Monterey Bay Aquarium
Seafood Watch

Environmental sustainability assessment of wild-caught Atlantic croaker *(Micropogonias undulatus)* from the United States caught using set gillnets, bottom trawls, stationary uncovered pound nets, and beach seines.

Species:	Atlantic croaker *(Micropogonias undulatus)*
Location:	United States: Northwest and Western Central Atlantic
Gear:	Set gillnets, Bottom trawls, Stationary uncovered pound nets, Beach seines
Type:	Wild Caught
Author:	Seafood Watch
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Assessed using Seafood Watch Fisheries Standard v3

Table of Contents

About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the environmental sustainability of wild-caught and farmed seafood commonly found in the United States marketplace. Seafood Watch defines sustainable seafood as originating from sources, whether wild-caught or farmed, which can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems. The program's goals are to raise awareness of important ocean conservation issues and empower seafood consumers and businesses to make choices for healthy oceans.

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

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

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

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

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

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

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

Guiding Principles

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

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

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

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

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

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

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

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

Avoid/Red: Take a pass on these for now; they're caught or farmed in ways that harm other marine life or the environment.

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

Summary

This report provides recommendations for the commercial Atlantic croaker (*Micropogonias undulatus*) fishery, operating along the East Coast of the United States. This report analyzes the primary gears used in the croaker fishery including gillnet, bottom trawl, beach seine, and pound nets. The latest stock assessment models indicate that the Atlantic croaker overfished/overfishing status is unknown.

By-catch in the pound net fishery is thought to be low, but the main concerns are with the impacts on forage fish and finfish (the latter only in the south of Cape Hatteras region). By-catch in gillnets is more abundant, and the main concerns are related to by-catch of sea turtles in both the inshore and coastal/offshore fisheries. Sharks are also a by-catch concern in the offshore gillnet fishery, whereas finfish and forage fish may also be a by-catch concern in the inshore gillnet fishery. By-catch in the trawl fishery is high, and the most affected species are sea turtles. Lastly, beach seines may have impacts on forage species.

Atlantic croaker is managed as a single stock by the Atlantic States Marine Fisheries Commission (ASMFC), under Amendment 1 to the Interstate Fishery Management Plan (IFMP) for Atlantic croaker, as well as Addenda I, II, and III (from 2011, 2014, and 2020, respectively). The ASMFC framework includes a Fisheries Management Plan Policy Board, scientific committees, an advisory panel, technical committees, and plan review/development teams. Addendum III revises the Traffic Light Approach (TLA) as the new management framework for Atlantic croaker, including a triggering mechanism: if thresholds for both population characteristics (harvest and adult abundance) achieve or exceed the proportion of threshold for three of the past four years, management action will be taken. The Fishery Management Plan has yearly reviews, with recommendations for management, research, and monitoring. There are also both fishery-dependent and -independent monitoring programs across the states, which are also incorporated into the TLA analysis. State-level regulations may include bag limits, size restrictions, time and area closures, and gear restrictions. More recently, in 2017, a report on sciaenid habitats was published, highlighting threats and uncertainties regarding habitats used by the species at different life stages. Stakeholder involvement is part of a robust management framework, where annual action planning for fisheries under the ASMFC includes strengthening interactions and input among stakeholders and technical, advisory, and management groups under an efficient, transparent, and accountable management process. By-catch management for the offshore gillnet fishery is ineffective at reducing the risk of this fishery to North Atlantic right whale, which is critically endangered, and entanglement in fishing gear is a leading cause of mortality.

Because Atlantic croaker inhabits primarily mud and sand-bottom areas, most gears assessed are expected to have minimal impact on bottom habitats. Ecosystem-based fishery management (EBFM) that considers targeted forage species in the region is under development.

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Atlantic croaker | Northwest Atlantic | Beach seines | United States	2.644	1.732	4.000	3.000	**Good Alternative (2.723)**
Atlantic croaker | Northwest Atlantic | Bottom trawls | United States	2.644	1.000	4.000	2.449	**Good Alternative (2.256)**
Atlantic croaker | Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras	2.644	1.000	4.000	3.000	**Good Alternative (2.373)**
Atlantic croaker | Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras	2.644	1.000	4.000	3.000	**Good Alternative (2.373)**
Atlantic croaker | Northwest Atlantic | Set gillnets | United States | coastal/offshore	2.644	1.000	1.000	3.000	**Avoid (1.678)**
Atlantic croaker | Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras	2.644	1.732	4.000	3.000	**Good Alternative (2.723)**
Atlantic croaker | Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras	2.644	1.000	4.000	3.000	**Good Alternative (2.373)**

Summary

Croaker caught using beach seines, trawls, inshore gillnets, and pound nets are rated a Good Alternative. Croaker caught using offshore gillnets is rated an Avoid, due to the risks from this gear to North Atlantic right whale and the ineffectiveness of management measures to mitigate these risks.

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 provides the recommendation for the commercial Atlantic croaker (*Micropogonias undulatus*) fishery, operating along the East Coast of the United States. This report analyzes the primary gears used in the croaker fishery including gillnet, bottom trawl, beach seine, and pound nets. For gillnet gear, the assessment was divided into two components: inshore, which covers the fishery in estuarine regions, and offshore, which covers the fishery in open water.

Species Overview

Atlantic croaker is a sciaenid species that tolerates a wide range of salinity and occurs from Cape Cod, Massachusetts to the Bay of Campeche in Mexico (Vanderkooy 2017). In the U.S. Atlantic coast, the species is more abundant from Chesapeake Bay (an important spawning/nursery habitat) to northern Florida (ASMFC 2020b). The croaking noise that the species makes in spawning season is the reason for its name. It spawns in warm pelagic waters in the colder months, then both larvae and juveniles mature near estuaries (ASMFC 2020b). The species is fast growing and reaches maturity at age 2, at 18.2 cm for males and 17.3 cm for females (ASMFC 2010).

The Atlantic croaker fishery is almost equally distributed among commercial fishers (about 57%) and recreational anglers (about 43%) (ASMFC 2020b). For commercial fisheries, the most common gears used are sink gillnets, otter trawls, haul seines, and pound nets (ASMFC 2005). Commercial landings have varied substantially over the years, with a peak in 2001 at 28.6 million pounds, and have declined consistently since 2003 to only 3.7 million pounds in 2018 (Figure 1) (ASMFC 2020b).

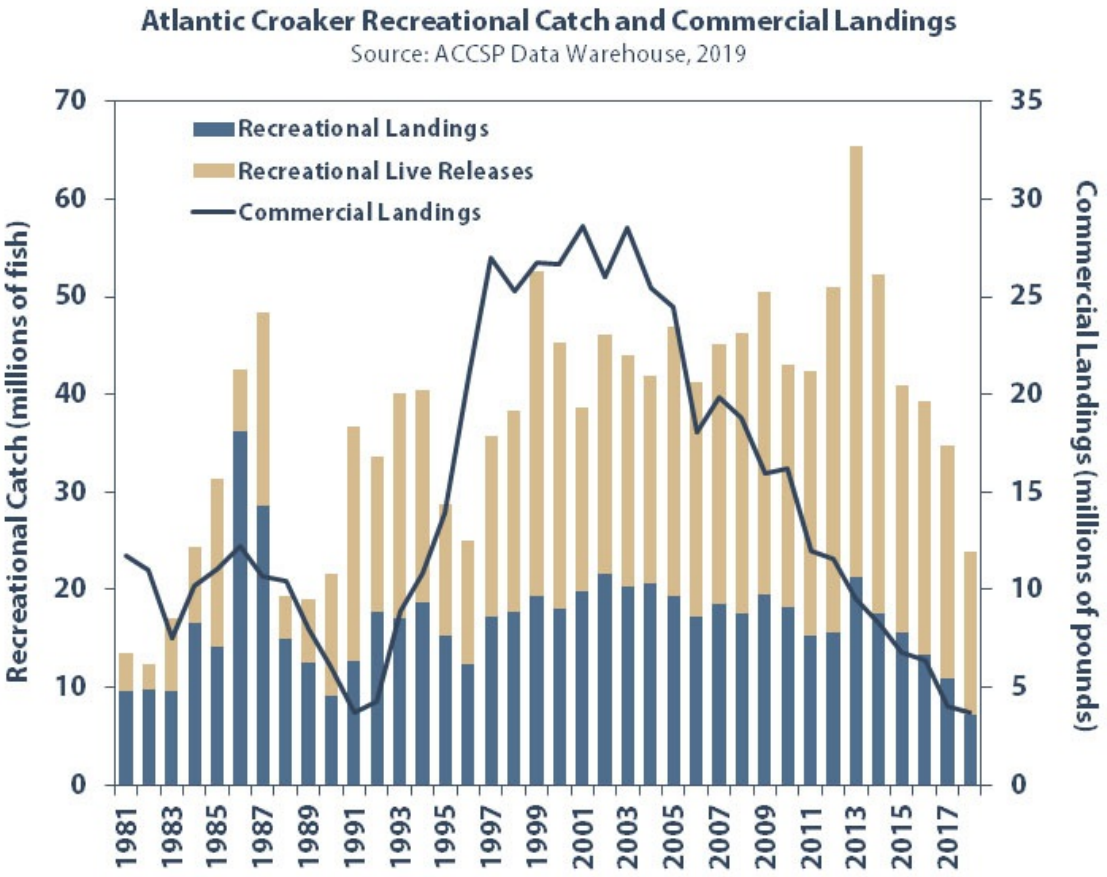

Figure 1: Commercial landings and recreational catch of Atlantic croaker, 1981–2018. Source: (ASMFC 2020b)

The species is managed under Amendment 1 to the Interstate Fishery Management Plan (IFMP) for Atlantic croaker (ASMFC 2005), as well as Addenda I, II, and III (ASMFC 2020d). Addendum III revises the Traffic Light Approach (TLA) as the new management framework for Atlantic croaker, including a triggering mechanism: if thresholds for both population characteristics (harvest and adult abundance) achieve or exceed the proportion of threshold for three of the past four years, management action will be taken (Schmidtke et al. 2018.)(ASMFC 2020d). Addendum III also provides which specific response should be performed if the TLA triggers management (ASMFC 2020d). A report on essential habitats and habitat areas of particular concern was published in 2017, with recommendations for management and research (Odell et al. 2017).

Production Statistics

Most commercial landings for Atlantic croaker come from the mid-Atlantic region (particularly Virginia and North Carolina). Along the U.S. Atlantic coast, there is a declining trend in landings since the late 1990s (Figure 2) (ASMFC 2020d). Commercial landings have declined consistently since 2003 and have reached 3.7 million pounds in 2018 (ASMFC 2020b).

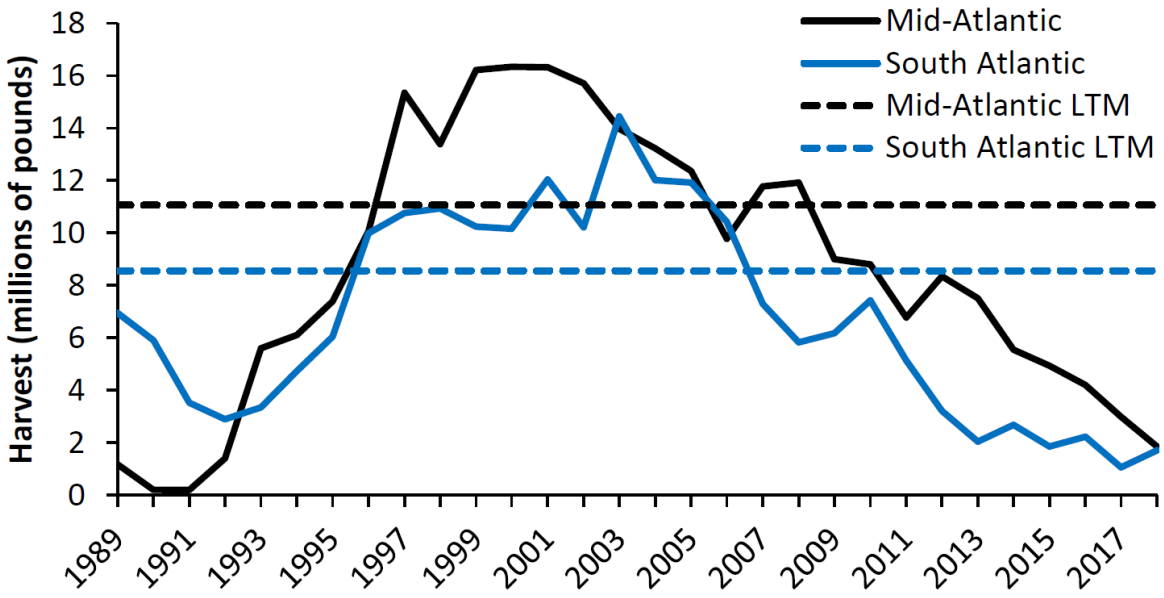

Figure 2: Atlantic croaker commercial harvest and the long-term mean (average, LTM) harvest for 1989–2017 in the Mid-Atlantic (NJ–VA) and South Atlantic (NC–FL) regions. Source: (ASMFC 2020).

Importance to the US/North American market.

Atlantic croaker is not listed in the Foreign Trade statistics from the National Marine Fisheries Service (both import and export statistics). In 2019, commercial production was 3.7 million pounds (ASMFC 2020b) and is likely entirely consumed within the U.S.

Common and market names.

Croaker, hardhead, King Billy, grumbler (ASMFC 2007).

Primary product forms

Fresh iced, whole. Also processed into cat food, frozen crab bait, and surimi (ASMFC 1987).

Assessment

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

Criterion 1: Impacts on the species under assessment

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

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

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

Guiding principles

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

Criterion 1 Summary

ATLANTIC CROAKER			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northwest Atlantic | Beach seines | United States	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Bottom trawls | United States	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Set gillnets | United States | coastal/offshore	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance
Goal: Stock abundance and size structure of native species is maintained at a level that does not impair recruitment or productivity.

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

Factor 1.2 - Fishing Mortality

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

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

Atlantic croaker

Factor 1.1 - Abundance

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Moderate Concern

The most recent benchmark stock assessment for Atlantic croaker was completed in 2017, but was ultimately not recommended for management use, partly because of conflicting trends in harvest characteristics (declining) and abundance characteristics (increasing) (Able et al. 2017)(ASMFC 2021). Stock status relative to a sustainable level is therefore considered unknown (ASMFC 2021d). The International Union for the Conservation of Nature (IUCN) last assessed the species in 2020, with a determination of "Least Concern" {Chao, L. & Espinosa-Perez, H. 2020}. The combination of a lack of accepted stock assessment and some data indicating that status is not of concern allows for a rating of moderate concern.

Factor 1.2 - Fishing Mortality

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Moderate Concern

The 2017 stock assessment for Atlantic croaker estimated values for fishing mortality; however, because the assessment was not recommended for management use, those values are not used (Able et al. 2017){Schmidtke et al. 2018}. Nonetheless, the trends observed in the time series parameters indicate a decrease in F values (Able et al. 2017). In addition, catch appears to be stable or declining over time (Able et al. 2017). Although the estimates were not precise, there was an agreement among the panel that recent removals of the stock were sustainable (Able et al. 2017). The previous assessment from 2010 indicates that overfishing was not occurring and that total F values had decreased over the years (ASMFC 2010). The current Atlantic States Marine Fisheries Commission (ASMFC) stock status overview indicates unknown fishing mortality and low harvest in 2018 (ASMFC 2020). Because of uncertainties about current F estimates, fishing mortality is deemed a moderate concern.

Criterion 2: Impacts on Other Species

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

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

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

Guiding principles

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

Criterion 2 Summary

Criterion 2 score(s) overview

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

ATLANTIC CROAKER			
REGION / METHOD	**SUB SCORE**	**DISCARD RATE/LANDINGS**	**SCORE**
Northwest Atlantic | Beach seines | United States	1.732	1.000: < 100%	Red (1.732)
Northwest Atlantic | Bottom trawls | United States	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Set gillnets | United States | coastal/offshore	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras	1.732	1.000: < 100%	Red (1.732)
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras	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 | BEACH SEINES | UNITED STATES			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Finfish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Forage fish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | BOTTOM TRAWLS | UNITED STATES			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Finfish	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Atlantic white-sided dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Bottlenose dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Gray seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Risso's dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Longfin squid	5.000: Very Low Concern	3.000: Moderate Concern	Green (3.873)
Silver hake	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | SET GILLNETS | UNITED STATES | COASTAL/OFFSHORE			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Sharks	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic sturgeon	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Finfish	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Atlantic menhaden	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Humpback whale	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
Gray seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor porpoise	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Harbor seal	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Minke whale	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Short-beaked common dolphin	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)

NORTHWEST ATLANTIC | SET GILLNETS | UNITED STATES | INSHORE - NORTH OF CAPE HATTERAS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Finfish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Forage fish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | SET GILLNETS | UNITED STATES | INSHORE - SOUTH OF CAPE HATTERAS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Finfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Sea turtles	1.000: High Concern	1.000: High Concern	Red (1.000)
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Forage fish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | STATIONARY UNCOVERED POUND NETS | UNITED STATES | NORTH OF CAPE HATTERAS			
SUB SCORE: 1.732	DISCARD RATE: 1.000	**SCORE: 1.732**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Finfish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Forage fish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | STATIONARY UNCOVERED POUND NETS | UNITED STATES | SOUTH OF CAPE HATTERAS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	**SCORE: 1.000**	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Finfish	1.000: High Concern	1.000: High Concern	Red (1.000)
Bottlenose dolphin	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Forage fish	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic croaker	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

For all gears in the Northwest Atlantic, catch composition data provided by the National Marine Fisheries Service from 2018 were evaluated, and species making up at least 5% of the total catch were included in this assessment. Also, the list of commercial fisheries in the Atlantic Ocean, Gulf of Mexico, and the Caribbean was considered in order to include any species of concern, following the Marine Mammal Protection Act. Sharks, forage fish, and finfish were included for gears based on catch/observer data provided by Maryland, Virginia, and North Carolina state management bodies (VAMRC 2019)(MDDNR 2019)(NCDEQ 2019). But, data composition differed from each state: Maryland and Virginia provided catch composition, whereas North Carolina provided landings data. Sea turtles were included based on information available (ASMFC 2005). Unknown By-catch Matrix (UBM) values were used where other information was not available. Gillnets data were split as inshore (estuarine) and offshore (including

coastal). Not all states provided information with this level of detail for this gear, so some species may have not been included. Because of distinct geographic characteristics between the South of Cape Hatteras and North of Cape Hatteras, another division was included to consider different species composition in both the gillnet and pound net fisheries.

For the beach seine fishery in the Northwest Atlantic, a forage fish (American shad) limits the score for Criterion 2 because the species is both overfished and experiencing overfishing.

For the trawl fishery in the Northwest Atlantic, sea turtles limit the score for Criterion 2 because all species are listed under the Endangered Species Act (ESA), CITES, and the International Union for the Conservation of Nature (IUCN) as "Threatened" species.

For the coastal/offshore gillnet fishery in the Northwest Atlantic, North Atlantic right whale, sea turtles, and sharks limit the score for Criterion 2 due to the catch of species listed by the IUCN, ESA, and/or CITES.

For the inshore gillnet fishery in the North of Cape Hatteras portion of the Northwest Atlantic, sea turtles and forage fish limit the score for Criterion 2 because all sea turtle species are listed under ESA, CITES, and IUCN as "Threatened" species, and one forage fish (American shad) is depleted.

For the inshore gillnet fishery in the South of Cape Hatteras portion of the Northwest Atlantic, sea turtles, finfish, and forage fish limit the score for Criterion 2: all sea turtle species are listed under ESA, CITES, and IUCN as "Threatened" species, one finfish species (southern flounder) is overfished or experiencing overfishing, and one species of forage fish (American shad) is depleted.

For the pound net fishery in the North of Cape Hatteras portion of the Northwest Atlantic, a forage fish (American shad) limits the score because the species is currently depleted.

For the pound net fishery in the South of Cape Hatteras portion of the Northwest Atlantic, finfish and forage fish limit the score because one finfish species (southern flounder) is both overfished and experiencing overfishing, and one forage fish species (American shad) is currently depleted.

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 menhaden

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

Atlantic menhaden is considered a single stock in U.S. Atlantic waters from Maine to Florida (Schueller et al. 2017). The 2020 single-species assessment indicates that the stock is not overfished (SEDAR 2020)(ASMFC 2021b). There have been several peaks and declines in the species population over the last decades, and juvenile abundance also follows a similar pattern of high and low biomass over the decades (SEDAR 2020). Because this is a forage species, and there are concerns of localized depletion in the Chesapeake Bay (Pikitch et al. 2012), there is a scientific consensus to comply with more precautionary thresholds (e.g., fishing prohibition required at biomass below 40% of B_0) {Adams et al. 2017}. Because available information and current reference points are not consistent with the Lenfest Forage Fish Task Force recommendation for this species (Pikitch et al. 2012), abundance receives a score of moderate concern.

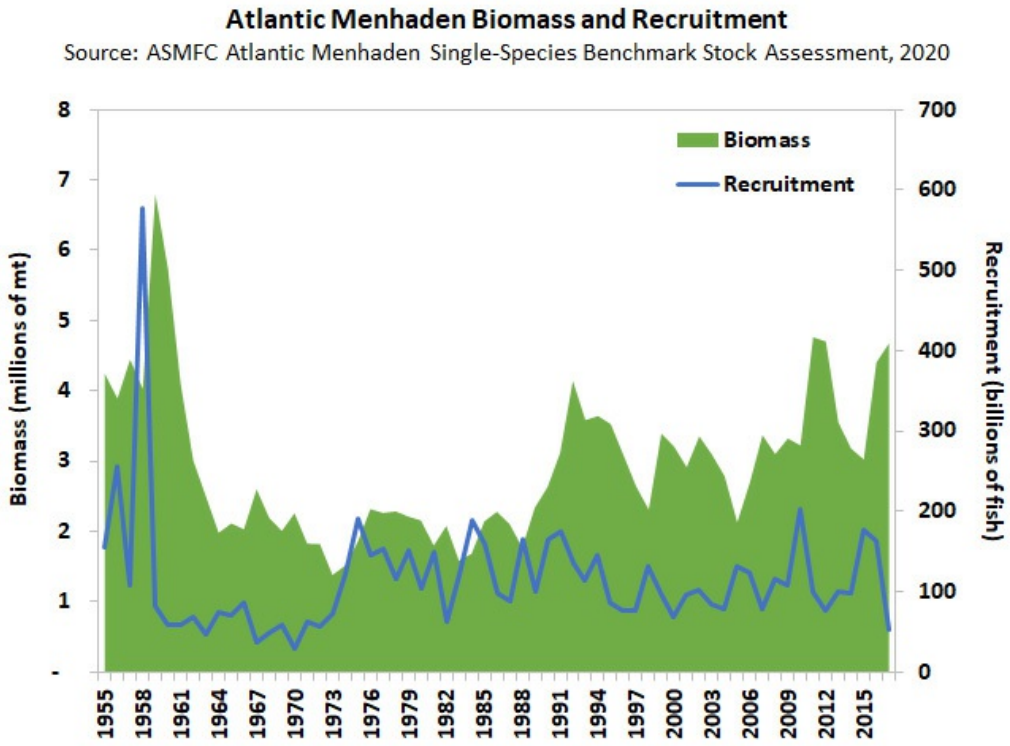

Figure 3: Biomass and recruitment of Atlantic menhaden. Source: (SEDAR 2020).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

Current F benchmarks for Atlantic menhaden are calculated considering the full fishing mortality rate (F_{BASED}) and the spawner-per-recruit calculations (fecundity-based), using the mean values of time-varying components (e.g., growth and maturity) over the 1955–2017 period (SEDAR 2020). In 2017, F was estimated at 0.11, which is below the $F_{THRESHOLD}$ (0.60) and F_{TARGET} (0.22)(SEDAR 2020). Overfishing is not currently occurring (SEDAR 2020)(ASMFC 2021b). Fishing mortality has remained below $F_{THRESHOLD}$ since the mid-1970s and also below F_{TARGET} since the mid-1990s (SEDAR 2020b). The 2020 Ecological Reference Point assessment for the species suggests that reference points for F should be lower than the current values, to account for menhaden's role as a forage fish (SEDAR 2020b). Because estimates have been below the overfishing thresholds for many decades, but there are uncertainties related to current reference points established to account for the species' role as a forage species, fishing mortality is scored a moderate concern.

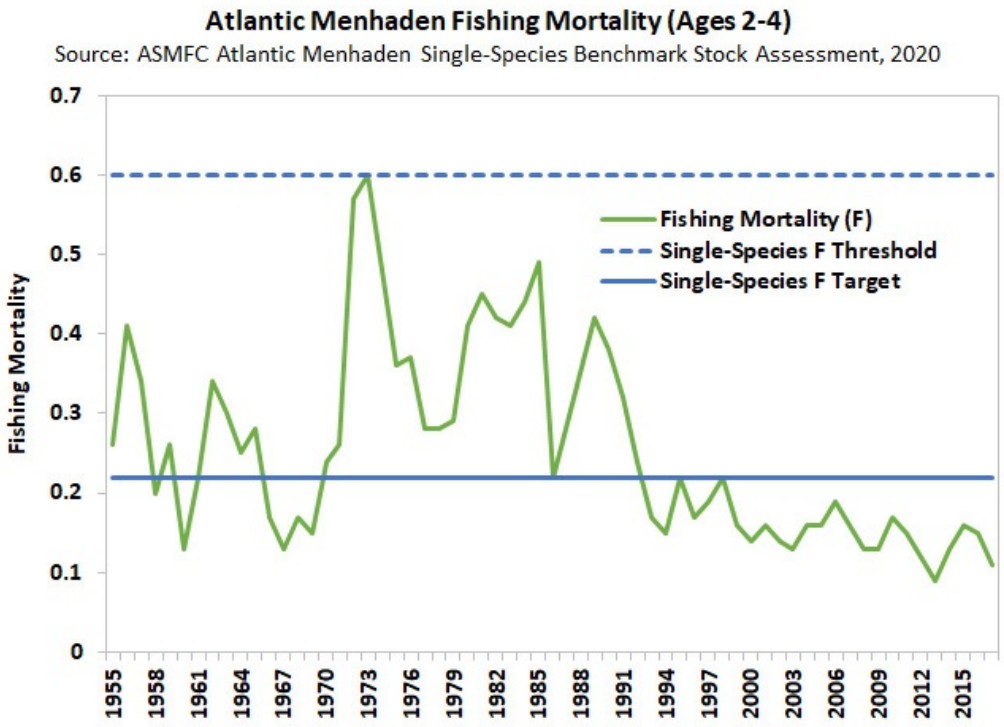

Figure 4: Fishing mortality for Atlantic menhaden. Source: (SEDAR 2020).

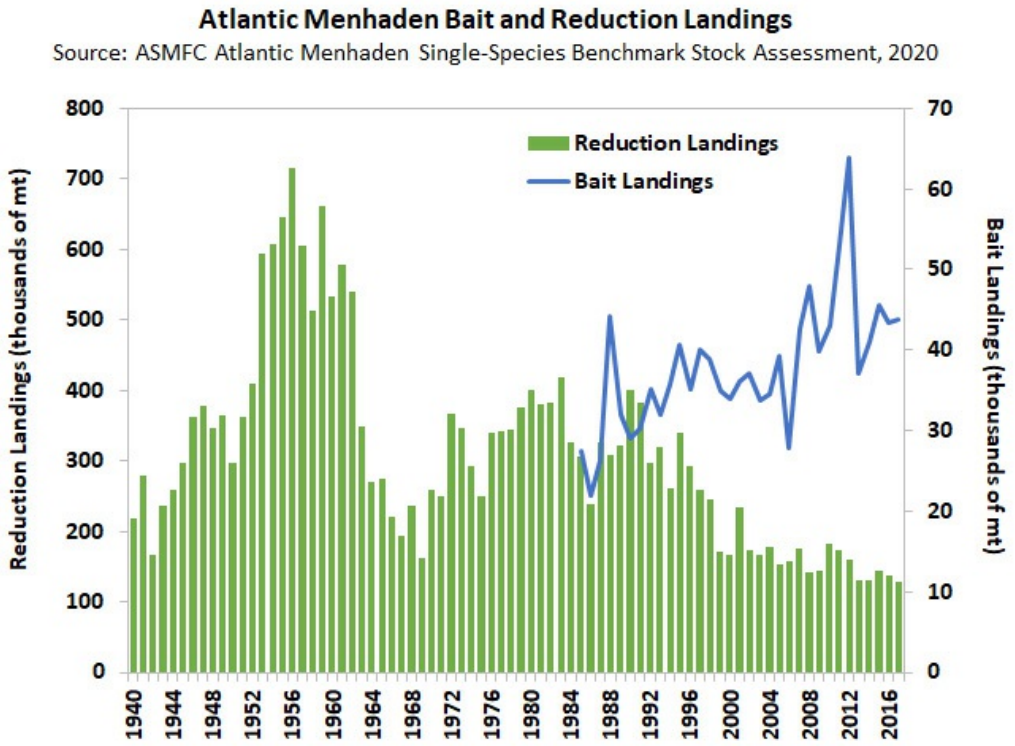

Figure 5: Landings (reduction/bait fisheries) for Atlantic menhaden. Source: (SEDAR 2020).

Atlantic sturgeon

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

Under the Endangered Species Act (ESA), Atlantic sturgeon is listed as "Endangered" in the Carolina, Chesapeake Bay, New York Bight, and South Atlantic distinct population segments (DPS), and as "Threatened" in the Gulf of Maine DPS (NOAA 2019). The species is currently listed as depleted by the latest stock status overview (ASMFC 2020c). The decline of Atlantic sturgeon abundance is a result of overfishing (targeted for their eggs, valued as a high quality caviar), habitat loss, and by-catch in gillnet and trawl fisheries (NOAA 2019). Abundance estimates, when available, show populations ranging from hundreds to thousands of individuals (NOAA 2019). Because the species' populations in the U.S. are either "Endangered" or "Threatened" according to the ESA, stock status for Atlantic sturgeon is scored a high concern.

Atlantic Sturgeon Coastwide and DPS-level Stock Status Based on Mortality Estimates (Z) and Biomass/Abundance Status Relative to Historic Levels and the Last Year of Available Indices Data Relative to the Start of the Coastwide Moratorium

	Mortality Status	Biomass/Abundance Status	
Population	Probability that $Z > Z_{50\%EPR}$ 80%	Relative to Historical Levels	Average probability of terminal year of indices > 1998* value
Coastwide	7%	Depleted	95%
Gulf of Maine	74%	Depleted	51%
New York Bight	31%	Depleted	75%
Chesapeake Bay	30%	Depleted	36%
Carolina	75%	Depleted	67%
South Atlantic	40%	Depleted	Unknown (no suitable indices)

*For indices that started after 1998, the first year of the index was used as the reference value.

Figure 6: Stock status of Atlantic sturgeon. Extracted from (ASMFC 2020c).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

Atlantic sturgeon is under a coast-wide moratorium from 1998 to 2038 because the population is severely depleted (the stock declined first because of overfishing, but now the main factors also include incidental fishing, habitat loss, dredging, ship strikes, and climate change) (ASMFC 2019c). Regarding incidental fishing, gillnet is among the gears known to catch Atlantic sturgeon (NOAA 2019); however, fishing mortality values are not available (and, other than by-catch, are assumed to be nonexistent since the moratorium) (ASMFC 2019c). The latest stock assessment indicates that the current mortality level is sustainable (ASMFC 2019c). Fishing mortality for Atlantic sturgeon is scored a low concern, because fishery contribution to mortality has been low in the past years (Figure 7).

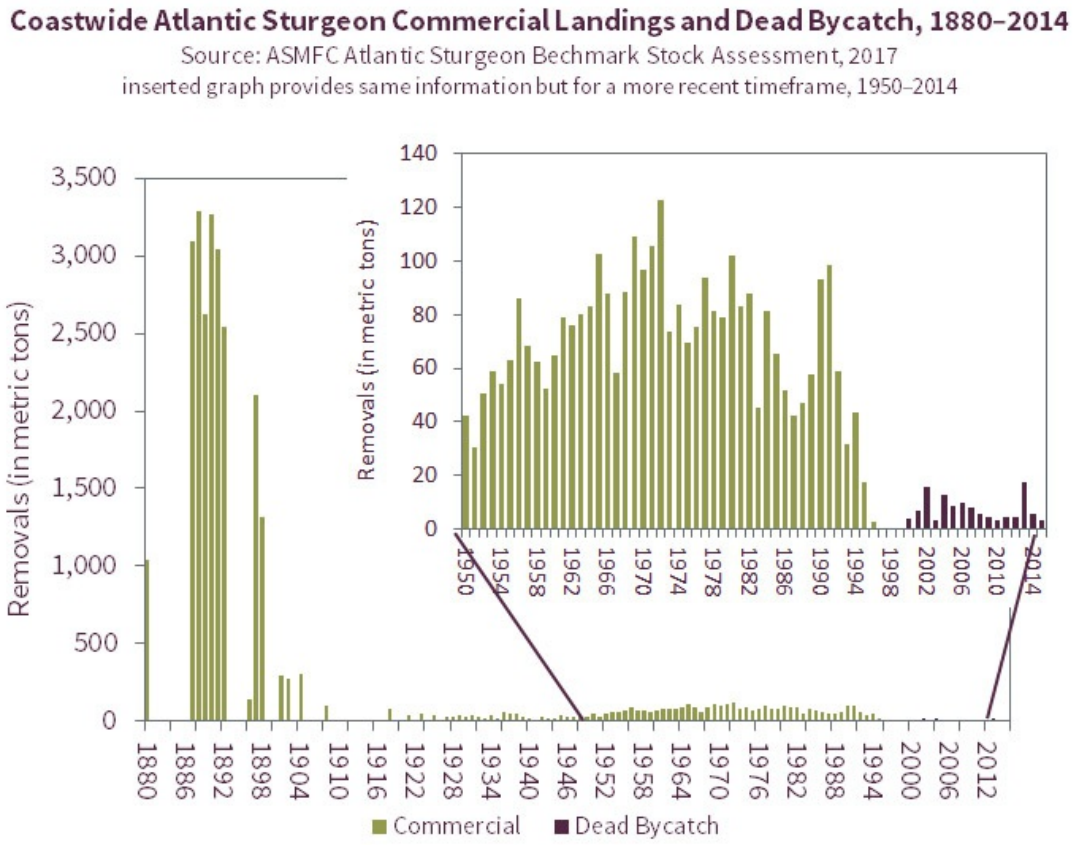

Figure 7: Landings and dead by-catch of Atlantic sturgeon. Extracted from (ASMFC 2019c).

Atlantic white-sided dolphin

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

According to the most current marine mammal stock assessment report, the best estimate of abundance for the North Atlantic white-sided dolphin stock was 93,233 (CV = 0.71), with a minimum population size of 54,443 {Hayes et al. 2020}. The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species {Hayes et al. 2020}. The IUCN considers this species "Least Concern" {Hammond et al. 2008a}. Because the status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Low Concern

A total annual estimated average fishery-related mortality or serious injury to this stock during 2013–2017 was 26 (CV = 0.20) (NOAA 2019r). But, this estimate faces uncertainties such as the observer coverage in some fisheries. When considering the entire Western North Atlantic stock, the mortality in Canadian waters is mostly unquantified (NOAA 2019r). The current potential biological removal (PBR) for this species is 544 (NOAA 2019r). This factor is deemed a low concern, because the species is not considered strategic and the total mortality estimate is much lower than the current PBR.

Bottlenose dolphin

Factor 2.1 - Abundance

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

High Concern

Both beach seine/long haul and set gillnets (inshore) fisheries may interact with the same set of bottlenose dolphin stocks: the Northern Migratory Coastal Stock (NMCS), the Southern Migratory Coastal Stock (SMCS), the Northern North Carolina Estuarine System Stock (NNCES), and the Southern North Carolina Estuarine System Stock (SNCES) (NOAA 2019l). All these stocks are strategic under the Marine Mammal Protection Act (MMPA), and both SMCS and NMCS have a "Depleted" designation under the MMPA (NOAA 2018g)(NOAA 2018f)(NOAA 2018h)(NOAA 2018e). In addition, bottlenose dolphin is listed as "Least Concern" by the IUCN (Wells et al. 2019). The NNCES is the one with the smaller population (estimated at 823 animals) (CV = 0.06) (NOAA 2018f) and the largest is the NMCS with 6,639 animals (CV = 0.41) (NOAA 2018e). Even though the species is not listed as a species of concern by the IUCN or listed under the Endangered Species Act, all stocks assessed are strategic to the MMPA due to uncertainties in the population status (NOAA 2018f)(NOAA 2018h) or to depleted status (NOAA 2018g)(NOAA 2018e); therefore, abundance is deemed a high concern.

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

The Western North Atlantic offshore bottlenose dolphin population is estimated to be 62,851 (CV = 0.23) (NOAA 2019r), which is the best available estimate from surveys conducted in 2016. Currently, the stock is not listed as threatened or endangered under the Endangered Species Act (ESA), nor it is considered strategic under the Marine Mammal Protection Act (MMPA) (NOAA 2019r). In addition, there are uncertainties to determine populations trends; such uncertainties are related to interannual variation in abundance, likely caused by either changes in spatial distribution (due to environmental variability) or changes in the population size of this stock (NOAA 2019r). Bottlenose dolphin is listed as "Least Concern" by the IUCN (Wells et al. 2019). Because it is not listed as a species of concern by either the IUCN, the ESA, or the MMPA, abundance is deemed a moderate concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

The Mid-Atlantic gillnet fishery is known to interact with five different populations of bottlenose dolphin: the Northern Migratory Coastal Stock, Southern Migratory Coastal Stock, Western North Atlantic offshore population, Northern North Carolina Estuarine System Stock (NNCES), and Southern North Carolina Estuarine System Stock (SNCES) (NOAA 2019l). Bottlenose dolphin is listed as "Least Concern" by the IUCN (Wells et al. 2019). Except the Western North Atlantic offshore population (NOAA 2019r), all stocks are considered strategic under the Marine Mammal Protection Act (MMPA) due to uncertainties in the population and/or depleted status (NOAA 2018g)(NOAA 2018f)(NOAA 2018h)(NOAA 2018e). Abundance receives a score of high concern, because of the stocks with the most concerning status.

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

High Concern

Pound net fisheries are known for interacting with three different stocks of bottlenose dolphin: the Northern Migratory Coastal Stock (NMCS), Southern Migratory Coastal Stock (SMCS), and the Northern North Carolina Estuarine Stock (NNCES) (NOAA 2019l). These stocks are considered strategic under the Marine Mammal Protection Act (MMPA), with both the Northern Migratory Coastal Stock and the Southern Migratory Coastal Stock bearing a "Depleted" designation under the MMPA (NOAA 2018f)(NOAA 2018g)(NOAA 2018e). Bottlenose dolphin is listed as "Least Concern" by the IUCN (Wells et al. 2019). The NNCES has the smallest population (estimated at 823 animals) (CV = 0.06) (NOAA 2018f) and the largest is the NMCS with 6,639 animals (CV = 0.41) (NOAA 2018e). Because all stocks interacting with this fishery are strategic to the MMPA and there are uncertainties in the population status or depleted status, abundance is deemed a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Moderate Concern

For bottlenose dolphin, the Northern Migratory Coastal Stock (NMCS), the Southern Migratory Coastal Stock (SMCS), the Northern North Carolina Estuarine System Stock (NNCES), and the Southern North Carolina Estuarine System Stock (SNCES) are known for interacting with both beach seine/long haul and set gillnets (inshore) fisheries (NOAA 2019l). The total annual human-caused mortality and serious injury are unknown for all these stocks. Except for the SNCES, both inshore gillnet and beach seines had observed strandings and/or entanglements from 2011 to 2015 (NOAA 2018e)(NOAA 2018f)(NOAA 2018g)(NOAA 2018h). Documented mean values vary among stocks, and are either not less than 10% of the potential biological removal (PBR) (NNCES and NMCS) (NOAA 2018e)(NOAA 2018f) or estimates cannot be considered due to missing or biased information (SNCES and SMCS) (NOAA 2018g)(NOAA 2018h). Fishing mortality

is deemed a moderate concern, because there are uncertainties about PBR and total mortality estimates.

Northwest Atlantic | Bottom trawls | United States

Low Concern

The total annual estimated average fishery-related mortality to the Western North Atlantic offshore population during 2013–2017 was 28 (CV = 0.34) bottlenose dolphin (NOAA 2019r), as a result of interactions with sink gillnet, bottom trawl, and pelagic longline fisheries. The current potential biological removal (PBR) for this species is 519 (NOAA 2019r). Fishing mortality is deemed a low concern, because the stock is not considered strategic under the MMPA and the total mortality estimate is less than 10% of the current calculated PBR.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

Five stocks are considered for this factor: the Northern Migratory Coastal Stock (NMCS), Southern Migratory Coastal Stock (SMCS), Western North Atlantic offshore population (WNAO), Northern North Carolina Estuarine System Stock (NNCES), and Southern North Carolina Estuarine System Stock (SNCES) (NOAA 2019l). The WNAO population is the only stock with known values for total annual estimated average fishery-related mortality (during 2013–2017, 28 individuals [CV = 0.34] (NOAA 2019r)). The current potential biological removal (PBR) for this stock is 519 (NOAA 2019r); therefore, the total mortality estimate is less than 10% of the current calculated PBR. For the other four stocks, the total annual human-caused mortality and serious injury values are unknown, and documented mean values vary among stocks and are either not less than 10% of PBR (NNCES and NMCS) (NOAA 2018e)(NOAA 2018f) or estimates cannot be considered due to missing or biased information (SNCES and SMCS) (NOAA 2018g)(NOAA 2018h). Fishing mortality is deemed a moderate concern, because of uncertainties about PBR and total mortality estimates for most of the stocks included in this fishery.

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

Moderate Concern

Three different stocks of bottlenose dolphin interact with pound net fisheries targeting Atlantic croaker: the Northern Migratory Coastal Stock (NMCS), Southern Migratory Coastal Stock (SMCS), and the Northern North Carolina Estuarine Stock (NNCES) (NOAA 2019l). The total annual human-caused mortality and serious injury are unknown for these stocks. Documented mean annual fishery-related mortality and serious injury for both observed fisheries and strandings identified vary among stocks and are not less than 10% of the potential biological removal (PBR); for pound nets, there is one documented stranding (mortality) for the SMCS and one for the NMCS (NOAA 2018e)(NOAA 2018g). For the NNCES, estimates cannot be considered due to missing or biased information (NOAA 2018f). Fishing mortality is deemed a moderate concern, because there are uncertainties about PBR and total mortality estimates.

Finfish

Factor 2.1 - Abundance

Northwest Atlantic | Beach seines | United States

High Concern

Finfish species in beach seines may include black drum, bluefish, catfish, cobia, red drum, sheepshead, spadefish, Spanish mackerel, spot, summer flounder, weakfish, white perch, and other species (NCDEQ 2019)(VAMRC 2019). Such species are not from highly vulnerable taxa; however, at least two species are listed as overfished/depleted from recent stock assessments: weakfish (ASMFC 2021d), which is most commonly caught in Virginia (VAMRC 2019), and bluefish, which is overfished based on the 2021 management track stock assessment (ASMFC 2021c), whereas in the previous assessment, the stock was not overfished (NOAA 2019b). The 2021 assessment used data up to 2019, and spawning stock biomass (SSB) in 2019 was estimated at 211 million pounds, which is 95% of the SSB threshold of 222 million pounds (ASMFC 2021c). For this reason, abundance is scored a high concern.

Northwest Atlantic | Bottom trawls | United States

High Concern

Finfish species in bottom trawl fisheries may include black seabass, bluefish, kingfishes, monkfish, scup, and summer flounder (NCDEQ 2019). Such species are not from highly vulnerable taxa or are not overfished (ASMFC 2021d)(NEFSC 2013)(NEFSC 2019)(NEFSC 2019b)(SEDAR 2014). But, bluefish was recently listed as overfished (ASMFC 2021d). Because of the bluefish overfished status, abundance is scored a high concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

Finfish species in the offshore/coastal gillnet fishery may include (as the most frequent species) bluefish, cobia, gray seatrout/weakfish, kingfishes, king mackerel, Spanish mackerel, and spot (NCDEQ 2019)(VAMRC 2019)(MDDNR 2019). Such species are not from highly vulnerable taxa; however, two species are currently overfished: gray seatrout and bluefish (ASMFC 2021c). Gray seatrout is more commonly caught with this gear in Virginia and with less frequency in North Carolina (NCDEQ 2019)(VAMRC 2019). Because of gray seatrout and bluefish stock status, abundance is scored a high concern.

Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

High Concern

Finfish species in the North of Cape Hatteras portion of the inshore gillnet fishery may include (as the most frequent species) black drum, bluefish, catfish, kingfishes, red drum, sheepshead, Spanish mackerel, spot, weakfish, and white perch (NCDEQ 2019)(VAMRC 2019)(MDDNR 2019). These species are not from highly vulnerable taxa (ASMFC 2021d)(NEFSC 2019)(DNR Maryland

2016b). But, weakfish is listed as "Depleted" since 2003 (ASMFC 2019h)(ASMFC 2021d) and is among the most common catches in Virginia (VAMRC 2019). Also, bluefish was recently listed as overfished (ASMFC 2021d). Because of weakfish and bluefish stock status, abundance is scored a high concern.

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras

High Concern

Finfish species in the South of Cape Hatteras portion of the inshore gillnet fishery may include (as the most frequent species) bluefish, catfishes, red drum, southern flounder, Spanish mackerel, spot, and spotted seatrout (NCDEQ 2019). These species are not from highly vulnerable taxa, or they have unknown overfished status (ASMFC 2021d); however, southern flounder and bluefish are overfished, according to recent assessments (NCDMF 2019d)(ASMFC 2021d). For this reason, abundance is scored a high concern.

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

High Concern

Finfish species in the North of Cape Hatteras portion of the pound net fishery may include black drum, bluefish, catfish, gray seatrout/weakfish, red drum, sheepshead, spadefish, Spanish mackerel, spot, summer flounder, white perch, and other species (NCDEQ 2019)(VAMRC 2019). Where information about such species was available, it indicated that they are not from highly vulnerable taxa (ASMFC 2021d)(NEFSC 2019)(DNR Maryland 2016b). The exceptions are gray seatrout (also known as weakfish), which is listed as "Depleted," and bluefish, which is listed as overfished (ASMFC 2021d). Weakfish is most abundant in Virginia reported catches (VAMRC 2019). Because of weakfish and bluefish depleted and overfished status, abundance is scored a high concern.

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

High Concern

Finfish species in the South of Cape Hatteras portion of the pound net fishery may include catfishes, southern flounder, Spanish mackerel, and other species (NCDEQ 2019). Most of these species are not from highly vulnerable taxa or are not overfished (ASMFC 2021d). But, southern flounder is overfished, according to a recent stock assessment (NCDMF 2019d). For this reason, abundance is scored a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Beach seines | United States

Moderate Concern

Finfish species most frequently caught in beach seines may include black drum, bluefish, catfish, cobia, red drum, sheepshead, spadefish, Spanish mackerel, spot, summer flounder, weakfish, white perch, and other species (NCDEQ 2019)(VAMRC 2019). These species are either not

currently experiencing overfishing (e.g., bluefish F = 0.172 and F_{MSY} proxy = $F_{35\% SPR}$ (ASMFC 2021c)(NEFSC 2019), black drum, cobia, red drum, Spanish mackerel, summer flounder, and weakfish (ASMFC 2021d)) or their status is unknown. Therefore, fishing mortality is scored a moderate concern, because of the species with unknown fishing mortality status.

Northwest Atlantic | Bottom trawls | United States

Low Concern

Among the main finfish species caught in bottom trawls (including black seabass, bluefish, kingfishes, monkfish, scup, and summer flounder) (NCDEQ 2019), none are currently experiencing overfishing (ASMFC 2021d)(NEFSC 2013)(NEFSC 2019)(NEFSC 2019b)(SEDAR 2014). For this reason, fishing mortality is scored a low concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

The finfish species most frequently caught in the offshore/coastal gillnet fishery may include bluefish, cobia, gray seatrout/weakfish, king mackerel, kingfishes, Spanish mackerel, and spot (NCDEQ 2019)(VAMRC 2019)(MDDNR 2019). None of these species are currently experiencing overfishing (ASMFC 2021d)(SEDAR 2014). For this reason, fishing mortality is scored a low concern.

Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Moderate Concern

The most frequently caught finfish species in the North of Cape Hatteras portion of the inshore gillnet fishery may include black drum, bluefish, catfish, cobia, kingfishes, red drum, sheepshead, Spanish mackerel, spot, weakfish, and white perch (NCDEQ 2019)(VAMRC 2019)(MDDNR 2019). None of these species are currently experiencing overfishing (ASMFC 2021d)(NEFSC 2019)(DNR Maryland 2016b), or they have unknown fishing mortality; therefore, this factor is scored a moderate concern.

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras

High Concern

The most frequently caught finfish species in the South of Cape Hatteras portion of the inshore gillnet fishery may include bluefish, catfishes, red drum, southern flounder, Spanish mackerel, spot, and spotted seatrout (NCDEQ 2019). Southern flounder is experiencing overfishing, according to a recent assessment (estimated fishing mortality in 2017 was 0.91, which is higher than the threshold: $F_{25\%}$ = 0.53), and gillnets are the main gear used to catch the species (NCDMF 2019d). For this reason, fishing mortality is scored a high concern.

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

Moderate Concern

The most common finfish species in the North of Cape Hatteras portion of the pound net fishery may include black drum, bluefish, catfish, gray seatrout, red drum, sheepshead, spadefish, Spanish mackerel, spot, summer flounder, white perch, and other species (NCDEQ 2019). Because none of these species are currently experiencing overfishing (ASMFC 2021d)(NEFSC 2019)(DNR Maryland 2016b), or they have unknown fishing mortality, this factor is scored a moderate concern.

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

High Concern

The most common finfish species in the South of Cape Hatteras portion of the pound net fishery may include catfishes, southern flounder, Spanish mackerel, and other species (NCDEQ 2019). Southern flounder is experiencing overfishing, according to a recent assessment (estimated fishing mortality in 2017 was 0.91, which is higher than the threshold: $F_{25\%}$ = 0.53), and pound nets are the second most-used gear reported in species landings (NCDMF 2019d). For this reason, fishing mortality is scored a high concern.

Forage fish

Factor 2.1 - Abundance

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

High Concern

Forage species in:

- pound net fisheries may include American shad, gizzard shad, menhaden, penaeid shrimp, and thread herring (NCDEQ 2019)(VAMRC 2019);
- inshore gillnet fisheries may include American shad, gizzard shad, hickory shad, and menhaden (NCDEQ 2019)(MDDNR 2019)(VAMRC 2019);
- beach seine fisheries may include American shad, butterfish, gizzard shad, menhaden, mullet, penaeid shrimp, and thread herring, among others (NCDEQ 2019)(VAMRC 2019).

Most of these species are not from highly vulnerable taxa. But, the coast-wide stock assessment conducted by the ASMFC in 2020 found that American shad stocks are depleted (ASMFC 2020j) (ASMFC 2021d). There are differing regional trends in abundance of system-specific stocks, but the

coast-wide metapopulation is depleted based on the decline of landings since the 1950s; of the coast-wide and riverine stocks from Maryland, Virginia, and North Carolina, 10 stocks have unknown adult abundance levels, 1 is depleted, and 1 is not overfished (see Figure 8 in Justification) (ASMFC 2020j). Within this region, the Cape Fear stock is showing positive adult abundance trends from 2005 to 2017 (ASMFC 2020j). The decline in shad stocks is likely due to overfishing, pollution, and habitat loss from dam construction, and it is not possible to separate the impacts of each factor (ASMFC 2020j). The 2020 stock assessment found that, although there is some improvement, shad stocks are still in decline throughout their range (ASMFC 2020j). Because the coast-wide stock remains depleted, a score of high concern is awarded to forage fish

Summary of American Shad Stock & Habitat Conditions

System	Historic Riverine Habitat Currently Unobstructed	Abundance Trends (2005-2017)	Adult Status*	
			Total Mortality Rate	Abundance
Merrymeeting Bay	50.02%	YOY: No trend Adults: No data	Unknown	Unknown
Merrimack	17.83%	YOY: No data Adults: Increasing trend	Unknown	Unknown
Pawcatuck	19.21%	YOY: No data Adults: Increasing trend	Unknown	Unknown
Connecticut	45.19%	YOY: No trend Adults: Conflicting trends between indices (1 increasing, 1 no trend)	Unsustainable	Unknown
Hudson	89.24%	YOY: No trend Adults: No trend	Sustainable	Depleted
Delaware	72.05%	YOY: No trends (2 indices) Adults: Conflicting trends between indices (1 increasing, 1 no trend)	Unsustainable	Unknown
Nanticoke	100%	YOY: Declining trend Adults: No trends (2 indices)	Unknown	Unknown
Susquehanna & Upper Chesapeake	4.38%	YOY: No trend Adults: No trends (2 indices)	Unknown	Unknown
Patuxent	100%	YOY: No data Adults: No trend	Unknown	Unknown
Potomac	90.02%	YOY: No trend Adults: No trends (2 indices)	Unsustainable	Unknown
Rappahannock	95.98%	YOY: Increasing trend Adults: No trends (2 indices)	Sustainable	Unknown
York	87.42%	YOY: Conflicting trends between indices (1 increasing, 2 no trends) Adults: No trend	Sustainable	Unknown
James	72.77%	YOY: No trend Adults: No trends (2 indices)	Unknown	Unknown
Albemarle Sound	58.92%	YOY: Increasing trend Adults: Conflicting trends between indices (2 no trends, 1 increasing)	Sustainable	Not overfished
Tar-Pamlico	75.68%	YOY: No data Adults: No trend	Unknown	Unknown
Neuse	90.05%	YOY: No data Adults: Conflicting trends between indices (1 increasing, 1 no trend)	Sustainable	Unknown
Cape Fear	46.59%	YOY: No data Adults: Increasing trends (2 indices)	Unknown	Unknown
Winyah Bay	73.13%	YOY: No data Adults: Conflicting trends (1 increasing, 2 no trend)	Unknown	Unknown
Santee-Cooper	20.95%	YOY: No data Adults: Conflicting trends between indices (1 increasing, 2 no trend)	Unknown	Unknown
ACE Basin	82.28%	YOY: No data Adults: No trend	Unknown	Unknown
Savannah	59.19%	YOY: No data Adults: No trends (2 indices)	Unknown	Unknown
Altamaha	82.24%	YOY: No data Adults: Conflicting trends between indices (1 increasing, 1 no trend)	Unknown	Unknown
St Johns	90.04%	YOY: No trend Adults: Increasing trend	Unknown	Unknown
Coastwide	55.42%	YOY: NA Adult: Conflicting trends between indices	Unknown	Depleted

* The status determinations identified in the table for total mortality and abundance are for adults only. System-specific data on juvenile American shad as they transition from young-of-the-year (YOY) to mature spawning adults are unavailable, which can impact overall status determinations.

Figure 8: Summary of American shad stock conditions. Taken from (ASMFC 2020).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

Moderate Concern
Fishing mortality relative to a sustainable level is unknown, this factor is scored a moderate concern.

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Moderate Concern
The only assessed species from the list is American shad, which is currently not experiencing overfishing (ASMFC 2021d). Because information for other species is not available fishing mortality is considered unknown and scores a moderate concern.

Gray seal

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern
The North Atlantic stock of gray seal is found from New Jersey to Labrador, Canada (NOAA 2019r). Population estimates are calculated separately in the United States and Canada; however, there is a lack of information on the exchange rate between animals from both countries, which may influence seasonal changes in abundance throughout the entire stock range (NOAA 2019r). In 2016, the estimate for the Canadian population was 424,300 (95% CI = 263,600 to 578,300) and, using the same model from the Canadian population, the estimate of gray seal in U.S. waters was 27,131 (CV = 0.19; 95% CI = 18,768–39,221) (NOAA 2019r). In addition, the species is not listed as threatened under the Endangered Species Act (ESA), nor is it considered strategic by the Marine Mammal Protection Act (MMPA) (NOAA 2019r). Gray seal is also assessed as "Least Concern" by the IUCN (Bowen 2016). This population has been recovering from a previous over-exploitation status, with the establishment of pupping sites/breeding colonies (Wood et al. 2019) (Moxley 2016). Because gray seal is not listed as a species of concern by either the IUCN, the ESA, or the MMPA, abundance is deemed a moderate concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Low Concern

The total annual estimated average fishery-related mortality and serious injuries to this stock during 2014–2018 was 4,729 gray seals (Hayes et al. 2021), as a result of interactions with sink gillnet, mid-water and bottom trawl, gillnet, and purse seine fisheries. The current potential biological removal (PBR) for this species is 1,389 animals (Hayes et al. 2021). The mid-Atlantic bottom trawl fishery is responsible for 23 mortalities per year (average from 2014 to 2018) (Hayes et al. 2021). Because the impact of the bottom trawl fishery is less than 10% of PBR, a score of low concern is given.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

The total annual estimated average fishery-related mortality and serious injuries to this stock during 2014–2018 was 4,729 gray seals (Hayes et al. 2021), as a result of interactions with sink gillnet, mid-water and bottom trawl, gillnet, and purse seine fisheries. The current potential biological removal (PBR) for this species is 1,389 animals (Hayes et al. 2021). The mid-Atlantic gillnet fishery is responsible for 8.8 mortalities per year (average from 2014 to 2018) (Hayes et al. 2021). Because the impact of the gillnet fishery is less than 10% of PBR, a score of low concern is given.

Harbor porpoise

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 95,543 (CV = 0.31), with a minimum population size of 74,034, which is from a 2016 U.S. shipboard and aerial survey combined with a DFO aerial survey of the Bay of Fundy and Scotian Shelf {Hayes et al. 2021}. However, the surveyed area may not have covered the entire area of the stock's habitat at the appropriate time of the year, and the current abundance estimate did not account for availability bias due to the submergence of animals. Without a correction for availability bias, the abundance estimate is expected to be biased low {Hayes et al. 2021}. The status of this population relative to the optimum sustainable population (OSP) in the U.S. Atlantic EEZ is unknown, and a trend analysis has not been conducted for this species {Hayes et al. 2021}. The IUCN considers this species "Least Concern" (Hammond et al. 2008b), and because the status and trend analysis are unknown, abundance is considered a moderate concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

The total annual estimated average fishery-related mortality or serious injury to the harbor porpoise stock from U.S. fisheries during 2014 to 2018 was 150 (CV = 0.14), with a potential biological removal (PBR) of 851 (Hayes et al. 2021). The mid-Atlantic gillnet fishery is a relatively minor contributor, accounting for 11% (17/150 individuals) of the total by-catch across all fisheries (Hayes et al. 2021). Because total U.S. fisheries mortality or serious injury does not exceed PBR, and mortality or serious injury specifically for the bottom gillnet fishery is less than 10% of PBR, fishing mortality is considered a low concern.

Harbor seal

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

The harbor seal population in the Western North Atlantic is estimated to be 75,834 (CV = 0.15) (NOAA 2019e), which is the best current estimate from surveys conducted in 2012. Currently, the stock is not listed as threatened or endangered under the Endangered Species Act (ESA), nor it is considered strategic under the Marine Mammal Protection Act (MMPA) (NOAA 2019e). Harbor seal is listed as "Least Concern" by the IUCN (Lowry 2016). Because harbor seal is not listed as a species of concern by either the IUCN, the ESA, or the MMPA, abundance is scored moderate concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

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

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Low Concern

The total human-caused mortality or serious injury to the harbor seal stock during 2014–2018 was 365.2 (351 per year from U.S. fisheries), with a potential biological removal (PBR) of 2,006 (Hayes et al. 2021). The mid-Atlantic bottom trawl fishery accounts for 1% (4.6/351 individuals) of the total by-catch across all fisheries (Hayes et al. 2021). Because PBR is not exceeded and the bottom trawl fishery is not a major contributor, fishing mortality is considered a low concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

The total human-caused mortality or serious injury to the harbor seal stock during 2014–2018 was 365.2 (351 per year from U.S. fisheries), with a potential biological removal (PBR) of 2,006 (Hayes et al. 2021). The mid-Atlantic gillnet fishery accounts for 7% (23/351 individuals) of the total by-catch across all fisheries (Hayes et al. 2021). Because PBR is not exceeded and the mid-Atlantic gillnet fishery is not a major contributor, fishing mortality is considered a low concern.

Humpback whale

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

Humpback whale is commonly present in the Western North Atlantic during spring, summer, and fall (NOAA 2019n). The best abundance estimate for this species is 1,396 (95% credible intervals 1,363−1,429) (NOAA 2019r), derived from a model of sightings histories of individual whales using photo-ID recapture data through October 2016. Moreover, humpback whale is listed as "Least Concern" by the IUCN (Cooke 2018). Lastly, the Gulf of Maine stock is not considered depleted according to any Endangered Species Act—Distinct Population Segments (NOAA 2019r). Humpback whale in the Western North Atlantic has a moderate concern for abundance, because the species is listed as "Least Concern" by the IUCN and is not a species of concern under the ESA.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

The average minimum annual rate of human-caused mortality and serious injury for 2013–2017 was 12.15 humpback whales in the Gulf of Maine, whereas the potential biological removal (PBR) for the Western North Atlantic stock is 22 whales (NOAA 2019r). In addition, this fishery is listed as Category I within the Marine Mammal Protection Act (NOAA 2019l). There is an ongoing discussion about the stock status review under the Distinct Population Segment designations because mortality and serious injuries reports are likely biased low, which generated uncertainties associated with the latest assessment (NOAA 2019r). Because of these uncertainties, fishing mortality is scored a moderate concern.

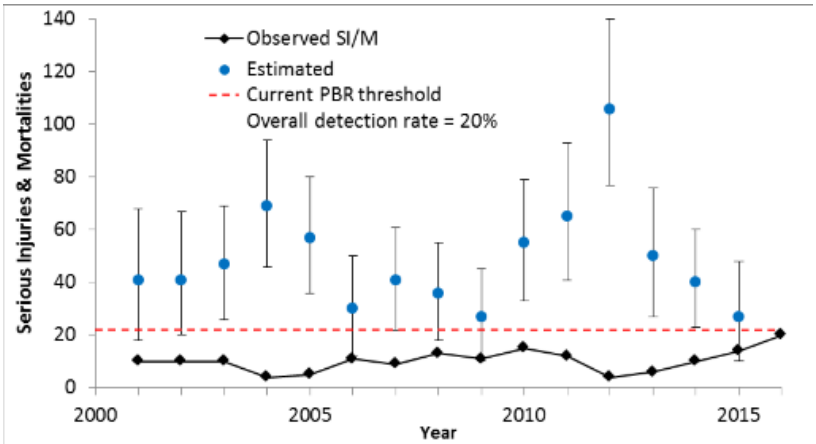

Figure 9: Observed annual total serious injuries (SI) and mortalities versus total annual estimated mortalities for humpback whale. The dashed line shows the current PBR of 22 individuals. Source: (NOAA 2019r).

Longfin squid

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States

Very Low Concern

The 2017 stock assessment update for longfin squid, which included new data from 2010 to 2016, showed that annual biomass ranged between 25,806 mt and 175,894 mt from 1976 to 2016 (Hendrickson 2017). The average annual biomass during 2015–2016 was 73,762 mt (80% CL = 67,198 to 80,327) and was much greater than the threshold B_{MSY} proxy of 21,203 mt and the target B_{MSY} proxy of 42,205 mt (Hendrickson 2017). The report recommends that the stock was not overfished because biomass estimates are much greater than the threshold values. Because there is a recent stock assessment update indicating that the stock is not overfished, abundance is scored a very low concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

There are no fishing mortality reference points for longfin squid, according to the most recent stock assessment update. There is a lack of evidence that annual catches affected annual biomass estimates during 1976–2009, and a lack of a theoretical basis for linking F_{MSY} to natural mortality or $F_{\%SPR}$ from per-recruit models for short-lived species such as longfin squid (Hendrickson 2017). The stock is believed to be 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 2017). Because there are no appropriate reference points for this stock, the overfishing status is unknown, so fishing mortality for longfin squid is rated a moderate concern.

Minke whale

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern

For the Canadian East Coast stock of common minke whale, the best estimate of abundance is 24,202 (CV = 0.30), as a sum of the 2016 Northeast Fisheries Science Center (NEFSC) and Department of Fisheries and Oceans Canada (DFO) surveys (which do not overlap) (NOAA 2019r). The species is listed as "Least Concern" by the IUCN (Cooke 2018b), but is not listed as threatened or endangered under the Endangered Species Act (ESA) nor considered strategic under the Marine Mammal Protection Act (MMPA) (NOAA 2019r). Despite being a species within a group of highly vulnerable species, minke whale abundance is deemed a moderate concern, because the species is not listed as a species of concern by the IUCN, the ESA, or the MMPA.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern

The average annual minimum detected human-caused mortality and serious injury was 10.55 minke whales per year during 2014–2018 (Hayes et al. 2021). But this estimate is seen as biased low, because the data source is primarily strandings and entanglements (Hayes et al. 2021). The current potential biological removal (PBR) for this species is 170 (Hayes et al. 2021). Fishing mortality is deemed a low concern, because the total mortality estimate is much less than 10% of the current calculated PBR.

North Atlantic right whale

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

The western Atlantic stock of North Atlantic right whale is listed as "Endangered" under the Endangered Species Act (ESA), and it is considered "Critically Endangered" by the International Union for the Conservation of Nature (IUCN) (Cooke 2020) because it is "considered to be facing an extremely high risk of extinction in the wild" (IUCN 2012). Minimum abundance from the most recent stock assessment was estimated at 364 individuals (best estimate 368) (Hayes et al. 2022),

while the best estimate of the population from the North Atlantic Whale Consortium was 336 individuals at the end of 2020 {Pettis et al. 2022}. There are fewer reproductive females producing fewer calves each year, with experts estimating that there are 88 or fewer reproductively active females remaining {Pettis et al. 2022}(NOAA 2022c). The population has been declining since 2011 and calving rates have been low (2017–2019 calving rates averaged four per season, which is <33% of the previous annual average). But in 2020, calving increased (10 calves sighted; 1 involved in a vessel strike) (Pace et al. 2017)(NOAA 2020b). The cause of reduced productivity is unknown but several factors are likely contributing to the declining health of North Atlantic right whale, including climate-related shifts in prey distribution, anthropogenic noise, pollution, vessel strikes, and entanglement in fishing gear (Pace et al. 2017)(NOAA 2019c). Because the North Atlantic right whale is considered "Critically Endangered" by the IUCN, abundance is rated a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

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

Vessel strikes and entanglement (from pot/trap and anchored gillnet fisheries) are the two leading causes of mortality and serious injury to North Atlantic right whale, with entanglements increasing over the past decade (Moore 2019) (Figure 10). Rope strengths have increased in recent decades (based on data from 1994 to 2010), leading to reduced escape success from entangling gear {Knowlton et al. 2016}. Sinking groundline (2009) and vertical line (2015) regulations have been implemented, resulting in gear configuration changes for which the effects on mitigation of whale entanglement have yet to be determined. Because of limited observation coverage, it is likely that the number of entanglements is severely underestimated {Kraus et al. 2019}. Based on mark-recapture studies through photo identification, <50% of entanglement-related mortality is estimated to be detected, with these same studies demonstrating that 59% of North Atlantic right whales have been entangled more than once (83% at least once), and new scars from entanglement are observed annually for at least 26% of the observed population {Knowlton et al. 2012}.

More than 90% of entanglements (based on 2010–2016 data and partial data for 2016/2017) are not linked to gear (7.8% of entangled NARW carry gear) and only 12% of those are linked to location {Knowlton et al. 2012}{Knowlton et al. 2019}{Kraus et al. 2019}. Fisheries interactions with NARW have been documented with gillnet fisheries (15% of entanglements attributed to gillnets from 1984 to 2016) {Kraus et al. 2019}. An entanglement that results in gear remaining attached to the whale places an energetic strain that can compromise overall fitness and reproductive success {van der Hoop et al. 2016}. Also, a new paper shows that whale lengths have been decreasing due to fishing gear entanglements and vessel strikes since 1981, possibly leading to reduced reproductive success and increased probability in the lethality of entanglements {Stewart et al. 2021}. Challenges in identifying the fishery involved in an entanglement occur due to ineffective gear marking (gear recovered from an entanglement does not carry a mark identifying the gear type, target species, and/or location) or the inability to recover gear from the entangled whale. A recent study estimated that, from 2010–2017, the carcass detection rate (how many whale deaths were identified) was 29% {Pace et al. 2021}. Pace et al. (2021) also concluded that, of the cryptic mortalities, the majority were likely caused by entanglement rather than blunt force trauma from vessel strikes.

An Unusual Mortality Event is in effect (since June 2017) for North Atlantic right whale, which includes 34 mortalities (21 in Canada and 13 in the United States, based on the location of stranding, not the location of mortality) through December 2021 (NOAA 2021). Mortalities are attributed to a combination of human interactions including vessel strikes and rope entanglement (final results are pending; however, preliminary investigations attribute 11 suspected as vessel strikes, 9 suspected as entanglement, 13 as pending or unknown causes, and 1 perinatal mortality) (NOAA 2021) (Figure 10).

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

Justification:
Distributional shifts in the abundance of North Atlantic right whale (NARW) across its range may lead to shifts in regional fisheries interactions and entanglement risks. Based on data from passive acoustic monitoring (2004–2014), North Atlantic right whale is highly mobile and has a year-round presence across its geographic range {Davis et al. 2017}. In recent years (2010–2014), there has been a distributional shift, with presence increased in the Southern New England and mid-Atlantic regions and decreased in the Scotian Shelf and greater Gulf of Maine. Visual surveys in Canadian waters reported increased presence farther north in the Gulf of St. Lawrence, which may be related to increased fisheries interactions with NARW in Canada {Meyer-Gutbrod et al. 2018}. A recent study of individual whales identified in the Gulf of St. Lawrence found that there was a high return rate from year to year, indicating that this is an important feeding area for a specific group of NARW (Crowe et al. 2021). The study also found that, in 2019, a total of 137 individual NARW

were estimated to have visited the Gulf of St. Lawrence (Crowe et al. 2021), which was 38% of the estimated 356 NARW alive at the end of 2019 {Pettis et al 2021}. Although this identifies the Gulf of St. Lawrence as an important foraging area for a significant proportion of the population, it does raise uncertainty regarding the location of the remaining individuals and the concern that they may be in areas that are offered less protection (Crowe et al. 2021).

In 2017, an Unusual Mortality Event for North Atlantic right whale was observed in the region (NOAA 2020). It is unclear if distributional shifts are due to environmental or anthropogenic effects; however, warming temperatures and shifting prey distributions are thought to play a part in the change {Meyer-Gutbrod et al. 2018}. Although there has been a general northward shift in the distribution of the NARW's primary prey (*Calanus finmarchicus*), the western Gulf of Maine has seen record abundances since 2010, particularly during the spring {Record et al. 2019}.

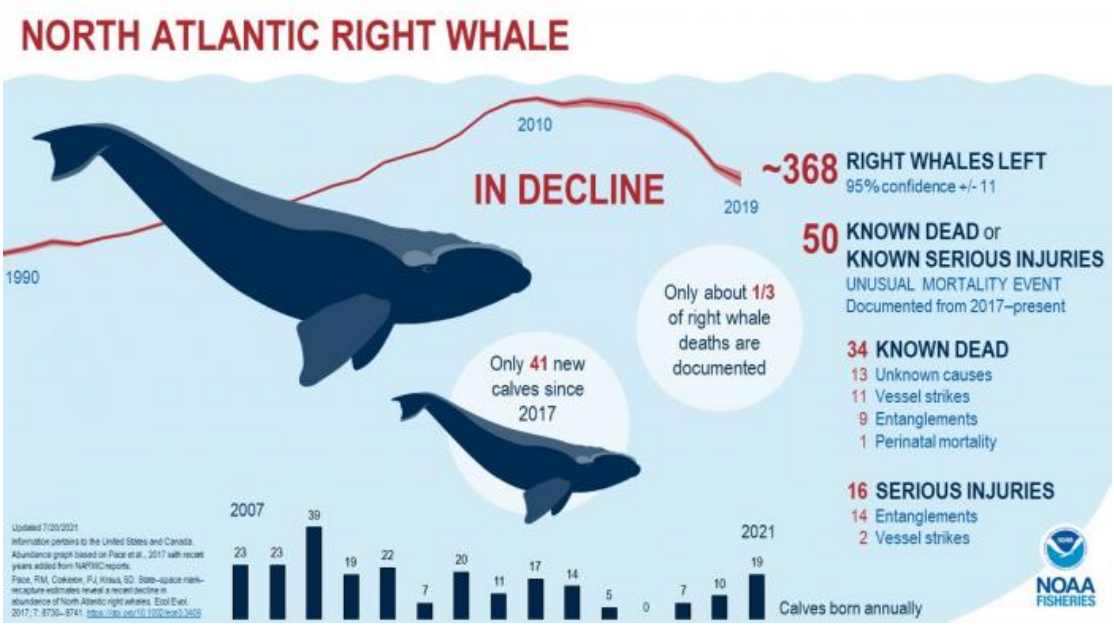

Figure 10: An infographic showing best estimates of current North Atlantic right whale population numbers and causes of death during the current Unusual Mortality Event, 2017 to present (NOAA 2021).

Risso's dolphin

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

The most recent abundance estimate for Risso's dolphin from the Western North Atlantic stock is from the 2016 Northeast Fisheries Science Center (NEFSC) and Department of Fisheries and Oceans Canada (DFO) surveys (abundance estimated at 35,493; CV = 0.19) (NOAA 2019r). The species is not listed as threatened or endangered under the Endangered Species Act (ESA), nor is it

considered strategic under the Marine Mammal Protection Act (MMPA) (NOAA 2019r). Risso's dolphin has an IUCN "Data Deficient" status because estimates of abundance are available for only a few regions (Gaspari and Natoli 2012). Abundance is deemed a moderate concern, because the species is not listed as a species of concern by the IUCN, the ESA, or the MMPA.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Low Concern

For the period 2013–2017, the total estimated annual mortality and serious injury to Risso's dolphin in the Western North Atlantic was 54.3 animals (53.9 estimated mortalities from observed U.S. fisheries, and 0.4 from nonfishery-related interaction) (NOAA 2019r). Fishery-related interaction includes pelagic longline, bottom trawl in both the Northeast and Mid-Atlantic regions, and sink gillnet fisheries (NOAA 2019r). The potential biological removal (PBR) for the Western North Atlantic Risso's dolphin is 303 (NOAA 2019r). Fishing mortality is scored a low concern, because the PBR is not exceeded and the bottom trawl fishery accounts for less than 50% of the PBR.

Sea turtles

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

High Concern

There are six sea turtle species found in U.S. waters: loggerhead turtle, green turtle, hawksbill turtle, olive ridley turtle, Kemp's ridley turtle, and leatherback turtle. The interaction with gears used in the Atlantic croaker fishery is described in Amendment 1 to the Interstate Fishery Management Plan for Atlantic Croaker (ASMFC 2005). All these species are listed under the Endangered Species Act (ESA) and the Convention on International Trade of Endangered Species (CITES) (NOAA 2019f)(NOAA 2019g)(NOAA 2019h)(NOAA 2019i)(NOAA 2019j)(NOAA 2019k), and are included in the International Union for the Conservation of Nature (IUCN) Red List: olive ridley turtle and loggerhead turtle as "Vulnerable" (Abreu-Grobois and Plotkin 2008)(Casale and Tucker 2017), green turtle as "Endangered" (Seminoff 2004), and hawksbill turtle and Kemp's ridley turtle as "Critically Endangered" (Mortimer and Donnelly 2008)(Wibbels and Bevan 2019). Because all species are ESA, CITES, and IUCN listed, abundance is scored a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

High Concern

By-catch of sea turtles is among the main threats to this group, because fishing gears such as bottom trawls are known to cause entanglements followed by drowning of the animal, which ultimately negatively affects the species' recovery (NOAA 2019f)(NOAA 2019g)(NOAA 2019h)(NOAA 2019i)(NOAA 2019k). Fishing mortality information of sea turtles in trawl nets is not available; however, trawl nets are typically known to have a high impact on sea turtle by-catch. Atlantic croaker is caught in a bottom trawl fishery targeting fish, which may not be required to use turtle excluder devices (TED), and as by-catch in shrimp trawls, which are mandated to use TEDs (NMFS 2022). Although TEDs are known to reduce by-catch of sea turtles, there is uncertainty regarding how much Atlantic croaker is landed in the fish trawl fishery compared to the shrimp trawl fishery, and fish trawls could pose a high risk to sea turtles, due to the lack of TEDs. Because each fishery's contribution is either high or unknown, fishing mortality of sea turtles is scored a high concern.

Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

High Concern

By-catch of sea turtles is among the main threats to this group, when fishing gears such as gillnets and bottom trawls are known for entanglements followed by drowning of the animal, which ultimately negatively affects the species' recovery (NOAA 2019f)(NOAA 2019g)(NOAA 2019h)(NOAA 2019i)(NOAA 2019k). A study assessing sea turtle observed interactions calculated a mortality rate of 30% of all sea turtle interactions from 2009 to 2011 in North Carolina for estuarine gillnets (Daniel III 2013). A broader report assessing the Georges Bank and Mid-Atlantic gillnet fisheries estimated by-catch at 5% of total landings: from 2012 to 2016, total estimated by-catch of sea turtles in sink gillnet gear was 705 loggerhead (of which 557 were mortalities) (CV = 0.29; 95% CI over all years: 335–1,116), 145 Kemp's ridley (115 mortalities) (CV=0.43; 95% CI over all years: 44–292), 27 leatherback (21 mortalities) (CV = 0.71; 95% CI over all years: 0–68), and 112 unidentified hard-shelled turtles (88 mortalities) (CV = 0.37; 95% CI over all years: 64–321). The total estimated loggerhead turtle by-catch was equivalent to 19 adults (NOAA 2018i). For other gears, such information is not available. Because each fishery's contribution is either high or unknown, fishing mortality is scored a high concern.

Sharks

Factor 2.1 - Abundance

Northwest Atlantic | Set gillnets | United States | coastal/offshore

High Concern

Elasmobranchs caught in the offshore gillnet fishery may include smooth dogfish, spiny dogfish, blacktip shark, sand tiger, and other species (NCDEQ 2019)(MDDNR 2019)(VAMRC 2019). Because this list includes species listed by the International Union for the Conservation of Nature (IUCN) (Fordham et al. 2016), abundance is scored a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern
Fishing mortality relative to a sustainable level is unknown, this factor is scored a moderate concern.

Short-beaked common dolphin

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | coastal/offshore

Moderate Concern
The current best abundance estimate is the total of Canadian and United States surveys conducted in 2016 (abundance estimated at 172,825; CV = 0.21) (NOAA 2019r). The species is not listed as threatened or endangered under the Endangered Species Act (ESA), nor is it considered strategic under the Marine Mammal Protection Act (MMPA) (NOAA 2019r). The species also has an International Union for the Conservation of Nature (IUCN) "Least Concern" conservation status {Hammond et al. 2008}. Despite being a species within a group of highly vulnerable species, abundance is deemed a moderate concern because the species is not listed as a species of concern by the IUCN, the ESA, or the MMPA.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | coastal/offshore

Low Concern
For the period 2013–2017, the total estimated annual mortality and serious injury to short-beaked common dolphin in the Western North Atlantic was 419 animals (CV = 0.10) (NOAA 2019r). Fishery-related interactions include sink gillnet, gillnets, and mid-water and bottom trawl fisheries in both the Northeast and Mid-Atlantic regions (NOAA 2019r). The potential biological removal (PBR) in the Western North Atlantic for the short-beaked common dolphin is 1,452 (NOAA 2019r). Fishing mortality is scored a low concern, because estimated annual mortality for bottom trawl is less than 50% of the PBR.

Silver hake

Factor 2.1 - Abundance

Northwest Atlantic | Bottom trawls | United States

Low Concern

Silver hake is currently assessed in two stocks: northern and southern, and both are within the Northwest Atlantic Area 21 of the Food and Agricultural Organization of the UN (FAO). The most recent assessment for the species suggests that both stocks are not overfished (Alade and Traver 2018). The northern stock demonstrates strong increases in biomass, but the southern stock's recruitment rates seem to remain poor (Figure 11) (Alade and Traver 2018). Because there is a recent stock assessment, and biomass estimates are above target reference points and management thresholds in the northern stock (current estimate: 19.92 kg/tow; target: 6.42 kg/tow; management threshold: 3.21 kg/tow), but below the target threshold in the southern stock (current estimate: 1.05 kg/tow; target: 1.65 kg/tow; management threshold: 0.83 kg/tow) (Alade and Traver 2018), abundance is scored a low concern.

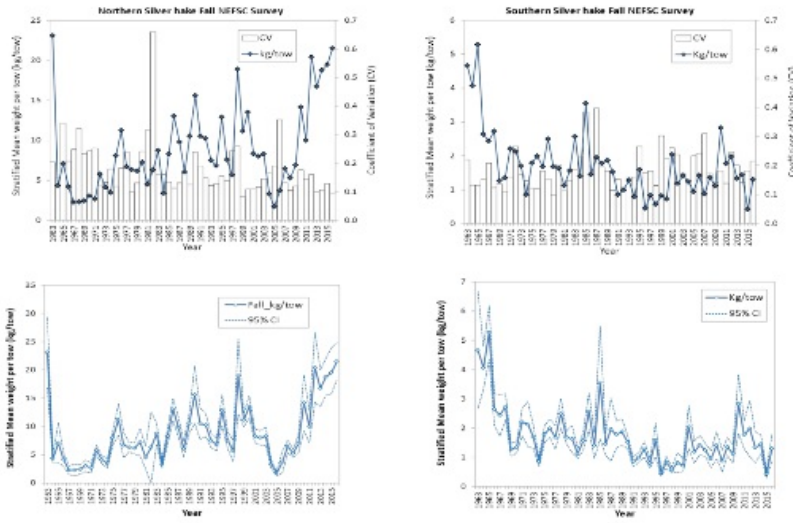

Figure 11: Northern (left) and southern (right) index of biomass (kg/tow) for silver hake from bottom-trawl survey, and estimated coefficient of variation (CV), 1963–2017. Bottom panels show estimated index and the 95% confidence intervals. Source: (Alade and Traver 2018).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Low Concern

Fishing mortality for silver hake is estimated by a relative exploitation index, which is used as a proxy. Such values have remained consistent and low for over 15 years (Alade and Traver 2018). For both northern and southern stocks, the 2016 3-year relative exploitation index was below the management overfishing thresholds (Figure 12) (Alade and Traver 2018). Because estimates are below the overfishing thresholds, fishing mortality is scored a low concern.

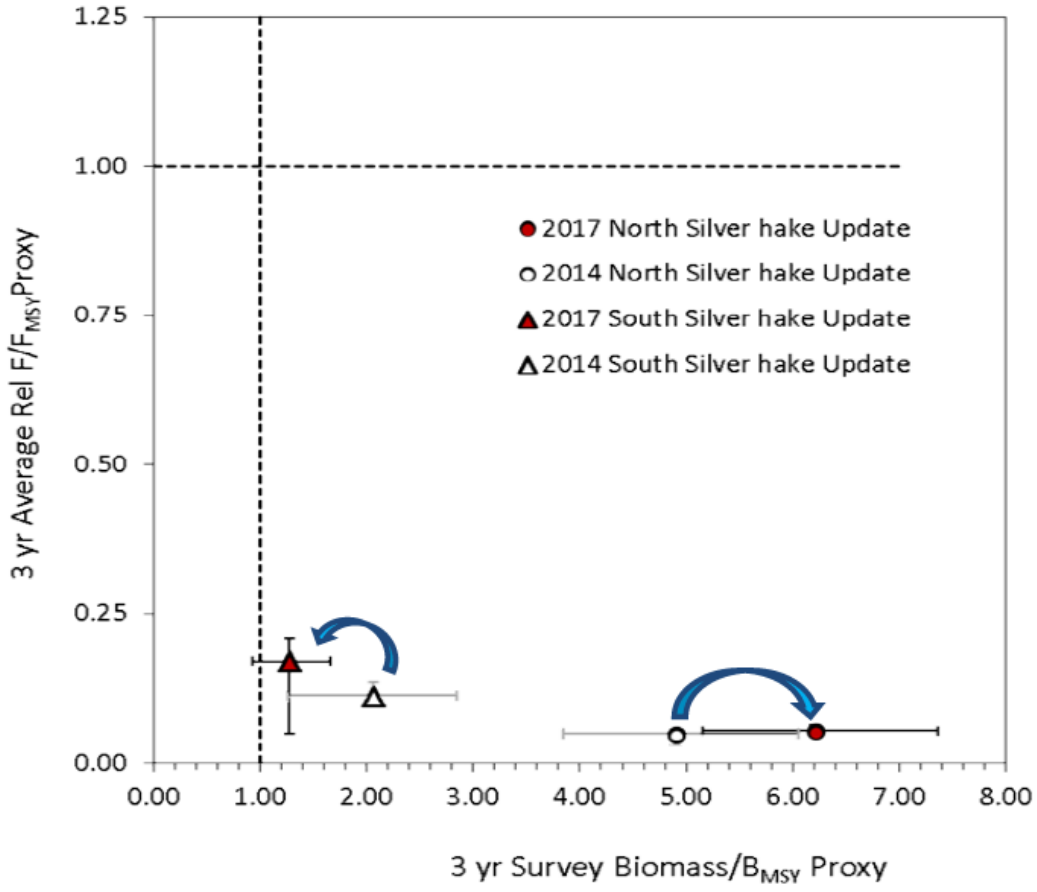

Figure 12: Silver hake biomass and fishing stock status plots, based on assessment updates for 2014, 2015, and 2017, and associated 95% confidence intervals. Source: (Alade and Traver 2018).

Factor 2.3 - Discard Rate/Landings

Northwest Atlantic | Beach seines | United States

< 100%

Beach seines are hauled from the shore, and other species caught are usually kept. Discards are expected to be low.

Northwest Atlantic | Bottom trawls | United States

< 100%

Discards from bottom trawls are assumed to suffer 100% mortality because of the depths fished and the length of the tow. According to the Standardized By-catch Reporting Methodology, the correlation of the ratio estimate (discard to kept estimator) for small mesh otter trawls in the Mid-Atlantic is 0.099 (MAFMC 2015).

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | coastal/offshore

< 100%

According to the Standardized By-catch Reporting Methodology (MAFMC 2015), the correlation of the ratio estimate (discard to kept estimator) for small mesh gillnets (sink, anchor, drift) in the Mid-Atlantic is 0.977.

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

< 100%

Pound nets may have by-catch and mortality associated with use. This gear may also trap small Atlantic croaker as well as other nontarget species. Escape panels may also be required by states (e.g., in North Carolina, it is mandatory Rule 15A NCAC 03J .0501 (e)). Because pound nets allow fishers to release live unwanted species, it is expected that dead discards are less than total landings.

Criterion 3: Management Effectiveness

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

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

The Criterion 3 rating is determined as follows:

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

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

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

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

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Northwest Atlantic | Beach seines | United States	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northwest Atlantic | Bottom trawls | United States	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northwest Atlantic | Set gillnets | United States | coastal/offshore	Highly effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**

Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras	Highly effective	Moderately Effective	Highly effective	Moderately Effective	Highly effective	**Green (4.000)**

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 | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Highly effective

Atlantic croaker is managed as a single stock by the Atlantic States Marine Fisheries Commission (ASMFC), under Amendment 1 to the Interstate Fishery Management Plan (IFMP) for Atlantic croaker (of 2005) as well as Addenda I, II, and III (ASMFC 2020b). The ASMFC framework includes a Fisheries Management Plan Policy Board, scientific committees, an advisory panel, technical committees, and plan review/development teams (Figure 13) (ASMFC 2019e). Addendum III revises the Traffic Light Approach (TLA) as the new management framework for Atlantic croaker, including a triggering mechanism: if thresholds for both population characteristics (harvest and adult abundance) achieve or exceed the proportion of threshold for three of the past four years, management action will be taken {Schmidtke et al. 2018}(ASMFC 2020b). Addendum III also provides which specific response should be performed if the TLA triggers management (ASMFC 2020b). The IFMP has yearly reviews, with recommendations for management, research, and monitoring. Such annual reviews also include updates on the status of both the stock and the fishery (ASMFC 2020b){Schmidtke et al. 2018}. There are also both fishery-dependent and -independent monitoring across the states, which are also incorporated into the TLA analysis. The COVID-19 pandemic had impacts on almost all monitoring programs, creating data with some caveats for harvest metrics, so some catch rate data were taken from 2018–2019 to generate catch estimates for 2020 (ASMFC 2021). Even with limitations of the most recent data, the TLA conclusions are: "[T]he harvest triggered in both the Mid-Atlantic (60% threshold) and South Atlantic (30% threshold) in 2020 indicating continued concern. The abundance did not trigger at any level for the South Atlantic and although the last two years are undetermined for the Mid-Atlantic due to missing 2020 data, the two years that are available are below the 60% threshold. Regardless, the previous TLA indicated that the Mid-Atlantic triggered at 30%. Addendum III requires management action taken in 2021 to remain in place for a minimum of three years (through and including the 2023 season). The Atlantic croaker remains triggered at the 30% threshold and the TC recommends maintaining management enacted in 2021" (ASMFC 2021). State-level regulations may include bag limits, size restrictions, time and area closures, and gear restrictions. In 2017, a report on sciaenid habitats was published, highlighting threats and uncertainties regarding habitats used by the species at different life stages (Odell et al. 2017). Because appropriate management targets have been defined, precautionary policies are in place, and strategies are being implemented, management strategy and implementation is scored highly effective.

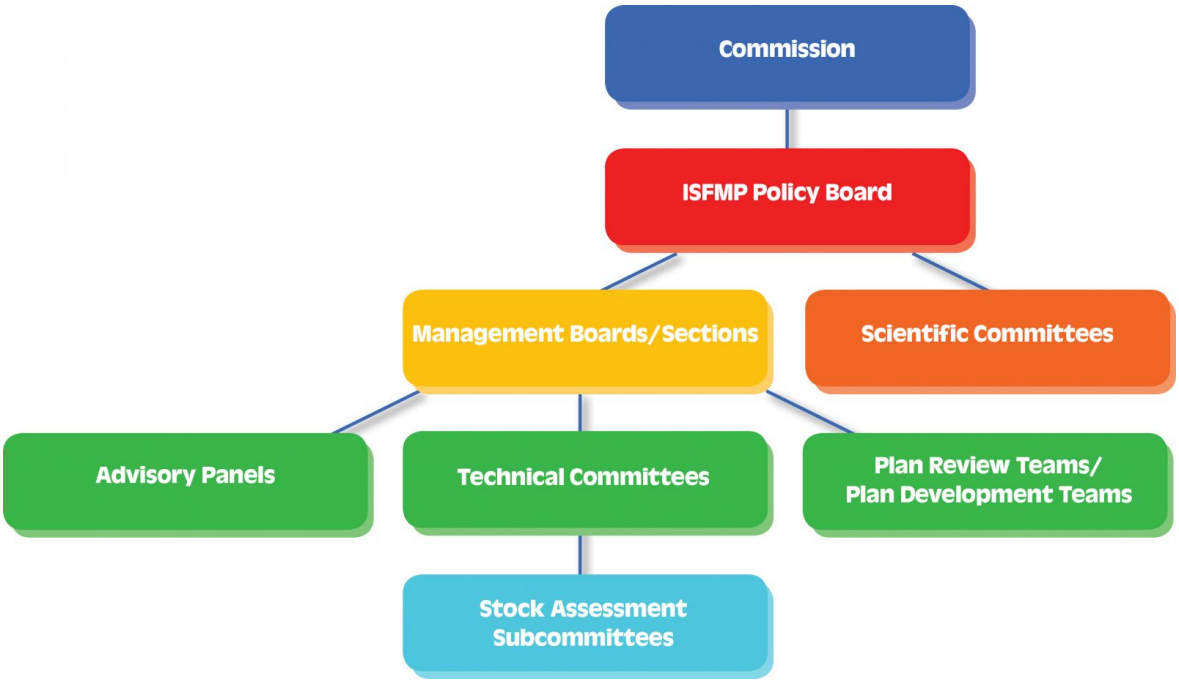

Figure 13: ASMFC decision-making flowchart. Source: (ASMFC 2019e).

Factor 3.2 - Bycatch Strategy

Northwest Atlantic | Beach seines | United States

Moderately Effective

The Mid-Atlantic Haul/Beach Seine Fishery and the North Carolina Long Haul Seine Fishery are Category 2 fisheries under the 2019 MMPA List of Fisheries (NOAA 2019l). The bottlenose dolphin stocks involved in these fisheries are the Northern Migratory Coastal Stock (NMCS), the Southern Migratory Coastal Stock (SMCS), the Northern North Carolina Estuarine System Stock (NNCES), and the Southern North Carolina Estuarine System Stock (SNCES) (NOAA 2019l). Currently, the Bottlenose Take Reduction Plan includes several regions within 3 nautical miles, which is where this fishery takes place. In North Carolina, there are specific rules regarding mesh size to minimize impacts on bottlenose dolphin (NCDENR 2015). Apart from that, other mitigating strategies in this fishery to address interaction with protected species are unknown, but beach seines are not seen as a substantial contributor to mortality of this species. By-catch strategy is scored moderately effective.

Northwest Atlantic | Bottom trawls | United States

Moderately Effective

To address the mortality and serious injury of long-finned pilot whale, short-finned pilot whale, common dolphin, and white-sided dolphin incidental to the Mid-Atlantic midwater trawl fishery, as well as other trawl fisheries, the Atlantic trawl take reduction team was formed in 2006 (NOAA 2019p). Voluntary measures were established, and in 2012 a monitoring strategy was published to

accompany the voluntary measures. The monitoring strategy's main goal is to review biological metrics: annual population abundance estimates, annual human-caused serious injury and mortality estimates, and the calculated potential biological removal (PBR) levels (NOAA 2019q). For sea turtles, turtle excluder devices (TED) are currently not required in trawl fisheries targeting croaker (although previous studies have proved the effectiveness of TEDs in reducing sea turtle by-catch (Gearhart 2010)). By-catch strategy is scored moderately effective, because the take reduction plan and monitoring strategy's effectiveness are not clear, and other by-catch strategies are not yet implemented.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Ineffective

The offshore gillnet fishery for croaker operates in the fall/winter seasons from October to May when croaker migrates from the inshore, estuarine habitats to warmer waters offshore. The fishery targets shoals of fish, and nets are set for a short time, minimizing the risk of entanglement to marine mammals and turtles; however, there are no specific requirements for nets to be attended, and interactions with whales are known to have occurred {Waring et al. 2004}.

The Atlantic Large Whale Take Reduction Plan (ALWTRP) was developed under the Marine Mammal Protection Act (MMPA) in 1997 to reduce mortality and serious injury to whales due to incidental take in U.S. commercial fisheries that interact with strategic stocks (NOAA 2012)(NOAA 2018j). To achieve this goal, several measures have been implemented, including requirements of sinking groundline, weak links, a vertical line rule, gear marking requirements, and area closures {Gouveia & Swails 2017}(NOAA 2018j). But, the Take Reduction Plans (TRPs) in the northeastern U.S. have been regarded as the least successful of the U.S. TRPs at reducing marine mammal by-catch {McDonald et al. 2016}. To date, the ALWTRP has failed to meet its statutory goal of reducing serious injuries and mortality (SIM) to a level below the potential biological removal (PBR) and to a level approaching zero (the Zero Mortality Rate Goal). Many management measures have been ineffective in reducing entanglement rates (based on data from 1999 to 2009, inclusive of entanglements attributed to unidentified fisheries) {Pace et al. 2014}, because annual SIMs due to entanglement continue to exceed PBR (NOAA 2019c). The impacts of introducing regulations such as the "sinking groundline rule" in 2009 and the "vertical line rule" {50 Federal Register 2014} in 2015 are not fully understood due to limited data and analyses (the latest marine mammal stock assessments consider data from 2014 to 2018). But, for most entanglement interactions, gear is not recovered or is unidentifiable (77% of entanglements between 2000 and 2018) and, although the croaker gillnet fishery has not been identified specifically in recent interactions, most interactions cannot be attributed to a specific fishery (NOAA 2019c). In 2014, a whale carcass was found south of Nantucket entangled in what was most likely gillnet gear {Sharp et al. 2019}{Sharp et al. 2019 Supplemental}.

A batched biological opinion published in May 2021 considers the impact of fisheries in U.S. federal waters on species listed under the Endangered Species Act (ESA) (NMFS 2021a). Although

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

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

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

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

Current management measures to prevent by-catch are insufficient, given the potential impacts of the fishery on endangered North Atlantic right whale, and the planned framework to implement risk reduction measures is not anticipated to reduce the impact of U.S. fisheries to below PBR until 2030 (NMFS 2021a). Therefore, the by-catch strategy is rated ineffective.

Justification:
There is a need for improved cooperation between United States and Canadian agencies in addressing the impact of fisheries on North Atlantic right whale. Since 2010, there has been a shift in North Atlantic right whale distribution, with whales migrating to the Gulf of St. Lawrence during the summer months {Davis et al. 2017}. The number of entanglements involving Canadian fisheries, including snow crab fisheries, increased starting in 2016 (NOAA 2021); during the ongoing Unusual Mortality Event, 21 of the 34 known mortalities have been attributed to Canadian waters (NOAA 2021). Although U.S. and Canadian agencies have introduced measures aimed at reducing the impact of, and the risk posed by, commercial fisheries (and other human activities) on North Atlantic right whale, the effectiveness of these measures remains unproved, and the impact of these activities continues to exceed a sustainable level (Hayes et al. 2021). Cumulative impacts (average of 8.15 SIMs per year from 2014 to 2018), particularly on SIMs from unknown sources (5.1 SIMs), remain far above levels that would allow the population to recover (PBR = 0.8) (Hayes et al. 2021), and the Conservation Framework will allow continued impacts above PBR for the next 9 years. Cumulative impacts must be addressed through a comprehensive and coordinated management strategy to account for the transboundary nature of North Atlantic right whale that migrate between U.S. and Canadian waters.

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

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Moderately Effective
In North Carolina, there is an Incidental Take Permit for the inshore gillnet fishery with regard to sea turtles (pers. comm., Bianchi A. 2019). In addition, gillnet fisheries are listed under the Marine Mammal Protection Act (MMPA) list of fisheries (NOAA 2019l). This fishery is managed under state and interstate fishery management plans, applying net and mesh size regulations as well as seasonal area closures in the Pamlico Sound Gillnet Restricted Area. It is an affected fishery under the Bottlenose Dolphin Take Reduction Plan (BDTRP) (NOAA 2020). By-catch strategy receives a moderately effective score because management in different regions may present different levels of effectiveness.

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Moderately Effective

Marine mammals and sea turtles are known to interact with pound net gear. For sea turtles, a pound net regulation and an inspection program was established in 2008 in Virginia waters of the Chesapeake Bay (Figure 14). (In it, the NMFS is requiring that "[A]ny offshore pound net leader during the period of May 6 through July 15, meet the definition of a modified pound net leader. It is intended to conserve sea turtles listed as threatened under the ESA and to help enforce the provisions of the ESA, including the provisions against takes of endangered species, while enabling fishermen to use leaders, an important component of pound net gear, during the regulated period" (71 FR 36024 2006)). In 2015, NOAA Fisheries issued a final rule amending the Bottlenose Dolphin Take Reduction Plan (BDTRP) and its implementing regulations under the Marine Mammal Protection Act (MMPA). The rule requires "the year-round use of modified pound net leaders for offshore Virginia pound nets in specified waters of the lower mainstem Chesapeake Bay and coastal state waters" (see Figure 15) (NOAA 2015). This final rule also presents Virginia pound net-related definitions, gear prohibitions, and nonregulatory measures (NOAA 2015). Lastly, the final rule also amends current regulations and definitions for Virginia pound nets under the Endangered Species Act (ESA) for sea turtle conservation (NOAA 2015). Because species of concern may be caught in this fishery but management strategies have been established, though not for enough time (particularly strategies focusing on bottlenose dolphin), by-catch strategy is deemed moderately effective.

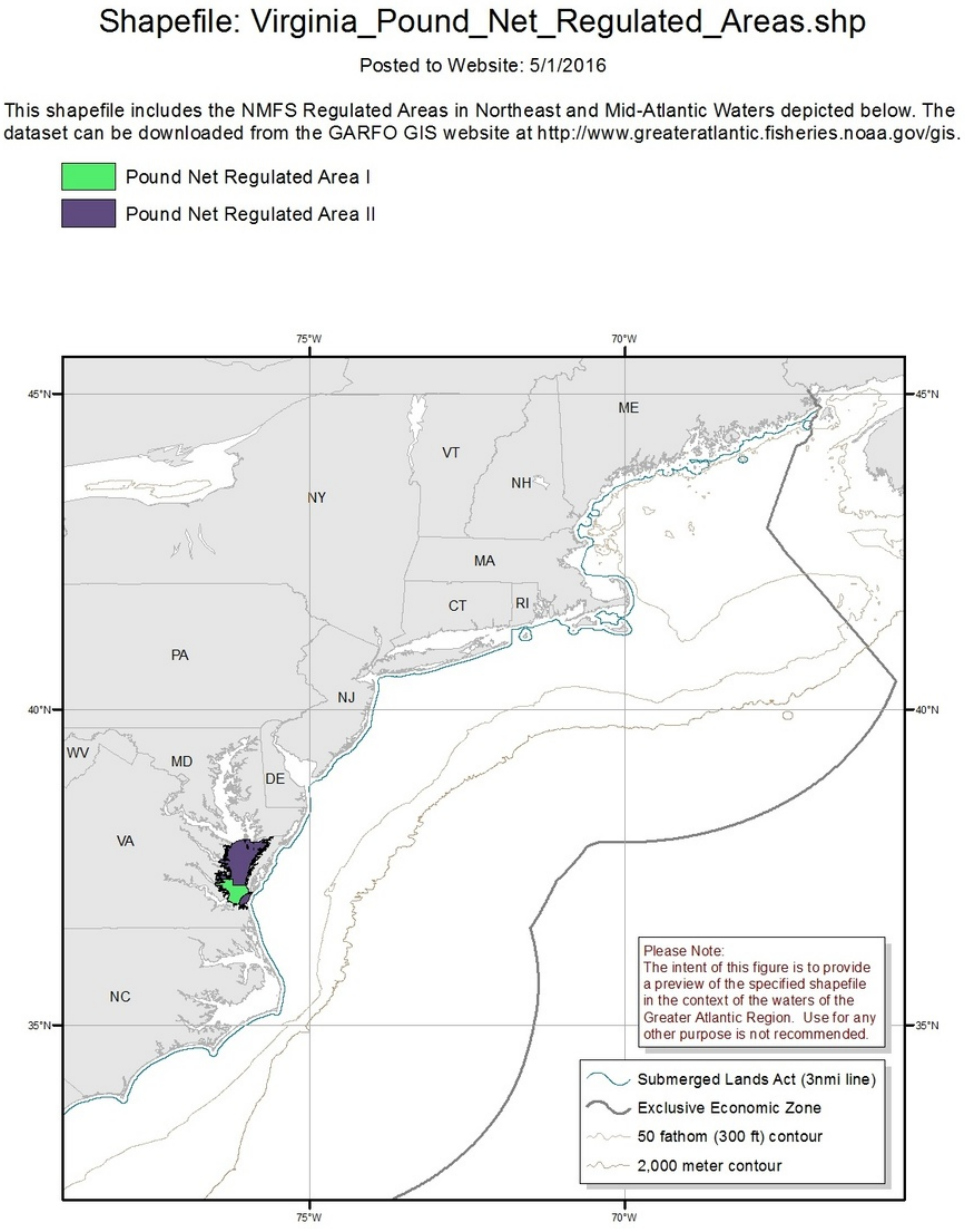

Figure 14: NMFS regulated areas in Mid-Atlantic areas. Dataset can be downloaded from the GARFO GIS website at http://www.greateratlantic.noaa.gov/gis.

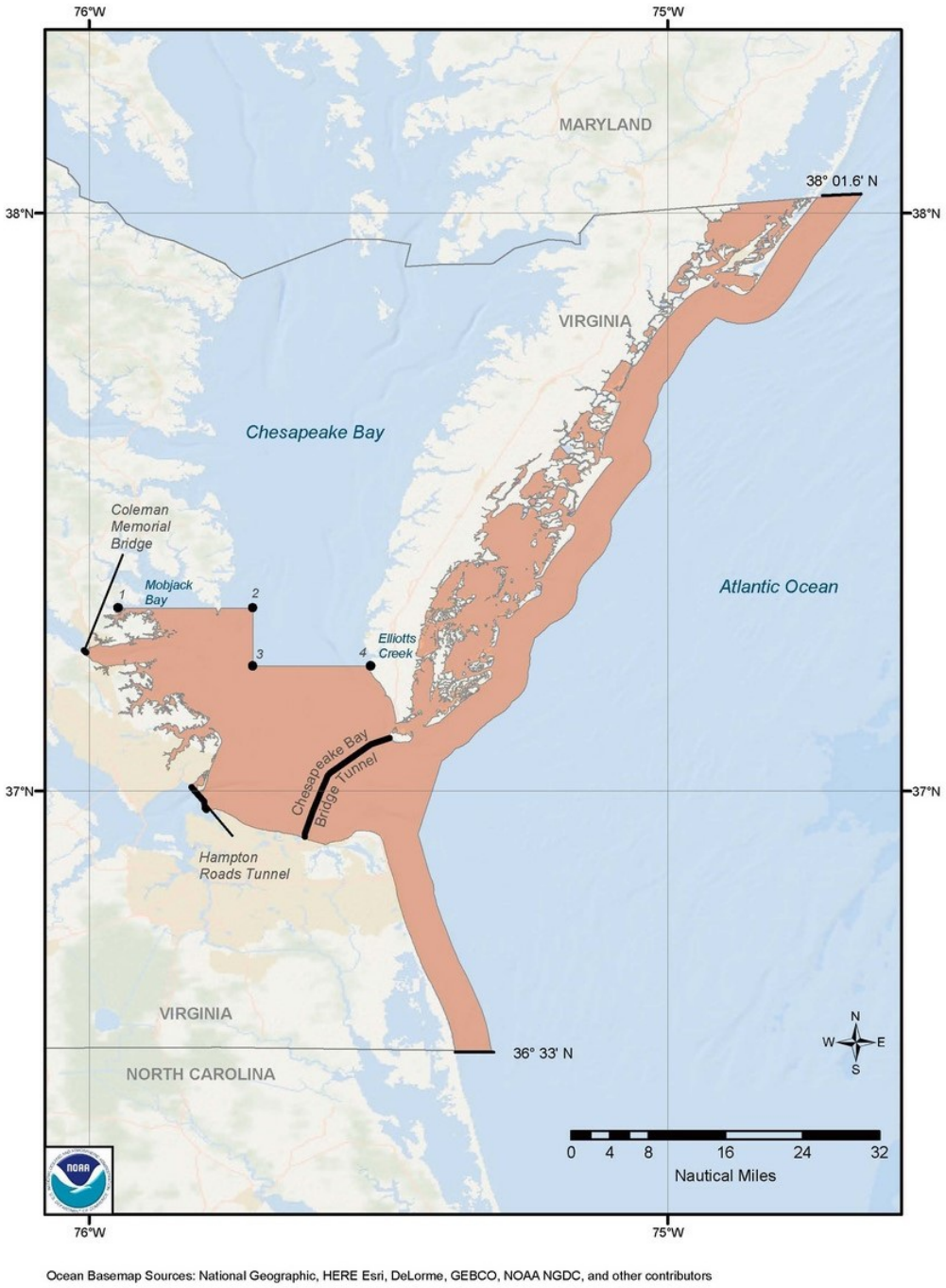

Figure 15: Bottlenose dolphin pound net regulated area within 3 nautical miles. Source: https://www.fisheries.noaa.gov/action/amendment-virginia-pound-net-regulations.

Factor 3.3 - Scientific Research And Monitoring

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Highly effective

States are required to submit an annual compliance report; however, research and monitoring programs are not required of the states (ASMFC 2018). In addition, the Northeast Fishery Science Center (NEFSC) executes a randomly stratified survey for groundfish along the East Coast of the U.S. (ASMFC 2018). Because Atlantic croaker is among the main species captured in the survey area, there is a long-term data set available (surveys started in 1972). From the management plan review (2018), it is mentioned that the NEFSC survey was not carried out in 2017, and the value utilized was the mean annual catch from the three previous years (2014–2016) (ASMFC 2018). As for fishery-independent data, both the Northeast Area Monitoring and Assessment Program (http://www.neamap.net/) and the Southeast Area Monitoring and Assessment Program (http://seamap.org/) collect long-term, standardized data, which include monitoring the population of Atlantic croaker. Because there is ongoing research and monitoring of this fishery and species, including fishery-independent surveys, this factor is scored highly effective.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

N/A

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

Factor 3.4 - Enforcement Of Management Regulations

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Moderately Effective

State regulatory agencies are responsible for enforcing regulations established by each fishing state. Because Virginia, Maryland, and North Carolina are the states with the highest catches for Atlantic croaker, this section will focus on state regulations enforcement from such states. For instance, in North Carolina, there is a state-level general statute, as well as rules established by the North Carolina Marine Fisheries Commission (NCFMF 2019c). When asked, fishers in North Carolina are required to carry observers onboard and, if not complied with, it may lead to enforcement action against the fisher and closing of the fishery for all users (NCFMF 2019c). In Maryland, it is required to submit an annual compliance report, which describes the fishery management program for Atlantic croaker, including fishery-dependent and -independent monitoring, regulations, commercial harvest reports, and recreational catch estimates (DNR Maryland 2016). All states in the management unit (New Jersey to Florida) are required to submit an annual compliance report. Also on an interstate level, the ASMFC's Law Enforcement Committee (LEC) comprises representatives from each of the Commission's participating states and the District of Columbia (also those representing the NOAA Fisheries Service, the United States Coast Guard, and the United States Fish and Wildlife Service) (ASMFC 2019f). But, Atlantic croaker has not been included in reports to management boards by the LEC (ASMFC 2019f). Enforcement is deemed "moderately effective" because effectiveness is unknown. Even though a compliance framework is established in most states, other enforcement measures, such as vessel monitoring systems (VMS), logbook reports, and compliance reports, are not in place.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

N/A

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

Factor 3.5 - Stakeholder Inclusion

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Highly effective

The Atlantic Coastal Fisheries Cooperative Management Act (Pub. L. 106–555, title I, §121, Dec. 21, 2000, 114 Stat. 2766) is the framework that carries out a cooperative program of fishery oversight and management, under the Atlantic States Marine Fisheries Commission (ASMFC). The Commission provides adequate opportunity for public participation in the plan preparation process, including at least four public hearings and procedures for the submission of written comments to the Commission (ASMFC 2019e). Annual action planning for fisheries under the ASMFC includes strengthening interactions and input among stakeholders and technical, advisory, and management groups under an efficient, transparent, and accountable management process (ASMFC 2018b). This factor receives a score of highly effective because stakeholder involvement is part of a robust management framework.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

N/A

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

Criterion 4: Impacts on the Habitat and Ecosystem

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

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

Guiding principles

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

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Northwest Atlantic | Beach seines | United States	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Northwest Atlantic | Bottom trawls | United States	Score: 2	Score: 0	Moderate Concern	**Yellow (2.449)**
Northwest Atlantic | Set gillnets | United States | coastal/offshore	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras	Score: 3	Score: 0	Moderate Concern	**Yellow (3.000)**

Criterion 4 Assessment

SCORING GUIDELINES

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

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

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

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very*

low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.

- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

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

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

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

Northwest Atlantic | Beach seines | United States

Score: 3

In haul/beach seines, the seines are set and hauled from the beach. They are set perpendicular to the shore with a staff anchored at the beach, and with the gillnet section anchored offshore with an attached line leading back to the beach (Steve et al. 2001). Because this is the only section of the gear contacting the bottom, habitat impacts are expected to be low. When pulled, the gear may drag the bottom, allowing demersal species such as Atlantic croaker to be retrieved. This factor receives a score of 3 because the gear likely does not have much of an impact.

Northwest Atlantic | Bottom trawls | United States

Score: 2

Atlantic croaker inhabits mud and sand-bottom areas (NCDMF 2019), so bottom trawls targeting this species receive a score of 2.

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Score: 3

The set gillnet fishery is manufactured to catch bottom-dwelling or midwater fish, using a vertical net wall with a weighted leadline that allows the net to hang in the water column (Steve et al. 2001). Sink gillnets respond to over 99.6% of trips in coastal areas, and 100% of the offshore set nets (Steve et al. 2001). The majority of set nets are built without anchors in this fishery, and the average net depth when targeting Atlantic croaker is 8 ft, for usually less than 4 hours of soaking time (Steve et al. 2001). Because this gear uses a stationary net that is usually unanchored, minimal bottom impact is expected. For this reason, this factor receives a score of 3.

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Score: 3

In estuaries, a more diversified gear composition is used in the inshore gillnet fishery (Steve et al. 2001). Set gillnets are used in two main configurations: sink gillnets (66% of total) and float gillnets (about 34%) (Steve et al. 2001). The sink gillnets are usually not anchored, and the float nets are set similarly to sink nets; however, target species are caught in the upper water column with the top line floating at the surface (Steve et al. 2001). Because Atlantic croaker inhabits sandy/mud habitats (NCDMF 2019), the gear structure that would contact the bottom does not cause significant contact, so this factor receives a score of 3.

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Score: 3

Pound net is a stationary fishing gear that is usually suspended from anchored poles (Silva et al. 2011). Pound nets are known for not having significant bottom contact and, because they are fixed, minimal impacts are expected on the seafloor/benthic habitats. Because minimal bottom contact is expected with pound nets, this factor receives a score of 3.

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Northwest Atlantic | Beach seines | United States

Northwest Atlantic | Bottom trawls | United States

Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras

Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras

Northwest Atlantic | Set gillnets | United States | coastal/offshore

Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras

Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Score: 0

Both juvenile and adult Atlantic croaker are commonly found in muddy and sandy substrates, although they may be also found over oyster, coral, sponge reefs, and seagrass beds (temperature-dependent), as well as around human structures such as bridges and piers (Odell et al. 2017). Essential habitats for this species include shallow, estuarine ecosystems characterized by soft substrate. Estuaries are also designated as Habitat Areas of Particular Concern, which are subject to human-driven activities that may reduce the quantity and quality of such habitats (Odell et al. 2017). There are state-level recommendations for habitat management and research, including protected areas; however, because such recommendations are not fully implemented, this factor receives a score of 0.

Factor 4.3 - Ecosystem-based Fisheries Management

Northwest Atlantic | Beach seines | United States
Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States | inshore - South of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | inshore - North of Cape Hatteras
Northwest Atlantic | Set gillnets | United States | coastal/offshore
Northwest Atlantic | Stationary uncovered pound nets | United States | North of Cape Hatteras
Northwest Atlantic | Stationary uncovered pound nets | United States | South of Cape Hatteras

Moderate Concern

As post-larvae and young of the year, Atlantic croaker feed on planktonic organisms; as juveniles and adults, they prey on bottom-dwelling organisms such as worms and crustaceans (ASMFC 2020b). Atlantic croaker plays a significant role in the food web by feeding on benthic animals, primarily polychaetes, while being preyed on by weakfish, southern flounder, bluefish, and inshore lizardfish (Binion-Rock et al. 2019). A review of sciaenid habitats made by ASMFC in 2017 made recommendations for Atlantic croaker habitat management, which include several measures to inventory the historical and present range of croaker, specify the habitats that are targeted for restoration, and impose or encourage measures to preserve the quantity and quality of Atlantic croaker habitats (Odell et al. 2017). Several studies on the impacts of climate patterns on recruitment, range, and population have been carried out (e.g., (Morley et al. 2016), {Hare and Able 2007}, (Hare et al. 2010), and (Munyandorero 2014)), showing that climate change affects both abundance and distribution of Atlantic croaker, including the survival of juveniles. Because food web impacts may be possible but further studies are needed, and there is some ecosystem approach for management in place, this factor is scored a moderate concern.

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