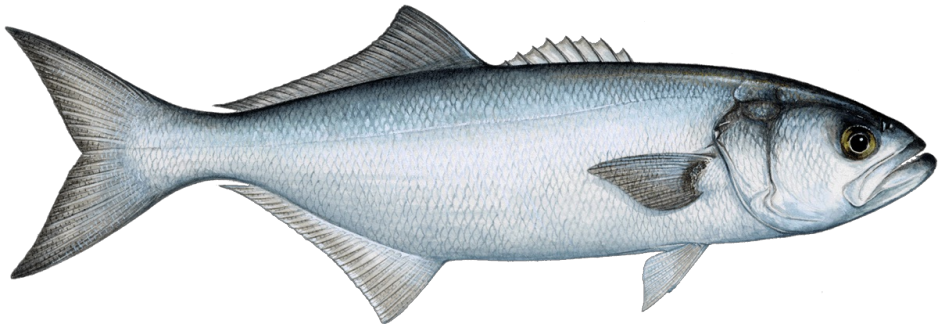
Bluefish

Pomatomus saltatrix



United States: Northwest Atlantic

Bottom trawls, Handlines and hand-operated pole-and-lines, Set gillnets (anchored)

Report ID 999

September 6, 2022

Seafood Watch Standard used in this assessment: Fisheries Standard v2

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About Seafood Watch

Monterey Bay Aquarium's Seafood Watch program evaluates the 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

Atlantic bluefish is managed jointly by NOAA Fisheries, the Atlantic States Marine Fisheries Commission, and the Mid-Atlantic Fishery Management Council. Because of declines in the stock biomass, a rebuilding plan was implemented in 2000 and, due to successful management strategies, the bluefish stock was declared rebuilt in 2009. But, according to the 2019 stock assessment update, the stock is in an overfished condition, although overfishing is not occurring. Although bluefish biomass has slightly declined, the decline does not appear to be the result of overfishing, because fishing mortality rates are low, commercial landings have only exceeded the total landings quota once in the past 10 years, and the overage was relatively small compared to the total quota.

Bluefish is a mixed fishery in which many other species are targeted. The most common species caught on targeted bluefish trips include spiny dogfish, striped bass, dusky smoothhound, and summer flounder. These fisheries, except for dusky smoothhound, have recently been declared rebuilt, and the most recent stock assessments and updates have found that the stocks are not overfished and overfishing is not occurring. The dusky smoothhound stock status is unknown because a stock assessment has not yet been completed. The following protected species are also known to interact with the Mid-Atlantic gillnet and trawl fisheries: fin, sei, humpback, and North Atlantic right whales; loggerhead, leatherback, green, and Kemp's ridley sea turtles; and Atlantic sturgeon. Though the bluefish fishery is not expected to cause jeopardy to any of these species, interactions can be significant; for example, with North Atlantic right whale in sink gillnets, loggerhead sea turtle in the bottom trawl fishery, and Atlantic sturgeon in sink gillnets. The bluefish gillnet fishery overlaps seasonally with migrations of humpback, fin, right, and sei whales, as well as sea turtles, from May through November, and bluefish gillnets are most likely to have by-catch during this time. Gillnet gear is also known to capture Atlantic sturgeon, although it has been estimated that sturgeon mortality is greater in the monkfish, summer flounder, skate, scup, and black sea bass fisheries. The bottom trawl fishery is more likely to interact with sea turtles; however, the use of turtle excluder devices (TED) in North Carolina and Virginia, as required by the summer flounder fishery, has greatly reduced the number of interactions in the mid-Atlantic. Because bluefish is often caught along with summer flounder, bluefish vessels often use TEDs to minimize sea turtle interactions. Handline gear used in the bluefish fishery is not known to interact with protected species.

In the bluefish fishery, some interactions are estimated to occur with protected species, including North Atlantic right whale, which is listed as "Critically Endangered" by the IUCN. The Atlantic Large Whale Take Reduction Plan has failed to reduce the impact of fisheries, which is the leading cause of mortality for this species. There are no specific observer requirements for the bluefish fishery, and bluefish trips are only observed if a vessel fishing for bluefish is randomly selected by NOAA Fisheries for another reason, such as to meet target coverage levels for a particular gear type. From the observer data that are available, discards are highest when using otter trawl gear, moderate when using gillnets, and nonexistent with the use of handlines.

Handline gear also has the least impact on the bottom habitat, giving handlines the highest habitat score of all the gear types. Handlines have little contact with the bottom and have been shown to do minimal damage to the bottom structure and bottom-dwelling organisms. Sink gillnets have a greater potential to affect the bottom, but the only part of the gear that touches the bottom is the anchors used to sink the

nets and the weights on the bottom of the nets. The anchors and weights can damage bottom structures such as rocky outcrops and reefs when they are set and hauled back, but have a much lesser impact on sandy and muddy bottoms such as in the mid-Atlantic region. The bluefish fishery operates primarily in the mid-Atlantic, where the bottom is sandy and there is little bottom structure for gillnets to damage. Even though bottom trawls are known to have significant impacts on bottom habitat, they cause less disturbance on muddy and sandy habitats than on highly structured/rocky bottoms.

Bluefish plays significant roles in the mid-Atlantic ecosystem as a predator and a prey, and is considered a species of exceptional importance to the ecosystem. Bluefish is a voracious predator, with over 70 species found in bluefish stomachs, and predation by bluefish is known to account for nearly all the young-of-the-year striped bass mortality in the Hudson River estuary system. Bluefish also is known to feed on bay anchovy, long-finned squid, striped anchovy, butterfish, menhaden, round herring, amphipods, channeled whelk, and other invertebrates. Bluefish is a primary prey for billfishes, sharks, and tunas, but especially for the shortfin mako shark, where bluefish makes up 80% or more of that shark's diet. Ecosystem-based management of the bluefish fishery is a moderate concern, because management currently does not account for the ecosystem role of bluefish, but management is investigating ways to incorporate ecosystem-based fishery management.

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
Bluefish | Northwest Atlantic | Bottom trawls | United States	2.709	2.236	3.000	2.598	**Good Alternative (2.621)**
Bluefish | Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	2.709	5.000	3.464	3.969	**Best Choice (3.694)**
Bluefish | Northwest Atlantic | Set gillnets | United States	2.709	0.950	1.732	3.122	**Avoid (1.931)**

Summary

Atlantic bluefish (*Pomatomus saltatrix*) caught using handline fishing gear is rated a Best Choice, while bluefish caught using bottom trawl is rated a Good Alternative. Atlantic bluefish caught using gillnets is rated an Avoid, because of the potential impact on North Atlantic right whale and the failure of the Atlantic Large Whale Take Reduction Plan to reduce the impact of fisheries on this critically endangered species.

Scoring Guide

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

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

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

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

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

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

Introduction

Scope of the analysis and ensuing recommendation

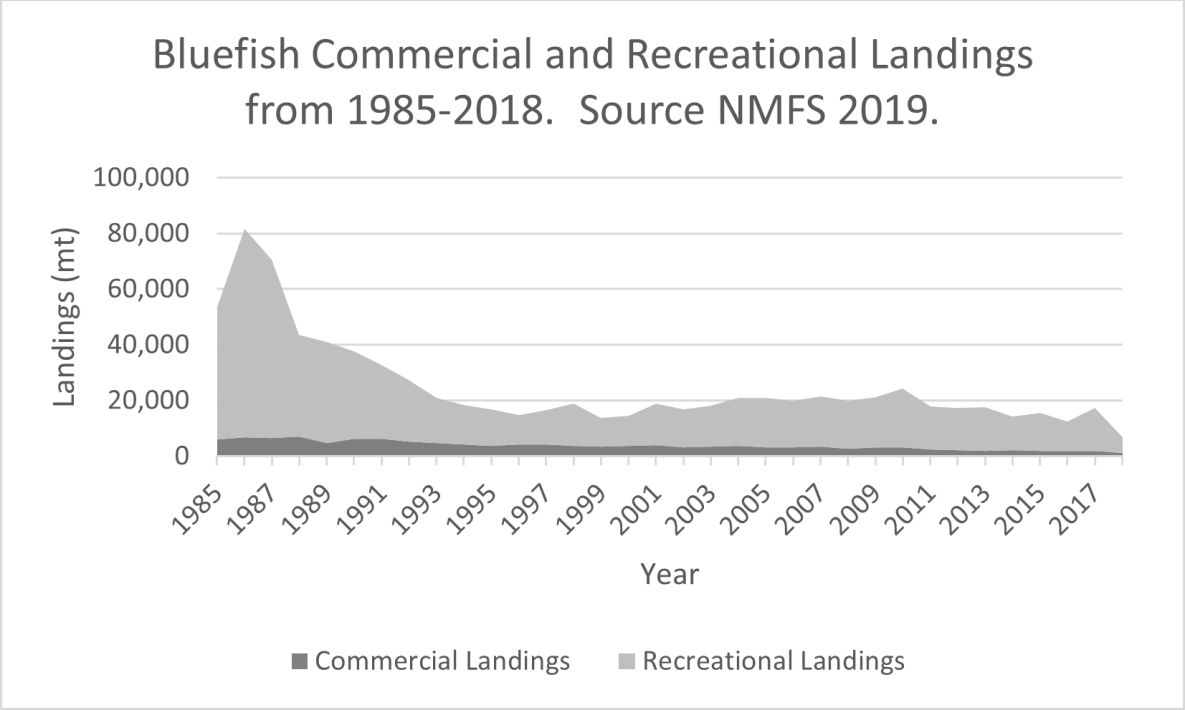
This report provides the recommendation for the commercial Atlantic bluefish (*Pomatomus saltatrix*) fishery, which operates in the Northwest Atlantic Ocean along the East Coast of the United States. Although Atlantic bluefish is found in other parts of the world (e.g., the Black Sea, the Mediterranean Sea), this report covers Northwest Atlantic bluefish only. This report analyzes the primary gears used in the bluefish fishery, including gillnet, handline, and bottom trawl gear. Based on observer data from 2008 to 2011, gillnet gear makes up 85.6% of bluefish catch, bottom trawl makes up 13.6% of catch, handline gear is used for 0.05% of catch, and haul/beach seines are used for 0.7% of catch. Vessel-reported bluefish landings from vessel trip reports show that 93% of catch is using gillnet gear and 5% is using handline gear. There is a small strike net fishery in Massachusetts that currently has one active vessel; this fishery is not considered within the scope of the gillnet rating presented in this report and is not assessed further.

Species Overview

Bluefish is found across the globe, but in the Northwest Atlantic, it is distributed from Nova Scotia to Florida. It is thought that there are two bluefish spawning events annually: one in the spring, and one in the summer, which results in two separate size classes recorded by bluefish surveys along the coast (Shepherd and Packer 2006). There is some evidence that the bimodal distribution in size classes may be due to one long spawning season and not two separate spawning events; however, this has yet to be resolved (Smith et al. 1994)(Hare and Cowen 1995). Bluefish is found in shallow estuarine ecosystems, sandy beaches, and oyster beds as juveniles and moves offshore as adults. Adult bluefish are known to travel in large schools and to migrate seasonally, to follow warmer waters. Bluefish is primarily found in the Mid-Atlantic Bight in the spring and summer, and moves offshore or into the South Atlantic in the fall.

Bluefish is a voracious eater preying on whatever is locally available. Over 70 species have been found in bluefish stomachs (MAFMC 1998), but the majority of prey comprises copepods for juveniles, and bay anchovy (Able and Rowe 2003), herring, longfin squid, butterfish, menhaden, and other small fishes for adults (Buckel et al. 1999a). Bluefish grows quickly, up to a weight of 27 lbs (Bigelow and Schroeder 1953) and can live to 12 years or older. Because of its size and speed, bluefish is only preyed upon by sharks, tunas, and billfishes (Shepherd and Packer 2006); bluefish was found to make up over 80% of the diet of shortfin mako shark (Stillwell and Kohler 1982)(Wood et al. 2009), and it is a primary species in the diet of bluefin tuna and swordfish (Chase 2002)(Stillwell and Kohler 1985).

The bluefish fishery is primarily a recreational fishery, with a small commercial component. Bluefish landings (commercial and recreational) peaked in the 1980s, and bluefish was one of the most sought-after species by recreational fishers on the East Coast. Bluefish recreational landings exceeded (by weight) the landings of any other species from 1979 to 1987 (MAFMC 1998). Landings declined after their peak in 1986, which prompted the creation of the Bluefish Fishery Management Plan in 1990. Bluefish in the North Atlantic is managed as a single stock jointly between the National Oceanic and Atmospheric Administration (NOAA), the Mid-Atlantic Fishery Management Council (MAFMC), and the Atlantic States Marine Fisheries Commission (ASMFC) (Shepherd and Packer 2006).



As bluefish stocks continued to decline, Amendment 1 to the Fishery Management Plan (FMP) was finalized in 2000 and implemented a 9-year rebuilding plan, with a target rebuilding year of 2010 (MAFMC 1998). Fishing mortality was limited as a part of the rebuilding plan, and the bluefish stock was declared rebuilt in 2009 (Kurkul 2009). But, the most recent stock assessment (2019) identified that abundance has once again dropped below the management threshold and the stock is in an overfished condition. The bluefish fishery currently operates primarily in the Mid-Atlantic region, with the bulk of commercial landings in North Carolina, New York, New Jersey, Massachusetts, and Rhode Island.

Production Statistics

There are no data on the import or export of bluefish in the NMFS foreign trade database, because bluefish is categorized as "other species." In a study by Dougherty and Brown in 1982, 1.4 million lbs. of bluefish were inspected by NMFS for export, and were shipped to Venezuela, Nigeria, and the West Indies. Bluefish is also found outside the United States and is caught in the Mediterranean and Black Seas. Commercial landings for bluefish outside the United States have decreased from historic highs in the 1980s; in some areas, to less than half. In Turkey, for example, bluefish landings decreased from 42 million to 15 million lbs. from 1993 to 1995 (MAFMC 1998). In 1995, Turkey, Brazil, and the United States had the highest bluefish landings worldwide, with landings occurring in Venezuela and Portugal in lower numbers.

Importance to the US/North American market.

In the U.S., bluefish landings vary by state, but overall landings and value are quite low compared to other fisheries. Landings from the commercial fishery have been below 2,500 mt since 2011 and reached a historical low of 1,105 mt in 2018 (NMFS 2019). Because bluefish is primarily a recreational fishery, the recreational catch of bluefish has a significant impact on local markets where bluefish is caught. Recreational anglers were estimated to spend approximately $73 million on goods and services related to bluefish fishing in 2011 from Maine to Virginia (MAFMC 2013)(Gentner and Steinback 2008).

Common and market names.

Blue, tailor, chopper, elf, fatback, greenfish, Hatteras blue, horse mackerel, rock salmon, skipjack, slammer, snapping mackerel, and snapper (small bluefish) (MAFMC 1998).

Primary product forms

Bluefish is available as fresh whole fish, fresh or frozen fillets, smoked fillets, and as pate (MAFMC 1998).

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. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.

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.

Criterion 1 Summary

BLUEFISH				
REGION / METHOD	**INHERENT VULNERABILITY**	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northwest Atlantic | Bottom trawls | United States	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)
Northwest Atlantic | Set gillnets | United States	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - - Inherent Vulnerability

- *Low—The FishBase vulnerability score for species is 0-35, OR species exhibits life history characteristics that make it resilient to fishing, (e.g., early maturing).*
- *Medium—The FishBase vulnerability score for species is 36-55, OR species exhibits life history characteristics that make it neither particularly vulnerable nor resilient to fishing, (e.g., moderate age at sexual maturity (5-15 years), moderate maximum age (10-25 years), moderate maximum size, and middle of food chain).*
- *High—The FishBase vulnerability score for species is 56-100, OR species exhibits life history characteristics that make is particularly vulnerable to fishing, (e.g., long-lived (>25 years), late*

maturing (>15 years), low reproduction rate, large body size, and top-predator). Note: The FishBase vulnerability scores is an index of the inherent vulnerability of marine fishes to fishing based on life history parameters: maximum length, age at first maturity, longevity, growth rate, natural mortality rate, fecundity, spatial behaviors (e.g., schooling, aggregating for breeding, or consistently returning to the same sites for feeding or reproduction) and geographic range.

Factor 1.2 - Abundance

- *5 (Very Low Concern)—Strong evidence exists that the population is above target abundance level (e.g., biomass at maximum sustainable yield, BMSY) or near virgin biomass.*
- *4 (Low Concern)—Population may be below target abundance level, but it is considered not overfished*
- *3 (Moderate Concern) —Abundance level is unknown and the species has a low or medium inherent vulnerability to fishing.*
- *2 (High Concern)—Population is overfished, depleted, or a species of concern, OR abundance is unknown and the species has a high inherent vulnerability to fishing.*
- *1 (Very High Concern)—Population is listed as threatened or endangered.*

Factor 1.3 - Fishing Mortality

- *5 (Very Low Concern)—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, FMSY), OR fishery does not target species and its contribution to the mortality of species is negligible (≤ 5% of a sustainable level of fishing mortality).*
- *3.67 (Low Concern)—Probable (>50%) chance that fishing mortality is at or below a sustainable level, but some uncertainty exists, OR fishery does not target species and does not adversely affect species, but its contribution to mortality is not negligible, OR fishing mortality is unknown, but the population is healthy and the species has a low susceptibility to the fishery (low chance of being caught).*
- *2.33 (Moderate Concern)—Fishing mortality is fluctuating around sustainable levels, OR fishing mortality is unknown and species has a moderate-high susceptibility to the fishery and, if species is depleted, reasonable management is in place.*
- *1 (High Concern)—Overfishing is occurring, but management is in place to curtail overfishing, OR fishing mortality is unknown, species is depleted, and no management is in place.*
- *0 (Critical)—Overfishing is known to be occurring and no reasonable management is in place to curtail overfishing.*

Bluefish

Factor 1.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

High
The FishBase vulnerability score is 58 out of 100, corresponding to a high vulnerability (Cheung et al. 2005).

Factor 1.2 - Abundance

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

High Concern
The bluefish stock in the western Atlantic is currently in an overfished condition. The most recent stock assessment found that spawning stock biomass (SSB) in 2018 was 201 million pounds, which is 92% of the threshold reference point of 219 million pounds (NMFS 2019). Because of the overfished condition of the stock, abundance is considered a high concern.

Factor 1.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Low Concern
The most recent estimate of fishing mortality is 0.146, which is below the threshold reference point ($F_{35\%}$) of 0.183, indicating that overfishing is not currently taking place (NMFS 2019). But, the 2019 operational stock assessment indicates that, when considering the revised reference points, overfishing has been taking place in all years since 1985 (NMFS 2019). Because fishing mortality is currently below a sustainable level but has only recently reached such a level, a score of low concern is given.

Criterion 2: Impacts on Other Species

All main retained and bycatch species in the fishery are evaluated in the same way as the species under assessment were evaluated in Criterion 1. 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.

To determine the final Criterion 2 score, the score for the lowest scoring retained/bycatch species is multiplied by the discard rate score (ranges from 0-1), which evaluates the amount of non-retained catch (discards) and bait use relative to the retained catch. 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

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.

BLUEFISH			
REGION / METHOD	**SUB SCORE**	**DISCARDS+BAIT / LANDINGS**	**SCORE**
Northwest Atlantic | Bottom trawls | United States	2.236	1.000: < 20%	Yellow (2.236)
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	5.000	1.000: < 20%	Green (5.000)
Northwest Atlantic | Set gillnets | United States	1.000	0.950: 20-40%	Red (0.950)

Criterion 2 main assessed species/stocks table(s)

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

NORTHWEST ATLANTIC | BOTTOM TRAWLS | UNITED STATES				
SUB SCORE: 2.236	DISCARD RATE: 1.000		**SCORE: 2.236**	
SPECIES	**INHERENT VULNERABILITY**	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Green turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Kemp's ridley turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Leatherback turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Loggerhead turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Bluefish	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)
Summer flounder	2.000: Medium	4.000: Low Concern	5.000: Very Low Concern	Green (4.472)

NORTHWEST ATLANTIC | HANDLINES AND HAND-OPERATED POLE-AND-LINES | UNITED STATES				
SUB SCORE: 5.000	DISCARD RATE: 1.000		**SCORE: 5.000**	
SPECIES	**INHERENT VULNERABILITY**	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Bluefish	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)

NORTHWEST ATLANTIC | SET GILLNETS | UNITED STATES				
SUB SCORE: 1.000		DISCARD RATE: 0.950		**SCORE: 0.950**
SPECIES	**INHERENT VULNERABILITY**	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic sturgeon	1.000: High	1.000: Very High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High	1.000: Very High Concern	1.000: High Concern	Red (1.000)
Striped bass	1.000: High	2.000: High Concern	1.000: High Concern	Red (1.414)
Sei whale	1.000: High	1.000: Very High Concern	3.670: Low Concern	Red (1.916)
Spiny dogfish	1.000: High	2.000: High Concern	2.330: Moderate Concern	Red (2.159)
Fin whale	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Green turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Kemp's ridley turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Loggerhead turtle	1.000: High	1.000: Very High Concern	5.000: Very Low Concern	Yellow (2.236)
Humpback whale	1.000: High	3.000: Moderate Concern	2.330: Moderate Concern	Yellow (2.644)
Bluefish	1.000: High	2.000: High Concern	3.670: Low Concern	Yellow (2.709)
Smooth dogfish	1.000: High	4.000: Low Concern	2.330: Moderate Concern	Yellow (3.053)

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Inherent Vulnerability
(same as Factor 1.1 above)

Factor 2.2 - Abundance
(same as Factor 1.2 above)

Factor 2.3 - Fishing Mortality
(same as Factor 1.3 above)

Atlantic sturgeon

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High
Atlantic sturgeon has a high inherent vulnerability (85 out of 100) (FishBase 2013).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Very High Concern
All U.S. populations of Atlantic sturgeon are listed as "Endangered" or "Threatened" under the Endangered Species Act (ESA) (NMFS 2012a).

U.S. populations of Atlantic sturgeon are divided into five distinct population segments (DPS) for management purposes (NOAA Fisheries 2012b). The Gulf of Maine DPS is currently listed as "Threatened" by the Endangered Species Act, while the four DPS south of Cape Cod are currently listed as "Endangered" (NOAA Fisheries 2012b). Little is known about stock status: reliable data are difficult to collect because many river systems have few fish and are difficult to sample {ASFMC 2017}. Although accurate stock assessments are difficult to conduct, some states conduct long-term monitoring of Atlantic sturgeon via fishery-independent surveys (see Figure 1) {ASFMC 2017}. The figure contains data from New Jersey and North Carolina surveys and provides an example of local conditions, with both surveys indicating an increase in the number of sturgeon in these areas {ASFMC 2017}.

Because all populations of Atlantic sturgeon are threatened or endangered, Seafood Watch deems this factor a very high concern.

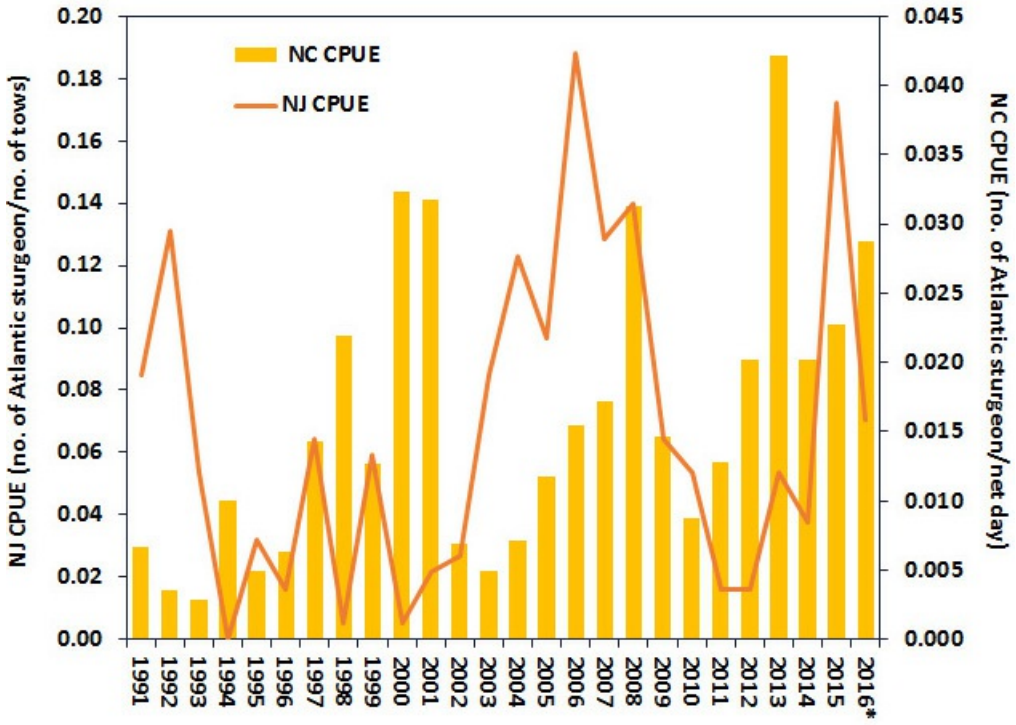


Figure 1: Atlantic sturgeon fishery-independent catch per unit effort (CPUE) in New Jersey's coastal waters and North Carolina's Albemarle Sound. Data from (ASMFC 2017).

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

High Concern

A variety of threats including directed harvest, commercial fisheries by-catch, and habitat destruction have contributed to the dramatic declines in Atlantic sturgeon populations since the mid-1800s {ASSRT 2007}. In late 1997 and early 1998, the Atlantic States Marine Fisheries Commission (ASMFC) and the federal government issued a moratorium on Atlantic sturgeon fishing to allow stocks to rebuild, which is projected to take at least 40 years {ASFMC 2012}. The 2007 status review of Atlantic sturgeon, which recommended the listing of five distinct population segments (DPS) of Atlantic sturgeon under the Endangered Species Act (ESA), found commercial fisheries by-catch to be a significant threat in each DPS {ASSRT 2007}. Bottom gillnet fisheries were found to have the greatest impact, while trawl gear used to fish the northern stock was not a high concern for Atlantic sturgeon {ASSRT 2007}. Several fisheries in the region contribute to Atlantic sturgeon by-catch, but sturgeon caught in the bottom gillnet fishery suffers some of the highest mortality rates, and the fishery has one of the highest levels of overall Atlantic sturgeon by-catch {ASSRT 2007}. Annual by-catch in the bottom gillnet fishery has averaged 350 individuals from 2006 to 2010 (NEFMC 2011c).

Current levels of by-catch are believed to be too high to allow Atlantic sturgeon from the New York Bight, Chesapeake, Carolina, and South Atlantic DPSs to recover (accounting for other threats as well) {ASSRT 2007}. Because gillnet fisheries have one of the highest levels of Atlantic sturgeon by-catch, it is likely that the fishery is a substantial contributor to this mortality. Methods for reducing sturgeon by-catch include seasonal and/or area closures, reduced soak times for sink gillnet gear, and modifications to sink gillnet gear, such as adjustments to tie-down hanging ratios. The effectiveness of management measures to reduce Atlantic sturgeon by-catch are unknown. This factor is deemed high concern, because fishing mortality from all sources is likely above a sustainable level that is appropriate, given the species' ecological role, and the fishery is a substantial contributor.

Fin whale

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9). The life history characteristics of marine mammals, including high age at maturity, low fecundity (single births), and low reproductive rates (every 1–5 years), make their populations vulnerable to high mortality rates. Higher than average mortality of marine mammals is frequently human-caused and can include mortality from ship or boat strikes and fisheries by-catch. Marine mammal populations (and those of other long-lived taxa) are especially vulnerable to mortality of adults (the reproductively active portion of the population) because it takes years, if not decades, for a calf to reach maturity and become reproductively active.

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Very High Concern

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

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

Very Low Concern

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

According to the List of Fisheries, the Northeast sink gillnet fishery is a Category I fishery, because previous estimates suggested that fishery-specific annual mortality and serious injury to fin whale was greater than or equal to 50% of the PBR {LOF 2017b}. In addition, fin whale is a strategic stock because it is listed as "Endangered" under the Endangered Species Act (ESA). Because the PBR is not exceeded, and the gillnet fishery contributes SIMs that are less than 10% of PBR, a score of low concern is given.

Green turtle

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States

High
Seafood Watch considers turtles to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Bottom trawls | United States

Very High Concern
Green sea turtle in the North Atlantic is listed as "Threatened" by the Endangered Species Act (ESA) (NOAA Fisheries 2013), so abundance is considered a very high concern.

Northwest Atlantic | Set gillnets | United States

Very High Concern
The North Atlantic distinct population segment (DPS) of green sea turtle is listed as "Threatened" under the Endangered Species Act (ESA) (Federal Register 2016), so abundance is considered a very high concern.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Very Low Concern
Green sea turtle has been observed captured in the pelagic driftnet, longline, shrimp trawl, and Mid-Atlantic trawl and gillnet fisheries. The most recent biological opinion for the Atlantic bluefish fishery used data from the Sea Turtle Disentanglement Network (STDN) to estimate that 32 green sea turtles will interact with bottom trawl fisheries in the U.S. Atlantic region over a 5-year period, resulting in 16 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the North Atlantic distinct population segment (DPS) of green sea turtle; however, it is not anticipated that bluefish fisheries will appreciably affect U.S. green sea turtle populations, because the estimated number of mortalities is <0.1% of the nesting population, based on recent nesting numbers (8,426 in Florida and 30,052 in Costa Rica) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect green sea turtle populations, a score of very low concern is given.

Northwest Atlantic | Set gillnets | United States

Very Low Concern

Green sea turtle has been observed captured in the pelagic driftnet, longline, shrimp trawl, and Mid-Atlantic trawl and gillnet fisheries. The most recent biological opinion for the Atlantic bluefish fishery used data from the Sea Turtle Disentanglement Network (STDN) to estimate that 10 green sea turtles will interact with gillnet fisheries in the U.S. Atlantic region over a 5-year period, resulting in 8 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the North Atlantic distinct population segment (DPS) of green sea turtle; however, it is not anticipated that bluefish fisheries will appreciably affect U.S. green sea turtle populations, because the estimated number of mortalities is <0.1% of the nesting population, based on recent nesting numbers (8,426 in Florida and 30,052 in Costa Rica) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect green sea turtle populations, a score of very low concern is given.

Humpback whale

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Moderate Concern

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

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

Moderate Concern

From 2013 to 2017, the average annual rate of human-caused mortality and serious injury for the Gulf of Maine humpback whale stock was 12.15 whales (7.75 for fishery interactions), which is considered negatively biased due to detection limitations {Hayes et al. 2020}. Based on the inference of undetected mortality from annual population estimates, managers determined that it is likely that annual average mortality and serious injury exceeds the potential biological removal (PBR) (22 whales); however, this has yet to be formally determined, and the proportion by nationality or cause is unknown. There is an Unusual Mortality Event in effect (since January 2016) for Atlantic humpback whale due to coast-wide elevated mortality levels in the United States observed from

strandings; however, it is likely that these mortalities are due to vessel strikes (NOAA 2021). It is estimated that 48–65% of the Gulf of Maine humpback stock have experienced a previous entanglement, based on scarring {Robbins & Mattila 2001}.

The majority of entanglements are not identifiable to fishery, so the proportion of entanglement due to the U.S. gillnet fisheries is unclear. Annual serious injury and mortality during 2013–2017 from unidentified U.S. gillnet interactions was 0.35 (1.6% of PBR), and from unidentified gillnet interactions first seen in U.S. waters but unassigned to country was 0.75 (3.4% of PBR), while those not attributable to gear type in the United States were 0.75 (3.4% of PBR), 3.2 (14.5% of PBR) for those first seen in the United States but unassigned to country, and 0.15 (0.7% of PBR) for those first seen in Canada but unassigned to country {Hayes et al. 2020}.

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

Kemp's ridley turtle

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States

High
Seafood Watch considers turtles to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Bottom trawls | United States

Very High Concern
The Kemp's ridley turtle is listed as "Endangered" under the Endangered Species Act (ESA) {NMFS & USFWS 2015}. Although there had been signs of recovery between 1995 and 2009, the number of nests has been decreasing in recent years, leading NMFS and USFWS to recommend the recovery priority be increased, due to an increased risk of extinction {NMFS & USFWS 2015}. Because of the poor status of Kemp's ridley turtle, abundance is considered a very high concern.

Northwest Atlantic | Set gillnets | United States

Very High Concern
Kemp's ridley sea turtle is listed as "Endangered" by the Endangered Species Act (ESA) (NOAA Fisheries 2013). Abundance is considered a very high concern.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Very Low Concern
Kemp's ridley turtle has been observed captured in the bottom trawl and gillnet fisheries. The most recent biological opinion for the Atlantic bluefish fishery used information from (Murray 2020) and data from the Sea Turtle Disentanglement Network (STDN) to estimate that 53 Kemp's ridley turtles will interact with non-shrimp bottom trawl fisheries in the U.S. Atlantic region over a 5-year period, resulting in 27 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the Kemp's ridley turtle population; however, it is not anticipated that bluefish fisheries will appreciably affect the population, because the estimated number of mortalities is <0.2% of the nesting population, based on a recent estimate of the adult population (22,341 from {Wibbels & Bevan 2019}) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect Kemp's ridley turtle populations, a score of very low concern is given.

Northwest Atlantic | Set gillnets | United States

Very Low Concern

Kemp's ridley turtle has been observed captured in the bottom trawl and gillnet fisheries. The most recent biological opinion for the Atlantic bluefish fishery used information from (Murray 2018), (Linden 2020), and data from the Sea Turtle Disentanglement Network (STDN) to estimate that 239 Kemp's ridley turtles will interact with gillnet fisheries in the U.S. Atlantic region over a 5-year period, resulting in 187 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the Kemp's ridley turtle population; however, it is not anticipated that bluefish fisheries will appreciably affect the population, because the estimated number of mortalities is <0.2% of the nesting population, based on a recent estimate of the adult population (22,341 from {Wibbels & Bevan 2019}) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect Kemp's ridley turtle populations, a score of very low concern is given.

Leatherback turtle

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States

High

Seafood Watch considers turtles to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Bottom trawls | United States

Very High Concern

The Northwest Atlantic distinct population segment (DPS) of leatherback turtle is listed as "Endangered" under the Endangered Species Act (ESA) and is experiencing a decreasing trend in nesting numbers {NMFS & USFWS 2020}. The rate of decrease in nesting sites has been more pronounced in recent years (2008–2017) {NMFS & USFWS 2020}. Because of the endangered status of leatherback turtle in the Northwest Atlantic, abundance is scored a very high concern.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Very Low Concern

Leatherback turtle has been observed captured in the bottom trawl, gillnet, and pot/trap fisheries. The most recent biological opinion for the Atlantic bluefish fishery used information from (Murray 2020) and data from the Sea Turtle Disentanglement Network (STDN) to estimate that 40 leatherback turtles will interact with non-shrimp bottom trawl fisheries in the U.S. Atlantic region over a 5-year period, resulting in 20 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the leatherback turtle population; however, it is not anticipated that bluefish fisheries will appreciably affect the population, because the estimated number of mortalities is ≈0.1% of the population (20,659) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect leatherback turtle populations, a score of very low concern is given.

Loggerhead turtle

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States

High
Seafood Watch considers turtles to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Set gillnets | United States

Very High Concern
Loggerhead turtle is listed under the Endangered Species Act (ESA) as "Threatened" in the Northwest Atlantic distinct population segment (DPS), and "Endangered" or "Threatened" in every other DPS {NOAA 2018d}. It is also listed as a CITES Appendix I species {NOAA 2018d}. Because of these current listings, a score of very high concern is awarded.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Very Low Concern
Loggerhead turtle is known to interact with bottom trawl, gillnet, and pot/trap fisheries. The most recent biological opinion for the Atlantic bluefish fishery used information from (Murray 2020), (Linden 2020), and data from the Sea Turtle Disentanglement Network (STDN) to estimate that 954 loggerhead turtles will interact with non-shrimp bottom trawl fisheries in the U.S. Atlantic region over a 5-year period, resulting in 477 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the loggerhead turtle population; however, it is not anticipated that bluefish fisheries will appreciably affect the population, because the estimated number of mortalities is ≈0.7% of the population, based on an estimate of the adult population (38,334 from {Richards et al. 2011}) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect loggerhead turtle populations, a score of very low concern is given.

Northwest Atlantic | Set gillnets | United States

Very Low Concern

Loggerhead turtle is known to interact with bottom trawl, gillnet, and pot/trap fisheries. The most recent biological opinion for the Atlantic bluefish fishery used information from (Murray 2018) and data from the Sea Turtle Disentanglement Network (STDN) to estimate that 1,036 loggerhead turtles will interact with gillnet fisheries in the U.S. Atlantic region over a 5-year period, resulting in 808 mortalities (NMFS 2021a). It is uncertain what the impact of fishing activities in the region is on the loggerhead turtle population; however, it is not anticipated that bluefish fisheries will appreciably affect the population, because the estimated number of mortalities is ≈0.7% of the population, based on an estimate of the adult population (38,334 from {Richards et al. 2011}) (NMFS 2021a). Because bluefish fisheries are not expected to negatively affect loggerhead turtle populations, a score of very low concern is given.

North Atlantic right whale

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9). The life history characteristics of marine mammals, including high age at maturity, low fecundity (single births), and low reproductive rates (every 1–5 years), make their populations vulnerable to high mortality rates. Higher than average mortality of marine mammals is frequently human-caused and can include mortality from ship or boat strikes and from fisheries by-catch. Marine mammal populations (and those of other long-lived taxa) are especially vulnerable to mortality of adults (the reproductively active portion of the population) because it takes years, if not decades, for a calf to reach maturity and become reproductively active.

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Very High Concern

The western Atlantic stock of North Atlantic right whale is listed as "Endangered" under the Endangered Species Act (ESA) and is considered "Critically Endangered" by the International Union for the Conservation of Nature (IUCN) (Cooke 2020). 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}. The population has been declining since 2011 and calving rates have been low. From 2017 to 2019, calving rates averaged four per season, <33% of the previous annual average. But, calving increased in 2020 with 10 calves sighted, and 1 involved in a vessel strike (Pace et al. 2017)(NOAA 2020b). The cause of reduced productivity is unknown, but it is likely attributed to several factors that contribute to declining North Atlantic right whale health, including climate-related shifts in prey distribution, anthropogenic noise, pollution, vessel strikes, and entanglement in fishing gear (Pace et al. 2017)(NOAA 2019c). Because North Atlantic right whale is considered "Critically Endangered" by the IUCN, abundance is rated a very high concern.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

High Concern

The western Atlantic stock of the North Atlantic right whale (NARW) is considered a strategic stock because annual serious injury and mortality (SIM) (7.7 from all sources; 5.7 attributed to fisheries entanglement from 2015 to 2019) exceeds the potential biological removal (PBR) (0.7 whales)

(Hayes et al. 2022). Due to a lack of information, it is often not possible to assign entanglements to a specific fishery. Documented entanglements from 2015 to 2019 involving pot/trap gear or unidentified gear are all attributed to unknown fisheries, of which the bluefish fishery may be a part. Annual SIMs attributed to entanglements in pot/trap gear in Canadian fisheries were 1.95 (279% of PBR), while none were attributed to pot/trap gear in United States fisheries. Serious injuries and mortalities first seen in the United States but not attributable to country were 2.65 (379% of PBR), and those first seen in Canada but not attributable to country were 1.05 (150% of PBR) (Hayes et al. 2022). In 2014, there was one SIM (0.2 average annual serious injuries and mortality, 29% of PBR) that was first seen in the U.S. but not attributable to country, and it was most likely caused by entanglement in netting gear {Sharp et al. 2019}{Sharp et al. 2019 Supplemental}.

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

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

An Unusual Mortality Event is in effect (since June 2017) for North Atlantic right whale, which includes 34 mortalities (21 in Canada and 13 in the United States, based on the location of stranding, not the location of mortality) through December 2021 (NOAA 2021). Mortalities are attributed to a combination of human interactions including vessel strikes and rope entanglement (final results are pending; however, preliminary investigations list 11 suspected as vessel strikes, 9 suspected as entanglement, 13 as pending or unknown causes, and 1 as perinatal mortality) (NOAA 2021) (see Figure 2).

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 sink gillnet fishery cannot be considered sustainable, and fishing mortality is scored a high concern.

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

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

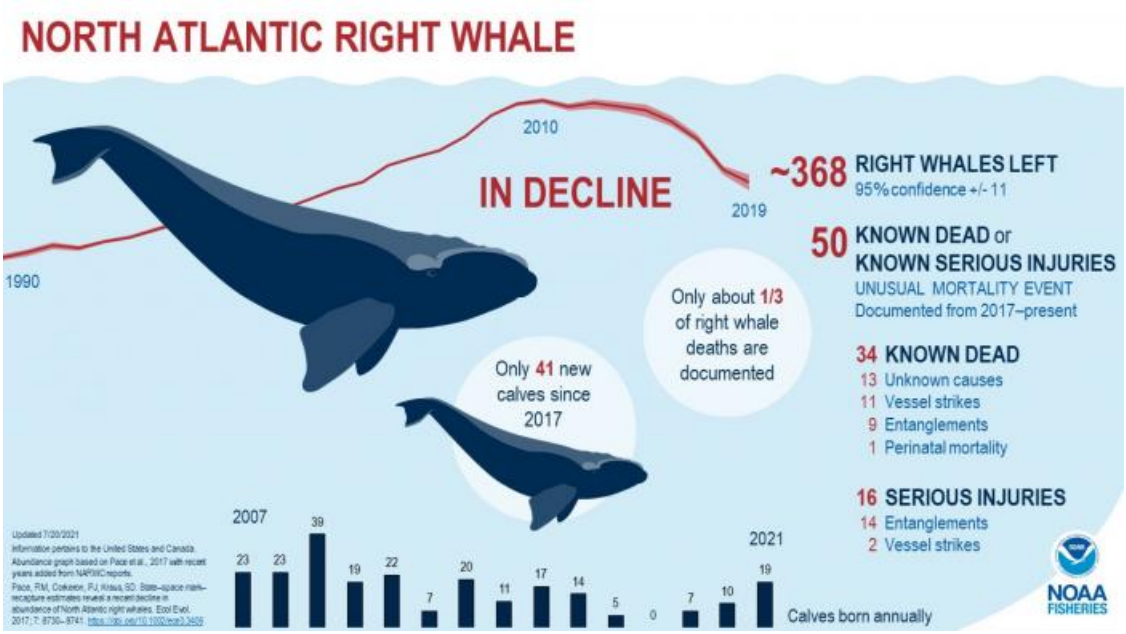


Figure 2: An infographic showing best estimates of current North Atlantic right whale population numbers and causes of death during the current Unusual Mortality Event, 2017 to present. (NOAA 2021)

Sei whale

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

Seafood Watch considers marine mammals to have a high vulnerability to fishing activities (Seafood Watch criteria document, p. 9).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Very High Concern

The minimum population estimate for the sei whale stock is 3,098 whales, with a modeled abundance of 6,292 whales, which is considered the best estimate for the Nova Scotia population (Hayes et al. 2021). A population trend analysis has not been conducted for the Nova Scotia population of sei whale, and status relative to an optimum sustainable population (OSP) is unknown (Hayes et al. 2021). Because sei whale is listed as "Endangered" under the Endangered Species Act (ESA), a score of very high concern is given.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

Low Concern

The major known sources of injury and mortality are from ship strikes and fishing gear entanglement. From 2014 to 2018, mortality and injury averaged 1.2 whales annually, with fisheries entanglements contributing 0.4 serious injuries and mortalities per year (Hayes et al. 2021). The Mid-Atlantic gillnet fishery is listed as a Category 1 fishery in the NMFS List of Fisheries. The current potential biological removal (PBR) for this population is 6.2 serious injuries and mortalities per year {Hayes et al. 2020}. Although it is unclear how much of the annual fishing mortality is attributable to the bluefish fishery, total fishing mortality is below PBR, so a score of low concern is given.

Smooth dogfish

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

The FishBase vulnerability score is 87 out of 100, corresponding to a high vulnerability (Cheung et al. 2005).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

Low Concern

The most recent stock assessment for smooth dogfish in the Western Atlantic was completed in 2015 and determined that the stock was not in an overfished condition (SEDAR 2015). The most recent estimate of biomass relative to B_{MSY} is 2.29 (NMFS 2021); however, this is based on data from 2012 and it is unclear whether this reflects the current status of the stock. Because the most recent estimate of biomass suggests that the stock is not in an overfished condition, but there is some uncertainty due to the age of the assessment, a score of low concern is given.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

Moderate Concern

The most recent stock assessment for smooth dogfish found that overfishing was not occurring; however, the level of fishing mortality was approaching F_{MSY} (SEDAR 2015). The stock assessment also used data from 2012, which results in some uncertainty due to the age of the assessment. Because overfishing is not taking place but there is uncertainty due to the age of the assessment, and because the most recent estimate is close to F_{MSY}, a score of moderate concern is given.

Spiny dogfish

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

The FishBase vulnerability score is 69 out of 100, corresponding to a high vulnerability (Cheung et al. 2005).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

High Concern

The most recent publicly available stock assessment for spiny dogfish is from 2011, so the results are not considered appropriate as an indicator of current abundance. In the absence of an up-to-date stock assessment, abundance is assessed using the vulnerability score from Factor 2.1; abundance is scored a high concern.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

Moderate Concern

The most recent publicly available stock assessment is from 2011 and is no longer considered a reliable indicator of fishing mortality for this stock. Thus, the impact of fisheries relative to a sustainable level is considered unknown and scored a moderate concern.

Striped bass

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Set gillnets | United States

High

The FishBase vulnerability score is 61 out of 100, corresponding to a high vulnerability (Cheung et al. 2005).

Factor 2.2 - Abundance

Northwest Atlantic | Set gillnets | United States

High Concern

The most recent stock assessment for Atlantic striped bass was completed in 2019 and found that the stock was in an overfished condition {ASMFC 2019}, with an estimated female spawning stock biomass (SSB) of 68,476 mt, which is below both the $SSB_{THRESHOLD}$ (91,436 mt) and SSB_{TARGET} (114,295 mt). Because the stock is currently overfished, a score of high concern is given.

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Set gillnets | United States

High Concern

The most recent estimate of fishing mortality (F_{2017}) is 0.307, which is greater than both the $F_{THRESHOLD}$ (0.240) and F_{TARGET} (0.197) {ASMFC 2019}. Because the stock is currently experiencing overfishing, a score of high concern is given.

Summer flounder

Factor 2.1 - Inherent Vulnerability

Northwest Atlantic | Bottom trawls | United States

Medium

The FishBase vulnerability score is 47 out of 100, corresponding to a medium vulnerability (Cheung et al. 2005).

Factor 2.2 - Abundance

Northwest Atlantic | Bottom trawls | United States

Low Concern

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

Factor 2.3 - Fishing Mortality

Northwest Atlantic | Bottom trawls | United States

Very Low Concern

The most recently updated assessment of summer flounder in the mid-Atlantic since 2007 states that the fishing mortality rate has increased and was 0.334 in 2017, 75% of the 2018 SAW-66 F_{MSY} proxy = $F_{35\%}$ = 0.448 {NOAA 2019}. Because overfishing of summer flounder is not occurring, we have awarded a very low concern score.

Factor 2.4 - Modifying Factor: Discards and Bait Use

Northwest Atlantic | Bottom trawls | United States

< 20%

The discard rate in the bluefish fishery was estimated as 0.04 in the National By-catch Report (NMFS 2011). The low by-catch rate has been confirmed by bluefish managers, so by-catch in the bluefish fishery is not a significant concern.

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

< 20%

The discard rate was calculated using data from the Northeast Fisheries Observer Program on trips targeting bluefish from 2008 to 2011 (NMFS 2011). The discard rate was calculated by dividing total discards, where all discards are assumed to be dead, by total landings. There were no reported discards on bluefish trips using handline gear from 2008 to 2011.

Northwest Atlantic | Set gillnets | United States

20-40%

The discard rate was calculated using data from the Northeast Fisheries Observer Program on trips targeting bluefish from 2008 to 2011 (NMFS 2011). The discard rate was calculated by dividing total discards, where all discards are assumed to be dead, by total landings.

Criterion 3: Management Effectiveness

Management is separated into management of retained species (harvest strategy) and management of nonretained species (bycatch strategy). The final score for this criterion is the geometric mean of the two scores.

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 either or both of Harvest Strategy (Factor 3.1) and Bycatch Management Strategy (Factor 3.2) ratings are Critical

Criterion 3 Summary

FISHERY	HARVEST STRATEGY	BYCATCH MANAGEMENT STRATEGY	SCORE
Northwest Atlantic | Bottom trawls | United States	3.000	3.000	**Yellow (3.000)**
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	3.000	4.000	**Green (3.464)**
Northwest Atlantic | Set gillnets | United States	3.000	1.000	**Red (1.732)**

Factor 3.1 Summary

FISHERY	STRATEGY	RECOVERY	RESEARCH	ADVICE	ENFORCE	TRACK	INCLUSION
Northwest Atlantic | Bottom trawls | United States	Moderately Effective	Moderately Effective	Highly effective	Highly effective	Highly effective	Moderately Effective	Highly effective
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	Moderately Effective	Moderately Effective	Highly effective	Highly effective	Highly effective	Moderately Effective	Highly effective
Northwest Atlantic | Set gillnets | United States	Moderately Effective	Moderately Effective	Highly effective	Highly effective	Highly effective	Moderately Effective	Highly effective

Factor 3.2 Summary

FISHERY	ALL SPECIES RETAINED?	CRITICAL?	STRATEGY	RESEARCH	ADVICE	ENFORCE
Northwest Atlantic | Bottom trawls | United States	No	No	Moderately Effective	Moderately Effective	Highly effective	Highly effective
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	No	No	Highly effective	Moderately Effective	Highly effective	Highly effective

Northwest Atlantic | Set gillnets | United States	No	No	Ineffective	Moderately Effective	Highly effective	Highly effective

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Harvest Strategy

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

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

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

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

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

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

Subfactor 3.1.5 – Enforcement of Management Regulations
Considerations: Do fishermen comply with regulations, and how is this monitored? To achieve a Highly Effective rating, there must be regular enforcement of regulations and verification of compliance.

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

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

Factor 3.2 - Bycatch Strategy

Four subfactors are evaluated: Management Strategy and Implementation, Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations. Each is rated as 'ineffective,' 'moderately effective,' or 'highly effective.' Unless reason exists to rate Scientific Research and Monitoring, Record of Following Scientific Advice, and Enforcement of Regulations differently, these rating are the same as in 3.1.

- *5 (Very Low Concern)—Rated as 'highly effective' for all four subfactors considered*
- *4 (Low Concern)—Management Strategy rated 'highly effective' and all other subfactors rated at least 'moderately effective.'*
- *3 (Moderate Concern)—All subfactors rated at least 'moderately effective.'*
- *2 (High Concern)—At minimum, meets standards for 'moderately effective' for Management Strategy but some other factors rated 'ineffective.'*
- *1 (Very High Concern)—Management exists, but Management Strategy rated 'ineffective.'*
- *0 (Critical)—No bycatch management even when overfished, depleted, endangered or threatened species are known to be regular components of bycatch and are substatntially impacted by the fishery*

Subfactor 3.2.1 – Management Strategy and Implementation
Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and how successful are these management measures? To achieve a Highly

Effective rating, the primary bycatch species must be known and there must be clear goals and measures in place to minimize the impacts on bycatch species (e.g., catch limits, use of proven mitigation measures, etc.)

Subfactor 3.2.2 – Scientific Research and Monitoring
Considerations: Is bycatch in the fishery recorded/documented and is there adequate monitoring of bycatch to measure fishery's impact on bycatch species? To achieve a Highly Effective rating, assessments must be conducted to determine the impact of the fishery on species of concern, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are being met

Subfactor 3.2.3 – Management Record of Following Scientific Advice
Considerations: How often (always, sometimes, rarely) do managers of the fishery follow scientific recommendations/advice (e.g., do they set catch limits at recommended levels)? A Highly Effective rating is given if managers nearly always follow scientific advice.

Subfactor 3.2.4 – Enforcement of Management Regulations
Considerations: Is there a monitoring/enforcement system in place to ensure fishermen follow management regulations and what is the level of fishermen's compliance with regulations? To achieve a Highly Effective rating, there must be consistent enforcement of regulations and verification of compliance.

Factor 3.1.1 - Mgmt Strategy / Implement

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Moderately Effective
Bluefish is currently managed under Amendment 1 (1998) and Addendum I (2012) of the Bluefish Fishery Management Plan (1989) (ASMFC 2020). States and jurisdictions manage bluefish fisheries consistent with the requirements of the interstate FMP and, based on annual state compliance reports, all states were found to be implementing measures consistent with the FMP in 2019 (ASMFC 2020). The states of Maine, South Carolina, and Georgia requested *de minimis* status for 2020, and qualify for such status because their landings constitute <0.1% of commercial coast-wide landings (ASMFC 2020).

The bluefish fishery is an open access fishery with unlimited entry; however, harvest in the commercial fishery is typically below the total allowable catch (TAC) (Armstrong 2013)(ASMFC 2020), indicating that fishing effort is likely not too high for the fishery. This is further supported by fishing mortality being below a sustainable level. The commercial fishing sector receives an allocation of 17% of the annual catch limit (ACL). In 2019, the ACL was set at 21.8 million lbs. and, following the transfer of 4 million lbs. from the recreational harvest limit (RHL), the TAC for the commercial fishery was set at 7.7 million lbs.; commercial harvest in 2019 was estimated at 3 million lbs. (ASMFC 2020).

Because an FMP is in place and states are managing their fisheries consistent with the FMP, but the stock is currently in an overfished condition that suggests that further measures may be necessary, the harvest management strategy is considered moderately effective.

Factor 3.1.2 - Recovery of Stock Concerns

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Moderately Effective
The bluefish stock is currently in an overfished condition, and the ASMFC and Mid-Atlantic Fishery Management Council (MAFMC) are in the process of developing a rebuilding plan for the stock (ASMFC 2020) as part of the Bluefish Allocation and Rebuilding Amendment. The amendment will include a review of the sector-based allocations (commercial vs. recreational), commercial allocations to the states, transfer processes, and the goals and objectives of the FMP (ASMFC 2020).

A previous rebuilding effort for bluefish was deemed successful when the stock was declared rebuilt in 2009 (Kurkul 2009).

Because there is work underway to develop a rebuilding plan, and previous efforts have been successful for this stock, we consider the rebuilding strategy to be moderately effective.

Factor 3.1.3 - Scientific Research / Monitoring

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective
The bluefish assessment is updated annually, with data from the previous year, and is presented to the Science and Statistical Committee for review (NOAA 2012). The assessment update includes updates to both fisheries-dependent and -independent data sources.

Fisheries-dependent data sources include: commercial landings from Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia, as well as Florida (east coast) coast-wide recreational landings and coast-wide recreational discards (NMFS Marine Recreational Information Program—MRIP). Length samples are collected on an annual basis as part of the NMFS monitoring program and monitoring programs in North Carolina and Florida. Recreational landings are sampled for length as part of the NMFS Marine Recreational Information Program (MRIP) (NMFS 2019)(ASMFC 2020).

Fisheries-independent data included the NMFS bottom trawl, the Southeast Area Monitoring and Assessment Program (SEAMAP) trawl survey, New Jersey ocean trawl survey, NEAMAP fall inshore trawl survey, Connecticut Long Island Sound trawl surveys, and the North Carolina Pamlico Sound independent gillnet survey (NMFS 2019).

Recreational landings and discards represent the majority of the fishing mortality for bluefish, and the 2019 operational stock assessment recommended that research be conducted to improve the methodology to characterize recreational discard lengths, to aid future assessments.

Because data are regularly collected from both commercial and recreational fisheries, and fishery-dependent and -independent data are used in regular stock assessments, scientific research and monitoring is considered highly effective.

Factor 3.1.4 - Scientific Advice

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective

The bluefish management process has been relatively uncontroversial since the inception of the FMP. The MAFMC has always heeded the advice of the SSC and used the assessment results to set management measures for the fishery (pers. comm., James Armstrong 2013). The ASPIC model was used to assess the bluefish stock—recognizing the limitations in age data—but without much controversy, until SARC 41, where it was replaced with the ASAP model, which was deemed more appropriate for bluefish (41st SAW 2006). In addition, state biological sampling programs have increased the amount of age data that is input into the assessment updates, and uncertainty in the model has decreased (ASMFC 2012) (pers. comm., James Armstrong 2013).

Even with the model uncertainties, bluefish management measures were set conservatively enough that they allowed for the stock to rebuild by 2009 (Kurkul 2009). Though bluefish is a popular gamefish, commercial demand is not considered extreme and, as a result, quotas are rarely met or exceeded (NEFSC 2015). Because managers take scientific advice into account when making management decisions and apply a precautionary approach when setting quotas, a score of highly effective is given.

Factor 3.1.5 - Enforce

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective
Annual catch limits (ACLs) and accountability measures (AMs) for the bluefish fishery were implemented with Amendment 2 (the Omnibus Amendment) to comply with the requirements of the Magnuson-Stevens Act (MSA). Even before the implementation of ACLs and AMs, bluefish landings consistently remained below the annual quota. Bluefish landings are monitored by the National Marine Fisheries Service on a weekly basis. When bluefish landings in a particular state exceed that state's allocation, the state fishery is closed for the season (NMFS 2013). States are permitted to transfer quota to avoid overages, which occur with some frequency each year. In addition, any quota overage accrued by each state will be deducted from that state's quota the following year. There is also an overage deduction provision for the bluefish recreational fishery in the FMP.

There is no specific vessel monitoring system (VMS) requirement for the bluefish fishery, although many vessels targeting bluefish are required to have VMS onboard their vessel as a requirement of other fishery permits. Vessel trip reports (VTR/logbooks) must be submitted to NMFS on a monthly basis. Vessels that are not compliant with sending in all VTRs will not be issued any federal permit the following year.

Because compliance with regulations appears to be high and quota overages are rare, enforcement is scored highly effective.

Factor 3.1.6 - Track Record

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Moderately Effective
The bluefish stock was rebuilt in 2009 and biomass remained above the target until 2014, when the stock became overfished once again (NEFSC 2015)(NMFS 2019). The bluefish fishery often remains under-harvested at the end of the fishing year, and overfishing is not currently occurring. Although the biomass has declined after a successful rebuilding effort, current biomass is 92% of the threshold value and current management measures appear to be ensuring that the bluefish stock is not experiencing overfishing in the short term (NMFS 2019). The track record of management is considered moderately effective.

Factor 3.1.7 - Stakeholder Inclusion

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective
Bluefish is managed jointly by the MAFMC, NMFS, and the ASMFC. The management process is public and there are multiple opportunities for stakeholder input throughout the development and before the implementation of any new management measures. All management measures are developed jointly and ultimately approved by the MAFMC and the ASMFC. At all MAFMC and ASMFC meetings, public comments are encouraged, accepted, and considered when developing management measures (ASMFC 2013a). Public comments are also accepted in writing via mail or email at any time.

The MAFMC and ASMFC both have advisory panels, which comprise representatives from the commercial, charter boat, and recreational fishing industries, as well as conservation interests, that have the opportunity to provide comments throughout the entire management process. In addition, NMFS publishes all proposed management measures in the Federal Register to receive public comment. All comments from the public are considered and directly responded to before the management measures are finalized and implemented.

Factor 3.2.1 - Mgmt Strategy / Implement

Northwest Atlantic | Bottom trawls | United States

Moderately Effective
Fish species:

Observer data show that the following species are also caught using bottom otter trawl gear on trips targeting bluefish: summer and winter flounder, hake, and black sea bass. In addition, Atlantic sturgeon was found to frequently interact with both bottom trawl and gillnet gear, although interactions with bottom trawl gear are fewer (NMFS 2013).

Marine mammals and sea turtles:

The 2013 List of Fisheries lists the Mid-Atlantic bottom trawl fishery as Category 2 (78 Federal Register 77 2013), which means that there is occasional incidental mortality or serious injury of marine mammals; annual mortality has been estimated between 1% and 50% of the potential biological removal (PBR) level (NOAA 2013a). This fishery has the potential to interact with bottlenose, common, and white-sided dolphins, and short- and long-finned pilot whales. Large whales are not likely to be injured in bottom trawl gear, and there have been no observed large whale interactions with the Northeast bottom trawl fishery. But, sea turtles feed on bottom-dwelling organisms and are known to hunker down to the bottom in response to noise, and therefore are subject to mortality from bottom trawl gear (NMFS 2010). The use of turtle excluder devices (TED) in bottom otter trawls has been shown to minimize the injury and mortality of sea turtles that come into contact with bottom trawl gear (NMFS 2010). Sea turtles are protected in North Carolina and Virginia by the mandatory use of TEDs in bottom trawl gear used for the summer flounder

fishery. The majority of sea turtle interactions with bottom trawl gear have occurred in southern New England and the mid-Atlantic, where fisheries overlap with abundant sea turtle populations. It is difficult to estimate sea turtle takes that are directly attributable to the bluefish fishery but, because the majority of the fishery occurs in the mid-Atlantic, there is a greater likelihood of sea turtle interactions. According to data collected from the Northeast Fisheries Observer Program (NEFOP), there was only one documented incidental take of a sea turtle from 2000 to 2009—a leatherback turtle in gillnet gear—that was attributed to the bluefish fishery. But, that is likely an underestimate because we are only aware of takes on observed trips, and observer rates are relatively low in the bluefish fishery. A new estimate of loggerhead sea turtle by-catch in bottom otter trawl gear using observer data from 1996 to 2008 estimated four incidents of loggerhead sea turtle by-catch per year (NMFS 2013). Even so, because there are no mandatory observer regulations for the bluefish fishery, and coverage levels tend to be low, it is unclear whether marine mammal and sea turtle by-catch is adequately accounted for. By-catch management strategy and implementation for the bluefish trawl fishery is considered moderately effective.

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

Highly effective
Finfish:

By-catch using hook and line gear is relatively low, and although catch of nontarget species does occur, mortality rates for such species are usually low (Chuenpagdee et al. 2003).

Marine mammals and sea turtles:

The 2013 List of Fisheries lists the Northeast and Mid-Atlantic bottom longline/hook and line fishery as a Category 3 fishery (78 Federal Register 77 2013), which means a remote likelihood of or no known incidental mortality or serious injury of marine mammals, and annual mortality has been estimated at less than 1% of the potential biological removal (PBR) level (NOAA 2013a). No documented interactions with protected species have occurred in the last 5 years. Although there were six documented humpback whale interactions with hook and line gear in the Northeast, none resulted in injury or mortality (NMFS 2010).

Northwest Atlantic | Set gillnets | United States

Ineffective
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 2018c). To achieve this goal, several measures have been implemented, including requirements of sinking groundline, weak links, a vertical line rule, gear marking requirements, and area closures {Gouveia & Swails 2017}(NOAA 2018c). But, the Take Reduction Plans (TRPs) in the northeastern U.S. have been regarded as the least successful of the U.S. TRPs at reducing marine mammal by-catch {McDonald et al. 2016}. To date, the ALWTRP has failed to meet its statutory goal of reducing SIM to a level below the potential biological removal (PBR), and to a level approaching zero (the Zero

Mortality Rate Goal). Many management measures have been ineffective in reducing entanglement rates (based on data from 1999 to 2009, inclusive of entanglements attributed to unidentified fisheries) {Pace et al. 2014}, because annual mortality and serious injury due to entanglement continues to exceed PBR (NOAA 2019c). The impacts of introducing regulations such as the "sinking groundline rule" in 2009 and the "vertical line rule" (50 Federal Register 2014) in 2015 are not fully understood due to limited data and analyses (the latest marine mammal stock assessments consider data from 2014 to 2018). But, for most entanglement interactions, gear is not recovered or is unidentifiable (77% of entanglements between 2000 and 2018) and, although the bluefish gillnet fishery has not been identified specifically in recent interactions, most interactions cannot be attributed to a specific fishery (NOAA 2019c). In 2014, a whale carcass was found south of Nantucket entangled in what was most likely gillnet gear {Sharp et al. 2019}{Sharp et al. 2019 Supplemental}.

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

Table 1: Actions to be taken under the ALWTRP Conservation Framework. From 2021 Batched Biological Opinion.

Phase	Year	Framework Action Description
	Annually	Provide updates, as appropriate, on the implementation of the Framework to the New England and Mid-Atlantic Fishery Management Councils, Atlantic States Marine Fisheries Commission, and ALWTRT.
1	2021	NMFS implements the MMPA ALWTRP rule-making focused on 60% reduction in right whale M/SI incidental to American lobster and Jonah crab trap/pot fisheries. In federal waters, this action reduces M/SIs, on average annually, to 2.69. Implementation for certain measures will begin in 2021; others will be phased over time.
2	2023	NMFS implements rule-making to reduce M/SI in federal gillnet and other pot/trap (i.e., other than lobster and Jonah crab fisheries included in Phase 1) fisheries by 60%, reducing M/SI, on average annually, to 2.61. The ALWTRT will convene in 2021 to recommend modifications to the ALWTRP to address risk in the remaining fixed gear fisheries. This phase will consider how any changes to the ALWTRP contribute to achieving the target reduction under this Framework.
Evaluation	2023–2024	NMFS evaluates any updated or new data on right whale population and threats to assess progress toward achieving the conservation goals of this Framework. At this time, we will also assess measures taken by Canada to address M/SI in Canadian waters.
3	2025	NMFS implements rule-making to further reduce M/SI by 60% in all federal fixed gear fisheries, reducing M/SI, on average annually, to 1.04.

Evaluation	2025–2026	NMFS evaluates measures implemented in 2025 action as well as new data on right whale population and threats to assess progress toward achieving the conservation goals of this Framework. Based on the results of this evaluation, NMFS will determine the degree to which additional measures are needed to ensure the fisheries are not appreciably reducing the likelihood of survival and recovery. As described above, if actions outside the federal fisheries reduce risk to right whales by 0.5 M/SI on average annually (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, we will evaluate whether further action in the federal fisheries is needed.
4	2030	In accordance with the goals identified in the 2025–2026 evaluation, NMFS implements regulations to further reduce M/SI (up to 87%) in fixed gear fisheries.

In July 2022, a District Court ruled that the 2021 Final Rule and 2021 Biological Opinion were invalid, 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}.

On February 6, 2012, NMFS issued two final rules listing five populations of Atlantic sturgeon along the U.S. East Coast as either threatened or endangered species. The Gulf of Maine Distinct Population Segments (DPS) of Atlantic sturgeon is listed as "Threatened," while the New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs of Atlantic sturgeon are listed as "Endangered." Because of the listing of Atlantic sturgeon, the biological opinions for multiple fisheries known to have interactions with Atlantic sturgeon were reinitiated, to determine what, if any, measures are required to reduce fishery interactions of Atlantic sturgeon. The bluefish fishery, and other associated gillnet fisheries, are not believed to reduce the survival and recovery of Atlantic sturgeon populations (NMFS 2021).

Because bluefish is often targeted along with other species, it is difficult to calculate observer coverage specifically in the bluefish fishery. In addition, there are no specific observer coverage requirements for the bluefish fishery as there are for other Northeast and Mid-Atlantic fisheries. Because the fishery primarily uses gillnet gear to target bluefish, all Mid-Atlantic gillnet trips have the chance of encountering bluefish. Observer coverage of Mid-Atlantic gillnet fisheries is generally low and averaged only about 2% from 2004 to 2008 (NOAA 2011a).

Although a number of by-catch mitigation and reduction measures have been implemented in the Northeast and Mid-Atlantic gillnet fisheries, 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. Therefore, the by-catch strategy is rated ineffective.

Justification:
Fish species:

Because bluefish is often targeted with other species, it is difficult to determine what species are by-catch on fishing trips where bluefish is landed. Observer data show the following fish species are also caught in gillnet gear on trips identified as targeting bluefish: striped bass, Atlantic bonito,

dusky smoothhound, spiny dogfish, scup, little skate, weakfish, and summer flounder. In general, sink and drift gillnet gear have the potential for high levels of finfish by-catch, and midwater gillnets have been known to result in high shark by-catch, as well as incidental capture of seabirds and sea turtles (Chuenpagdee et al. 2003). Atlantic sturgeon is known to be captured in sink gillnet, drift gillnet, and otter trawl gear (NMFS 2013). Of these gear types, sink gillnet gear poses the greatest known risk of mortality to sturgeon by-catch, and this is the primary gear used to harvest bluefish. But, the draft biological opinion found that Atlantic sturgeon interactions were more likely to occur in other fisheries, such as the goosefish, the skate, and the summer flounder, scup, and black sea bass fisheries, than in the bluefish fishery (NMFS 2013). In setting the 2013–2014 bluefish specifications, it was assumed that there are no commercial discards in the bluefish fishery (MAFMC 2013).

Marine mammals:

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 in Canada 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 for North Atlantic right whale, 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 of SIMs from unknown sources (5.1 SIMs), remain far above the levels that would allow the population to recover (PBR = 0.8) (Hayes et al. 2021), and the Conservation Framework will allow continued impacts above PBR for the next 9 years. Cumulative impacts must be addressed through a comprehensive and coordinated management strategy to account for the transboundary nature of North Atlantic right whales that migrate between United States and Canadian waters.

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

Factor 3.2.2 - Scientific Research / Monitoring

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Moderately Effective
Observer coverage in the bluefish fishery has not been estimated but is assumed to be extremely low. There are no specific requirements for observers on vessels targeting bluefish, although all federal vessels are required to carry an observer onboard, if randomly selected by NMFS. The Standardized By-catch Reporting Methodology report, which allocates observer sea days through the Northeast Fisheries Observer Program, uses three importance filters to determine whether observers will be allocated to that fishery. The filters are based on the importance of discards as a fraction of total mortality in a particular fishery. The bluefish fishery was filtered out, meaning that discards were not significant and allocating observers to the bluefish fishery was not a priority (NOAA 2011a).

Often, fisheries that do not have any specific observer requirements are observed anyway, due to regulations in other fisheries. But, even though bluefish is a mixed-species fishery, there are no federal observer requirements for the other species often targeted along with bluefish, such as summer flounder, croaker, and menhaden. Therefore, although trips targeting bluefish are occasionally randomly selected by NMFS for observer coverage, coverage is minimal. Because observer coverage is so infrequent, it is difficult to adequately quantify by-catch in the bluefish fishery. Scientific research and monitoring of by-catch is considered moderately effective.

Factor 3.2.3 - Scientific Advice

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective
There is no evidence that scientific advice for by-catch species is different than that for harvest measures, as described in Factor 3.1, Harvest Strategy.

Factor 3.2.4 - Enforce

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Highly effective
There is no evidence that enforcement of by-catch measures is different than that for harvest measures, as described in Factor 3.1, Harvest Strategy.

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 (plus the mitigation of gear impacts score) and the Ecosystem Based Fishery Management 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 cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Northwest Atlantic | Bottom trawls | United States	Moderate Concern	Minimal Mitigation	Moderate Concern	**Yellow (2.598)**
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States	None	Minimal Mitigation	Moderate Concern	**Green (3.969)**
Northwest Atlantic | Set gillnets | United States	Low Concern	Minimal Mitigation	Moderate Concern	**Yellow (3.122)**

Criterion 4 Assessment

SCORING GUIDELINES

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

- *5 (None) - Fishing gear does not contact the bottom*
- *4 (Very Low) - Vertical line gear*
- *3 (Low)—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. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (*
- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 (Very High)—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 - Mitigation of Gear Impacts

- *+1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.*
- *+0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.*
- *+0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced*
- *0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats*

Factor 4.3 - Ecosystem-Based Fisheries Management

- *5 (Very Low Concern)—Substantial efforts have been made to protect species' ecological roles and ensure fishing practices do not have negative ecological effects (e.g., large proportion of fishery area is protected with marine reserves, and abundance is maintained at sufficient levels to provide food to predators)*
- *4 (Low Concern)—Studies are underway to assess the ecological role of species and measures are in place to protect the ecological role of any species that plays an exceptionally large role in the ecosystem. Measures are in place to minimize potentially negative ecological effect if hatchery supplementation or fish aggregating devices (FADs) are used.*
- *3 (Moderate Concern)—Fishery does not catch species that play an exceptionally large role in the ecosystem, or if it does, studies are underway to determine how to protect the ecological role of these species, OR negative ecological effects from hatchery supplementation or FADs are possible and management is not place to mitigate these impacts*
- *2 (High Concern)—Fishery catches species that play an exceptionally large role in the ecosystem and no efforts are being made to incorporate their ecological role into management.*
- *1 (Very High Concern)—Use of hatchery supplementation or fish aggregating devices (FADs) in the fishery is having serious negative ecological or genetic consequences, OR fishery has resulted in trophic cascades or other detrimental impacts to the food web.*

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

Northwest Atlantic | Bottom trawls | United States

Moderate Concern

The bottom trawl fishery for bluefish makes up a very small percentage of overall catch. But, bottom trawls are known to have a significant impact on bottom habitat (Chuenpagdee et al. 2003). The impacts of bottom otter trawls on habitat depend on the configuration of the gear and the type of habitat in which the gear is used. The least impact occurs in muddy/sandy habitats, while the highest impacts would occur on a gravel/hard bottom with vertical structures, such as clay outcroppings, that can be destroyed by the movement of the gear over the ground (Stevenson et al. 2004). The

Mid-Atlantic Bight region, where the bluefish fishery operates, is primarily sand with some gravel, silt, and clay (Stevenson et al. 2004).

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

None
Handline gear does not touch the bottom and therefore does not have any negative impact on bottom habitat.

Northwest Atlantic | Set gillnets | United States

Low Concern
Bottom gillnets are the predominant gear used in the bluefish fishery (MAFMC 2013). Sink gillnets have very little contact with the bottom and therefore have little impact on habitat. Anchors that are used to sink the nets, as well as the weights on the bottom of the nets, are the only parts of the fishing gear that touch the bottom (Stevenson et al. 2004). Although Grizzle et al. (Grizzle et al. 2009) found that gillnets had a significant impact on bottom fauna in the Gulf of Maine, the bottom in the Gulf of Maine is primarily rocky gravel, and gillnet gear can easily get hung up on bottom structure. Though the bluefish fishery does operate in the Gulf of Maine, the majority of landings occur in the Mid-Atlantic (New York, New Jersey, and North Carolina), where the bottom is sandy and gillnets have little impact on the bottom (MAFMC 2013).

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Minimal Mitigation
The use of an annual coast-wide quota that is divided among the states on the Eastern seaboard controls effort in the bluefish fishery. Although bluefish harvest in some states may exceed their quota allocation, the coast-wide bluefish quota has been consistently under-harvested since at least 2000. There are no areas designated as Habitat of Particular Concern for the bluefish fishery (MAFMC 1998)(MAFMC 2013).

Factor 4.3 - Ecosystem-based Fisheries Management

Northwest Atlantic | Bottom trawls | United States
Northwest Atlantic | Handlines and hand-operated pole-and-lines | United States
Northwest Atlantic | Set gillnets | United States

Moderate Concern
Considering the important roles of bluefish in the Mid-Atlantic ecosystem as a predator and as a prey

for mako shark, bluefish is considered a species of exceptional importance. Although the ecosystem role of bluefish is recognized, there are currently no ecosystem considerations taken into account in the stock assessment or in the development of management measures. Ecosystem considerations were not explicitly taken into consideration during SARC 41, the most recent bluefish stock assessment, which is consistent with other fishery stock assessments at the time {SAW 41, 2006}. The use of ecosystem components in fisheries stock assessments is relatively new and continues to expand as ecosystem models are further developed (Link et al. 2011). Adequately accounting for natural mortality of bluefish due to predation and other factors is one method of accounting for the roles of bluefish in the Mid-Atlantic ecosystem during the assessment process. The current bluefish assessment assumes natural morality to be static, which is the common approach across fisheries assessments (NOAA 2012). But, predation rates on bluefish depend on both the size and the age of the fish, as well as population estimates of known predators. Yet, there are plans to investigate ecosystem considerations in the next stock assessment (Wood 2013). In addition, the MAFMC Ecosystem Committee is examining how to best integrate ecosystem-based management practices into decision-making in the future (MAFMC 2013b). Because ecosystem-based approaches to management are being developed, a score of moderate concern has been given.

Justification:
Bluefish as prey:

Due to bluefish's size and speed, it is primarily preyed upon by large sharks, billfishes, and tunas. Shortfin mako shark migrates inshore along the northeast coast of the U.S. every spring to feed on bluefish, which makes up the majority of the mako shark's prey (Wood et al. 2009). Large schooling populations of herring and mackerel are known to attract adult bluefish, and subsequently, the mako shark (Stillwell and Kohler 1982). Stillwell and Kohler (Stillwell and Kohler 1982) estimated that bluefish made up nearly 80% of the diet of Northeast shortfin mako shark, and an updated analysis by Wood et al. (Wood et al. 2009) found that bluefish remains the dominant prey item for shortfin mako shark, accounting for 92.6% of its diet by weight. Wood et al. (Wood et al. 2009) analyzed historical bluefish predation (1982–1997) and found that, although bluefish biomass levels were historically low, bluefish still represented a substantial proportion of the diet of shortfin mako shark (55.6% of its diet by number and 86.9% by volume). The population of shortfin mako shark may have been smaller at the time (there is little population data on the species), or there may have remained enough bluefish that the sharks were still able to feed exclusively on bluefish when they were available during the spring. Ecosystem modeling studies have shown that, because bluefish is a primary prey item for the mako shark, bluefish biomass levels are directly correlated with shortfin mako shark populations (Harford 2013). When fishing effort on bluefish is increased, shortfin mako shark populations appear to decrease. Although Wood et al. (Wood et al. 2009) suggested that shark predation may be a significant factor in reductions in bluefish biomass, Harford (Harford 2013) found that fluctuation in bluefish populations with increases in shark fishing effort was minimal. Model results found indications of bottom-up control between shortfin mako shark and bluefish, but top-down control of the shark on bluefish was not apparent. Therefore, bluefish clearly is an important ecosystem component for the survival of shortfin mako shark populations on the

Northeast coast. In addition, bluefish is known to be one of the top prey items for Northwestern Atlantic bluefin tuna and swordfish, making up 7% of prey by weight on average (Chase 2002) and 4% of prey by volume (Stillwell and Kohler 1985), respectively.

Bluefish as predator:

Bluefish is a voracious predator, and over 70 different species has been found in bluefish stomachs (MAFMC 1998). The East Coast bluefish population has been estimated to consume eight times its own biomass in prey in 1 year (Buckel et al. 1999a). Predation by bluefish is known to account for nearly all the young-of-the-year striped bass mortality in the Hudson River estuary system (Buckel et al. 1999b). Though the diets of spring and summer spawned bluefish may vary, the dominant prey item was found to be the bay anchovy, followed by long-finned squid, striped anchovy, butterfish, menhaden, round herring, amphipods, channeled whelk, and other invertebrates. Invertebrates dominated the diets of juvenile bluefish, while adult bluefish primarily consumed larger fish such as butterfish, squid, and herrings (Buckel et al. 1999a)(Buckel et al. 1999b). Bluefish predation on these species (except menhaden) was higher than the annual fisheries landings of the same species from 1984 to 1992. In 1999, bluefish predation on longfin squid was nearly five times the target yield (Buckel et al. 1999a).

Bluefish share prey resources with striped bass, weakfish, Spanish mackerel, spotted sea trout, and mackerels (Fay et al. 1983), as well as the common and roseate tern (Safina and Burger 1989). Bluefish abundance is thought to be inversely correlated with tern abundance, and Safina (Safina 1990) believed that bluefish could be considered an indicator species for tern population abundance.

Bluefish and striped bass:

Bluefish and striped bass have opposite trends in abundance: when bluefish is abundant and landed by commercial and recreational fisheries in great numbers, striped bass appears to be absent in the ecosystem and landings are extremely low. The opposite is true when striped bass is abundant. The relationship between the two fisheries, if any, has not been determined (MAFMC 1998). Studies comparing diets between the two have found little evidence to suggest an overlap in dietary preferences between juvenile striped bass and bluefish, because their prey items are primarily invertebrates or fish, respectively (Buckel and McKown 2002). But, further studies in adult fishes may yield different results, because striped bass is known to prey on more fish species as it matures.

By-catch in the bluefish fishery:

The main by-catch species caught in the bluefish fishery cannot be classified as exceptional species; therefore, there are no specific policies in place to protect the ecosystem function of such species.

Acknowledgements

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

Seafood Watch would like to thank five anonymous reviewers for graciously reviewing this report for scientific accuracy.

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Appendix A: Report Review and Update

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

The overall recommendation for bluefish caught in the U.S. gillnet was downgraded to Avoid. The overall recommendation for bluefish caught in the U.S. bottom trawl fishery remains a Good Alternative, while the overall recommendation for bluefish caught in the U.S. handline and hand-operated pole and line fishery remains a Best Choice.

The most recent bluefish stock assessment was reviewed and included in the assessment. The most recent stock assessment found the bluefish stock to be overfished, resulting in a downgrade in Factor 1.2 (abundance) from low concern to high concern.

The most recent stock status information was used to update answers for Factors 2.2 and 2.3 for North Atlantic right whale. This resulted in a downgrade for Factor 2.3 (fishing mortality) from moderate concern to high concern.

The most recent scientific information on the impact of bottom trawl fisheries on loggerhead turtle was reviewed and used to update Factor 2.3 (fishing mortality), resulting in an upgrade from moderate concern to very low concern.

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

Red criterion scores for Criteria 2 and 3 result in an overall rating of Avoid for the U.S. gillnet fishery for bluefish.