effort or spatial closures that protect vulnerable habitats. There are a number of permanent and temporary spatial closures in place in the Gulf of Maine (GoM) and Georges Bank. There are two groundfish closed areas (Western GoM Groundfish Closure, Cashes Ledge Groundfish Closure), eight applicable habitat management areas (HMAs), and two dedicated habitat research areas (Stellwagen DHRA and Georges Bank DHRA) in place to protect essential fish habitat (EFH) from the impacts of bottom trawling and set gillnets (see Figure 47) (GARFO 2018b)(GARFO 2018c). These areas are either closed year-round to all bottom-tending mobile gears, or closed to all fishing vessels with certain exemptions (see details in Justification section).

In addition, there are five GoM cod protection closures in which certain areas are closed to all fishing vessels, with handline (HL) and pelagic longline (LL) exemptions, during certain months (GARFO 2018b)(GARFO 2018c). There are also four seasonal closures affecting all fishing vessels with HL and LL exemptions: 1) Closed Area 1 North Seasonal Closure (1,937 km^2), closed from February 1 to April 15; 2) Winter Massachusetts Bay Spawning Protection Area (310 km^2), closed from November 1 to January 31; 3) Spring Massachusetts Bay Spawning Protection Area (46 km^2), closed from April 15–30; and 4) "Whaleback" GoM Cod Spawning Protection Area (114 km^2), closed from April 1 to June 30 (see Figure 48) (GARFO 2018b)(GARFO 2018c). These closures are primarily designed to protect important spawning grounds and juvenile fish (GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Because approximately only 7.5% to 18% of these habitats are closed to bottom trawling at any given time (taking into consideration spatial and temporal overlap), this factor is scored as 0.

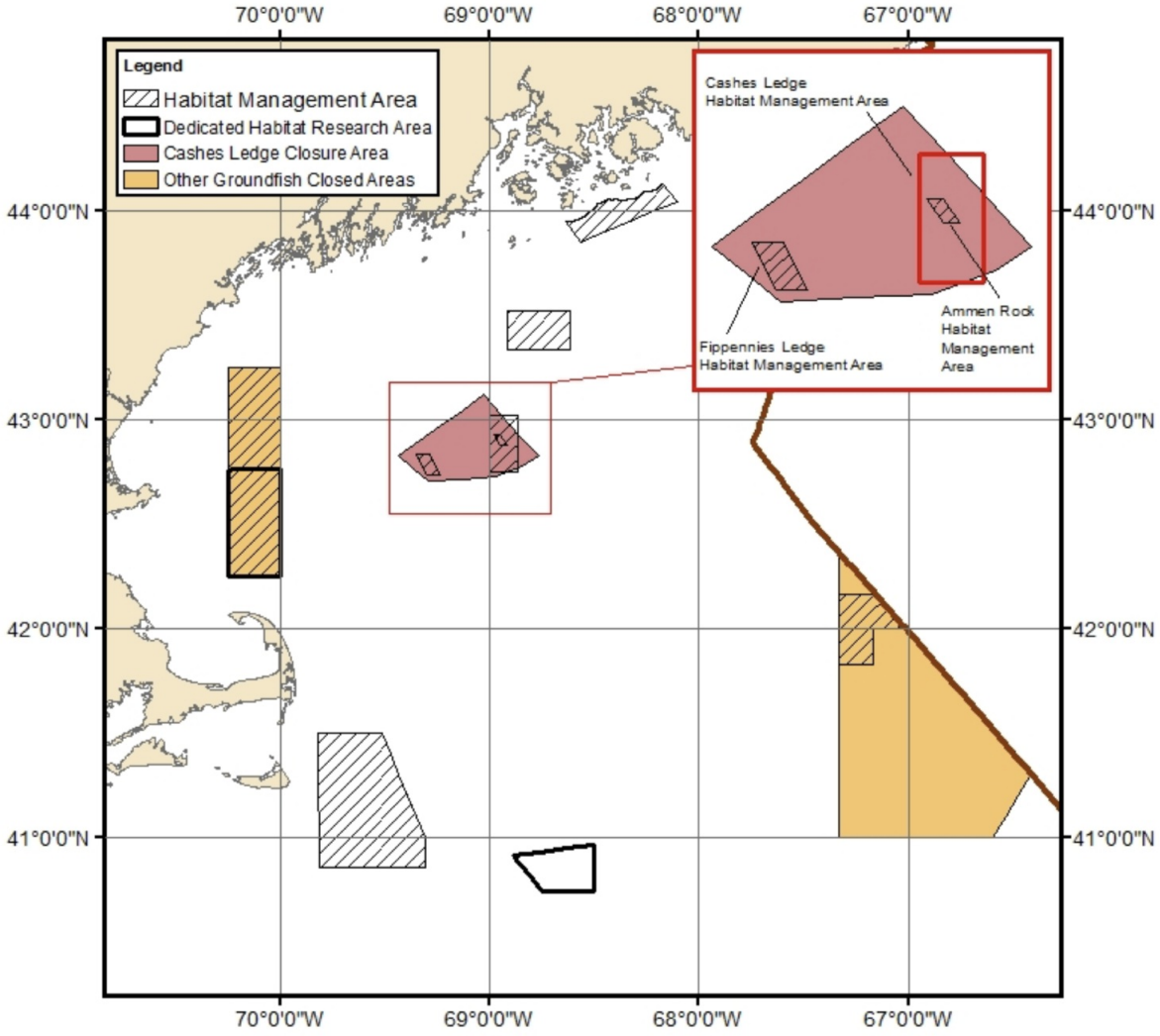

Figure 47: Year-round spatial closures in the Gulf of Maine and Georges Bank region that prohibit bottom trawling {GARFO 2018}.

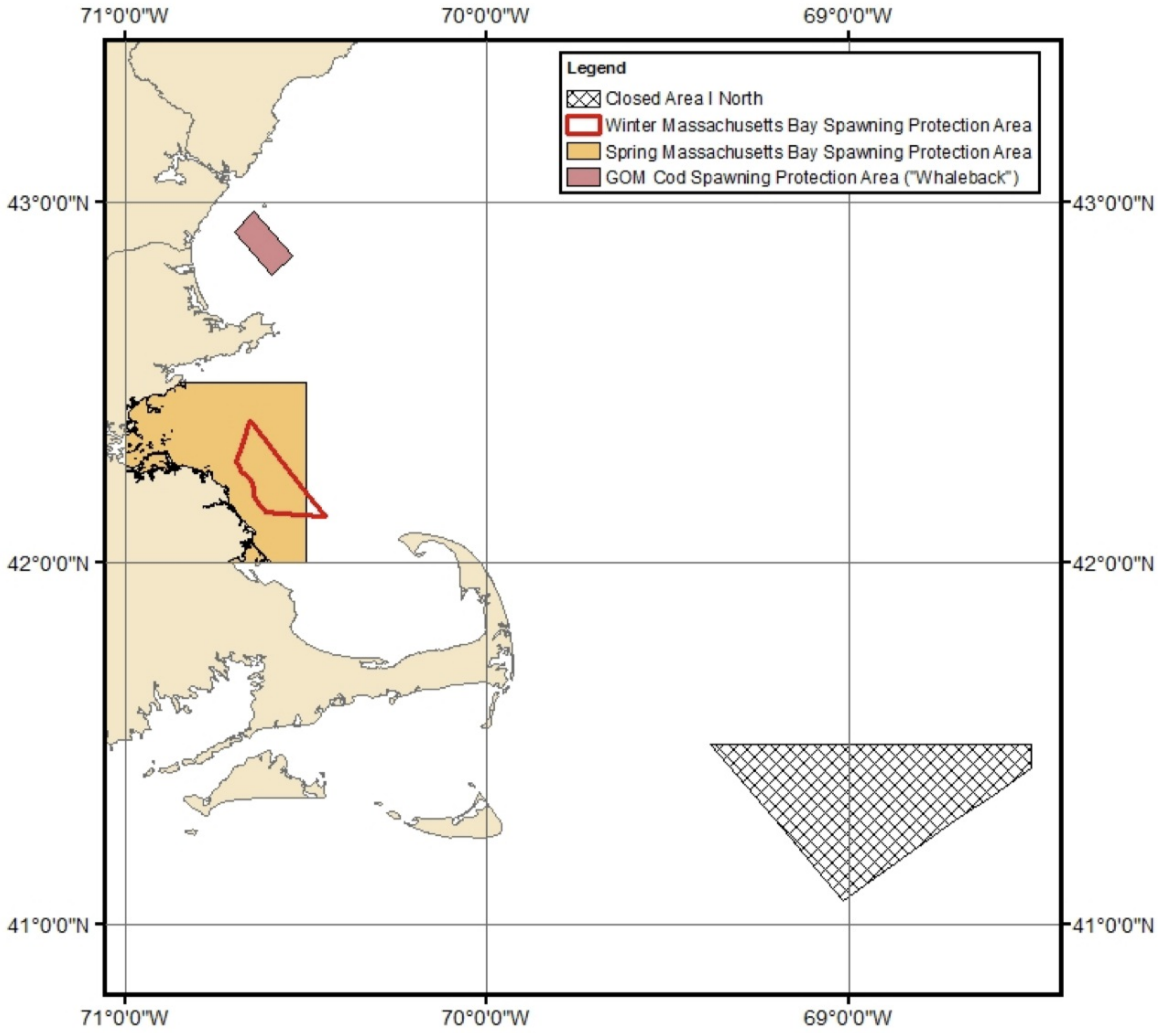

Figure 48: Gulf of Maine and Georges Bank Seasonal Closure Areas {GARFO 2018}.

Closed year-round to all fishing vessels, with exemptions: 1) Western GoM Groundfish Closure (3,030 km^2; HL and LL gears exempted), the Stellwagen DHRA (large: 1,177 km^2, small: 670 km^2; HL and LL gears exempted); 2) Cashes Ledge Groundfish Closure Area (1,373 km^2; HL and LL gears exempted); 3) the Ammen Rock HMA (15 km^2; closed to all fishing, except lobster traps); and 4) Closed Area II (2,650 km^2; HL and LL gears exempted) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c).

Closed year-round to all bottom-tending mobile gears: 1) Western GoM Habitat Closure Area (2,272 km^2); 2) Cashes Ledge (443 km^2) HMA; 3) Fippennies Ledge (45 km^2) HMA; 4) Eastern Maine HMA (483 km^2); 5) Jeffrey's Bank (499 km^2) HMA; 6) Georges Bank DHRA (584 km^2); 7) Closed Area II Habitat Closure Area (641 km^2, which is an HMA); and 8) two Great South Channel HMAs (2,301 km^2) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Total fishing area for cod, haddock, and pollock in the U.S. EEZ area was estimated at 131,464 km^2. Closures to set gillnet and bottom trawl gear roughly equated to 9,810 km^2 in total closure area, not including seasonal closures, and 13,430 km^2 in total closure area including seasonal closures, where overlapping closures were accounted for (NEFMC 2016)(GARFO 2018b)(GARFO 2018c). GoM cod protection closures in May and June provided an additional 10,000 km^2 of closure area. This gives an approximate total closure range of 7.5% to 18% (possibly slightly more at certain times during the season due to those overlapping closures that did not overlap completely, but were not included in these values).

The requirement for fisheries management plans to minimize to the extent practicable the adverse effects of fishing on essential fish habitat was set forth in the Sustainable Fisheries Act of 1996 (SFA). Amendment 11 of the Multispecies FMP established EFH for the species covered by the plan and established areas where bottom-tending gears were to be prohibited in order to protect the marine habitats (NEFMC and NMFS 1998).

To mitigate against and minimize potential damage to EFH, the NEFMC has implemented spatial closures, introduced limited permit schemes, and placed restrictions on the gears that can be used when trawling (Orphanides and Magnusson 2007). In addition to the year-round closures mentioned above, there are restricted gear areas (RGAs) that provide protection from particular gear types; for example, the Inshore Restricted Roller Gear Area (GARFO 2018b)(GARFO 2018c).

Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States

Score: 0
The impacts of the handline fishery on the marine habitat are believed to be minimal. Handline gear is exempt from all the closed areas indicated in the preceding figure. Because there is no mitigation of gear impacts, this factor is scored a 0.

Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States

Score: 0
The alteration of marine habitats by fishing gear can be lessened through the reduction of fishing effort or spatial closures that protect vulnerable habitats. There are a number of permanent and temporary spatial closures in place in the Gulf of Maine (GoM) and Georges Bank. There are two groundfish closed areas (Western GoM Groundfish Closure, Cashes Ledge Groundfish Closure), eight applicable habitat management areas (HMAs), and two dedicated habitat research areas (Stellwagen DHRA and Georges Bank DHRA) in place to protect essential fish habitat (EFH) from the impacts of bottom trawling and set gillnets (see Figure 47) (GARFO 2018b)(GARFO 2018c). These areas are either closed year-round to all bottom-tending mobile gears, or closed to all fishing vessels with certain exemptions (see details in Justification section).

In addition, there are five GoM cod protection closures in which certain areas are closed to all fishing vessels, with handline (HL) and pelagic longline (LL) exemptions, during certain months (GARFO 2018b)(GARFO 2018c). There are also four seasonal closures affecting all fishing vessels, with HL and LL exemptions: 1) Closed Area 1 North Seasonal Closure (1,937 km^2), closed from February 1 to April 15; 2) Winter Massachusetts Bay Spawning Protection Area (310 km^2), closed from November 1 to January 31; 3) Spring Massachusetts Bay Spawning Protection Area (46 km^2), closed from April 15–30; and 4) "Whaleback" GoM Cod Spawning Protection Area (114 km^2), closed from April 1 to June 30 (see Figure 48) (GARFO 2018b)(GARFO 2018c). These closures are primarily designed to protect important spawning grounds and juvenile fish (GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Because less than approximately 6% to 17% of these habitats are closed to set gillnets at any given time, taking into consideration spatial and temporal overlap, and the fact that only habitats closed to all fishing (not also "bottom-tending gear") are protected from this gear, this factor is scored a 0.

Justification:
Closed year-round to all fishing vessels, with exemptions: 1) Western GoM Groundfish Closure (3,030 km^2; HL and LL gears exempted), the Stellwagen DHRA (large: 1,177 km^2, small: 670 km^2; HL and LL gears exempted); 2) Cashes Ledge Groundfish Closure Area (1,373 km^2; HL and LL gears exempted); 3) the Ammen Rock HMA (15 km^2; closed to all fishing, except lobster traps); and 4) Closed Area II (2,650 km^2; HL and LL gears exempted) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c).

Closed year-round to all bottom-tending mobile gears: 1) Western GoM Habitat Closure Area (2,272 km^2); 2) Cashes Ledge (443 km^2) HMA; 3) Fippennies Ledge (45 km^2) HMA; 4) Eastern Maine HMA (483 km^2); 5) Jeffrey's Bank (499 km^2) HMA; 6) Georges Bank DHRA (584 km^2); 7) Closed Area II Habitat Closure Area (641 km^2, which is an HMA); and 8) two Great South Channel HMAs (2,301 km^2) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Total fishing area for cod, haddock, and pollock in the U.S. EEZ area was estimated at 131,464 km^2. Closures to set gillnet and longline gear roughly equated to 8,286 km^2 in total closure area, not including seasonal closures, and 11,906 km^2 in total closure area including seasonal closures, where overlapping closures were accounted for (NEFMC 2016)(GARFO 2018b)(GARFO 2018c). GoM cod protection closures in May and June provided an additional 10,000 km^2 of closure area. This gives an approximate total closure range of 6% to 17% (possibly slightly more at certain times during the season due to those overlapping closures that did not overlap completely, but were not included in these values).

The requirement for fisheries management plans to minimize to the extent practicable the adverse effects of fishing on essential fish habitat was set forth in the Sustainable Fisheries Act of 1996 (SFA). Amendment 11 of the Multispecies FMP established EFH for the species covered by the plan and established areas where bottom-tending gears were to be prohibited in order to protect the marine habitats (NEFMC and NMFS 1998).

To mitigate against and minimize potential damage to EFH, the NEFMC has implemented spatial closures, introduced limited permit schemes, and placed restrictions on the gears that can be used when trawling (Orphanides and Magnusson 2007). In addition to the year-round closures mentioned above, there are restricted gear areas (RGAs) that provide protection from particular gear types; for example, the Inshore Restricted Roller Gear Area (GARFO 2018b)(GARFO 2018c).

Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Score: 0

The alteration of marine habitats by fishing gear can be lessened through the reduction of fishing effort or spatial closures that protect vulnerable habitats. A number of permanent and temporary spatial closures are in place in the Gulf of Maine (GoM) and Georges Bank. There are two groundfish closed areas (Western GoM Groundfish Closure, Cashes Ledge Groundfish Closure), eight applicable habitat management areas (HMAs), and two dedicated habitat research areas (Stellwagen DHRA and Georges Bank DHRA) in place to protect essential fish habitat (EFH) from the impacts of bottom trawling and set gillnets (see Figure 47) (GARFO 2018b)(GARFO 2018c). These areas are either closed year-round to all bottom-tending mobile gears, or closed to all fishing vessels with certain exemptions (see details in "Justification" section).

In addition, there are five GoM cod protection closures in which certain areas are closed to all fishing vessels, with handline (HL) and pelagic longline (LL) exemptions, during certain months (GARFO 2018b)(GARFO 2018c). There are also four seasonal closures affecting all fishing vessels, with HL and LL exemptions: 1) Closed Area 1 North Seasonal Closure (1,937 km^2) closed from February 1 to April 15; 2) Winter Massachusetts Bay Spawning Protection Area (310 km^2), closed from November 1 to January 31; 3) Spring Massachusetts Bay Spawning Protection Area (46 km^2), closed from April 15–30; and 4) "Whaleback" GoM Cod Spawning Protection Area (114 km^2), closed from April 1 to June 30 (see Figure 48) (GARFO 2018b)(GARFO 2018c). These closures are primarily designed to protect important spawning grounds and juvenile fish (GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Because less than approximately 6% to 17% of these habitats are closed to set longlines at any given time, taking into consideration spatial and temporal overlap, and only habitats closed to all fishing (not also "bottom-tending gear") are protected from this gear, this factor is scored a 0.

Justification:

Closed year-round to all fishing vessels, with exemptions: 1) Western GoM Groundfish Closure (3,030 km^2; HL and LL gears exempted), the Stellwagen DHRA (large: 1,177 km^2, small: 670 km^2; HL and LL gears exempted); 2) Cashes Ledge Groundfish Closure Area (1,373 km^2; HL and LL gears exempted); 3) the Ammen Rock HMA (15 km^2; closed to all fishing, except lobster traps); and 4) Closed Area II (2,650 km^2; HL and LL gears exempted) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c).

Closed year-round to all bottom-tending mobile gears: 1) Western GoM Habitat Closure Area (2,272 km^2); 2) Cashes Ledge (443 km^2) HMA; 3) Fippennies Ledge (45 km^2) HMA; 4) Eastern Maine HMA (483 km^2); 5) Jeffrey's Bank (499 km^2) HMA; 6) Georges Bank DHRA (584 km^2); 7) Closed Area II Habitat Closure Area (641 km^2, which is an HMA); and 8) two Great South Channel HMAs (2,301 km^2) (NEFMC 2016)(GARFO 2018b)(GARFO 2018c) (pers. comm., M. Bachman 16 July 2018).

Total fishing area for cod, haddock, and pollock in the U.S. EEZ area was estimated at 131,464 km^2. Closures to set gillnet and longline gear roughly equated to 8,286 km^2 in total closure area, not including seasonal closures, and 11,906 km^2 in total closure area including seasonal closures, where overlapping closures were accounted for (NEFMC 2016)(GARFO 2018b)(GARFO 2018c). GoM cod protection closures in May and June provided an additional 10,000 km^2 of closure area. This gives an approximate total closure range of 6% to 17% (possibly slightly more at certain times during the season due to overlapping closures that did not overlap completely, but were not included in these values).

The requirement for fisheries management plans to minimize to the extent practicable the adverse effects of fishing on essential fish habitat was set forth in the Sustainable Fisheries Act of 1996 (SFA). Amendment 11 of the Multispecies FMP established EFH for the species covered by the plan and established areas where bottom-tending gears were to be prohibited in order to protect the marine habitats (NEFMC and NMFS 1998).

To mitigate against and minimize potential damage to EFH, the NEFMC has implemented spatial closures, introduced limited permit schemes, and placed restrictions on the gears that can be used when trawling (Orphanides and Magnusson 2007). In addition to the year-round closures mentioned above, there are restricted gear areas (RGAs) that provide protection from particular gear types; for example, the Inshore Restricted Roller Gear Area (GARFO 2018b)(GARFO 2018c).

Factor 4.3 - Ecosystem-based Fisheries Management

Georges Bank | Atlantic, Northwest | Bottom trawls | United States
Gulf of Maine | Atlantic, Northwest | Bottom trawls | United States
Georges Bank | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Gulf of Maine | Atlantic, Northwest | Handlines and hand-operated pole-and-lines | United States
Georges Bank | Atlantic, Northwest | Set gillnets | United States
Gulf of Maine | Atlantic, Northwest | Set gillnets | United States
Georges Bank | Atlantic, Northwest | Set longlines | United States
Gulf of Maine | Atlantic, Northwest | Set longlines | United States

Moderate Concern

Collectively, the Magnuson-Stevens Fishery Conservation and Management Act, the National Environmental Policy Act, the Endangered Species Act, the Marine Mammal Protection Act, and the Coastal Zone Management Act require fisheries managers to take into account the impact of fishery

operations on the ecosystem they are conducted in (NEFMC SSC 2010). In July 2010, an Executive Order established the first U.S. national policy on the stewardship of the oceans, coasts, and Great Lakes. One of the nine national priorities set out in this policy is the adoption of ecosystem-based fisheries management (EBFM) (NEFMC SSC 2010).

The NEFMC has started the process of developing and implementing EBFM. It is anticipated that the process of moving from the current management system to EBFM will take a minimum of 5 years. The current Multispecies FMP has elements of EBFM within it, because it already considers multiple species rather than using the traditional single-species fisheries management. Moving forward, other EBFM plans will become more holistic and integrated for a given ecosystem region, such as the Western Gulf of Maine (NEFMC SSC 2010), with predator-prey relationships, competition, habitat status and gear impacts, and protected species all considered under one plan. The development and implementation of these plans is proceeding through 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.

Most recently, NEFSC has published the "Ecosystem Status Report for the Northeast Large Marine Ecosystem," which: 1) provides observations on climate forcing and hydrographic conditions; 2) documents changes at the base of the food web; 3) reports on the status of fish and shellfish of commercial and recreational importance that provide high quality food resources; 4) provides metrics related to human well-being and the status of certain uses of the ocean in addition to fishing; and 5) describes several pressures and stressors affecting the status of the system (NEFSC 2018d).

Because ecosystem-based fisheries management is underway but has not been fully implemented, this factor is scored moderately effective.

Justification:
The 2018 Ecosystem-Based Fishery Management (EBFM) Strategy Review was hosted by the Northeast Fisheries Science Center from April 30 to May 4, 2018. The goal of this research-track review is to show how the proposed EBFM strategy and conceptual framework could be applied to provide information needed in fisheries management by the NEFMC {NEFMC 2018}. During this meeting, information on the structure and function of the Georges Bank ecosystem, the proposed management procedure, and models used to test that procedure were presented to external peer reviewers (NEFSC 2018b). The reviewers will evaluate simulation studies conducted to assess the performance of the proposed management procedure, as well as the data to support such a procedure. The results will help shape the way forward for the council as it explores the use of fishery ecosystem plans for the Northeast {NEFMC 2018}.

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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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References

50 Federal Register Part 229. 2014. Taking of Marine Mammals Incidental to Commercial Fishing Operations; Atlantic Large Whale Take Reduction Plan Regulations. Federal Register. Vol 79., No. 124. June 27, 2014.

A02O.

Alade, L. 2017. Gulf of Maine Yellowtail Flounder. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17.

Album, G. 2010. Survey of the trade flow in the fisheries sector in Asia. Analysis for the Norwegian Ministry of Fisheries and Coastal Affairs. Revised Version.

Bettridge, S., C.S. Baker, J. Barlow, P.J. Clapham, M. Ford, D. Gouveia, et al. 2015. Status Review of the Humpback Whale (Megaptera novaeangliae) under the Endangered Species Act. NOAA Technical Memorandum NMFS. NOAA-TM-NMFS-SWFSC-540 U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center, California.

Bowen, D. 2016. Halichoerus grypus ssp. grypus. The IUCN Red List of Threatened Species 2016: e.T61382004A61382007

Bowen, D. 2016. Halichoerus grypus. The IUCN Red List of Threatened Species 2016: e.T9660A45226042. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T9660A45226042.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/details/9660/0.

Brooks, L. 2017. Georges Bank Haddock. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/georges_bank_haddock.pdf.

Brown, J, G. Macfadyen, T. Huntington, J. Magnus and J. Tumilty. 2005. Ghost Fishing by Lost Fishing Gear. Final Report to DG Fisheries and Maritime Affairs of the European Commission. Fish/2004/20. Institute for European Environmental Policy / Poseidon Aquatic Resource Management Ltd joint report.

Choi, Y.M., J.T. Yoo, J.H. Choi, K.H. Choi, J.K. Kim, Y.S. Kim, J.B. Kim. 2008. Ecosystem structure and trophic level to the oceanographic conditions around the waters of Jeju Island. Journal of Environmental Biology. 29:4, 419-25. Available at: https://www.ncbi.nlm.nih.gov/pubmed/19195374.

Cooke, J.G. 2020. Eubalaena glacialis. The IUCN Red List of Threatened Species 2020: e.T41712A162001243. https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T41712A162001243.en

Cooke, J.G. 2018. Balaenoptera physalus. The IUCN Red List of Threatened Species 2018: e.T2478A50349982.

Crowe, L.M., Brown, M.W., Corkeron, P.J., Hamilton, P.K., Ramp, C., Ratelle, S., Vanderlaan, A.S.M., & Cole, T.V.N., 2021. In plane sight: a mark-recapture analysis of North Atlantic right whales in the Gulf of St. Lawrence. Endangered Species Research. Vol. 46:227-251 https://doi.org/10.3354/esr01156

DeAlteris, J., R. Allen. 2018. MSC Sustainable Fisheries Certification: US Gulf of Maine and Georges Bank Haddock, Pollock and Redfish Trawl. On behalf of Acoura Marine. 293 pp. February 2018.

FAO (Fisheries and Aquaculture Statistics). 2017. 2015 FAO Yearbook. Food and Agricultural Organization of the United Nations Rome. Available at: http://www.fao.org/3/a-i7989t.pdf.

Federal Register. 2006. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery, Framework Adjustment 42; Monkfish Fishery, Framework Adjustment 3. 50 CFR Part 648.

Federal Register. 2008. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Region Standardized Bycatch Reporting Methodology Omnibus Amendment. 50 CFR Part 648.

Federal Register. 2009. Magnuson-Stevens Act Provisions; Annual Catch Limits; National Standard Guidelines. 50 CFR Part 600.

Federal Register. 2010. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery; Amendment 16; Final Rule. 50 CFR Part 648.

Federal Register. 2012. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery; Framework Adjustment 47. 50 CFR Part 648

Federal Register. 2016. Endangered and Threatened Species; Identification of 14 Distinct Population Segments of the Humpback Whale (Megaptera novaeangliae) and Revision of Species-Wide Listing. 81 FR 62259. Pages 62259-62320 (62 pages). September 8. Available at: https://www.federalregister.gov/documents/2016/09/08/2016-21276/endangered-and-threatened-species-identification-of-14-distinct-population-segments-of-the-humpback.

Federal Register. 2018a. Magnuson-Stevens Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery; 2018 Sector Operations Plans and Allocation of Northeast Multispecies Annual Catch Entitlements. Document Citation: 83 FR 34492, 50 CFR 648. Available at: https://www.federalregister.gov/documents/2018/07/20/2018-15477/magnuson-stevens-act-provisions-fisheries-of-the-northeastern-united-states-northeast-multispecies.

Federal Register. 2018b. List of Fisheries for 2018. Vol. 83, No. 26/Wednesday, February 7, 2018. Available at: https://s3-us-west-2.amazonaws.com/sfwart/comments/61635/2018-02442.pdf.

Froese, R., D. Pauly. Editors. 2017. FishBase. World Wide Web electronic publication. Available at:

www.fishbase.org, version (10/2017).

Froese, R., D. Pauly. Editors. 2018. FishBase. World Wide Web electronic publication. Available at: www.fishbase.org.

GARFO (Greater Atlantic Regional Fisheries Office). 2018b. Northeast (NE) Multispecies Information Sheet Closed Area Regulations. Available at: https://www.greateratlantic.fisheries.noaa.gov/regs/infodocs/multsclosedareas.pdf.

GARFO. 2017b. Greater Atlantic Region Statistical Areas. Available at: https://www.greateratlantic.fisheries.noaa.gov/educational_resources/gis/gallery/grafostatisticalareas.html.

GARFO. 2018a. Northeast Multispecies (Groundfish) Fishing Year 2018 Regulations. Greater Atlantic Region Bulletin. May 1. Available at: https://www.greateratlantic.fisheries.noaa.gov/nr/2018/April/18multifw572018recrulephl.pdf.

GARFO. 2018c. Omnibus Essential Fish Habitat Amendment Changes to Year-Round and Seasonal Closure Areas. April 9. 9pp. Available at: https://www.greateratlantic.fisheries.noaa.gov/nr/2018/April/180405_oa2_final_rule_phl_corrected.pdf.

GARM. 2008. Report of the Retrospective Working Group. A Working Paper in Support of Term of Reference 4. GARM 2008 Methods Meeting Woods Hole, MA. 25-29 February 2008. 34 pp.

Hammond, P.S., G> Bearzi, A. Bjørge, K.A. Forney, L. Karkzmarski, T. Kasuya, W.F. Perrin, M.D. Scott, J.Y. Wang, R.S. Wells, B. Wilson. 2012. Tursiops truncatus. The IUCN Red List of Threatened Species 2012: e.T22563A17347397. http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T22563A17347397.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/details/22563/0.

Hammond, P.S., G. Bearzi, A. Bjørge, K. Forney, L. Karczmarski, T. Kasuya, W.F. Perrin, M.D. Scott J.Y. , Wang, R.S. Wells, B. Wilson. 2008a. Lagenorhynchus acutus. The IUCN Red List of Threatened Species 2008: e.T11141A3255721. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T11141A3255721.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/details/11141/0.

Hammond, P.S., G. Bearzi, A. Bjørge, K. Forney, L. Karczmarski, T. Kasuya, W.F. Perrin, M.D. Scott, J.Y. Wang, R.S. Wells, B. Wilson. 2008b. Phocoena phocoena. The IUCN Red List of Threatened Species 2008: e.T17027A6734992. http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T17027A6734992.en. Downloaded on 25 March 2018. Available at: http://www.iucnredlist.org/search.

Harris, L.E., P.A. Comeau, D.S. Clark. 2002. Evaluation of cusk (Brosme brosme) in Canadian waters. CSAS Res. Doc. 2002/104, 66 p. Oldham, W. S. 1972. Biology of Scotian Shelf cusk, Brosme brosme. ICNAF Res. Bull. 9:85-98.

Hayes, S.A., E. Josephson, K. Maze-Foley, P.E. Rosel. 2017. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2016. National Marine Fisheries Service, Northeast Fisheries Science Center

Woods Hole, Massachusetts. June. Available at: https://www.nefsc.noaa.gov/publications/tm/tm241/tm241.pdf.

Hayes, S.A., Josephson, E., Maze-Foley, K., & Rosel, P.E., 2020. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2019. NOAA Technical Memorandum NMFS-NE-264.

Hayes, S.A., Josephson, E., Maze-Foley, K., Rosel, P.E. & Turek, J., 2021. US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments 2020. US Department of Commerce. National Oceanic and Atmospheric Administration. National Marien Fisheries Service. Northeast Fisheries Science Center. Woods Hole, Massachusetts.

Hayes, S.A., Josephson, E., Maze-Foley, K., Rosel, P.E., & Wallace, J. Eds. 2022. U.S. Atlantic and Gulf of Mexico Marien Mammal Stock Assessments 2021. National Marine Fisheries Service.

Hendrickson. L. Georges Bank Winter Flounder. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/georges_bank_winter_flounder.pdf.

IUCN. 2012. IUCN Red List Categories and Criteria: Version 3.1. Second edition. Gland, Switzerland and Cambridge, UK: IUCN. iv + 32pp.

Kitts, A., E. Bing-Sawyer, J. Walden, C. Demarest, M. McPhearson, P. Christman, S. Steinback, J. Olson, P. Clay. 2011. 2010 Final Report on the Performance of the Northeast Mul speceis (Groundfish) Fishery (May 2010–April 2011). 2nd Edition. Northeast Fisheries Science Center Reference Document 11-19. 97pp.

Kovacs, K.M. 2015. Pagophilus groenlandicus. The IUCN Red List of Threatened Species 2015: e.T41671A45231087. http://dx.doi.org/10.2305/IUCN.UK.2015-4.RLTS.T41671A45231087.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/41671/0.

Kovacs, K.M. 2016. Cystophora cristata. The IUCN Red List of Threatened Species 2016: e.T6204A45225150. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T6204A45225150.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/6204/0.

Kraus, S.D., A J. Read, A. Solow, K. Baldwin, T. Spradlin, E. Anderson, J. Williamson. 1997. Acous c alarms reduce porpoise mortality. Nature 388, 525.

L. J. Buckley, A. S. Smigielski, T. A. Halavik, E. M. Caldarone, B. R. Burns, G. C. Laurence. 1991. Winter flounder Pseudopleuronectes americanus reproductive success. II. Effects of spawning time and female size on size, composition and viability of eggs and larvae. Marine Ecology Progress Series 74, 125-135.

Labaree, J. M. 2012. Sector Management in New England's Groundfish Fishery: Dramatic Change Spurs Innovation. Gulf of Maine Research Institute. 13pp.

Legault, C. 2017a. Georges Bank Atlantic Cod. Operational Assessment of 19 Northeast Groundfish

Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/georges_bank_cod.pdf.

Legault, C. 2017b. Georges Bank Yellowtail Flounder. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at:
https://www.nefsc.noaa.gov/publications/crd/crd1717/georges_bank_yellowtail_flounder.pdf.

Linton, B. 2017a. Pollock. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at:
https://www.nefsc.noaa.gov/publications/crd/crd1717/pollock.pdf.

Linton, B.. 2017b. Acadian redfish. 2015 Assessment Update Report. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at:
https://www.nefsc.noaa.gov/publications/crd/crd1717/acadian_redfish.pdf.

Lowry, L. 2016. Phoca vitulina. The IUCN Red List of Threatened Species 2016: e.T17013A45229114. http://dx.doi.org/10.2305/IUCN.UK.2016-1.RLTS.T17013A45229114.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/17013/0.

Lux, F.E., 1973. Age and Growth of the Winter Flounder, Pseudopleuronectes americanus, on Georges Bank. Fishery Bulletin. Vo. 71:2 pp 505-512

Massachusetts Register 2022. 322 CMR 12.00: Protected Species. Mass. Register #1463 2/18/22.

McDonald, S.L., R.L. Lewison, A.J. Read. 2016. Evaluating the efficacy of environmental legislation: A case study from the US marine mammal Take Reduction Planning process. Global Ecology and Conservation 5, 1–11.

MDMF 2022. Buoy Line Marking Rules for Trap Fisheries in 2022. The Commonwealth of Massachusetts Division of Marine Fisheries. Boston, MA.

Miller, T., D.E. Richardson, P. Politis, J. Blaylock 2017. Northeast Fisheries Science Center bottom trawl catch efficiency and biomass estimates for 2009- 2017 for 8 flatfish stocks included in the 2017 Northeast Groundfish Operational Assessments. Available at:
https://www.nefsc.noaa.gov/groundfish/operational-assessments-2017/docs/catch-efficiency-biomass-estimates-wp.pdf.

Moore, M.J. 2019. How we can all stop killing whales: a proposal to avoid whale entanglement in fishing gear. ICES Journal of Marine Science, Volume 76(4): 781–786. https://doi.org/10.1093/icesjms/fsy194

NEFMC and NMFS. 1998. Amendment 11 to the Northeast Multispecies Fishery Management Plan for Essential Fish Habitat. In New England Fishery Management Council and National Marine Fisheries Service, 62 CFR 1403.

NEFMC SSC (New England Fishery Management Council, Scientific and Statistical Committee). 2010. White Paper on Ecosystem-Based Fisheries Management for New England Fisheries Management Council. Prepared by Scientific and Statistical Committee, NEFMC. October 2010. Available at: http://archive.nefmc.org/press/council_discussion_docs/Sept%202011/priorities/9_Priorities%20Discussion%20Document_EBFM%20White%20Paper.pdf.

NEFMC. 2015. Standardized Bycatch Reporting Methodology: An Omnibus Amendment to the Fishery Management Plans of the New England and Mid-Atlantic Regional Fishery Management Councils. March 2015; 361 p. Available from: http://www.greateratlantic.fisheries.noaa.gov/regs/2015/June/15SBRMOmnibusAmend.html.

NEFMC. 2016. FINAL Omnibus Essential Fish Habitat Amendment 2 Volume 4: Environmental impacts of spatial management alternatives on habitat, human community, and protected resources. In cooperation with the National Marine Fisheries Service. December 8. Available at: http://s3.amazonaws.com/nefmc.org/OA2-FEIS_Vol_4_FINAL_161208.pdf.

NEFMC. 2017. Scoping Document for Amendment 23 to the Northeast Multispecies Fishery Management Plan (Groundfish Monitoring Amendment). Available at: http://s3.amazonaws.com/nefmc.org/170217_GF_A23_Scoping-Document.pdf.

NEFMC. 2018a. Memorandum to Groundfish Committee: Additional Analyses for Amendment 23/Groundfish Monitoring. May 29. Available at: https://s3.amazonaws.com/nefmc.org/180529-GF-PDT-memo-to-GF-CMTE-re-additional-analyses-for-A23_revised.pdf.

NEFSC (Northeast Fisheries Science Center). 2015a. Operational Assessment of 20 Northeast Groundfish Stocks, Updated Through 2014. U.S. Department of Commerce National Oceanic and Atmospheric Administration National Marine Fisheries Service. Northeast Fisheries Science Center. Woods Hole, Massachusetts.

NEFSC (Northeast Fisheries Science Center). 2017a. Brief history of the groundfishing industry of New England. Available at: https://www.nefsc.noaa.gov/history/stories/groundfish/grndfsh1.html.

NEFSC (Northeast Fisheries Science Center). 2017a. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. US Dept Commerce, Northeast Fisheries Science Center Reference Document. 17-17; 259 p. doi: 10.7289/V5/RD-NEFSC-17-17.

NEFSC (Northeast Fisheries Science Center). 2018b. 2018 Ecosystem-Based Fishery Management Strategy Review. Available at: https://www.nefsc.noaa.gov/program_review/.

NEFSC. 2008. Assessment of 19 Northest Groundfish Stocks through 2007: Report of the 3rd Groundfish Assessment Review Meeting (GARM III). Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2012. Assessment or data updates of 13 Northeast Groundfish Stocks through 2010. Northeast

Fisheries Science Center Reference Document 12-06. 784pp.

NEFSC. 2013a. 55th Northeast Regional Stock Assessment Workshop (55th SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-11; 41 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

NEFSC. 2015b. Operational Assessment of 20 Northeast Groundfish Stocks, Updated through 2014. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 15-24; 251 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

NEFSC. 2015d. Summary of Stock Assessment Prospectuses: Cusk, Brosme brosme. Population Dynamics Branch Northeast Fisheries Science Center. Last Update: July 24, 2015. Available at: https://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/docs/Stock%20Prospectus.pdf.

NEFSC. 2017b. Fishing Industry, NEFSC Team Up for Gulf of Maine Longline Study. October 12. Available at: https://www.nefsc.noaa.gov/press_release/pr2017/features/crp-longline-survey/.

NEFSC. 2018a. Standardized Bycatch Reporting Methodology and Sea Day Schedule. Available at: https://www.nefsc.noaa.gov/fsb/SBRM/.

NEFSC. 2018c. Northeast Fisheries At-Sea Monitoring Program (ASM). Available at: https://www.nefsc.noaa.gov/fsb/asm/ASM_Fact_Sheet.pdf.

NEFSC. 2018d. Ecosystem Status Report for the Northeast Large Marine Ecosystem. Available at: https://www.nefsc.noaa.gov/ecosys/ecosystem-status-report/executive-summary.html.

Nitschke, P. 2017. Gulf of Maine Winter Flounder. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/gulf_of_maine_winter_flounder.pdf.

NMFS (National Marine Fisheries Service). 2016. U.S. National Bycatch Report First Edition Update 2 [L. R. Benaka, D. Bullock, J. Davis, E. E. Seney, and H. Winarsoo, Editors]. U.S. Dep. Commer., 90 p. Available at: https://www.st.nmfs.noaa.gov/Assets/Observer-Program/bycatch-report-update-2/NBR%20First%20Edition%20Update%202_Final.pdf.

NMFS (National Marine Fisheries Service). 2017a. Proactive Conservation Program: Species of Concern. Species of Concern List: Atlantic Halibut. Available at: http://www.nmfs.noaa.gov/pr/species/concern/.

NMFS (National Marine Fisheries Service). 2017b. 2017 List of Fisheries (LOF). Available at: http://www.nmfs.noaa.gov/pr/interactions/fisheries/2017_list_of_fisheries_lof.html#table2_cat1

NMFS (National Marine Fisheries Service). 2018c. 2018 Status of U.S. Fisheries. Summary of Stock Status for FSSI Stocks

NMFS 2021. National Marine Fisheries Service 2nd Quarter 2021 Update. Summary of Stock Status for

FSSI and non-FSSI stocks.

NMFS 2021a. Endangered Species Act Section 7 Consultation on the: (a) Authorization of the American Lobster, Atlantic Bluefish, Atlantic Deep-Sea Red Crab, Mackerel/Squid/Butterfish, Monkfish, Northeast Multispecies, Northeast Skate Complex, Spiny Dogfish, Summer Flounder/Scup/Black Sea Bass, and Jonah Crab Fisheries and (b) Implementation of the New England Fishery Management Council's Omnibus Essential Fish Habitat Amendment 2. National Marine Fisheries Service. National Oceanographic and Atmospheric Administration. Department of Commerce. May 2021.

NMFS 2022. 1st Quarter 2022 Update: Summary of Stock Status for FSSI Stocks. Available at https://www.fisheries.noaa.gov/national/population-assessments/fishery-stock-status-updates

NMFS. 2011a. U.S National Bycatch Report. National Marine Fisheries Service, U.S. Department of Commerce.

NMFS. 2018a. Commercial Fisheries Statistics. Annual Commercial Landing Statistics. Available at: https://www.st.nmfs.noaa.gov/pls/webpls/FT_HELP.SPECIES.

NMFS. 2018b. Commercial Fisheries Statistics. Imports & Exports of Fishery Products. Available at: https://www.st.nmfs.noaa.gov/commercial-fisheries/foreign-trade/raw-data/imports-exports-annual.

NOAA (National Oceanic and Atmospheric Administration). 2009. Magnuson-Stevens Act Provisions; Annual Catch Limits; Na onal Standard Guidelines; Final Rule. In 50 CFR Part 600, Federal Register, Vol.74.

NOAA (National Oceanic and Atmospheric Administration). 2017a. Convention on International Trade in Endangered Species of Wild Fauna and Flora. Available at: https://www.fisheries.noaa.gov/national/international-affairs/convention-international-trade-endangered-species-wild-fauna-and.

NOAA (National Oceanic and Atmospheric Administration). 2017b. Laws and Policies: Marine Mammal Protection Act. Available at: https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act.

NOAA 2020c. Georges Bank Winter Flounder 2020 Assessment Update Report. NOAA, National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts.

NOAA 2021. 2017-2021 North Atlantic Right Whale Unusual Mortality Event. Accessed 9th November 2021. Available at https://www.fisheries.noaa.gov/national/marine-life-distress/2017-2021-north-atlantic-right-whale-unusual-mortality-event.

NOAA 2022c. North Atlantic Right Whale Calving Season 2022. Available at: https://www.fisheries.noaa.gov/national/endangered-species-conservation/north-atlantic-right-whale-calving-season-2022

NOAA. 2012. Atlantic Large Whale Take Reduction Plan (ALWTRP) Enforcement Update Draft. Available at:http://www.nero.noaa.gov/whaletrp/trt/meetings/day1/Enforcement%20update%20ALWTRT_southeast.pdf

NOAA. 2018a. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2017. 349pp. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/marine-mammal-stock-assessment-reports-species-stock.

NOAA. 2018b. Summary of Analyses Conducted to Determine At-Sea Monitoring Requirement for Multispecies Sectors FY2018. 12 pp. Available at: https://www.greateratlantic.fisheries.noaa.gov/ro/fso/reports/Sectors/ASM/FY2018_Multispecies_Sector_ASM_Requirements_Summary.pdf.

NOAA. 2018c. Atlantic Large Whale Take Reduction Plan Northeast Trap/Pot Fisheries Requirements and Management Areas.

NOAA. 2018c. Atlantic Large Whale Take Reduction Plan: Northeast Gillnet Fisheries Requirements and Management Areas. Available at: https://www.greateratlantic.fisheries.noaa.gov/protected/whaletrp/docs/Outreach%20Guides%20Updated%20May%202015/northeast_gillnet_2018_1.pdf.

NOAA. 2019c. 2019 Draft U.S. Atlantic and Gulf of Mexico Draft Marine Mammal Stock Assessment. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports

NOAA. 2019c. 2019 Draft U.S. Atlantic and Gulf of Mexico Draft Marine Mammal Stock Assessment. Available at: https://www.fisheries.noaa.gov/national/marine-mammal-protection/draft-marine-mammal-stock-assessment-reports

NOAA. 2020. Active and Closed Unusual Mortality Events. Available at: https://www.fisheries.noaa.gov/national/marine-life-distress/active-and-closed-unusual-mortality-events

NOAA. 2020b. New North Atlantic Right Whale Calves Born off Florida, Georgia, and South Carolina. February 12, 2020 Available at: https://www.fisheries.noaa.gov/feature-story/new-north-atlantic-right-whale-calves-born-florida-georgia-and-south-carolina

O'Brien, L. 2006. Cusk. Northeast Fisheries Science Center. 8 pp.

Orphanides, C.D., G.M. Magnusson. 2007. Characterization of the Northeast and Mid-Atlanicc Bottom and Mid-water Trawl Fisheries Based on Vessel Trip Report (VTR) Data. Northeast Marine Fisheries Science Center Reference Document 07-15. National Marine Fisheries Service, Woods Hole Lab, 166 Water St, Woods Hole MA 02543-1026.

Pace, R.M., III, P.J. Corkeron, S.D. Kraus. 2017. State space model abundance estimates reveal right whales falling off the track to recovery. Ecol. and Evol. DOI: 10.1002/ece3.3406.

Palmer, M. 2017a. Gulf of Maine Atlantic Cod. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/gulf_of_maine_cod.pdf.

Palmer, M. 2017b. Gulf of Maine Haddock. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/gulf_of_maine_haddock.pdf.

Palmer, M.C. 2014. 2014 Assessment update report of the Gulf of Maine Atlantic cod stock. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 14-14; 119 p. Available from: National Marine Fisheries Service,166 Water Street, Woods Hole, MA 02543-1026.

Pettis, H.M., Pace, R.M. III, Hamilton, P.K. 2021. North Atlantic Right Whale Consortium 2020 Annual Report Card. Report to the North Atlantic Right Whale Consortium.

Provencher, E. 2017. FY16 JEA HPTRP and JEA Pinger Annual report. Available at: https://www.greateratlantic.fisheries.noaa.gov/protected/porptrp/trt/Meetings/Nov%202017/fy16_jea_hptrp_and_jea_pinger_annual_report.docx.pdf.

Reilly, S.B., J.L Bannister, P.B. Best, M., Brown, R.L. Brownell Jr., D.S. Butterworth, P.J. Clapham, J. Cooke, G.P. Donovan, J. Urbán, A.N. Zerbini. 2008b. Balaenoptera acutorostrata. The IUCN Red List of Threatened Species 2008: e.T2474A9444043.
http://dx.doi.org/10.2305/IUCN.UK.2008.RLTS.T2474A9444043.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/2474/0.

Richards, A. 2013. Goosefish (Lophius americanus). Status of Fishery Resources off the Northeastern US NEFSC - Resource Evaluation and Assessment Division. Available at: https://www.nefsc.noaa.gov/sos/spsyn/og/goose/.

Richards, R.A. 2016. 2016 Monkfish Operational Assessment. US Department of Commerce, Northeast Fisheries Science Center. Reference Document 16-09. July 2016. 109 p. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1609/crd1609.pdf.

Scotten, L.N., Smith, R.E., Smith, N.S., Price, K.S., & de Sylva, D.P., 1973. Pictorial Guide to Fish Larvae of Delaware Bay. Delaware Bay Report Series. Volume 7. College of Marine Studies, University of Delaware, Newark, Delaware, 19711

Sosebee, K. 2020. 2019 NE Skate Stock Status Update. Northeast Fisheries Science Center. 15pp.

Sosebee, K. 2017a. White Hake. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/white_hake.pdf.

Sosebee, K.A., S.X.Cadrin. 2006. A historical perspective on the abundance and biomass of northeast

demersal complex stocks from NMFS and Massachusetts inshore bottom trawl surveys, 1963-2002. NEFSC Res. Doc. 06-05. 200 p.

Steimle, F. W., W. W. Morse, D. L. Johnson. 1999. Essential Fish Habitat Source Document: Goosefish, Lophius americanus, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-127. 31 pp. Available at: https://www.nefsc.noaa.gov/publications/tm/tm127/tm127.pdf.

Taylor, B.L., R. Baird, J. Barlow, S.M. Dawson, J.K.B. Ford, J.G. Mead, G. Notarbartolo di Sciara, P. Wade, R.L. Pitman. 2012. Grampus griseus. The IUCN Red List of Threatened Species 2012: e.T9461A17386190. http://dx.doi.org/10.2305/IUCN.UK.2012.RLTS.T9461A17386190.en. Downloaded on 26 March 2018. Available at: http://www.iucnredlist.org/details/9461/0.

Terceiro, M. 2017. Gulf of Maine - Georges Bank American Plaice. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/gom_gb_american_plaice.pdf.

TRAC. 2020. Georges Bank Yellowtail Flounder. TRAC Status Report 2020/03.

Walsh, S.J. 1992. Size-Dependent Selection at the Footgear of a Groundfish Survey Trawl. North American Journal of Fisheries Management 12:3, 625–633. Available at: https://s3-us-west-2.amazonaws.com/sfwart/comments/61625/walsh%201992.pdf.

Waring, G.T., R.A. DiGiovanni Jr, E. Josephson, S. Wood, J.R. Gilbert. 2015. 2012 population estimate for the harbor seal (Phoca vitulina concolor) in New England waters. NOAA Tech. Memo. NMFS NE-235. 15 pp.Waring, G.T., M.C. Rossman and F.W. Wenzel. 2015b. Serious injury determinations for small cetaceans and pinnipeds caught in commercial fisheries off the northeast U.S. coast, 2012. Northeast Fish. Sci. Cent. Ref. Doc. 15-12. 19 pp.

Wigley S.E., C. Tholke. 2018. 2017 Discard Estimation, Precision, and Sample Size Analyses for 14 Federally Managed Species Groups in the Waters off the Northeastern United States. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 17-07; 170 pp. Available at: https://www.nefsc.noaa.gov/nefsc/publications/crd/crd1707/.

Wigley, S. 2017a. Ocean Pout. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17. Available at: https://www.nefsc.noaa.gov/publications/crd/crd1717/ocean_pout.pdf.

Wigley, S. 2017b. Witch Flounder. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17.

Zhang, C., Y. Chen. 2015. Development of Abundance Indices for Atlantic Cod and Cusk in the Coastal Gulf of Maine from their Bycatch in the Lobster Fishery, North American Journal of Fisheries Management 35, 4: 708-719, DOI: 10.1080/02755947.2015.1043413.

Appendix A: Report Review and Update

This report was reviewed and updated in September 2022 for any significant stock status or management updates to the fishery. Additional data and scientific information were found that significantly affected some of the ratings.

The overall recommendations for pollock caught in U.S. gillnet fisheries were downgraded to Avoid. The overall recommendations for Atlantic cod caught in U.S. gillnet fisheries remain Avoid. The overall ratings for Atlantic cod, haddock, and pollock caught using bottom trawls, longlines, and handlines and hand-operated pole and lines are unchanged.

The most recent stock status information was used to update answers for Factors 2.1 and 2.2 for North Atlantic right whale. This did not result in a change in the score for either factor.

Information on recent entanglements of North Atlantic right whale resulting in serious injury was considered with respect to the effectiveness of management measures implemented in U.S. gillnet fisheries for Atlantic cod and pollock to minimize the impact on this endangered marine mammal. The cumulative impact of fishing mortality, the potential for U.S. gillnet fisheries for Atlantic cod and pollock to contribute to this excessive fishing mortality, and the failure of management measures to prevent entanglement leading to serious injury or mortality of North Atlantic right whale resulted in a score of ineffective (a downgrade from the previous moderately effective score).

Red criterion scores for Criteria 2 and 3 result in an overall rating of Avoid for U.S. gillnet fisheries for Atlantic cod and pollock.