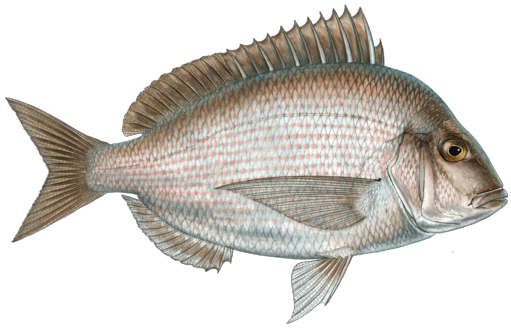
Scup

Stenotomus chrysops



United States: Northwest Atlantic

Bottom trawls

Report ID 27722

October 3, 2022

Seafood Watch Standard used in this assessment: Fisheries Standard v4

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

Scup is a temperate, demersal, migratory species found along the northeast Atlantic waters of the United States in areas that have sandy, muddy sea bottoms, mussel beds, and seagrass beds. This report assesses the sustainability of the U.S. scup caught using bottom otter trawls across New England and the Mid-Atlantic. Approximately 75% of commercial scup landings are caught using this gear.

In 1996, the scup stock was declared overfished and the fishery was under a rebuilding plan. Since 2009, the stock has recovered and subsequently has been declared rebuilt. The most recent stock assessment update indicates that scup is not overfished and overfishing is not occurring.

Trawls usually catch nontarget species and are not highly selective. Bycatch data that were analyzed showed that several endangered, threatened and protected (ETP) species were incidentally caught in the fishery, including loggerhead turtle, sharks, Atlantic sturgeon, blue herring, and horseshoe crab. But, management measures are in place to ensure that bycatch of these vulnerable species is reduced.

Trawls typically have adverse effects on bottom habitats, although this impact is reduced on sandy and muddy sea bottoms where scup is usually fished.

Overall, because of concerns about bycatch of species in the New England and Mid-Atlantic regions, the scup bottom otter trawl fishery has been rated Yellow or a Good Alternative.

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Scup | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic	5.000	1.732	3.000	2.449	**Good Alternative (2.824)**
Scup | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery	5.000	1.000	3.000	2.449	**Good Alternative (2.462)**

Summary

Overall, fisheries for scup caught using bottom trawls in the Mid-Atlantic and New England regions are given a Good Alternative rating by Seafood Watch, because of concerns about their impact on bycatch 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 report addresses the major sources of wild-caught scup (*Stenotomus chrysops*) for the North American market, caught from the U.S. Mid-Atlantic and New England using bottom trawls.

Species Overview

Scup (*Stenotomus chrysops* Linnaeus 1766) is a temperate, demersal species found in areas that have sandy, muddy sea bottoms, mussel beds, and seagrass beds (NOAA 1999)(MAFMC 2021). This species lives in areas that are rich in benthic prey, along the northeast and mid-Atlantic waters of the United States (NOAA 1999)(MAFMC 2021).

At around 2 years of age and 15.5 cm fork length (FL), 50% of both male and female scup reach sexual maturity (NOAA 1999)(MAFMC 2021). At 3 years of age and 21 cm FL, most scup are sexually mature. Scup typically lives up to 14 years, although its maximum age is 20 years, growing to a size >45 cm FL and weighing up to 2 kg (NOAA 1999)(MAFMC 2021). But, most scup that are currently caught in the Mid-Atlantic are less than 7 years of age, at about 33 cm FL (MAFMC 2021). The average size of scup has significantly declined since the 1930s (NOAA 1999).

Scup usually spawns over sandy and weedy regions along the inner continental shelf from May through to August in waters less than 10 m deep (NOAA 1999). Fertilization is external, without parental care (NOAA 1999). Spawning occurs only once annually, during the spring, when scup migrates to inshore waters where temperatures are above 10 °C (NOAA 1999). Although adult scup are demersal, their eggs and larvae are pelagic, and the larvae gradually transition to the demersal adult stage (NOAA 1999).

Being demersal, scup is a benthic feeder, consuming prey that includes zooplankton, polychaete worms, mollusks, small squid, detritus, insect larvae, hydroids, sand dollars, and small fish (NOAA 1999)(MAFMC 2021). Predators of adult scup include several shark species, bluefish, silver hake, summer flounder, black sea bass, weakfish, lizardfish, king mackerel, northern stargazer, and goosefish/monkfish (NOAA 1999) (MAFMC 2021). Scup larvae feed on zooplankton and small benthic invertebrates and are prey to planktivores such as medusae, crustaceans, and fish (NOAA 1999). Juvenile scup feed on polychaetes, epibenthic amphipods, other small crustaceans, mollusks, fish eggs, and larvae (NOAA 1999). Smaller-sized scup are preyed upon by cod during fall and by shorebirds during summer (NOAA 1999). The dietary composition of scup varies slightly, based on location (NOAA 1999).

Scup feeds mostly when it occupies inshore waters, and accumulates food reserves from spring to fall (NOAA 1999). Feeding in scup reduces greatly in the winter, when it occupies offshore waters, because it shows little growth during this period (NOAA 1999). Scup belongs to an offshore-wintering guild of fishes that includes species such as summer flounder (*Paralichthys dentatus*), black sea bass (*Centropristis striata*), northern searobin (*Prionotus carolinus*), and smooth dogfish (*Mustelus canis*) (NOAA 1999).

Scup is migratory, and seasonally moves from offshore waters in the fall and winter to more inshore, estuarine coastal habitats in the spring and summer (MAFMC 2021). Being a temperate species, scup migrates during the winter from the northeast of the United States, south of New Jersey to warmer, offshore waters (NOAA 1999). This winter migration occurs when inshore waters drop to less than 8–9

°C, so scup migrates to warmer waters on the outer continental shelf at depths of 75–185 m. Juveniles follow adults in this migration, but sometimes occupy larger and deeper estuaries over the winter (NOAA 1999). As waters get warmer in the spring, scup returns inshore. Larger adults arrive first, followed by subadults (NOAA 1999). Thus, schools of migrating scup are structured by age (NOAA 1999). Stored energy from feeding during the warmer months supports the scup migration, the reduced feeding during winter, and gonadal development (NOAA 1999).

Scup is found from Cape Hatteras in North Carolina to the Gulf of Maine (MAFMC 2021). From spring to fall, scup is found in estuaries and coastal waters, and in winter it is found in offshore waters of the outer continental shelf at about 200 m (NOAA 1999). Whereas larvae and smaller-sized scup are found in bays, estuaries, and coastal waters, larger-sized scup tend to occupy deeper waters (NOAA 1999).

The density and distribution of scup during the winter is linked to its preference for the 7 °C bottom isotherm in the outer continental shelf, which represents the lower limit of the species' temperature tolerance (NOAA 1999). This band of warmer water in the outer continental shelf is maintained by the Gulf Stream.

The scup fishery along the East Coast of the United States is managed cooperatively by the Mid-Atlantic Management Council (MAFMC or Council) and the Atlantic States Marine Fisheries Commission (ASMFC or Commission). The National Marine Fisheries Service (NMFS) implements federal regulations and acts as the enforcement agency (NMFS 2019)(MAFMC 2021). The U.S. Coast Guard is also responsible for enforcement (NMFS 2019). This cooperative management strategy was developed because scup is landed from both state and federal waters. The management unit for scup in the U.S. extends from Cape Hatteras in North Carolina to the United States–Canada border.

The scup Fisheries Management Plan (FMP) was finalized and incorporated into the summer flounder FMP in 1996, as Amendment 8 (ASMFC 1996). This amendment included gear restrictions, reporting requirements, commercial quotas, a moratorium on commercial permits, possession limits in the recreational industry, and minimum size restrictions (ASMFC 1996). The commercial scup fishery currently operates year-round; the fishery is under federal jurisdiction in the winter months when scup tends to occupy offshore waters, and is under state jurisdiction during the summer when scup migrates to coastal waters (MAFMC 2021).

Production Statistics

Scup is a species that is in high demand, both in the commercial and recreational fishing industries (MAFMC 2021). The scup fishery comprises about 60% commercial fishing and 40% recreational fishing (NEFSC 2020); however, the proportion of commercial to recreational landings in the fishery fluctuates every year (Figure 1). Overall, approximately 75% of commercial scup landings are caught with bottom otter trawls (NOAA 2021b). Other gears used in the commercial fishery include floating traps, hand lines, paired trawls, pound nets, and pots. Recreational fishers use rods and reels. In federal waters, the predominant gear of the commercial scup fishery is bottom otter trawls: 96% of the commercial scup landings reported by VTR data in 2020 were caught using this gear. In federal waters in 2020, pots and traps composed only about 2% of the landings, and other gears composed less than 1% (MAFMC 2021).

Commercial scup landings reached a peak in 1960 at 48.6 million pounds (lb) and then declined until the 1980s, with landings between 11 and 22 million lb (ASMFC 2021). Although landings increased in 1991 to 15.6 million lb, by 2000 they dropped to 2.7 million lb. Thereafter, landings increased, reaching 15 million lb in 2011. Subsequently, landings have ranged from 13.4 million lb (in 2018) to 17.9 million lb (in 2013) (Figure 1) (MAFMC 2021). The average discard rate from the commercial fishery is 26% {ASFMC 2021}; however, in 2017, the level of discards reached a peak at 10.4 million lb.

After the scup FMP was formulated in 1996, recreational landings were low for a few years and ranged from 2 to 4 million lb (Figure 1) (MAFMC 2021){ASFMC 2021}. This helped the spawning stock biomass of scup to recover in the early 2000s. The recreational scup fishery is managed using a regional approach. More recently, recreational landings remain high, with anglers harvesting 12.9 million lb in 2020 {ASFMC 2021}. Most of these anglers are from Massachusetts, Rhode Island, Connecticut, New York, and New Jersey. Overall, in 2020, total scup landings increased to 26.49 million lb (MAFMC 2021).

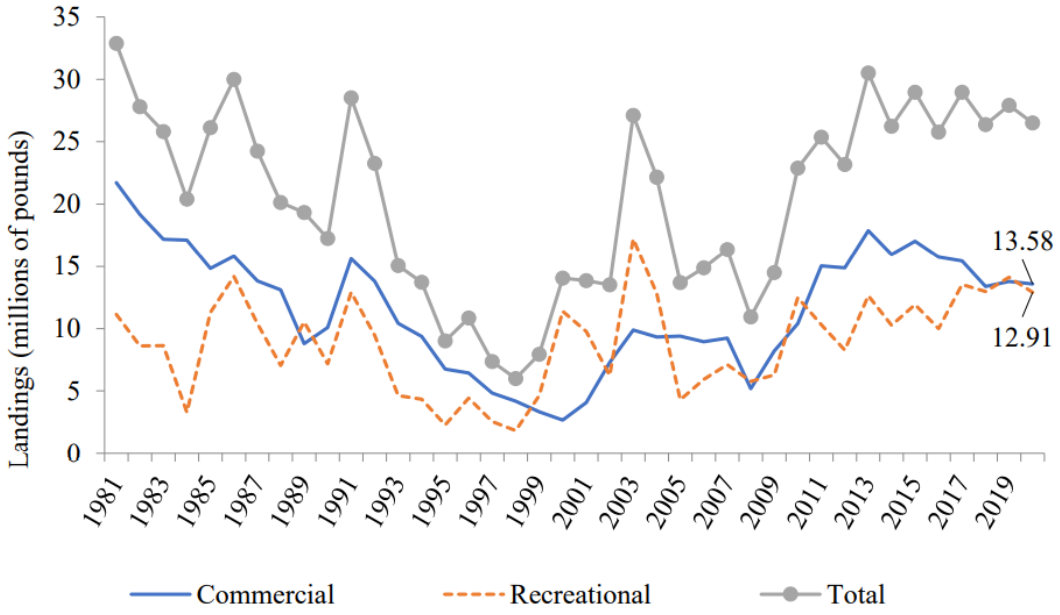


Figure 1: Commercial and recreational scup landings, from Maine to North Carolina, 1981–2020. Taken from (MAFMC 2021).

Scup caught from New England and the Mid-Atlantic region belongs to one stock, occupying separate offshore waters over the winter. In 1996, after the formulation of the scup FMP, the scup stock was declared overfished and the fishery was under a 7-year recovery plan (ASMFC 1996). Again, in 2007, scup was under a stock rebuilding plan until 2015. Since 2009, the stock of scup has experienced a recovery and has been declared rebuilt (NESFC 2015).

Importance to the US/North American market.

Scup is found in the Western Atlantic, and hence is a fishery of commercial importance along the East Coast of the United States. In 2020, commercial landings of scup reached 13.6 million lb and were more

than $9.3 million in value (NOAA 2021b). From 2011 to 2020, the following states landed 95% of the scup in their commercial fisheries: Rhode Island (42%), New York (27%), New Jersey (15%), Massachusetts (10%), and Connecticut (6%); the highest catch occurs in waters off the coast of these states (Figure 2) (ACCSP Data Warehouse 2022)(NOAA 2021b). Scup is neither exported nor imported and is consumed domestically in the U.S.; however, it is likely that the species will be exported from the U.S. in the future (pers. comm., Leaning D.).

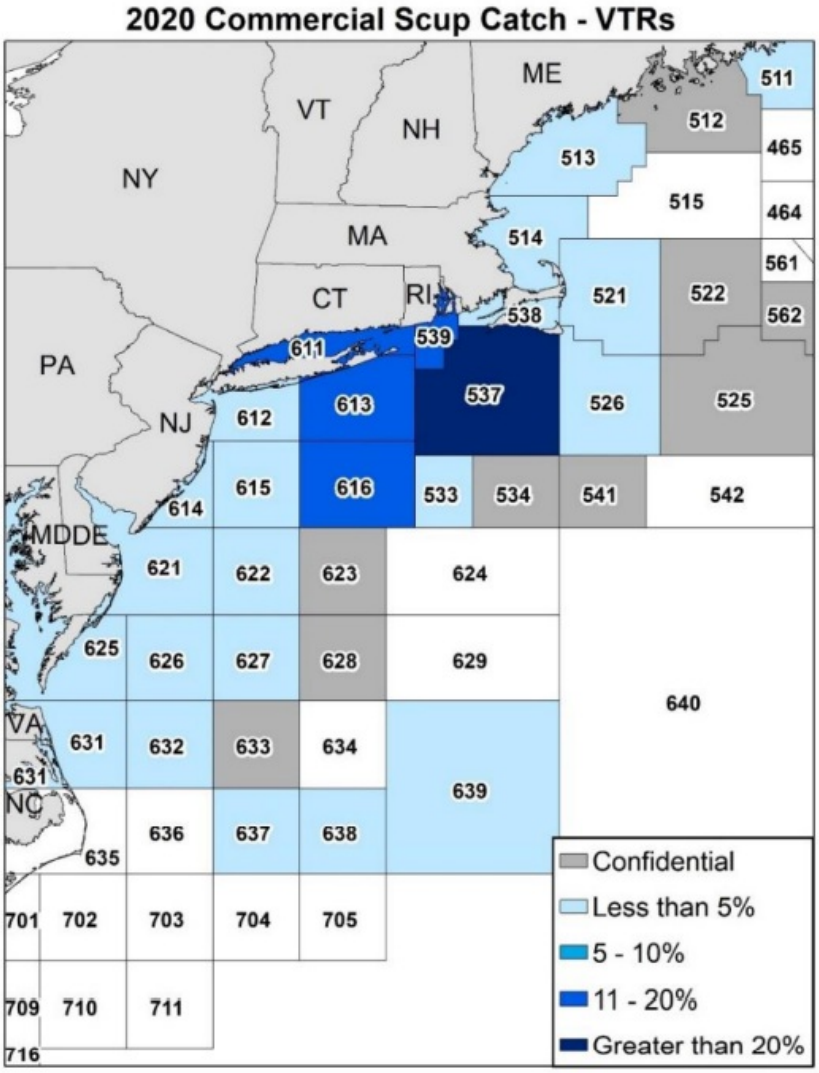


Figure 2: Proportion of scup catch by statistical area in 2020 based on federal VTR data. Statistical areas marked "confidential" are associated with fewer than three vessels and/or dealers. Taken from (MAFMC 2021).

Common and market names.

Scup is also known as porgy, maiden, fair maid, ironsides, and Northern porgy (NOAA FishWatch 2021).

Primary product forms

Scup is generally sold and cooked whole, after it has been descaled and cleaned (NOAA FishWatch 2021).

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

SCUP			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery	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.*

Scup

Factor 1.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Very Low Concern

The most recent stock assessment update was conducted in 2021, with data from 2019 (NEFSC 2022). Abundance data have been consistently collected over the years {NMFS & NEFSC 2017}. Because there is a recent stock assessment and update for scup, which has been published by the Northeast Fisheries Science Center, and spawning stock biomass has been well above the target reference point set for the scup fishery, abundance for this fishery has been scored a very low concern.

Justification:

Abundance data in terms of spawning stock biomass (SSB) appear to have been collected consistently since 1984 (Figure 3). The most recent abundance estimates were collected in 2019 (NEFSC 2022). After 2000, the SSB started gradually increasing, and this corresponded with an increase in recruitment in several year classes (Figure 3) {NMFS & NEFSC 2017}. The 2021 updated stock assessment showed that, in 2019, SSB was 176,404 mt, which was almost double the updated target reference point of SSB_{MSY} = $SSB_{40\%}$ = 90,019 mt (NEFSC 2022), indicating that the stock is not overfished.

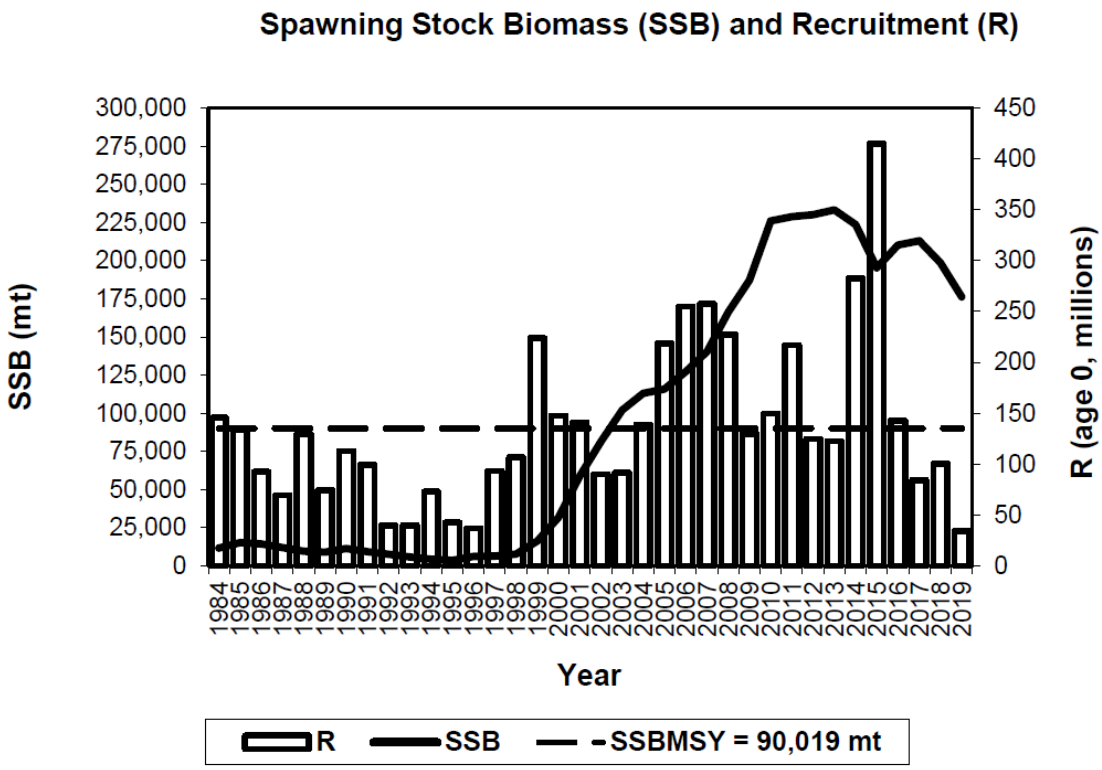


Figure 3: Scup spawning stock biomass (SSB; solid line) and recruitment at age 0 (R; vertical bars) by calendar year from 1984 to 2019. The horizontal dashed line is the updated SSB_{MSY} proxy = $SSB_{40\%}$ = 90,019 mt. Taken from (NEFSC 2022).

Factor 1.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Low Concern

The fishing mortality on the fully selected age 4 fish was 0.136 in 2019, which is lower than the updated biological reference point of F_{MSY} or $F_{40\%}$ set at 0.200, indicating that the stock is currently not experiencing overfishing (Figure 5) (NEFSC 2022). 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 it is probable 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 is deemed 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 as a result of management strategies put in place between 2005 and 2009.

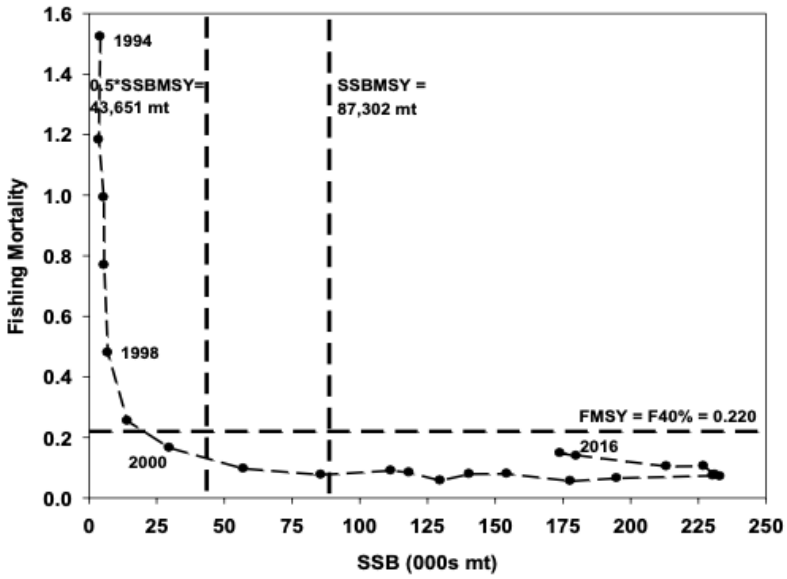


Figure 4: Fishing mortality and spawning stock biomass (in metric tons) of the scup fishery from 1994 to 2017 {NMFS & NEFSC 2017}, showing target reference points $F_{MSY} = F_{40\%} = 0.220$ and $SSB_{MSY} = SSB_{40\%} = 87{,}302$ mt.

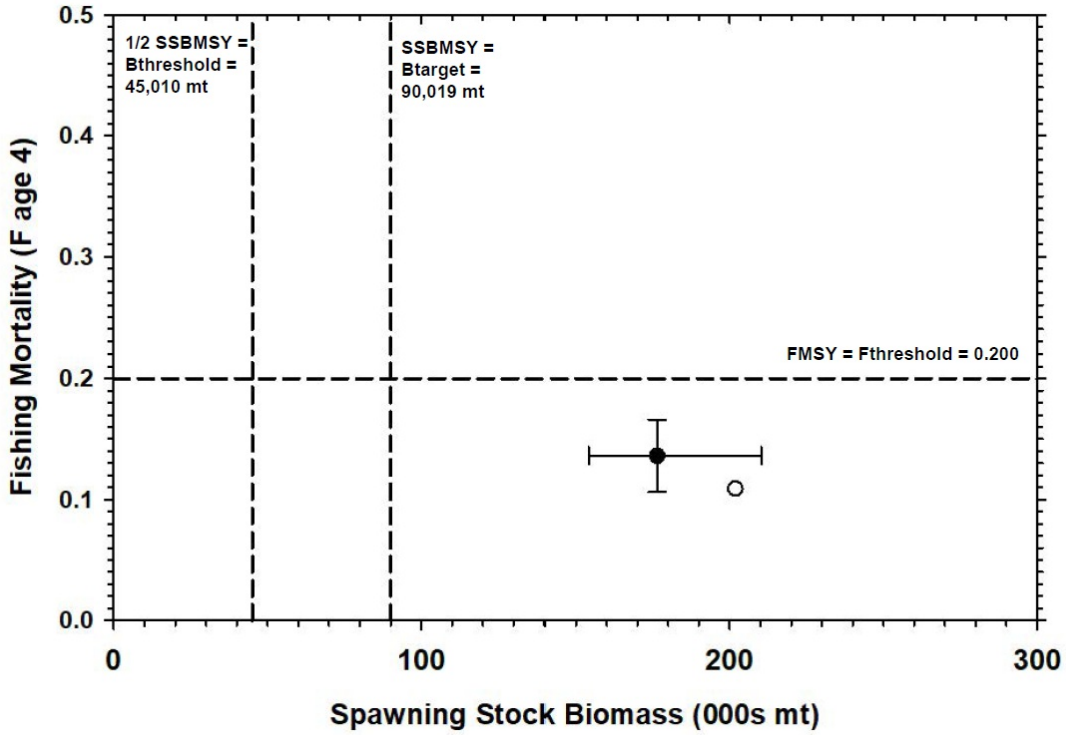


Figure 5: Fishing mortality F at age 4 and spawning stock biomass (SSB) in metric tons of the scup fishery, from 2019. Taken from (NEFSC 2022).

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.

SCUP			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic	1.732	1.000: < 100%	Red (1.732)
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery	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.

NORTHWEST ATLANTIC | BOTTOM TRAWLS | UNITED STATES | NORTH OF CAPE HATTERAS | MID ATLANTIC			
SUB SCORE: 1.732	DISCARD RATE: 1.000		**SCORE: 1.732**
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic sturgeon	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Horseshoe crabs	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Ocean sunfish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Rays	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Sharks	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Witch flounder	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Loggerhead turtle	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Skates (unspecified)	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Northern shortfin squid	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Longfin squid	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Spiny dogfish	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Little 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)
Black sea bass	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)

NORTHWEST ATLANTIC | BOTTOM TRAWLS | UNITED STATES | NORTH OF CAPE HATTERAS | NEW ENGLAND FISHERY			
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 sturgeon	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Blueback herring	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Horseshoe crabs	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Ocean sunfish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Rays	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Sharks	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Witch flounder	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Loggerhead turtle	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Skates (unspecified)	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Northern shortfin squid	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Longfin squid	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Silver hake	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Scup	5.000: Very Low Concern	5.000: Low Concern	Green (5.000)

Catch composition data for bottom otter trawls targeting scup in the Mid-Atlantic and New England regions were provided by NOAA Federal (NOAA Federal 2021). Species were evaluated from this data set, and those making up more than 5% of the catch were included in this assessment. Further, any endangered, threatened, or protected (ETP) species listed under the U.S. Endangered Species Act (ESA) or the International Union for the Conservation of Nature (IUCN) Red List was included in this assessment if its potential biological removal (PBR) level was exceeded, or if the level to which it could be sustainably fished was unknown. In addition, for any species that was overfished or being overfished, if bycatch in the scup bottom otter trawl fishery amounted to >5% of that species' F_{MSY} or was unknown, it was included in this assessment.

In the Mid-Atlantic bottom trawl fishery, Atlantic sturgeon limits the score of Criterion 2 because the species is listed under the ESA. Horseshoe crab, ocean sunfish, rays, and sharks limit the score because they are listed on the IUCN Red List. Northern shortfin squid limits the score as a result of its high vulnerability, as identified by conducting a productivity-susceptibility analysis (PSA). Witch flounder limits the score because it is overfished; the stock condition is poor compared to previous years.

In the New England bottom trawl fishery, Atlantic sturgeon limits the score of Criterion 2 because the species is listed under the ESA. Yellowtail flounder and witch flounder limit the score as a result of their overfished and/or overfishing status. Blueback herring, horseshoe crab, ocean sunfish, rays, and sharks limit the score because they are listed on the IUCN Red List. Northern shortfin squid limits the score because it is highly vulnerable, as identified by conducting a PSA.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Abundance
(same as Factor 1.1 above)

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

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

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

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

Atlantic cod

Factor 2.1 - Abundance

Georges Bank Stock | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

Based on the 2017 Georges Bank Atlantic cod stock assessment, the stock status of Georges Bank cod cannot be quantitatively determined because of a lack of biological reference points associated with the "Plan B smooth" approach (Legault, C. 2017a). But, it is considered to be overfished as a result of poor stock condition (Legault, C. 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 (Figure 6) (Legault, C. 2017a). According to the NMFS first quarter 2019 update, Georges Bank Atlantic cod is overfished and in year 15 of a 23-year rebuilding plan (NMFS 2019).

Based on the 2017 Gulf of Maine Atlantic cod stock assessment, spawning stock biomass (SSB) of Gulf of Maine cod 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) (Palmer 2017a). According to the NMFS first quarter 2019 update, Gulf of Maine Atlantic cod is overfished and in year 5 of a 10-year rebuilding plan (NMFS 2019).

Because Gulf of Maine and Georges Bank cod stocks are overfished, abundance is considered a high concern.

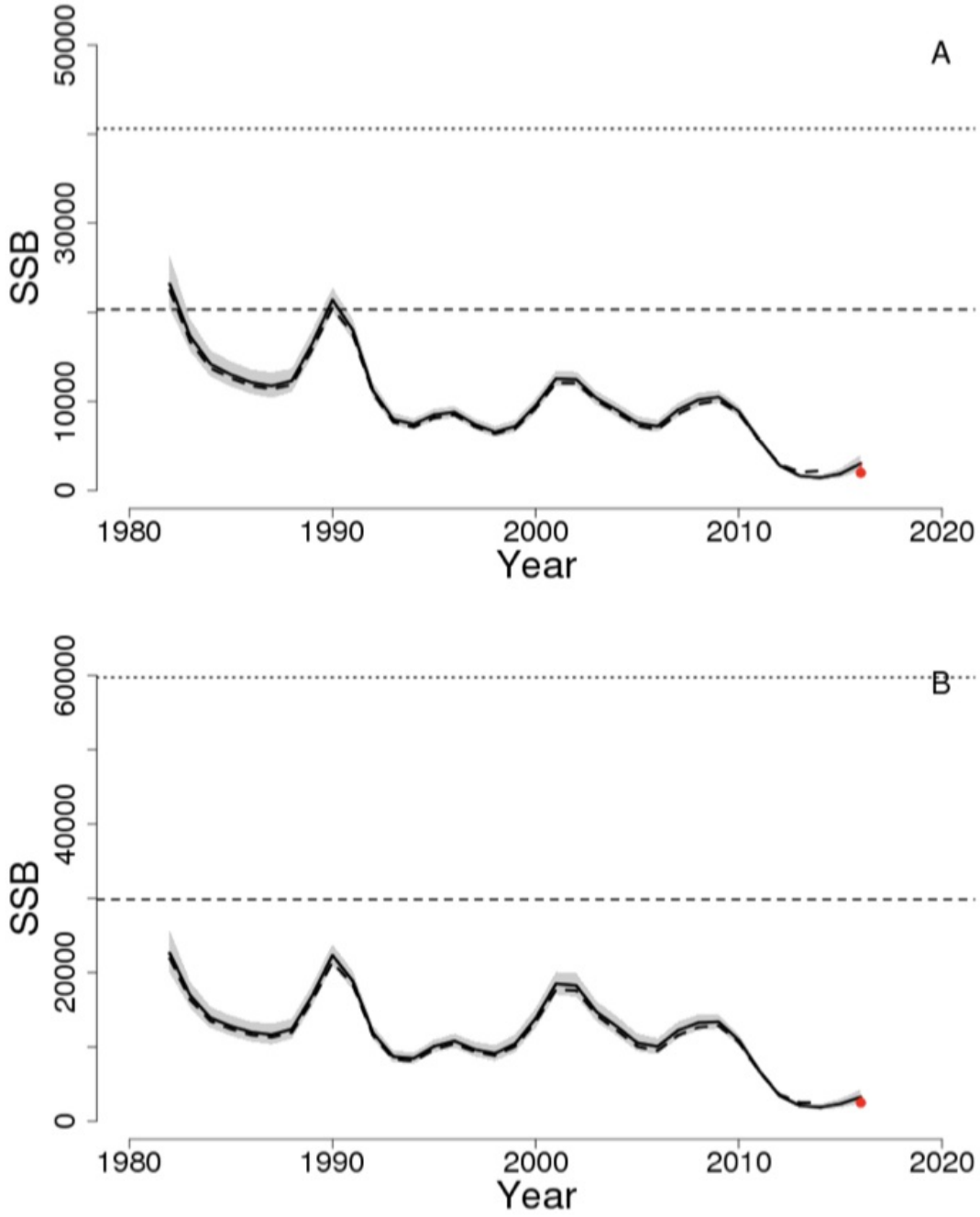


Figure 6: Estimated trends in the spawning stock biomass (SSB) of Gulf of Maine Atlantic cod between 1982 and 2016 from the current (solid line) and previous (dashed line) assessment and the corresponding $SSB_{THRESHOLD}$ (1/2 SSB_{MSY}; horizontal dashed line) as well as SSB_{TARGET} (SSB_{MSY}; horizontal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

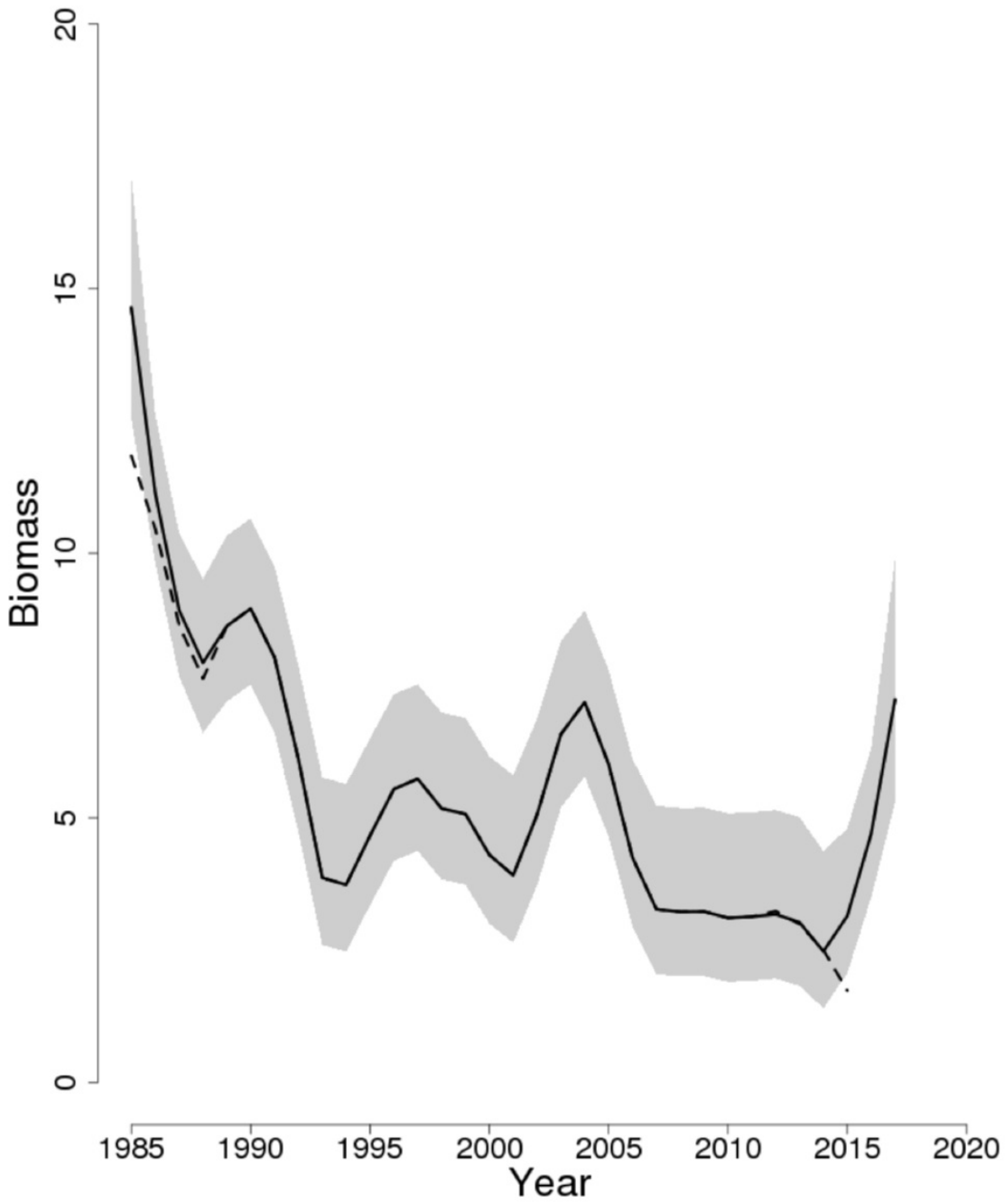


Figure 7: Trends in smoothed survey biomass (kg/tow) of Georges Bank Atlantic cod between 1985 and 2017 from the current (solid line) and previous (dashed line) assessment, based on the 2017 assessment. The approximate 90% lognormal confidence intervals are shown {Legault 2017}.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Low Concern

According to the updated 2016 operational assessment of northeast groundfish stocks, there are no suitable reference points such as F_{MSY} or F_{MSY} proxy to determine whether Atlantic cod from George's Bank is being overfished (NEFSC 2017), so the overfishing status is unknown. Based on the 2017 Gulf of Maine Atlantic cod stock assessment, the 2016 fully selected fishing mortality was estimated at 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 (Palmer 2017a). Nevertheless, because the observed fishing mortality of Atlantic cod caught in the scup trawl fishery is less than 1% of the total fishing mortality of Atlantic cod, the scup trawl fishery is not considered a substantial contributor to the fishing mortality of Atlantic cod. For this reason, fishing mortality of Atlantic cod has been rated a low concern.

Atlantic sturgeon

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

Historically, Atlantic sturgeon was abundant along the Atlantic coast of the United States and Canada (ASMFC 2017b). Landings of this species peaked in 1890 at 3,349 mt, declined thereafter, and collapsed in 1901, remaining low until the mid-1990s (ASMFC 2017b). Currently, all five distinct population segments (DPS) of Atlantic sturgeon in the U.S. are listed under the ESA; four of the five DPS (from Carolina, Chesapeake Bay, New York Bight, and South Atlantic) are "Endangered," while the Gulf of Maine DPS remains "Threatened" (ASMFC 2017b)(NOAA Fisheries 2021c). A recent stock assessment confirms that Atlantic sturgeon is depleted in the U.S. (ASMFC 2017b). For these reasons, abundance has been rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

After the collapse of the Atlantic sturgeon fishery along the Atlantic coast of the U.S., the ASFMC enacted a moratorium, banning the harvest and possession of Atlantic sturgeon (ASMFC 2017b), and the NMFS enacted a moratorium in federal waters, within the exclusive economic zone (EEZ) along the Atlantic coast {U.S. Fish & Wildlife Service 2021}. Nevertheless, bycatch from the trawl fishery does contribute to mortality of Atlantic sturgeon (ASMFC 2017b). There are no estimates of Atlantic sturgeon bycatch mortality in Atlantic bottom trawl fisheries; however, the average annual

bycatch mortality of Atlantic sturgeon in bottom trawls is not likely to reduce the survival and recovery of this species (NMFS 2021). For this reason, fishing mortality of this species in the scup bottom trawl fishery has been rated a moderate concern.

Black sea bass

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Very Low Concern

Abundance estimates of black sea bass stock targeted in the commercial and recreational fishery have been collected consistently since 1989. According to the recent black sea bass Operational Assessment for 2021, SSB was estimated at 29,769 mt in 2019, which is about 2.1 times the updated biomass target reference point SSB_{MSY} proxy = $SSB_{40\%}$ = 14,441 mt, indicating that the stocks are not overfished. Recruitment of the 2018 year class at age 1 in 2019 was estimated at 46.2 million and 79.4 million with retro adjustment; both of these values are well above average (Figure 8) (NEFSC 2021). For these reasons, abundance is rated a very low concern (NEFSC 2021).

Justification:

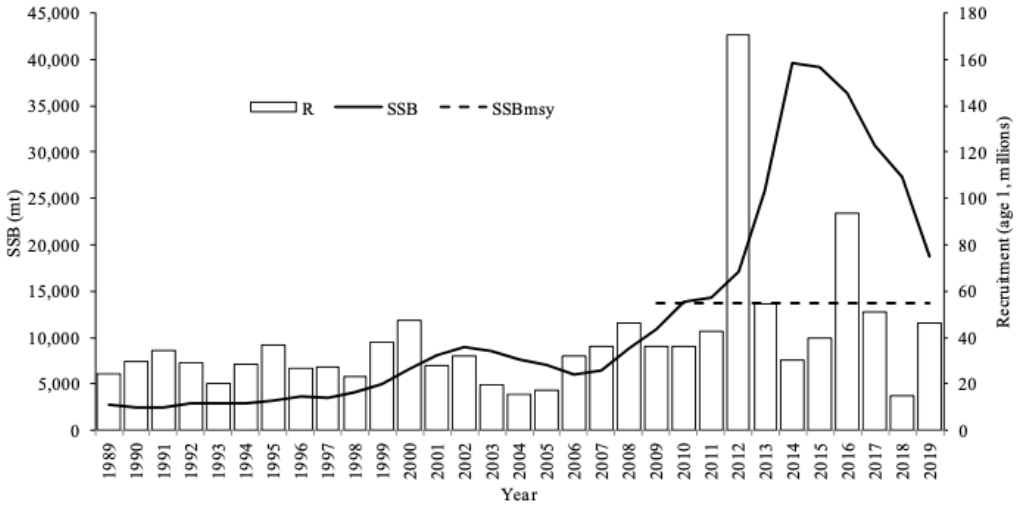


Figure 8: Black sea bass spawning stock biomass (SSB; solid line) and recruitment at age 0 (R; vertical bars) from 1989 to 2019. The horizontal dashed line is the updated SSB_{MSY} proxy = $SSB_{40\%}$ = 14,441 mt. Taken from {NMFS & NEFSC 2021}.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

According to the recent black sea bass Operational Assessment for 2021, fishing mortality on the fully selected ages 6–7 fish was 0.39 in 2019, which was 85% of the updated fishing mortality threshold reference point F_{MSY} proxy = $F_{40\%}$ = 0.46 (Figure 9) (NEFSC 2021), indicating that the black sea bass stock is currently not experiencing overfishing. Hence, fishing mortality is rated a low concern.

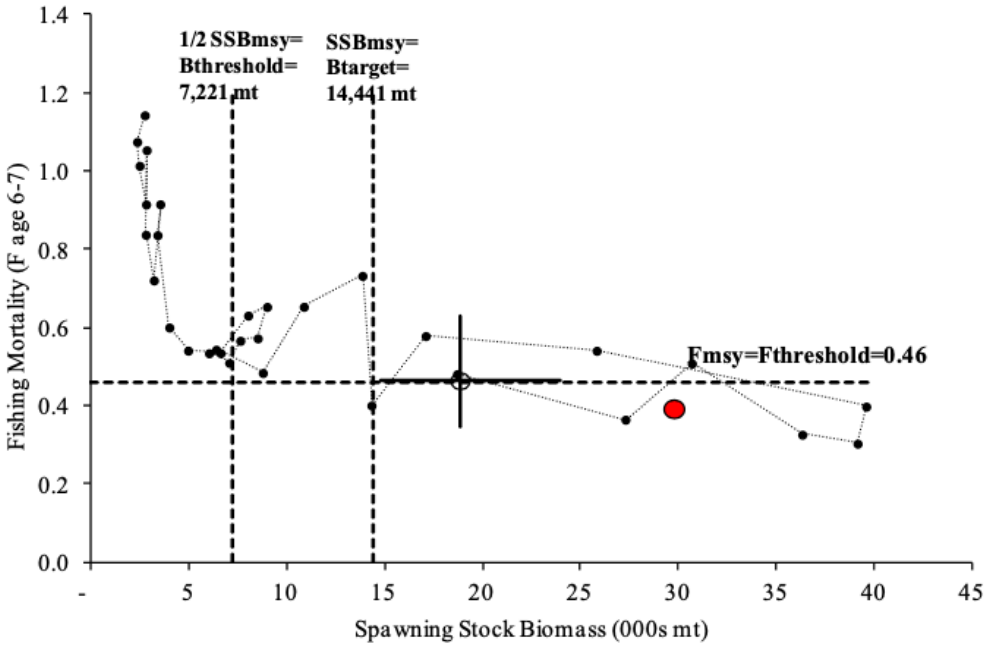


Figure 9: Estimates of black sea bass spawning stock biomass (SSB) and fully recruited fishing mortality (F, peak at ages 6–7) relative to the updated 2021 biological reference points. Taken from {NMFS & NEFSC 2021}.

Blueback herring

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

Blueback herring is listed by the IUCN as "Vulnerable" in the United States and Canada (NatureServe 2013). Although there is an official stock assessment conducted for this species, no estimates of spawning stock biomass or biological reference points, such as SSB_{MSY} and SSB_{MSY} proxy, have been made {ASMFC 2017}. For this reason, abundance of blueback herring is rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

The fishing mortality of blueback herring is unknown because only total mortality (Z) estimates have been mentioned in the stock assessment conducted on this species {ASMFC 2017}. But, blueback herring is caught in quite small proportions in the scup bottom trawl fishery. For these reasons, fishing mortality is rated a moderate concern.

Horseshoe crabs

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

The American horseshoe crab (*Limulus polyphemus*) has been listed as "Vulnerable" by the IUCN along its range of occurrence across the Atlantic coast of North America, and as "Endangered" in the New England subregion (Smith et al. 2016). Although a stock assessment has been conducted for this species, no overfished definition was adopted; stock status was based on the percentage of surveys within a region having >50% probability of their terminal year fitted value being less than the 1998 index-based reference point (ASMFC 2019). Because of the IUCN status, abundance is rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Although a recent stock assessment has been conducted on the American horseshoe crab, fishing mortality is unknown because benchmark values are based on harvest including horseshoe crabs attributed to the biomedical industry, and thus are confidential (ASMFC 2019). Despite the stock assessment, no overfishing definition was adopted (ASMFC 2019). But, the species is found in small proportions in the scup trawl fishery. For these reasons, fishing mortality is rated a moderate concern.

Little skate

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

NEFSC surveys conducted in 2017–2019 indicate that the spring average biomass index for little skate was 5.32 kg/tow, which is above the limit reference point of 3.07 kg/tow, and 87% of the target reference point or B_{MSY} proxy of 6.15 kg/tow, indicating that the stock is not overfished (Sosebee, K. 2020). For this reason, abundance is rated a low concern.

Justification:

The biomass reference point is based on NEFSC survey data, because reliable landing and discard data were not available. Thus, the B_{MSY} proxy has been defined as the 75th percentile of the appropriate survey biomass index time series for little skate (Sosebee, K. 2020).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

According to the 2019 New England skate stock status update, fishing mortality reference points are based on changes in survey biomass indices; fishing mortality is assumed to be $>F_{MSY}$ and overfishing is occurring if the 3-year moving average of the survey biomass index declines more than the CV of the time series (Sosebee, K. 2020). Because the 2017–2019 biomass index is above the 2017–2019 average index by 13.4%, the 2019 NE skate stock status update reports that little skate is not experiencing overfishing (Sosebee, K. 2020). For this reason, fishing mortality is rated a low concern.

Loggerhead turtle

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

Loggerhead turtle (*Caretta caretta*) is globally "Vulnerable" on the IUCN Red List {Casale, P. & Tucker, A.D. 2017}, and is also listed under the U.S. Endangered Species Act (ESA). The Northwest Atlantic population of loggerhead turtle is listed as "Threatened" under the ESA (NOAA Fisheries 2021)(NMFS 2021c). For these reasons, abundance is rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Low Concern
According to the recent Endangered Species Act consultation biological opinion on the impact (in terms of injury and mortality) of several Atlantic fisheries on marine endangered species (NMFS 2021d), 954 loggerhead turtles are estimated to interact with bottom trawl gear in the next 5 years, resulting in 477 mortalities (Murray, K. 2020). This indicates that there will be approximately 95 mortalities of loggerhead turtles per year during the period (NMFS 2021d). Assuming that the adult loggerhead population comprises 38,334 individuals, the estimated number of mortalities of loggerhead turtle would be approximately 0.25% (NMFS 2021d). Thus, bycatch in bottom trawl fisheries is not expected to affect the loggerhead population substantially (NMFS 2021d). For these reasons, fishing mortality of loggerhead turtle is rated a low concern.

Longfin squid

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern
Per the 2017 stock assessment for Atlantic longfin squid (*Doryteuthis [Amerigo] pealeii*), the biomass estimate from the fall and spring 2015–2016 surveys was 73,762 mt, which is much higher than the biomass threshold (50% of B_{MSY} proxy) of 21,203 mt and the target reference point or B_{MSY} proxy of 42,405 mt (Figure 10) (Hendrickson, L. 2017). Therefore, the Atlantic longfin squid stock was not overfished. Squid is a species with highly fluctuating populations and it is difficult to determine definitive reference points; however, annual biomass was above both determined proxies, so a score of low concern was awarded.

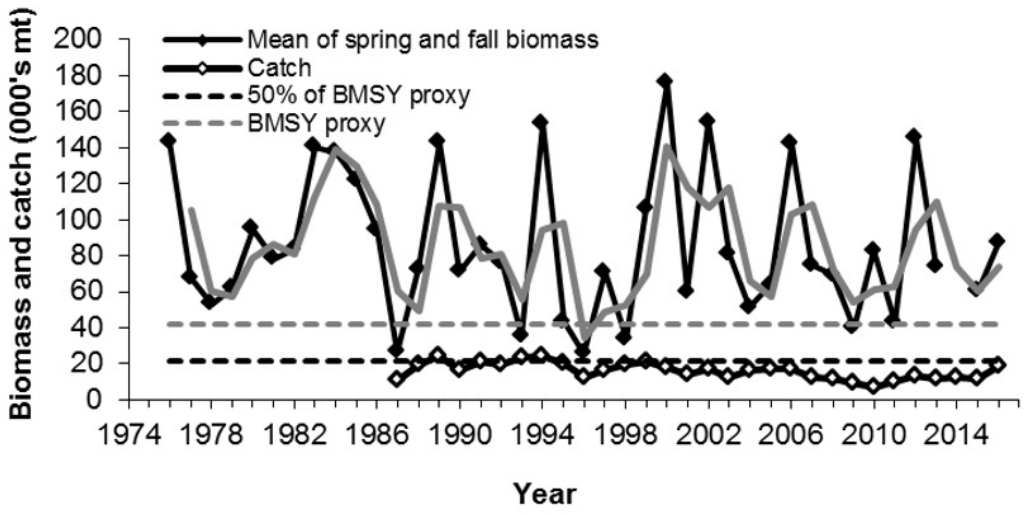


Figure 10: Annual estimates of longfin squid biomass in relation to biomass reference points and catches. The grey line represents the 2-year moving average. Taken from {Hendrickson 2017}.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Moderate Concern

Following the 2017 stock assessment of Atlantic longfin squid, reference points for fishing mortality could not be recommended because there was not enough evidence to show that annual catches had an impact on biomass estimates from 1976 to 2009, and F_{MSY} could not be linked to natural mortality or $F_{\%SPR}$ because longfin squid is a short-lived species (Figure 11) (Hendrickson, L. 2017). But, the stock is likely lightly exploited because annual catches during 1987–2016 were less than annual biomass, and estimates of natural mortality for this semelparous species were quite high in relation to exploitation indices (Hendrickson, L. 2017). For this reason, fishing mortality is rated a moderate concern.

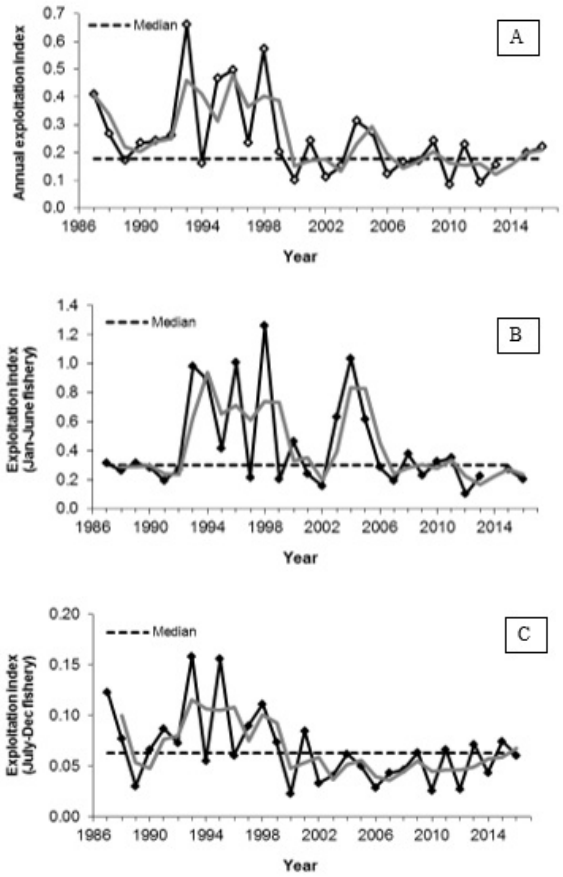


Figure 11: A) Annual exploitation indices for Atlantic longfin squid; B) seasonal exploitation indices for the January–June fishery; and C) seasonal exploitation indices for the July-December fishery. The grey line represents the catch in year *t* divided by the 2-year moving average of biomass. Taken from {Hendrickson 2017}.

Northern shortfin squid

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Because the northern shortfin squid (*Illex illecebrosus*) is listed as "Least Concern" on the IUCN Red List {Barratt & Allcock 2014}, a score of moderate concern has been awarded for abundance.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern
The impact of the fishery relative to a sustainable level is considered unknown, so fishing mortality is scored a moderate concern.

Ocean sunfish

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

High Concern
Ocean sunfish is found in offshore waters of the Atlantic, and its abundance during the summer has been estimated to be 18,000 {Potter & Howell 2011}. This species has been listed as globally "Vulnerable" by the IUCN (Liu, J. 2015), but no stock assessment has been conducted on the population. For these reasons, abundance has been rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Moderate Concern
Although fisheries bycatch is known to be a huge threat to the ocean sunfish populations (Liu, J. 2015), no stock assessment has been conducted on this species in the northwest Atlantic and there are no estimates of fishing mortality of this species. Also, only small numbers of ocean sunfish are found in the scup bottom trawl catch. For these reasons, fishing mortality has been rated a moderate concern.

Rays

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

High Concern

Three species of rays were found in the catch in small proportions, including bullnose eagle ray, bluntnose stingray, and roughtail stingray. Bluntnose stingray has been listed as "Near Threatened," while bullnose eagle ray and roughtail stingray have been listed as "Vulnerable" on the IUCN Red List (Carlson, J. et al. 2020)(Carlson, J. et al. 2020b)(Carlson, J. et al. 2021). But, no stock assessment has been conducted on these species in the Northwest Atlantic region. Thus, abundance is rated a high concern.

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

Roughtail stingray was found in the catch in small proportions; this species has been listed as "Vulnerable" on the IUCN Red List (Carlson, J. et al. 2020b). But, no stock assessment has been conducted on this species in the Northwest Atlantic region. Hence, abundance is rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Moderate Concern

Although trawl fisheries are known to affect bluntnose stingray and roughtail stingray, the extent of this impact in the Northwest Atlantic is low (Carlson, J. et al. 2020)(Carlson, J. et al. 2020b). Furthermore, fishing mortality estimates of these species in the region are unknown, because no stock assessment has been conducted. For these reasons, fishing mortality for both these species is rated a moderate concern.

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Although trawl fisheries are known to affect roughtail stingray, the extent of this impact in the Northwest Atlantic is low (Carlson, J. et al. 2020b). Furthermore, fishing mortality estimates for this species in the region are unknown, because no stock assessment has been conducted. For these reasons, fishing mortality is rated a moderate concern.

Sharks

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

High Concern

A number of shark species were found in the scup trawl catch in small proportions. These include basking shark, porbeagle shark, sandbar shark, spinner shark, thresher shark, tiger shark, and white shark; all these species are listed as globally "Near Threatened," "Vulnerable," or "Endangered" on the IUCN Red List. Of these, the Northwest Atlantic population of porbeagle shark is overfished {NMFS & NOAA 2016} and sandbar shark is likely overfished (SEDAR 2017); no stock assessment has been conducted for the remaining species. Therefore, abundance of these species is collectively rated a high concern.

Justification:

Basking shark: IUCN status is "Endangered" (Rigby, C.L. et al. 2021).

Porbeagle shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2019); the number of porbeagle shark in the Northwest Atlantic population was approximately 188,000 to 195,000 and the stock is considered overfished ($B < ½B_{MSY}$) {NMFS & NOAA 2016}.

Sandbar shark: IUCN status is "Endangered" {Rigby, C.L., Derrick, D., Dicken, M., Harry, A.V., Pacoureau, N. & Simpfendorfer, C. 2021}; the current relative biomass level or SSF_{2009}/SSF_{MSY} = 0.51–0.72 (SEDAR 2017).

Spinner shark: IUCN status is "Vulnerable" {Rigby, C.L., Carlson, J., Smart, J.J., Pacoureau, N., Herman, K., Derrick, D. & Brown, E. 2020}.

Thresher shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2019b).

Tiger shark: IUCN status is "Near Threatened" {Ferreira, L.C. & Simpfendorfer, C. 2019}.

White shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2019c).

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

A number of shark species were found in the scup trawl catch in small proportions. These include basking shark, bignose shark, dusky shark, scalloped hammerhead shark, porbeagle shark, sand tiger shark, sandbar shark, sharpnose sevengill shark, silky shark, thresher shark, and tiger shark; all these species are listed as globally "Near Threatened," "Vulnerable," "Endangered," or "Critically Endangered" on the IUCN Red List. Of these, the Northwest Atlantic populations of porbeagle shark and dusky shark are overfished {NMFS & NOAA 2016}(SEDAR 2016), and sandbar shark and scalloped hammerhead shark are likely overfished (SEDAR 2017)(Hayes et al. 2009); no stock assessment has been conducted for the remaining species. Thus, abundance of these species is collectively rated a high concern.

Justification:
Basking shark: IUCN status is "Endangered" (Rigby, C.L. et al. 2021).

Bignose shark: IUCN status is "Near Threatened" {Rigby, C.L., Morgan, D.L. & Derrick, D. 2020b}.

Dusky shark: IUCN status is "Endangered" (Rigby, C.L. et al. 2019d); all population models showed that the dusky shark stock was overfished because $SSF_{2015} < SSF_{MSST}$ and SSF_{2015}/SSF_{MSST} ranged between 0.52 and 0.73 (SEDAR 2016).

Scalloped hammerhead shark: IUCN status is "Critically Endangered" (Rigby, C.L. et al. 2019f); there is a >95% probability that the population is overfished (Hayes et al. 2009).

Porbeagle shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2019); the number of porbeagle shark in the Northwest Atlantic population was approximately 188,000 to 195,000 and the stock is considered overfished ($B < ½B_{MSY}$) {NMFS & NOAA 2016}.

Sandtiger shark: IUCN status is "Critically Endangered" (Rigby, C.L. et al. 2021c).

Sandbar shark: IUCN status is "Endangered" {Rigby, C.L., Derrick, D., Dicken, M., Harry, A.V., Pacoureau, N. & Simpfendorfer, C. 2021}; the current relative biomass level or SSF_{2009}/SSF_{MSY} = 0.51–0.72 (SEDAR 2017).

Sharpnose sevengill shark: IUCN status is "Near Threatened" (Finucci, B. et al. 2020).

Silky shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2017).

Thresher shark: IUCN status is "Vulnerable" (Rigby, C.L. et al. 2019b).

Tiger shark: IUCN status is "Near Threatened" {Ferreira, L.C. & Simpfendorfer, C. 2019}.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Moderate Concern
Although trawl fisheries are known to cause bycatch mortality of sharks, the extent of this impact is generally low, particularly in the Northwest Atlantic region. In the case of basking shark, spinner shark, thresher shark, tiger shark, and white shark, fishing mortality in the Northwest Atlantic region is unknown because no stock assessment has been conducted. By contrast, overfishing of porbeagle shark is not occurring because $F < F_{MSY}$ {NMFS & NOAA 2016}; similarly, overfishing of sandbar shark was likely not occurring because $F_{2015}/F_{MSY} < 1$ (SEDAR 2017). Nevertheless, the impact of trawl fisheries on many of these shark species in the Northwest Atlantic region is unknown. Therefore, fishing mortality is rated a moderate concern.

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Although trawl fisheries are known to cause bycatch mortality of sharks, the extent of this impact is generally low, particularly in the Northwest Atlantic region. In the case of basking shark, bignose shark, sand tiger shark, sharpnose sevengill shark, silky shark, thresher shark, and tiger shark, fishing mortality in the Northwest Atlantic region is unknown because no stock assessment has been conducted. Overfishing of porbeagle shark is not occurring because $F < F_{MSY}$ {NMFS & NOAA 2016}; similarly, overfishing of sandbar shark is likely not occurring because $F_{2015}/F_{MSY} < 1$ (SEDAR 2017). In contrast, overfishing of the dusky shark population is occurring because $F_{2015} > F_{MSY}$ (SEDAR 2016). Nevertheless, the impact of trawl fisheries on many of these shark species in the Northwest Atlantic region is unknown. Therefore, fishing mortality is rated a moderate concern.

Silver hake

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

The most recent stock assessment update for silver hake reports that both stocks (called northern and southern stocks; both are within FAO's Northwest Atlantic Area 21) are not overfished (Alade and Traver 2018). Although the northern stock demonstrates strong increases in biomass ($B/B_{MSY} = 3.1$), the southern stock's biomass indicates that $B/B_{MSY} = 0.64$, possibly because of poor recruitment rates (Figure 12) (Alade and Traver 2018). Because there is a recent stock assessment and one of the stocks is less than 75% of B_{MSY}, this factor is scored a moderate concern.

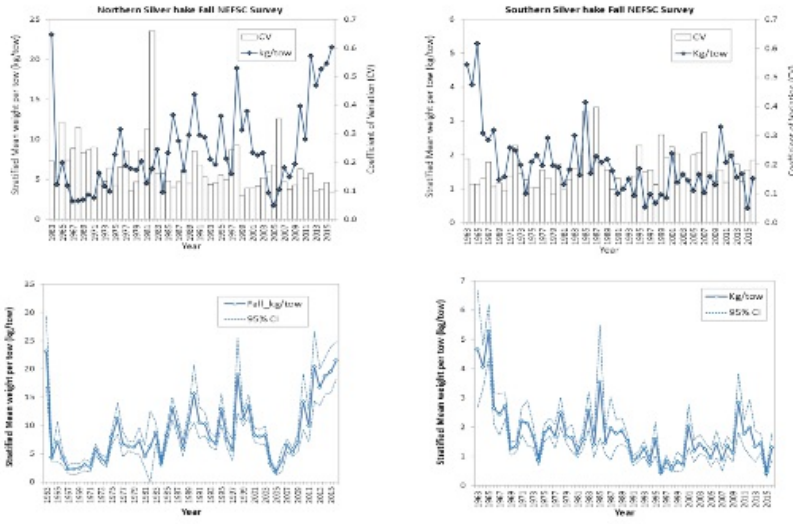


Figure 12: Northern (left) and southern (right) index of biomass (kg/tow) for silver hake from bottom-trawl survey, and estimated coefficient of variation (CV), 1963–2017. Bottom panels show estimated index and the 95% confidence intervals. Source: (Alade and Traver 2018).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Low Concern

Based on the 2017 silver hake stock assessment, overfishing was not occurring on either stock. Overfishing occurs when the ratio between the catch and the arithmetic fall survey biomass index from the most recent 3 years exceeds the overfishing threshold. The most recent estimates of the overfishing threshold are 2.78 kt/kg for the northern stock and 34.19 kt/kg for the southern stock of silver hake (Alade and Traver 2018). The northern stock's 3-year mean exploitation index was 0.149 kt/kg, which was below the overfishing threshold (2.78 kt/kg) (Alade and Traver 2018). The southern stock's 3-year mean exploitation index was 5.85 kt/kg, which was below the overfishing threshold (34.17 kt/kg) (Alade and Traver 2018). Because overfishing is not occurring, fishing mortality is scored a low concern.

Skates (unspecified)

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

A number of skate species were consistently found in smaller proportions in the catch of the Mid-Atlantic and New England scup fisheries, including barndoor skate, clearnose skate, rosette skate,

and winter skate, as well as little skate in the New England fishery. In addition, an unknown skate category was also present in the catch. Therefore, in this report, skates have been grouped together and given a precautionary score, based on the skate species with the lowest status. According to the 2019 skate stock status update, barndoor skate, clearnose skate, rosette skate, winter skate, and little skate are not overfished; however, thorny skate is overfished (Sosebee, K. 2020) and is also "Vulnerable" on the IUCN Red List (Kulka et al. 2020). For this reason, skates as a group are scored a high concern.

Justification:
According to the 2019 skate stock status update (Sosebee, K. 2020), B/B_{MSY} proxy for each skate species is as follows:

Barndoor skate: 1.29 (not overfished).

Clearnose skate: 1.59 (not overfished).

Rosette skate: 1.04 (not overfished).

Winter skate: 1.52 (not overfished).

Little skate: 0.87 (not overfished).

Thorny skate: 0.04 (overfished).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Low Concern
According to the 2019 NE skate stock status update, fishing mortality reference points are based on changes in survey biomass indices; fishing mortality is assumed to be $>F_{MSY}$ and overfishing is occurring if the 3-year moving average of the survey biomass index declines more than the CV of the time series (Sosebee, K. 2020). Because the 2017–2019 biomass index for barndoor skate, clearnose skate, rosette skate, winter skate, little skate, and thorny skate is above the 2017–2019 average index by 11.4%, 73.1%, 6.4%, 19.2%, 13.4%, and 11.4%, respectively, the 2019 NE skate stock status update reports that overfishing of these species is not occurring (Sosebee, K. 2020). Therefore, fishing mortality is rated a low concern.

Spiny dogfish

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Moderate Concern

The spawning stock biomass of spiny dogfish along the Atlantic coast is 106,800 mt, which is above the $SSB_{THRESHOLD}$ of 79,600 mt but less than 75% of the target reference point SSB_{MAX} of 159,288 mt {Sosebee, K. and P. Rago 2018}, indicating that the stock is not overfished. Because the spawning stock biomass is above the limit reference point but less than 75% of the target reference point, abundance is scored a moderate concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

Fishing mortality of spiny dogfish along the Atlantic coast was found to be 0.202, which is lower than the F_{MSY} proxy of 0.2439 {Sosebee, K. and P. Rago 2018}. Because overfishing is not occurring, fishing mortality is rated a low concern.

Summer flounder

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

According to the summer flounder Management Track Assessment for 2021, the SSB for the summer flounder stock in 2019 was 47,397 mt, which is 86% of the updated biomass target reference point SSB_{MSY} proxy = $SSB_{35\%}$ = 55,217 mt, with a 90% probability that SSB in 2019 was between 42,000 and 54,000 mt (Figure 13) (Terceiro 2021). Thus, the summer flounder stock was not overfished. Nevertheless, recruitment was below average during 2011–2017, ranging from 31 to 45 million and averaging 36 million fish. Although the 2018 year class was above average at an estimated 61 million fish, the 2019 year class was below average at 49 million fish. Overall, the summer flounder spawning stock biomass is near the updated target reference point, so abundance is scored a low concern.

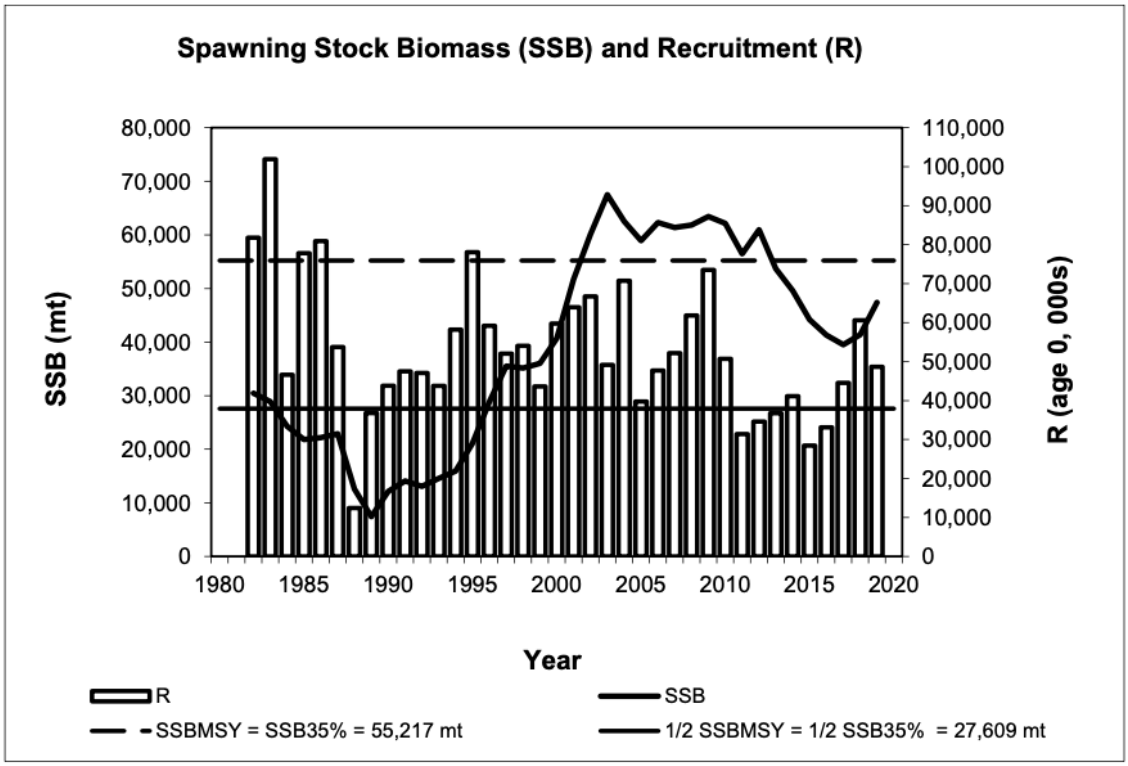


Figure 13: Summer flounder spawning stock biomass (SSB; solid line) and recruitment at age 0 (R; vertical bars) by calendar year through 2019. The horizontal dashed line is the updated 2021 MTA target biomass reference point proxy. The horizontal solid line is the updated 2021 MTA threshold biomass reference point proxy. Taken from (Terceiro 2021).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Low Concern

The most recently updated assessment of summer flounder in the Mid-Atlantic Ocean states that the fishing mortality on the fully selected age 4 fish was 0.340 in 2019, which is 81% of the fishing mortality threshold reference point F_{MSY} proxy = $F_{35\%}$ = 0.422 (NOAA 2019). Because overfishing of summer flounder is not occurring, we have awarded a score of low concern.

Witch flounder

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

According to the 2016 updated Operational Assessment of 19 Northeast groundfish stocks, witch flounder is overfished (Figure 14) (NEFSC 2017). The exploitable biomass in 2016 was estimated at 14,563 mt, although the biological target reference point or SSB_{MSY} proxy was not determined (NEFSC 2017). For this reason, abundance of witch flounder is rated a high concern.

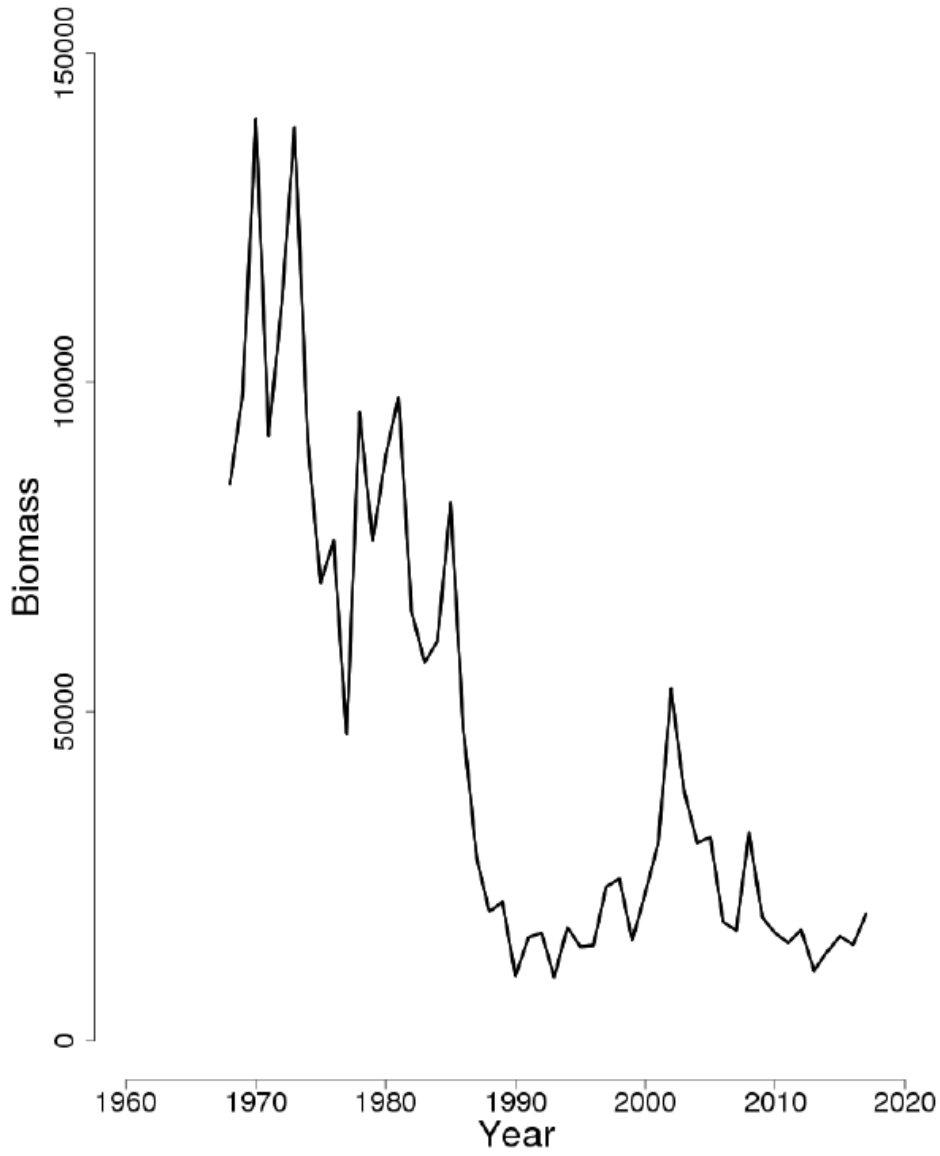


Figure 14: Exploitable biomass (mt) of witch flounder between 1968 and 2017, from the 2016 operational assessment. Taken from (NEFSC 2017).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Based on the 2016 updated operational assessment of 19 groundfish stocks, it is unknown whether overfishing is occurring in the witch flounder stock, because the biological target reference point is unknown (Figure 15) (NEFSC 2017). Nevertheless, the 2016 exploitation rate was estimated at 0.035 (NEFSC 2017). For this reason, fishing mortality for witch flounder is rated a moderate concern.

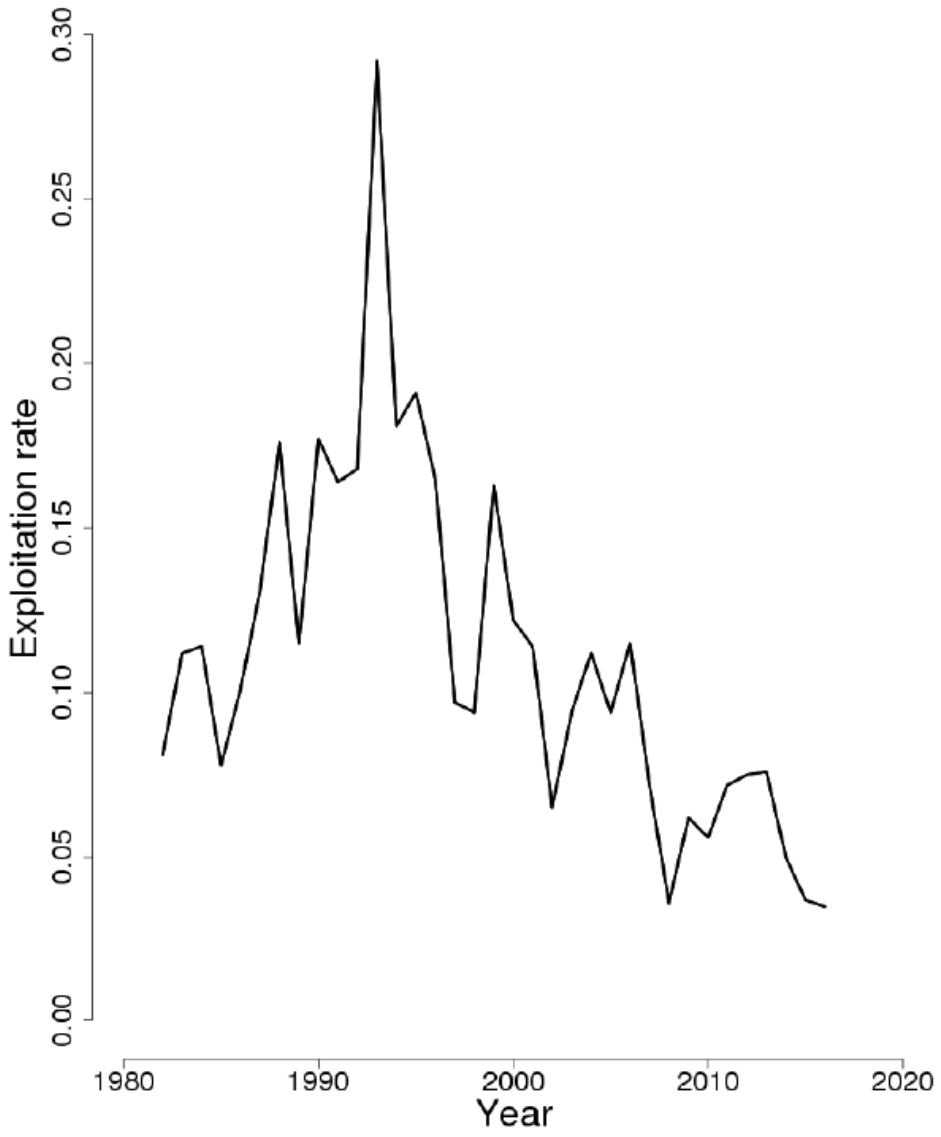


Figure 15: Exploitation rate (catch/exploitable biomass) of witch flounder between 1982 and 2016, from the 2016 operational assessment. Taken from (NEFSC 2017).

Yellowtail flounder

Factor 2.1 - Abundance

Georges Bank Stock | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

There are two stocks of yellowtail flounder that may be encountered by the fishery: the Georges Bank stock and the Cape Cod–Gulf of Maine stock. 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).

Based on the 2017 Cape Cod–Gulf of Maine yellowtail flounder stock assessment, spawning stock biomass (SSB) in 2016 was estimated at 1,191 mt, which is 26% of the biomass target (SSB_{MSY} proxy = 4,640) (Alade 2017).

Because the Cape Cod–Gulf of Maine stock is overfished and the Georges Bank stock has declined greatly over the last decade, abundance is scored a high concern.

Factor 2.2 - Fishing Mortality

Georges Bank Stock | Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

High Concern

The Transboundary Management Guidance Committee (TMGC) has implemented a strategy that seeks to minimize the risk of exceeding the fishing mortality reference for the Georges Bank stock, F_{REF} = 0.25 (TRAC 2020). At present, there is no assessment model, so 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. 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 being overfished and is in year 15 of a 26-year rebuilding plan (NMFS 2021).

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) (Alade 2017).

Because there is significant uncertainty regarding the impact of fishing on Georges Bank yellowtail flounder, and NMFS considers overfishing to be occurring on both the Georges Bank and Cape Cod–Gulf of Maine stocks, a score of high concern is given.

Factor 2.3 - Discard Rate/Landings

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

< 100%

The estimated ratio of discards to landings in the commercial scup fishery for the Mid-Atlantic region in 2018 was approximately 37% (Figure 16) {Northeast Fisheries Science Center 2020}. Mortality of commercial discards is assumed to be 100%. Therefore, the ratio of discards to landings has been rated as <100%.

Justification:

Year	Min	Max	Mean
Commercial landings	1,207	8,105	4,887
Commercial discards	436	4,733	1,819
Recreational landings	824	6,430	3,893
Recreational discards	30	1,079	336
Catch used in assessment	3,485	18,961	11,430
Spawning stock biomass	3.5	237.5	93.1
Recruitment (age 0)	37.5	325.9	133.5
Fully selected F (age 4)	0.066	1.593	0.521

Figure 16: Discards and landings of the commercial scup fishery in metric tons (mt) from 2018. Taken from (NEFSC 2020).

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	DATA COLLECTION AND ANALYSIS	ENFORCEMENT	INCLUSION	SCORE
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic	Moderately Effective	Moderately Effective	Moderately Effective	Highly effective	Highly effective	**Yellow (3.000)**
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery	Moderately Effective	Moderately Effective	Moderately Effective	Highly 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

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderately Effective

The main scup fishery in the western Atlantic Ocean extends north of Cape Hatteras, North Carolina and is currently managed under the Summer Flounder, Scup, and Black Sea Bass Fishery Management Plan {MAFMC, NMFS, NEFMC & SAFMC 1987}. The fishery falls under the mandate of the National Marine Fisheries Service (NMFS), and because scup is a migratory species, it is also cooperatively managed by the Mid-Atlantic Fisheries Management Council (MAFMC) and the Atlantic States Fisheries Commission (ASFMC) (MAFMC 2021). Management strategies adopted for the commercial fishery include annual commercial quotas divided into three harvest periods (Winter II or November–December, Winter I or January–April, and Summer or May–October), minimum fish size limits, gear restrictions such as minimum mesh sizes for trawl nets and bag size limits, permit requirements, and a moratorium on entering the fishery (ASMFC 1996).

The scup FMP requires NMFS to set fishery specifications for 1 to 3 years at a time, including the overfishing limit (OFL), the allowable biological catch (ABC), the commercial annual catch limit (ACL), the commercial annual catch target (ACT), and commercial quotas (NMFS 2020). Management measures that may be changed annually include: 1) minimum size of possession; 2) minimum mesh; 3) the threshold to trigger minimum mesh requirements; 4) maximum roller rig trawl roller diameter; and 5) the Summer, Winter I, and Winter II quotas and landing limits (ASMFC 2020). The NMFS is specifically responsible for adjusting the commercial scup quota between the Winter I and II periods and for the per-trip federal landing limit (NMFS 2021b).

States are required to implement annually specified landing limits during the Winter I and II quota periods (ASMFC 2020), and must notify both state and federal permit holders of initial period landing limits, in-period adjustments, and closures. Following the projections of NMFS, states are required to prohibit fishing for and landing of scup when a period quota has been landed. During the Summer quotas period, states are required to implement a plan of trip limits or other measures to manage their summer share of the scup quota, following allocation percentages set by the ASMFC (MAFMC 2021). States may transfer or combine quota shares and must report all landings from state waters to NMFS for counting toward the state share quota. As a measure of compliance, states are required to submit an annual report to the Chair of the ASMFC Scup Plan Review Team (PRT) by June 1 (ASMFC 2020).

In 1996, scup was declared overfished and the fishery was under a 7-year recovery plan. In 2007, scup was under a stock rebuilding plan until 2015. Since 2009, the stock of scup has experienced a recovery and has been declared rebuilt (NESFC 2015), with recent updates indicating that stock levels are still high {NMFS & NEFSC 2017}(NEFSC 2020)(NEFSC 2022). Hence, the management strategy of the scup fisheries in the New England and Mid-Atlantic regions is successful.

Although the measures being adopted to effectively manage the scup fisheries seem to be working successfully, groundfish species (such as yellowtail flounder and Atlantic cod from the New England region, and witch flounder from both the New England and Mid-Atlantic regions), which are managed under the Northeast Multispecies Fishery Management Plan (NE Multispecies FMP) by the New England Fishery Management Council (NEFMC), are caught and retained in this fishery as well, so the NE Multispecies FMP is considered in scoring this factor. Of these species, 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, M. 2017}(Legault, C. 2017) (Legault, C. 2017b)(Alade, L. 2017)(Wigely, S. 2017). 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 reduced the race to fish and improved 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 help reduce the likelihood of exceeding sustainable fishing mortality rates for targeted stocks. In addition, sectors have not exceeded their ACLs, whereas in the past it was possible for target TACs to be exceeded because the regulations were based on effort control (days at sea [DAS]) rather than output control (Kitts, A., et al. 2011)(GARFO. 2018a)(GARFO 2018b)(GARFO 2018c) (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 that noncompliance may be occurring (NEFMC 2018a)(NEFMC 2018a). Thus, ACLs/AMs based on scientific input are in place for many 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 ACLs. But, rebuilding targets for certain species have not yet been met, and there is potential underreporting of discarding.

Furthermore, the Northeast Skate Complex Fishery Management Plan (NESC FMP) is considered when scoring this factor, because skates are caught and retained in both the New England and Mid-Atlantic fisheries but not always reported to the species level. The NESC FMP was implemented by the NEFMC in 2003 because, at the time, four of seven species in the Northeast skate complex (winter, smooth, thorny, and barndoor skate) were overfished (NEFMC 2022). Despite improved management measures, thorny skate is still overfished, and the NESC FMP has not been successful in rebuilding the stock (NEFMC 2022). Although there is a requirement that skates must be identified when they are caught and reported, and "unclassified" skate landings may no longer be reported (NOAA Fisheries 2022b), this regulation was not followed in the catch data analyzed. Because the unclassified category could include thorny skate, we assume a precautionary approach and consider the rebuilding target of the NESC FMP to be unfulfilled.

The management of northern shortfin squid, through the Atlantic Mackerel, Squid and Butterfish Fishery Management Plan (MSB FMP) by the MAFMC, is also considered when scoring this factor,

because this species is also caught and retained in the New England and the Mid-Atlantic scup fisheries. As a result of uncertainty in the distribution and productivity, which are dependent on environmental variables, the MAFMC sets annual quotas based on scientific recommendations to manage this species (MAFMC 2022b). The Illex Working Group of the MAFMC is in the process of addressing the basis for a stock assessment of this species, and is developing an approach for in-year quota adjustments (MAFMC 2022b). But, there currently is no recent stock assessment model that has been developed for this species, and the relationship between stock abundance and removals is poorly understood (MAFMC 2022c).

Finally, management of horseshoe crab (caught in the New England and Mid-Atlantic regions), through the Horseshoe Crab Fishery Management Plan by the ASMFC, is considered when scoring this factor. A trend analysis was used to assess regional and coast-wide stocks, and an additional stage-based model was used to assess the stock in the Delaware region (ASMFC 2019)(ASMFC 2020b). But, biological reference points developed for the Delaware region population were not endorsed by the Peer Review Panel for use in management (ASMFC 2019)(ASMFC 2020b). Furthermore, the analysis has high uncertainty because the actual rate of discard mortality in various fisheries along the Atlantic coast is unknown (ASMFC 2019)(ASMFC 2020b). Based on this analysis, no overfished or overfishing definitions have been adopted for management use (ASMFC 2019)(ASMFC 2020b).

Taken together, although the management of scup is successful, rebuilding targets of a number of retained species have not been met, and there are uncertainties in the stock assessments of some retained species, which likely affects their management. Therefore, management strategy and implementation are scored moderately effective.

Justification:
The scup FMP was incorporated into the summer flounder FMP in 1996 as Amendment 8 (ASMFC 1996), recognizing that commercial landings of scup had declined since peak landings in the 1960s, scup was overexploited, and if management strategies were not put in place, the fishery could collapse. Consequently, the Council and the Commission approved a fishery recovery plan that aimed to reduce scup overfishing over a 7-year period {MAFMC, ASMFC, NMFS, NEFMC & SAFMC 1996}. Management strategies adopted in the commercial fishery included annual commercial quotas, minimum fish size limits, gear restrictions such as minimum mesh sizes for trawl nets, permit requirements, and a moratorium on entering the fishery (ASMFC 1996). In 2000, broad scale gear restricted areas (GRAs) for scup were implemented under the framework provisions of the FMP to reduce discards of scup in the small mesh fisheries for *Loligo* squid and silver hake (Beal R, ASMFC 1999). In 2007, Amendment 14 to the scup FMP implemented a stock rebuilding plan for scup, and made the GRAs modifiable through a framework adjustment. The scup stock was considered fully rebuilt by 2009 (NESFC 2015).

The commercial scup fishery operates throughout the year, so during the winter months, when scup tends to occupy offshore waters, the fishery occurs mostly in federal waters and is under federal jurisdiction; during summer, when scup migrates to coastal waters, the fishery takes place mostly in state waters, falling under the jurisdiction of the states (MAFMC 2021). The commercial fishery has three quota periods (Winter I, Summer, and Winter II), and a coast-wide commercial quota is allocated between these periods (MAFMC 2021). Whereas the winter periods are managed under the coast-wide quota, the summer period quota is divided among the states, following allocation percentages set by the ASMFC (MAFMC 2021).

Factor 3.2 - Bycatch Strategy

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderately Effective
The Standardized Bycatch Reporting Methodology (SBRM) Omnibus Amendment to FMPs of the Mid-Atlantic and New England Fishery Management Councils was developed in 2007 to address the requirements of the Magnuson-Stevens Act (MSA) {MAFMC, NOAA & NEFMC 2015}. The purpose of this amendment was to clarify finfish bycatch monitoring and assessment methods for fisheries in the Greater Atlantic region, to update and supplement these methods where necessary, to establish precise standards for bycatch estimation, and to establish, maintain, and adopt biological sampling programs with minimum bias and maximum accuracy {MAFMC, NOAA & NEFMC 2015}. Nevertheless, the scup fishery discards make up 37% of the landings (NEFSC 2020).

The Atlantic Trawl Take Reduction Team (ATTRT) was convened by NOAA and NMFS in 2006, under the Marine Mammal Protection Act (MMPA), to address incidental mortality and serious injury of long-finned pilot whale (*Globicephala melas*), short-finned pilot whale (*Globicephala macrorhynchus*), common dolphin (*Delphinus delphis*), and Atlantic white-sided dolphin (*Lagenorhynchus acutus*) in trawl gear fisheries operating in the Atlantic Ocean, which are known to interact with these species (NOAA Fisheries 2021d). In 2008, the team provided a nonregulatory Atlantic Trawl Gear Take Reduction Strategy (ATGTRS), which provides recommendations to NMFS on compiling data on fisheries interactions with the above-mentioned species, conducts education and outreach on these interactions, and establishes research priorities to further understand these species (NOAA Fisheries 2012). This monitoring strategy includes reviewing biological metrics such as annual population abundance estimates, human-caused serious injury and mortality estimates, and potential biological removal (PBR) levels of the species concerned (NOAA Fisheries 2012). But, this monitoring strategy does not contain regulatory requirements.

Under the MMPA, NMFS classifies each commercial fishery on the List of Fisheries (LOF) into one of three categories, based upon the level of mortality and serious injury of marine mammals that occurs incidental to each fishery (NMFS 2021). Based on the classification of a fishery on the LOF, participants in a fishery may be required to comply with certain provisions of the MMPA, including registration, observer coverage, and take reduction plan requirements. For instance, Mid-Atlantic bottom otter trawls and New England bottom otter trawls, which compose most of the commercial scup fishery, have been classified as Category II fisheries, thus warranting this extra compliance according to the MMPA (NMFS 2021). In comparison to the Atlantic Large Whale Take Reduction plan (NOAA Fisheries 2022), which has been unsuccessful, no marine mammals appear to be caught above the level of their PBR in the scup trawl fisheries, so the bycatch strategy for marine mammals in these fisheries is successful.

Nevertheless, both the overarching finfish and marine mammal bycatch strategies do not address compliance or effectiveness, and discards are 37%, so the bycatch strategy for the scup fisheries is scored moderately effective.

Factor 3.3 - Scientific Data Collection and Analysis

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderately Effective

Regular stock assessments for scup, based on abundance and fishing mortality data, have been published consistently since 1995. Two benchmark stock assessments of scup were conducted: one in 2011 (NEFSC 2011) and the other in 2015 (NESFC 2015). Subsequently, more recent updated stock assessments were conducted in 2016 (NEFSC 2017), 2019 (NEFSC 2020), and 2021 (NEFSC 2022). Recently, in the 2021 Management Track Assessment, the biological target reference points for $SSB_{40\%}$ and $F_{40\%}$ were updated (NEFSC 2022). The assessment model for scup is a complex statistical catch-at-age model, incorporating a broad range of fishery and survey data (NEFSC 2020). The fishery catch is modeled as four fleets: commercial landings, recreational landings, commercial discards, and recreational discards. Commercial landings data are collected by the NOAA Fisheries Vessel Trip Report system and by state reporting systems (ASMFC 2020). The Northeast Fisheries Science Center (NEFSC) sea sampling program collects commercial discard information. Biological samples (age, length) from the commercial fishery are collected through the NEFSC weighout system, the observer program, and by the state of North Carolina. Fishery-independent abundance indices are available from surveys conducted by the NEFSC, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, and the Virginia Institute of Marine Science. All surveys, except Delaware's, are included in the species stock assessment. Bycatch data are collected by observers through the Data and Information Systems branch of the Fisheries Monitoring and Research Division at the NEFSC. From 2015 to 2019, observer coverage in the commercial bottom otter trawl scup fishery was an average of 6.8% in the Mid-Atlantic region and 3.9% in the New England region.

Although NOAA has a marine debris program (NOAA 2022b), and it is possible that otter trawls cause ghost fishing if they break free, not much is known about this gear in the context of ghost gear (NOAA Marine Debris Program 2015).

Although regular peer-reviewed and robust stock assessments of the scup fishery have been conducted since 1995, including benchmark assessments (in 2011 and 2015) with recent updates (in 2016 and 2019), and bycatch data in this fishery are regularly collected, observer coverage is relatively low, so estimates of total effort and discards would be less accurate. Therefore, the scientific data collection and analysis factor of the scup bottom otter trawl fishery is considered moderately effective.

Factor 3.4 - Enforcement of and Compliance with Management Regulations

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Highly effective

The National Marine Fisheries Service (NMFS) Office of Law Enforcement (OLE) and the U.S. Coast Guard are responsible for enforcing the law and regulations (NMFS 2019). The OLE enforces domestic laws and supports international treaties (NOAA Fisheries 2021). The OLE has special agents, enforcement officers, and investigative and support staff to ensure compliance with and education on marine resource laws in the United States (NOAA Fisheries 2021). The jurisdiction of the OLE extends throughout the exclusive economic zone (EEZ) of the United States, between 3 and 200 miles offshore, adjacent to all the U.S. and its territories. In partnership with tribal, state, nongovernmental, and other federal organizations, and using innovative technology, the OLE conducts 1) enforcement patrols on and off the water; 2) electronic vessel monitoring; and 3) civil and criminal investigations (NOAA Fisheries 2021). At the state level, law enforcement is also conducted by state agencies; the ASFMC has a law enforcement committee (comprising each of the Commission's participating states) that provides advice to the Commission on enforcement issues (ASMFC 2022). For all these reasons, the enforcement and compliance with management regulations of the scup commercial fishery is considered highly effective.

Factor 3.5 - Stakeholder Inclusion

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Highly effective
Both the Atlantic States Marine Fisheries Commission and the Mid-Atlantic Fishery Management Council have public stakeholder representation, and have advisory panels of fishery stakeholders who are involved in the management process. Also, the fishery management process is transparent and open to public participation and comments, so stakeholder inclusion is considered highly effective.

Justification:
The Atlantic States Marine Fisheries Commission is represented by each of the 15 member states, with 3 commissioners representing each state (ASMFC 2021b). The three commissioners of a state comprise the director of the state's marine fisheries management agency, a state legislator, and an individual appointed to represent stakeholder interests. The Mid-Atlantic Fishery Management Council comprises 21 voting members, including 13 private citizens who are knowledgeable about regional fisheries (MAFMC 2021b). In addition, seven voting members are state officials who represent each of the Mid-Atlantic states' fish and wildlife agencies. The final voting member is the regional administrator for the National Marine Fisheries Service's Greater Atlantic Regional Office. There are also nonvoting members on the Council who represent the U.S. Coast Guard, the U.S. State Department, the U.S. Fish and Wildlife Service, and the Atlantic States Marine Fisheries Commission. In both the Commission and the Council, the citizens appointed include commercial and recreational fishers, industry leaders, environmentalists, academics, and other interested stakeholders. These individuals are nominated by each state's governor and appointed by the U.S. Secretary of Commerce for 3-year terms.

Both the ASMFC and MAFMC also have advisory panels of fishery stakeholders who regularly meet (two to four times a year) and are actively involved in the the management process. The advisory panels provide advice and recommendations when developing or amending fishery management plans and on management measures (such as annual quota setting) (MAFMC 2022)(ASMFC 2000).

There are several opportunities for the public to provide input into the fisheries management process and changes to the SFSBSB FMP, because all Council meetings are open to the public, and all Council and Commission actions are open to public comment at various stages.

Thus, there is appropriate representation of stakeholder groups in both the Council and Commission, and the Fishery Management process is transparent and allows for public participation and comments.

Criterion 4: Impacts on the Habitat and Ecosystem

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

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

Guiding principles

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

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	FORAGE SPECIES?	SCORE
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic	Score: 2	Score: 0	Moderate Concern		**Yellow (2.449)**
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery	Score: 2	Score: 0	Moderate Concern		**Yellow (2.449)**

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 - Physical Impact of Fishing Gear on the Habitat/Substrate

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Score: 2

Scup is a demersal species that inhabits sandy and muddy bottoms and mussel and seagrass beds in the northwest Atlantic (MAFMC 2021). The species is found in estuaries and coastal waters in spring and summer, and migrates offshore and to the south in fall and winter. It spawns annually over sandy and weedy areas off the south of New England.

Bottom otter trawls are the predominant gear used in the commercial scup fishery, and in 2020, 96% of the commercial scup landings in federal waters were caught using this gear (MAFMC 2021). These bottom otter trawls come into contact with the seafloor and sediment, and therefore often affect sedentary living organisms (FAO 2021), altering the biogeochemical nature of the sediment and reducing species diversity and the abundance of invertebrates living in the sediment (Watling 2014). Nevertheless, the impact of bottom otter trawls over sandy and muddy bottoms is variable, and for this reason, the physical impact to the substrate has been rated moderate.

Justification:

Bottom otter trawls are cone-shaped and consist of a body that is made of a number of panels and is closed at the bottom by one or two codends, with lateral extensions or wings at the opening (FAO 2021). The net itself is kept open and horizontal by two otter boards, also known as trawl doors (Figure 17). The trawl is designed to have contact with the seafloor, and the groundrope shields the lower leading margin of the trawl from damage while dragging on the sea bottom. Bottom otter trawls can operate at depths ranging from a few meters to between 1,500 and 2,000 m.

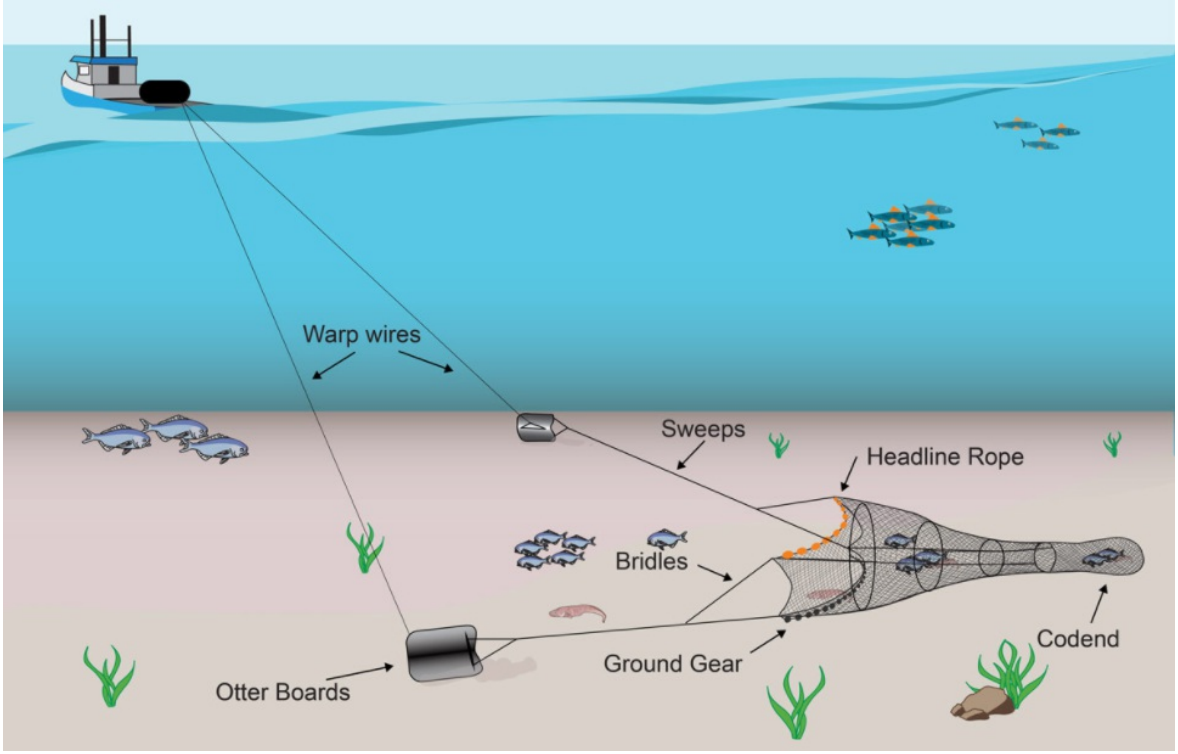


Figure 17: A bottom otter trawl, taken from: https://www.afma.gov.au/fisheries-management/methods-and-gear/trawling

Bottom otter trawls are the predominant gear used in the commercial scup fishery. In 2020, 96% of the commercial scup landings in federal waters were caught using this gear (MAFMC 2021). The impacts of trawling on benthic communities have been well documented (Løkkeborg 2005). Invertebrates affected are small and commonly found in deep-sea sediments (Watling 2014). Trawling on deep-sea muddy bottom beds has an impact on the biogeochemistry of the sediment, and reduces the species abundance and diversity of invertebrates in the sediment (Watling 2014). Frequent trawling also lowers the organic content of the surface of the sediment, thus reducing the food value of the sediment and the quality of the habitat; in turn, this affects abundance, biodiversity, and the species richness of invertebrates (Watling 2014). Repeated and intensive trawling shows changes in sediment surface characteristics including roughness, which can be seen through sonar and video observations. In addition, sonar observations have shown that bottom trawling decreases habitat complexity of the upper sediment by destroying biogenic structures such as tubes and burrows (Løkkeborg 2005). Trawl doors and wires cause scrape marks on the seabed floor, and the nets and ground ropes cause flattening of the micro-topography (Løkkeborg 2005).

Sonar information also showed that intensive trawling causes a decrease in sediment hardness and an increase in surface roughness, although moderate trawling does not have the same impacts (Løkkeborg 2005). The penetration depth of the trawl doors depends on the weight and performance of the doors, and on the nature (size and hardness) of the sediment; trawls penetrate deeper in mud than in sand (Løkkeborg 2005). The persistence of trawl marks on the seafloor depends on the depth, sediment type, current, wave action, and biological activity in the sediment. These marks tend to last longer in deeper waters, sheltered sites, and areas that have fine sediment. Impacts of otter trawling on muddy and sandy bottoms, such as changes to sea bed topography and surface roughness, have been found to recover over time (Løkkeborg 2005).

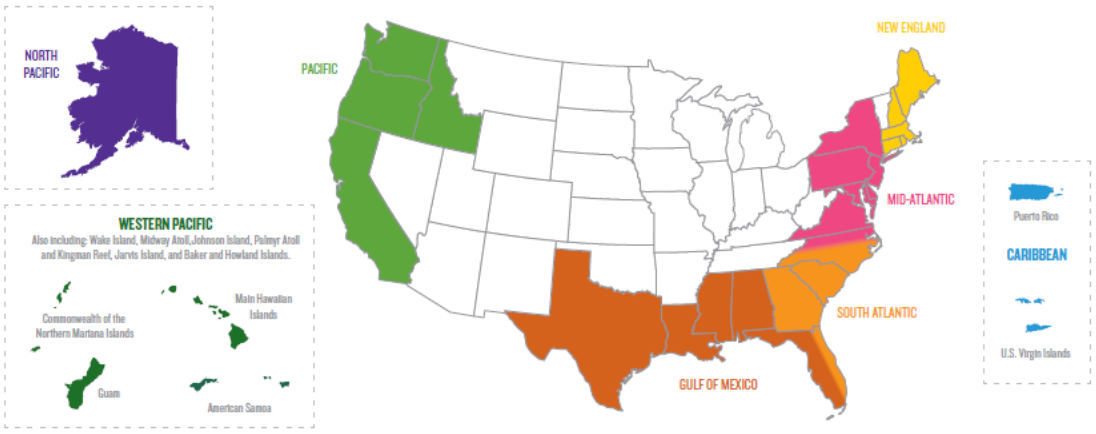
Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Score: 0
The Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) has a provision known as the Essential Fish Habitat (EFH) provision, which aims to protect, conserve, and enhance EFH {NMFS & NOAA 2002}. The NMFS and the Councils are mandated to coordinate and develop recommendations to define actions that would prevent adverse impacts on EFH. But, only a small proportion of Council-designated EFH is effectively protected from bottom trawling in federal waters (NDRC 2021).

The Mid-Atlantic scup fishery has several restrictions in place to ensure that the fishery is managed effectively, including a seasonal quota system, possession limits, and gear restricted areas (GRAs) (MAFMC 2021). Although the seasonality of the scup fishery and the GRAs contribute to mitigating the impacts of otter trawls on the habitat, only a small proportion of the habitat is included in the GRAs. Nevertheless, there is a specific federal restriction on using rollers greater than 18 inches in diameter in otter trawls, presumably to mitigate the impact of gear on scup habitat ((NOAA 2021), CFR § 648.126); however, the effectiveness of this measure on protecting bottom habitat is unknown. For these reasons, although the scup fishery has some measures in place that are expected to be effective toward mitigation of gear impacts on the habitat, their effectiveness is unknown, so this factor has been rated minimal or 0.

Justification:
The EFH provision of the Magnuson-Stevens Act establishes guidelines to 1) assist Regional Fishery Councils and the Secretary of Commerce to describe and identify EFH in FMPs; 2) identify adverse effects to EFH; and 3) identify actions that are necessary to conserve EFH {NMFS & NOAA 2002}. This provision is meant to protect, conserve, and enhance EFH. Both the NMFS and the Councils are meant to coordinate to develop recommendations to federal and state agencies on actions that would adversely impact EFH. According to the final rule issued by the NMFS, which revises regulations pertaining to the EFH, Councils are meant to identify EFH in FMPs for each life stage of a managed fish species in a fishery management unit {NMFS & NOAA 2002}. Furthermore, information on habitats that are required includes the spawning, breeding, feeding, and growth to maturity of managed fish species. Maps need to be provided with geographic boundaries to define the EFH of each species. In addition, Councils are meant to identify habitats of particular concern where EFH are vulnerable to degradation {NMFS & NOAA 2002}. FMPs are also meant to include management strategies that reduce the negative impacts of fishing on EFH. But, in the Mid-Atlantic and New England region, the proportion of Council-designated EFH in federal waters that is effectively protected from bottom trawling is small (Figure 18) (NDRC 2021).



Region	% of region's in federal waters designated as EFH	% of council-designated EFH in federal waters protected from bottom trawling[a]
Gulf of Mexico	44%	1%
Caribbean	96%	<1%[b]
Western Pacific	100%[c]	100%
Pacific	100%	90%
North Pacific	100%	39%
New England	66%	5%
Mid-Atlantic	52%	3%
South Atlantic	64%	18%

a This percentage includes both protections from bottom trawl gear implemented through the EFH provision and other protections from this gear implemented under the MSA for the purposes of habitat protection. For details, see Appendices 2 and 3.

b The Caribbean Council has not expressly prohibited bottom trawling in its protected EFH. However, we give the council credit for protections in our analysis because bottom trawl gear is not used in the region, and the council has prohibited bottom-tending gear that is actively used in the region (bottom longlines, gillnets, trammel nets, pots, and traps). See page 16 and Appendix 2. Appendix 3 includes a table of areas included in this analysis for the Caribbean region.

c The Western Pacific Council's narrative descriptions of EFH cover 100 percent of its jurisdiction in federal waters.

Figure 18: EFH designated and protected from bottom trawling in federal waters. Taken from {NRDC 2021}.

The scup fishery has several restrictions in place to ensure effective management, including a seasonal quota system with a possession limit and GRAs. The scup commercial fishery is allocated through a coast-wide commercial quota, over three seasons (Winter I, Winter II, and Summer). Because scup occupies offshore habitat during the winter and coastal habitat during the summer, the winter periods are managed under the coast-wide federal quota system, while the summer quota is divided among the states, following the Commission's allocation percentages. There is also a possession limit of 50,000 pounds in effect during the Winter I quota period, and a limit of 12,000 pounds during the Winter II period (MAFMC 2021). In 2000, two GRAs were implemented to reduce scup bycatch in small-mesh fisheries. The boundaries of the GRAs were modified several times over the years, and currently there is a Northern GRA and a Southern GRA (Figure 19) (MAFMC 2021). Trawl vessels are not allowed to fish for longfin squid, black sea bass, or silver hake in the Northern GRA from November 1 to December 31 and in the Southern GRA from January 1 to March 15 if they do not use a mesh size of at least 5 inches in diameter (MAFMC 2021). Although this measure likely contributed to the recovery of the scup fishery, it covers a small proportion of the trawled area. In addition, although the Code of Federal Regulations

specifies that there is a restriction on using rollers greater than 18 inches in diameter in otter trawls, which is likely to mitigate the impact of gear on scup habitat ((NOAA 2021), CFR § 648.126), the effectiveness of this measure is unknown. Taken together, although there are some measures in place that contribute toward mitigating the impact of bottom otter trawls on the habitat, their effectiveness appears to be minimal or unknown.

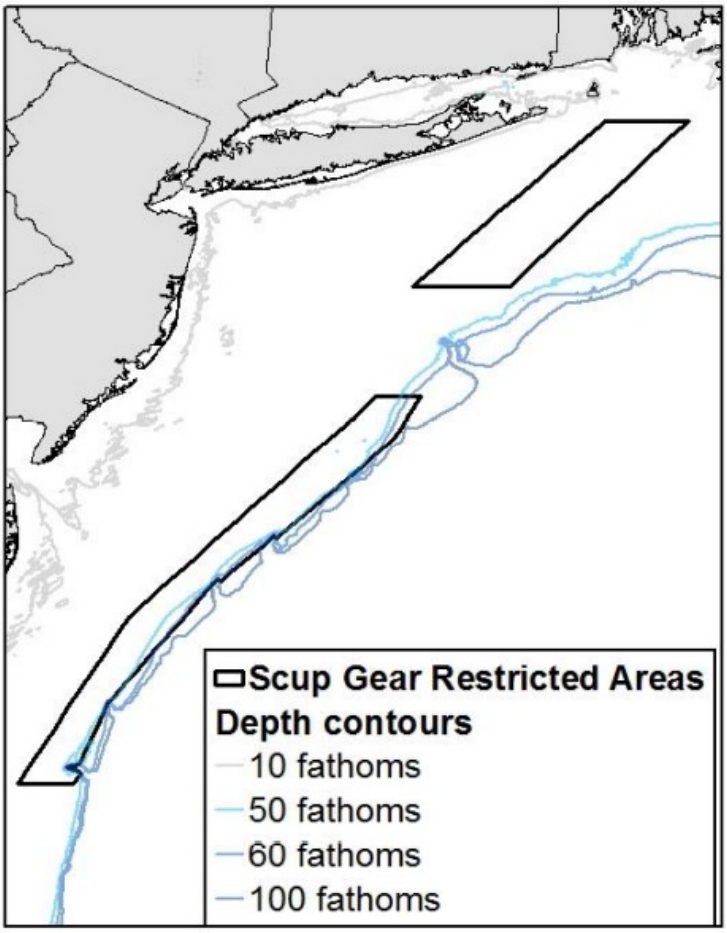


Figure 19: Scup gear restricted areas in the Mid-Atlantic region. Taken from (MAFMC 2021) .

Factor 4.3 - Ecosystem-based Fisheries Management

Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | Mid Atlantic
Northwest Atlantic | Bottom trawls | United States | North of Cape Hatteras | New England Fishery

Moderate Concern

Scup is a demersal species and does not have an important ecosystem role relative to its biomass. Hence, the scup fishery is not a substantial contributor to forage species mortality, either directly or indirectly via bycatch. Consequently, management of the fishery lacks temporal and spatial policies that would protect ecosystem function and account for the ecological role of scup, but adverse effects on the ecosystem from this fishery are unlikely. For these reasons, the ecosystem-based fisheries management function factor for this fishery is scored a moderate concern.

Justification:

In 2011, the MAFMC hosted the fourth National Scientific and Statistical Committee Workshop to discuss the possibility of incorporating ecosystem considerations into the management of fisheries at the federal level (MAFMC 2019). The MAFMC also organized four workshops from 2013 to 2015 to discuss ecosystem-related issues in fisheries management, including how to incorporate forage and low trophic-level species into management, how to incorporate ecosystem and habitat conservation into management, how to address changes in oceanographic conditions and abundance and distribution of fish stocks, and how to address interactions between species, fleet, habitat, and climate, and their impacts on sustainable fisheries management (MAFMC 2019). A guidance document was drafted to establish a framework for building an ecosystem approach to fisheries management in the Mid-Atlantic.

By considering an ecosystem approach to fisheries management (EAFM), the MAFMC recognizes the importance of the biological, economic, social, and physical interactions among the various aspects of the ecosystems so that optimum yields in fisheries management may be achieved (MAFMC 2019). Through the EAFM, the MAFMC aims to transition from a single-species management to a multi-species approach, which prevents overfishing and fishing at optimum yield while accounting for interactions between species within the ecosystem that also depend on key species for food. For instance, forage fish play an important role in the ecosystem and the marine environment, providing support to many species, and are often valued as a fisheries resource as well, thus warranting a more ecosystem-based approach in their management (Pikitch et al. 2012).

Nevertheless, scup is a demersal species, not a forage fish species, and does not hold a significant role in the ecosystem relative to its biomass. The scup fishery therefore does not substantially contribute to forage fish species mortality, either directly or indirectly via bycatch. Hence, although management of the fishery currently lacks policies that adopt an ecosystem-based approach, negative consequences to the ecosystem from this fishery are unlikely.

Acknowledgements

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.

Seafood Watch would like to thank Dustin Leaning as well as two anonymous reviewers for graciously reviewing this report for scientific accuracy.

References

NESFC 2015. Scup benchmark stock assessment for 2015. 60th SAW Assessment report.

ACCSP Data Warehouse 2022. Scup commercial landings by state.

Alade L. and Traver M. 2018. 2017 Northern and Southern Silver Hake and Red Hake Stock Assessment Update Report. NEFSC Ref Doc 18-02; 71 p. doi: 10.7289/V5/RD-NEFSC-18-02

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

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.

ASMFC 1996. Amendment 8 to the Summer Flounder Fishery Management Plan: Fishery Management Plan for the Scup Fishery. Fishery Management Report No. 26 of the ASMFC. March 1996.

ASMFC 2000. ASMFC advisory Primer: A guide to the Commission's advisory panel process.

ASMFC 2017b. 2017 Atlantic Sturgeon Benchmark Stock Assessment and Peer Review Report. October 2017.

ASMFC 2019. 2019 Horseshoe Crab Benchmark Stock Assessment Non-Confidential Report.

ASMFC 2020. Review of the interstate Fisheries Management Plan for Scup (Stenotomus chrysops) 2020 fishing year. August 2021.

ASMFC 2020b. Atlantic States Marine Fisheries Commission Stock Assessment Overview: Horseshoe Crabs 5/19. Fisheries 52.

ASMFC 2021. Scup - Commercial and Recreational Fisheries. Taken from: http://www.asmfc.org/species/scup

ASMFC 2021b. ASMFC About Us. Taken from: http://www.asmfc.org/about-us/program-overview

ASMFC 2022. Atlantic States Marine Fisheries Commission: The Law enforcement Committee. Accessed from: http://www.asmfc.org/law-enforcement/the-law-enforcement-committee

Beal R., M. Armstrong, B. Figley, J Mason, C. Moore, D. Simpson 1999. Review of interstate fishery management plan 1999 fishing year Scup (Stenotomus chrysops). ASMFC. November 2000.

Carlson, J. et al. 2020. Bathytoshia centroura Roughtail Stingray. The IUCN Red List of Threatened Species 2020: e.T104065040A3122808. https://dx.doi.org/10.2305/IUCN.UK.2020-

3.RLTS.T104065040A3122808.en

Carlson, J. et al. 2020. Hypanus say, Bluntnose stingray. The IUCN Red List of Threatened Species 2020: e.T60159A3090316. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T60159A3090316.en

Carlson, J. et al. 2021. Myliobatis freminvillei (amended version of 2020 assessment). The IUCN Red List of Threatened Species 2021: e.T161568A201183089.
https://www.iucnredlist.org/species/161568/201183089

FAO 2021. Single Boat Bottom Otter Trawls. Taken from: http://www.fao.org/fishery/geartype/306/en

Finucci, B., Barnett, A., Bineesh, K.K., Cheok, J., Cotton, C.F., Kulka, D.W., Neat, F.C., Rigby, C.L., Tanaka, S. & Walker, T.I. 2020. Heptranchias perlo. The IUCN Red List of Threatened Species 2020: e.T41823A2956343. https://dx.doi.org/10.2305/IUCN.UK.2020-3.RLTS.T41823A2956343.en

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. 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.

Hayes, C. G., Jiao, Y., and Cortez, E. 2009. Stock Assessment of Scalloped Hammerheads in the Western North Atlantic Ocean and Gulf of Mexico. North American Journal of Fisheries Management. 29:1406–1417.

Hendrickson, L. 2017. Longfin Inshore Squid (Doryteuthis (Amerigo) pealeii) Stock Assessment Update for 2017. NMFS. April, 2017.

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.

Kulka, D.W., Ellis, J., Anderson, B., Cotton, C.F., Derrick, D., Pacoureau, N. & Dulvy, N.K. 2020. Amblyraja radiata. The IUCN Red List of Threatened Species 2020: e.T161542A124503504.
https://www.iucnredlist.org/species/161542/124503504

Legault, C. 2017. Georges Bank Atlantic Cod. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016. Northeast Fisheries Science Center Reference Document 17-17.

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.

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.

Liu, J., Zapfe, G., Shao, K.-T., Leis, J.L., Matsuura, K., Hardy, G., Liu, M., Robertson, R. & Tyler, J. 2015. Mola mola (errata version published in 2016). The IUCN Red List of Threatened Species 2015: e.T190422A97667070.

Løkkeborg 2005. Impacts of trawling and scallop dredging on benthic habitats and communities. FAO technical paper 472. Rome 2004. Taken from: http://www.fao.org/3/y7135e/y7135e06.htm

MAFMC 2019. Ecosystem Approach to Fisheries Management Guidance Document. February 2019.

MAFMC 2021. Scup fishery information document. June 2021.

MAFMC 2021b. MAFMC - About the Council. Taken from: https://www.mafmc.org/about

MAFMC 2022. Mid-Atlantic Fishery Management Council: Advisory panels. Accessed from: https://www.mafmc.org/advisory-panels

MAFMC 2022b. Mackerel, squid, butterfish. Accessed from: https://www.mafmc.org/msb/

MAFMC 2022c. Illex quota Working Group. Accessed from: https://www.mafmc.org/actions/illex-working-group

Murray, K. 2020. Estimated Magnitude of Sea Turtle Interactions and Mortality in US Bottom Trawl Gear, 2014-2018. NOAA Fisheries & NEFSC. March 2020.

NatureServe. 2013. Alosa aestivalis. The IUCN Red List of Threatened Species 2013: e.T201946A2730890. http://dx.doi.org/10.2305/IUCN.UK.2013-1.RLTS.T201946A2730890.en

NatureServe. 2013. Alosa aestivalis. The IUCN Red List of Threatened Species 2013: e.T201946A2730890. https://www.iucnredlist.org/species/201946/2730890

NDRC 2021. A safety net for ocean fisheries: The case for stronger protection of Essential Fish Habitat under the Magnuson-Steven's Act.

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 2011. Stock Assessment of Scup for 2011. October 2011.

NEFSC 2017. Operational Assessment of 19 Northeast Groundfish Stocks, Updated Through 2016.

NEFSC 2020. Operational Assessment of the Black Sea Bass, Scup, Bluefish, and Monkfish Stocks, Updated Through 2018. January 2020.

NEFSC 2021. Black Sea Bass Operational Assessment for 2021. Draft report.

New England Fishery Management Council 2022. Skates: Northeast skate complex overview. Accessed from: https://www.nefmc.org/management-plans/skates

NMFS 2019. Fisheries of the United States. Silver Spring MD. May 2021.

NMFS 2020. Fisheries of the Northern United States; Summer Flounder, Scup, Black Sea Bass specifications. 50 CFR Part 648.

NMFS 2021. Endangered Species Act Section 7 Consultation - biological opinion. May 2021.

NMFS 2021. List of Fisheries for 2021.

NMFS 2021b. Fisheries of the Northeastern United States; adjustment to 2019 Winter II quota. 50 CFR Part 648.

NMFS 2021c. Endangered Species Act Section 7 consultation Biological opinion. https://doi.org/10.25923/cfsq-qn06

NOAA 1999. Essential Fish Habitat Source Document: Scup, Stenotomus chrysops, Life History and Habitat Characteristics. Technical Memorandum NMFS-NE-149. September 1999.

NOAA 2021. Code of Federal regulations § 648.126.

NOAA 2021b. Scup - Harvest. Taken from: https://www.fisheries.noaa.gov/species/scup

NOAA 2022b. Marine Debris Program - office of response and restoration. Accessed from https://marinedebris.noaa.gov/types/derelict-fishing-gear on February 25th, 2022.

NOAA Federal 2021. Scup catch composition raw data. Data provided on October 22nd, 2021.

NOAA Fisheries 2012. Atlantic trawl gear take reduction team monitoring strategy. August 2012.

NOAA Fisheries 2021. About US - Office of Law Enforcement. Taken from: https://www.fisheries.noaa.gov/about/office-law-enforcement

NOAA Fisheries 2021. Atlantic Trawl Take Reduction Team. https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-trawl-take-reduction-team

NOAA Fisheries 2021. Atlantic Trawl Take Reduction Team. https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-trawl-take-reduction-team.

NOAA Fisheries 2021. Stock SMART assessment - Spiny dogfish - Atlantic coast. Taken from: https://www.st.nmfs.noaa.gov/stocksmart?app=browse-by-stock

NOAA Fisheries 2021c. Atlantic Sturgeon. https://www.fisheries.noaa.gov/species/atlantic-sturgeon

NOAA Fisheries 2021d. Loggerhead turtle overview. https://www.fisheries.noaa.gov/species/loggerhead-turtle

NOAA Fisheries 2022. Atlantic Large Whale Take Reduction Plan. Accessed from https://www.fisheries.noaa.gov/new-england-mid-atlantic/marine-mammal-protection/atlantic-large-whale-take-reduction-plan on February 9th, 2022.

NOAA Fisheries 2022. Shortfin squid - Illex illecebrosus. Accessed from https://www.fisheries.noaa.gov/species/shortfin-squid#:~:text=Shortfin%20squid%20live%20for%20less,but%20die%20after%20they%20spawn on February 8th, 2022.

NOAA Fisheries 2022b. Northeast skate complex: Commercial fishing. Accessed from: https://www.fisheries.noaa.gov/species/northeast-skate-complex#commercial

NOAA FishWatch 2021. Scup. Taken from: https://www.fishwatch.gov/profiles/scup

NOAA Marine Debris Program 2015. Report on the impacts of "ghost fishing" via derelict fishing gear. Silver Spring, MD. 25 pp

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

Northeast Fisheries Science Centre 2022. Management track Assessment June 2021: Scup management track assessment for 2021. NEFSC reference document 22-10. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 22-10; 79 p.

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.

Pikitch E., D. Boersma, I. L. Boyd, D. O. Conover, et al. 2012. Big Fish Little Impact - Managing a crucial link in ocean food webs. April 2012.

Rigby, C.L. et al. 2019. Alopias vulpinus. The IUCN Red List of Threatened Species 2019: e.T39339A2900765. http://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T39339A2900765.en

Rigby, C.L. et al. 2019. Carcharhinus obscurus. The IUCN Red List of Threatened Species 2019: e.T3852A2872747. http://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T3852A2872747.en

Rigby, C.L. et al. 2019. Carcharodon carcharias. The IUCN Red List of Threatened Species 2019: e.T3855A2878674. http://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T3855A2878674.en

Rigby, C.L. et al. 2019d. Lamna nasus. The IUCN Red List of Threatened Species 2019: e.T11200A500969. http://dx.doi.org/10.2305/IUCN.UK.2019-3.RLTS.T11200A500969.en

Rigby, C.L. et al. 2021. Cetorhinus maximus (amended version of 2019 assessment). The IUCN Red List of Threatened Species 2021: e.T4292A194720078.https://dx.doi.org/10.2305/IUCN.UK.2021-1.RLTS.T4292A194720078.en

Rigby, C.L., Carlson, J., Derrick, D., Dicken, M., Pacoureau, N. & Simpfendorfer, C. 2021c. Carcharias taurus. The IUCN Red List of Threatened Species 2021: e.T3854A2876505. https://dx.doi.org/10.2305/IUCN.UK.2021-2.RLTS.T3854A2876505.en

Rigby, C.L., Dulvy, N.K., Barreto, R., Carlson, J., Fernando, D., Fordham, S., Francis, M.P., Herman, K., Jabado, R.W., Liu, K.M., Marshall, A., Pacoureau, N., Romanov, E., Sherley, R.B. & Winker, H. 2019f. Sphyrna lewini. The IUCN Red List of Threatened Species 2019: e.T39385A2918526. Downloaded on 17 November 2021.

Rigby, C.L., Sherman, C.S., Chin, A. & Simpfendorfer, C. 2017. Carcharhinus falciformis. The IUCN Red List of Threatened Species 2017: e.T39370A117721799.http://dx.doi.org/10.2305/IUCN.UK.2017-3.RLTS.T39370A117721799.en

SEDAR 2016. Update assessment to SEDAR 21 HMS Dusky Shark. July 2016.

SEDAR 2017. SEDAR 54 Stock Assessment Report HMS Sandbar Shark. October 2017.

Smith, D.R., Beekey, M.A., Brockmann, H.J., King, T.L., Millard, M.J. & Zaldívar-Rae, J.A. 2016. Limulus polyphemus. The IUCN Red List of Threatened Species 2016: e.T11987A80159830. https://www.iucnredlist.org/species/11987/80159830

Sosebee, K 2020. 2019 NE Skate Stock Status Update. NEFSC. October 2020.

Terceiro 2021. Summer Flounder Management Track Assessment for 2021. Draft review.

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

Watling 2014. Trawling exerts big impacts on small beasts. PNAS. Vol 111, no 24, p8704-8705.

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