

Monterey Bay Aquarium Seafood Watch®

Winter skate

Leucoraja ocellata

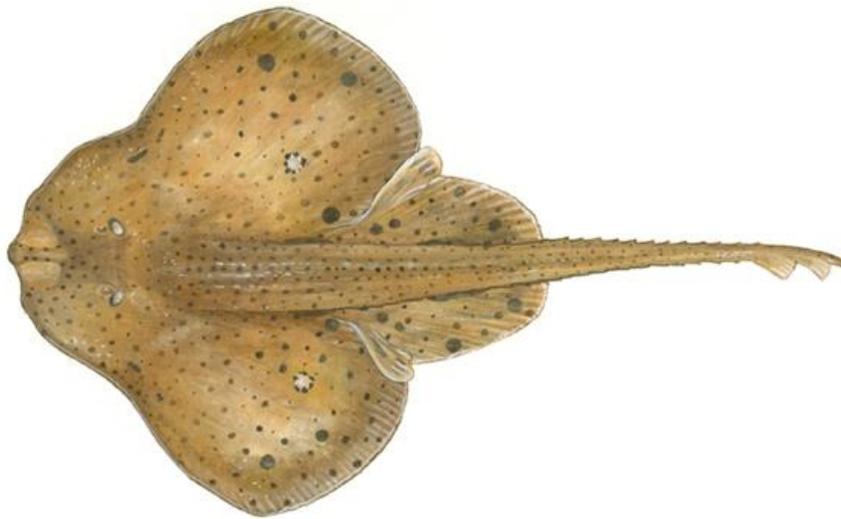


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US Atlantic

Bottom trawl and Sink gillnet

October 6, 2014

Stock status update March 2016

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About Seafood Watch®

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

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

Parties interested in capture fisheries, aquaculture practices and the sustainability of ocean ecosystems are welcome to use Seafood Reports in any way they find useful. For more information about Seafood Watch® and Seafood Reports, please contact the Seafood Watch® program at Monterey Bay Aquarium by calling 1-877-229-9990.

Guiding Principles

Seafood Watch defines sustainable seafood as originating from sources, whether fished¹ or farmed, that can maintain or increase production in the long-term without jeopardizing the structure or function of affected ecosystems.

Based on this principle, Seafood Watch had developed four sustainability **criteria** for evaluating wild-catch fisheries for consumers and businesses. These criteria are:

- How does fishing affect the species under assessment?
- How does the fishing affect other, target and non-target species?
- How effective is the fishery's management?
- How does the fishing affect habitats and the stability of the ecosystem?

Each criterion includes:

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

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

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

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

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

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

Summary

This report focuses on the winter skate (*Leucoraja ocellata*) wing bottom trawl and sink gillnet fishery in U.S. Atlantic waters. Along with winter skate, six other skate species make up the Northeast skate complex, but because only winter and thorny skates are consumed by humans and landing thorny skates is prohibited, this report only covers *L. ocellata*.

Winter skate is not overfished, but is limited by other benthic species' quotas, especially those of Atlantic cod, because winter skate wings are mostly landed as one of many species in the groundfish or Northeast multispecies fishery, and less so in the monkfish fishery. According to how overfishing is defined, it was not occurring on winter skate in FY 2014. But stock assessments and fishing mortality rates contain a moderate level of uncertainty because species are not reliably identified or reported.

Bottom trawl and sink gillnet fisheries in the Northeast and Mid-Atlantic Regions have some bycatch. The species listed in the table under Criterion 2 make up the lowest-scoring bycatch species in each fishery, so they drive the rankings for that criterion. The lowest-scoring species for the sink gillnet fishery are the North Atlantic right whale and Atlantic sturgeon. These species score very low due to their high inherent vulnerability and listings as endangered or threatened species. Several groundfish species, including Atlantic cod, limit the score in the bottom trawl fishery. Most of these stocks have high species inherent vulnerability, depleted stock status, and overfishing occurring.

Managers follow scientific advice and work is ongoing to minimize bycatch, particularly of species of special concern such as marine mammals and sea turtles. But this is complicated in multispecies fisheries such as those in which winter skates are landed, and the uncertainty in the skate stock assessment leads to the need for increased precaution.

Sink gillnets contact the bottom but have less impact on the seafloor compared to bottom trawls. In northern areas, there is some mitigation of trawl gear impacts, primarily by closed areas and spatial management, to reduce impacts.

Table of Conservation Concerns and Overall Recommendations

Stock / Fishery	Impacts on the Stock	Impacts on other Spp.	Management	Habitat and Ecosystem	Overall Recommendation
Winter skate United States Atlantic - Trawl, Bottom	Yellow (3.05)	Red (1.34)	Yellow (3.00)	Yellow (2.60)	Good Alternative (2.378)
Winter skate United States Atlantic - Gillnet, Bottom	Yellow (3.05)	Red (0.95)	Yellow (3.00)	Yellow (3.12)	Good Alternative (2.283)

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).

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Introduction

Scope of the analysis and ensuing recommendation

This report gives information and a recommendation for U.S. winter skate (*Leucoraja ocellata*). Most skate landings are from bottom trawls (82%) and sink gillnets (18%) in the Northeast and Mid-Atlantic regions (pers. comm., T. Curtis 2013); however, winter skate is primarily caught as bycatch in the Northeast multispecies groundfish fishery, and less so in the monkfish and sea scallop fisheries. The Northeast skate complex includes seven species of skate: winter, little (*Leucoraja erinacea*), barndoor (*Dipturus laevis*), clearnose (*Raja eglanteria*), rosette (*Leucoraja garmani*), smooth (*Malacoraja senta*), and thorny (*Amblyraja radiata*). Of these seven species, only winter and thorny skates (wings) are consumed by humans. Little skates are primarily used as bait. Clearnose and rosette skates may also be used for bait, but keeping barndoor, smooth, and thorny skates is prohibited.

Overview of the species and management bodies

Winter skate can live up to 21 years and matures at approximately age 12. It can grow up to 5 feet long. It is likely that female skates lay egg cases year-round. These cases are hard and leathery, and hatch after 6 to 12 months.

Winter skates are distributed mainly around Georges Bank and southern New England in the Northeast region. The New England Fishery Management Council developed a fishery management plan for skates after the first stock assessment was performed in 1999; the plan was implemented in 2003. The last stock assessment was conducted in 2012, and annual updates are provided, based on information collected in trawl surveys. Skate wings originate primarily from bottom trawls and sink gillnets, and are also caught to a lesser extent by scallop dredges, longlines, and trap gear.

Skates are often misidentified by species, so they are only reported as the skate complex. Winter skates are the only wings that are on the market, because the landing of thorny skates (the other species known to be consumed by humans) is prohibited. There has been mistaken reporting of wings from rosette, little, and smooth skates, which are too small to be winged. There are also skate species mistakenly reported from areas in which they do not occur.

Production Statistics

Skate landings declined in the 1970s, and only 800 metric tons (MT) were landed in 1981. Landings then increased, mostly in response to the increased demand for skate wing exports. In 2007, landings reached a high of 19,000 MT. Skates are landed in the U.S. relatively evenly in all months, with a slight increase in the summer due to increased demand for lobster bait. Most landings (85%–95%) are from Massachusetts (New Bedford) and Rhode Island (Point Judith).

Importance to the U.S./North American market

Most winter skate wings are exported, mainly to France, Korea, and Greece. There is a small fine dining U.S. market. Globally, winter skate wings originate only from the northeastern U.S. or Canada, but there are wings available from different species on the West Coast of the U.S. and in Europe.

Common and market names

The market name is winter skate wings. There are no other common or market names.

Primary product forms

Wings (skin on), fillets (skin off).

Assessment

This section assesses the sustainability of the fishery(s) relative to the Seafood Watch Criteria for Fisheries, available at <http://www.seafoodwatch.org>.

Criterion 1: Stock for which you want a recommendation

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

WINTER SKATE				
Region / Method	Inherent Vulnerability	Stock Status	Fishing Mortality	Subscore
United States Atlantic Gillnet, Bottom	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.053)
United States Atlantic Trawl, Bottom	1.00:High	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.053)

Criterion 1 Assessment

WINTER SKATE

Factor 1.1 - Inherent Vulnerability

Scoring Guidelines

- *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 it 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.*

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Winter skate has high vulnerability (FishBase score of 62) (FishBase 2013). Winter skate is a moderately long-lived species reaching a maximum age of 21 years (FishBase 2013) and has a low fecundity, laying a small number of egg cases on the seabed each year.

Factor 1.2 - Stock Status

Scoring Guidelines

- *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.*

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

The 2015 update to the skate stock assessment indicates that the winter skate average biomass index (5.06 kg/tow) is above the biomass threshold reference point of 2.83 kg/tow, but below the B_{MSY} proxy (5.66 kg/tow) (Sosebee 2015). Hence, winter skate is not overfished, but is currently below B_{MSY} . Due to this, abundance is scored as “low” concern.

Rationale:

Biomass reference points are based entirely on NEFSC survey data because reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (Brown et al. 2013).

Factor 1.3 - Fishing Mortality*Scoring Guidelines*

- *5 (Very Low Concern)—Highly likely that fishing mortality is below a sustainable level (e.g., below fishing mortality at maximum sustainable yield, F_{MSY}), OR fishery does not target species and its contribution to the mortality of species is negligible ($\leq 5\%$ 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.*

United States Atlantic, Gillnet, Bottom**United States Atlantic, Trawl, Bottom****Moderate Concern**

The 2015 update to the skate stock assessment indicates that the 2012–2014 NEFSC autumn average biomass index for winter skate is above the 2011–2013 index by 2% (Sosebee 2015). We have scored fishing mortality of the stock as “moderate” concern, because there is uncertainty in the biomass assessment (based on the 3-year average survey biomass), resulting in unknown fishing mortality relative to fishing at maximum sustainable yield (F_{MSY}).

Rationale:

The fishing mortality reference points for skates are based on changes in survey biomass indices. If the 3-year moving average of the survey biomass index for a skate species declines by more than the average coefficient of variation (CV) of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species (Sosebee 2015).

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 Critical.

Criterion 2 Summary

Only the lowest-scoring main species is/are listed in the table and text in this Criterion 2 section; a full list and assessment of the main species can be found in Appendix B.

Winter skate: United States Atlantic, Gillnet, Bottom				
Subscore::	1.000	Discard Rate:	0.95	C2 Rate: 0.950
Species	Inherent Vulnerability	Stock Status	Fishing Mortality	Subscore
ATLANTIC STURGEON	High	1.00: Very High Concern	1.00: High Concern	1.000
NORTH ATLANTIC RIGHT WHALE	High	1.00: Very High Concern	1.00: High Concern	1.000
ATLANTIC COD: GEORGES BANK	High	2.00: High Concern	1.00: High Concern	1.414
ATLANTIC COD: GULF OF MAINE	High	2.00: High Concern	1.00: High Concern	1.414
HUMPBACK WHALE	High	2.00: High Concern	1.00: High Concern	1.414
WINDOWPANE FLOUNDER: GULF OF MAINE / GEORGES BANK	Medium	2.00: High Concern	1.00: High Concern	1.414
WINTER FLOUNDER: GEORGES BANK	Low	2.00: High Concern	1.00: High Concern	1.414
WITCH FLOUNDER	High	2.00: High Concern	1.00: High Concern	1.414
YELLOWTAIL FLOUNDER: CAPE COD/ GULF OF MAINE	Medium	2.00: High Concern	1.00: High Concern	1.414

YELLOWTAIL FLOUNDER: GEORGES BANK	Medium	2.00: High Concern	1.00: High Concern	1.414
YELLOWTAIL FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Medium	2.00: High Concern	1.00: High Concern	1.414
FIN WHALE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
GREEN SEA TURTLE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
KEMP'S RIDLEY TURTLE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
LEATHERBACK TURTLE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
LOGGERHEAD TURTLE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
THORNY SKATE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
ATLANTIC HALIBUT	High	2.00: High Concern	2.33: Moderate Concern	2.159
HARBOR PORPOISE: GULF OF MAINE/BAY OF FUNDY	High	2.00: High Concern	2.33: Moderate Concern	2.159
WINTER FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Low	2.00: High Concern	2.33: Moderate Concern	2.159
ATLANTIC BLACKTIP SHARK: ATLANTIC LARGE COASTAL SHARK COMPLEX	High	2.00: High Concern	3.67: Low Concern	2.709
ATLANTIC WOLFFISH	High	2.00: High Concern	3.67: Low Concern	2.709
BARNDOR SKATE	High	4.00: Low Concern	2.33: Moderate Concern	3.053
ROSETTE SKATE	Medium	4.00: Low Concern	2.33: Moderate Concern	3.053
SMOOTH SKATE	Medium	4.00: Low Concern	2.33: Moderate Concern	3.053

WINTER SKATE	High	4.00: Low Concern	2.33: Moderate Concern	3.053
BULL SHARK: ATLANTIC LARGE COASTAL SHARK COMPLEX	High	2.00: High Concern	5.00: Very Low Concern	3.162
PILOT WHALE, LONG-FINNED: WESTERN NORTH ATLANTIC	High	2.00: High Concern	5.00: Very Low Concern	3.162
WINTER FLOUNDER: GULF OF MAINE	Low	3.00: Moderate Concern	3.67: Low Concern	3.318
CLEARNOSE SKATE	High	5.00: Very Low Concern	2.33: Moderate Concern	3.413
LITTLE SKATE	Medium	5.00: Very Low Concern	2.33: Moderate Concern	3.413
MONKFISH	High	4.00: Low Concern	3.67: Low Concern	3.831
WINDOWPANE FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Medium	4.00: Low Concern	3.67: Low Concern	3.831
ATLANTIC POLLOCK: GULF OF MAINE / GEORGES BANK	High	5.00: Very Low Concern	3.67: Low Concern	4.284
WHITE HAKE: GULF OF MAINE / GEORGES BANK	High	4.00: Low Concern	5.00: Very Low Concern	4.472
HADDOCK: GEORGES BANK	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000
HADDOCK: GULF OF MAINE	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000
SPINY DOGFISH: NORTHWEST ATLANTIC	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000

Winter skate: United States Atlantic, Trawl, Bottom

Subscore:: 1.414 Discard Rate: 0.95 C2 Rate: 1.343

Species	Inherent Vulnerability	Stock Status	Fishing Mortality	Subscore
ATLANTIC COD: GEORGES BANK	High	2.00: High Concern	1.00: High Concern	1.414
ATLANTIC COD: GULF OF MAINE	High	2.00: High Concern	1.00: High Concern	1.414
WINDOWPANE FLOUNDER: GULF OF MAINE / GEORGES BANK	Medium	2.00: High Concern	1.00: High Concern	1.414
WINTER FLOUNDER: GEORGES BANK	Low	2.00: High Concern	1.00: High Concern	1.414

WITCH FLOUNDER	High	2.00: High Concern	1.00: High Concern	1.414
YELLOWTAIL FLOUNDER: CAPE COD/ GULF OF MAINE	Medium	2.00: High Concern	1.00: High Concern	1.414
YELLOWTAIL FLOUNDER: GEORGES BANK	Medium	2.00: High Concern	1.00: High Concern	1.414
YELLOWTAIL FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Medium	2.00: High Concern	1.00: High Concern	1.414
ATLANTIC STURGEON	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
THORNY SKATE	High	1.00: Very High Concern	2.33: Moderate Concern	1.526
ATLANTIC HALIBUT	High	2.00: High Concern	2.33: Moderate Concern	2.159
OCEAN POUT: NORTHWESTERN ATLANTIC COAST	High	2.00: High Concern	2.33: Moderate Concern	2.159
WINTER FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Low	2.00: High Concern	2.33: Moderate Concern	2.159
ATLANTIC WHITE-SIDED DOLPHIN: WESTERN NORTH ATLANTIC	High	2.00: High Concern	3.67: Low Concern	2.709
PILOT WHALE, LONG-FINNED: WESTERN NORTH ATLANTIC	High	2.00: High Concern	3.67: Low Concern	2.709
BARNDOR SKATE	High	4.00: Low Concern	2.33: Moderate Concern	3.053
ROSETTE SKATE	Medium	4.00: Low Concern	2.33: Moderate Concern	3.053
SMOOTH SKATE	Medium	4.00: Low Concern	2.33: Moderate Concern	3.053
WINTER SKATE	High	4.00: Low Concern	2.33: Moderate Concern	3.053
SHORT-BEAKED COMMON DOLPHIN: WESTERN NORTH ATLANTIC	High	2.00: High Concern	5.00: Very Low Concern	3.162
WINTER FLOUNDER: GULF OF MAINE	Low	3.00: Moderate Concern	3.67: Low Concern	3.318

CLEARNOSE SKATE	High	5.00: Very Low Concern	2.33: Moderate Concern	3.413
LITTLE SKATE	Medium	5.00: Very Low Concern	2.33: Moderate Concern	3.413
WINDOWPANE FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC	Medium	4.00: Low Concern	3.67: Low Concern	3.831
AMERICAN PLAICE: GULF OF MAINE/ GEORGES BANK	High	4.00: Low Concern	5.00: Very Low Concern	4.472
SILVER HAKE	Medium	4.00: Low Concern	5.00: Very Low Concern	4.472
HADDOCK: GEORGES BANK	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000
HADDOCK: GULF OF MAINE	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000
SCUP	Medium	5.00: Very Low Concern	5.00: Very Low Concern	5.000
SPINY DOGFISH: NORTHWEST ATLANTIC	High	5.00: Very Low Concern	5.00: Very Low Concern	5.000

For Criterion 2, a species was included and assessed if it made up > 5% of the catch of the gillnet or trawl fisheries in the U.S. northeast and Mid-Atlantic regions, because these are the fisheries that land 5% or more of total U.S. winter skate landings. A species was also included if it was overfished, depleted, a stock of concern, endangered, threatened, IUCN Near Threatened, U.S. MMPA strategic species, and/or subject to overfishing *and* if winter skate fisheries caused (or could have caused) > 1% of the species' total mortality across all fisheries. In order to determine catch percentages, an analysis of NOAA landings data for fisheries landing winter skate was conducted.

Criterion 2 Assessment

ATLANTIC COD: GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Atlantic cod has a high to very high vulnerability (71 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The most recent assessment of Georges Bank cod was the Stock Assessment Review Committee (SARC) 55 assessment in 2012 (released in January 2013), which indicated $SSB_{2011} = 13,216$ MT. This is the equivalent of 7% of SSB_{MSY} , which is 186,535 MT. The stock was therefore overfished (NEFSC 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Overfishing is occurring on Georges Bank Atlantic cod. $F_{2011} = 0.43$, more than 2 times F_{MSY} (0.18) (NEFSC 2013).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC COD: GULF OF MAINE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Atlantic cod has a high to very high vulnerability (71 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The most recent assessment of Gulf of Maine cod was the SARC 55 assessment in 2012 (released in January 2013), which indicated $SSB_{2011} = 9,903$ MT or 10,221 MT. This is the equivalent of 18% or 13% of SSB_{MSY} proxy, which is 54,743 MT or 80,200 MT. The stock was therefore overfished (NEFMC 2013).

Rationale:

In this stock assessment (NEFMC 2013), two population assessment models were used: $M = 0.2$ and M-ramp, which is why there are two SSB estimates. In the $M = 0.2$ model, natural mortality (M) was assumed to be 0.2 for all years. In the M-ramp model, M was assumed to be 0.2 from 1982 to 1988 and 0.4 between 2003 and 2011, with a linear ramp between 1989 and 2002 (NEMFC 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Overfishing is occurring on Gulf of Maine Atlantic cod. $F_{2011} = 0.86$ or 0.90, roughly equivalent to four or five times the F_{MSY} proxy of 0.18 (NEFSC 2013).

Rationale:

In this stock assessment (NEFMC 2013), two population assessment models were used: $M = 0.2$ and M-ramp, which is why there are two SSB estimates. In the $M = 0.2$ model, natural mortality (M) was assumed to be 0.2 for all years. In the M-ramp model, M was assumed to be 0.2 from 1982 to 1988 and 0.4 between 2003 and 2011, with a linear ramp between 1989 and 2002 (NEMFC 2013).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC STURGEON**Factor 2.1 - Inherent Vulnerability**

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very High Concern

There are five distinct population segments (DPS) of Atlantic sturgeon in the U.S. In 2012, all except the Gulf of Maine segment were listed as endangered by the Endangered Species Act (ASMFC 2012). The Gulf of Maine segment, which overlaps with the winter skate fishery, was listed as threatened (ASMFC 2012).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

High Concern

A variety of threats including directed harvest, commercial fisheries bycatch, and habitat destruction have contributed to the dramatic declines in Atlantic sturgeon populations since the mid-1800s (Atlantic Sturgeon Status Review Team (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 (ASMFC 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, found commercial fisheries bycatch to be a significant threat in each DPS (Atlantic Sturgeon Status Review Team (ASSRT) 2007). In 2012, four of the segments were listed as endangered, while the Gulf of Maine segment was listed as threatened. Bottom gillnet fisheries were found to have the greatest impact, while trawl gear used to fish in the northern part of the range is not a high concern for Atlantic sturgeon (Atlantic Sturgeon Status Review Team (ASSRT) 2007). Several fisheries in the region contribute to Atlantic sturgeon bycatch, but sturgeon caught in the bottom gillnet fishery suffer some of the highest mortality rates.

The effectiveness of management measures to reduce Atlantic sturgeon bycatch is unknown, because these measures are in continuous development, but they are also currently used to address marine mammal bycatch. Methods for reducing sturgeon bycatch 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.

United States Atlantic, Trawl, Bottom

Moderate Concern

A variety of threats including directed harvest, commercial fisheries bycatch, and habitat destruction have contributed to the dramatic declines in Atlantic sturgeon populations since the mid-1800s (Atlantic Sturgeon Status Review Team (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 (ASMFC 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, found commercial fisheries bycatch to be a significant threat in each DPS (Atlantic Sturgeon Status Review Team (ASSRT) 2007). In 2012, four of the segments were listed as endangered, while the Gulf of Maine segment was listed as threatened. Bottom gillnet fisheries were found to have the greatest impact, while trawl gear used to fish in the northern part of the range is not a high concern for Atlantic sturgeon (Atlantic Sturgeon Status Review Team (ASSRT) 2007). According to the ASSRT (2007), "(M)ortality of Atlantic sturgeon captured by trawls seems to be low, with most surveys reporting 0% mortality... Overall, trawls do not seem to pose a significant threat to Atlantic sturgeon." Though many surveys reported 0% mortality, records of sturgeon being caught in trawls do exist; and, because there is no evidence to demonstrate that these impacts are sustainable, Seafood Watch considers the impact of trawls on Atlantic sturgeon to be a "moderate" conservation concern.

The effectiveness of management measures to reduce Atlantic sturgeon bycatch is unknown, because these measures are in continuous development, but they are also currently used to address marine mammal bycatch. Methods for reducing sturgeon bycatch 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.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries

characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

NORTH ATLANTIC RIGHT WHALE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

North Atlantic right whales are listed as endangered by the IUCN (IUCN 2013) and the U.S. Endangered Species Act (NOAA Fisheries 2013). This is a strategic MMPA stock because annual human-induced mortality exceeds the PBR.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

High Concern

The estimated human-induced mortality from fishing gear entanglements on this stock is no less than three animals per year; however, the gear cannot be differentiated (NOAA 2012). The Northeast sink gillnet fishery is one of the fisheries to interact with this stock and is responsible for some of the entanglements. The PBR for this stock is 0.9 (NOAA 2012).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WINDOWPANE FLOUNDER: GULF OF MAINE/GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Windowpane flounder has a medium inherent vulnerability (43 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Windowpane flounder is overfished. The most recent assessment of northern windowpane flounder was published in 2012, and it indicated B_{2010} index proxy = 0.46 kg/tow and B_{MSY} index proxy = 1.6 kg/tow. The result of this assessment was that northern windowpane flounder was considered overfished with $B_{2010}/B_{MSY} = 0.29$ (NEFSC 2012). No stock structure information (i.e., age and sex structure of the stock) is available for either stock of windowpane flounder, and neither has ever been

assessed as part of the SAW/SARC (Stock Assessment Review Committee) process; instead, the 2008 Groundfish Assessment Review Meeting (GARM III), which is similar to the SAW/SARC, included an index-based assessment of the stock (NEFSC 2012). The median of the NEFSC fall survey biomass indices between 1975 and 1987 was selected as a B_{MSY} proxy based on trends in relative fishing mortality rates and NEFSC fall survey biomass indices (NEFSC 2008b).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Overfishing is occurring on windowpane flounder. Because the Northeast bottom trawl and sink gillnet fisheries target groundfish, these fisheries are substantial contributors to windowpane flounder mortality. The most recent assessment of northern windowpane flounder indicated F_{2010} proxy = 0.51 and F_{MSY} proxy = 0.44, so $F_{2010}/F_{MSY} = 1.16$, and overfishing was therefore occurring (NEFSC 2012). Northern windowpane flounder is currently in year 2 of a 7-year rebuilding plan (NMFS 2013). As of October 2011, NMFS prohibits possession of any windowpane flounder, so there is effectively no targeted fishery for northern windowpane. Because this stock is overfished and overfishing is occurring, but some management actions that are believed to be effective are in place to reduce or constrain fishing mortality, Seafood Watch considers the fishing mortality of this stock a “high” concern.

Rationale:

MSY was assumed to be 1,000 MT because landings greater than this amount appeared to cause declines in the biomass indices, and the F_{MSY} proxy was calculated from the assumed MSY and B_{MSY} values. The relative F value was computed as catch in 2007 divided by the average of NEFSC fall survey relative biomass indices during 2005–2007 (NEFSC 2008b).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WINDOWPANE FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

Medium

Windowpane flounder has a medium inherent vulnerability (43 out of 100) (FishBase 2013).

United States Atlantic, Trawl, Bottom

Medium

Windowpane flounder has a medium inherent vulnerability (43 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

The most recent assessment of southern windowpane flounder was published in 2012, which indicated B_{2010} proxy = 0.35 kg/tow and B_{MSY} proxy = 0.24 kg/tow. As a result of that assessment, southern windowpane flounder was considered not overfished with $B_{2010}/B_{MSY} = 1.46$, and therefore rebuilt (NEFSC 2012). Southern windowpane flounder is classified as not overfished, but a thorough quantitative assessment is still lacking.

Rationale:

No stock structure information (i.e., age and sex structure of stock) is available for either stock of windowpane flounder, and neither has ever been assessed as part of the SAW/SARC process, although the GARM III included an index-based assessment of the stock (NEFSC 2012). The median of the NEFSC fall survey biomass indices between 1975 and 1987 was selected as a B_{MSY} proxy based on trends in relative fishing mortality rates and NEFSC fall survey biomass indices (NEFSC 2008b).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

The most recent assessment of southern windowpane flounder indicated F_{2010} proxy = 1.4 and F_{MSY} proxy = 2.09, so $F_{2010}/F_{MSY} = 0.670$, and overfishing was therefore not occurring (NEFSC 2012). Southern windowpane flounder is currently in year 8 of a 10-year rebuilding plan (NMFS 2013). As of October 2011, NMFS prohibits possession of any windowpane flounder, so there is effectively no targeted fishery for southern windowpane. Although fishing mortality is below 75% of F_{MSY} , and the stock is considered rebuilt, these figures are nonetheless based on proxy reference points rather than fully calculated reference points. Fishing mortality is considered a “low” concern.

Rationale:

The SNE/MAB stock appeared to be able to sustain itself at the catch levels occurring during 1995–2001, so MSY was assumed to be the median catch during this period, or 500 MT, and the F_{MSY} proxy was calculated from the assumed MSY and B_{MSY} values (NEFSC 2012).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%
Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WINTER FLOUNDER: GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom
United States Atlantic, Trawl, Bottom

Low

Winter flounder has a low inherent vulnerability (34 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom
United States Atlantic, Trawl, Bottom

High Concern

The observed estimated spawning stock biomass (SSB) in 2014 was 5,275 MT, which is 79% of the biomass target for an overfished stock ($SSB_{MSY} = 6,700$, with a threshold of 50% of SSB_{MSY}) (NEFSC 2015d). But when the observed abundance is corrected for retrospective error, an abundance estimate of 2,883 MT is found. This is 43% of SSB_{MSY} , so the stock is in an overfished condition (NEFSC 2015d). Seafood Watch considers stock abundance to be a “high” conservation concern for Georges Bank winter flounder.

Rationale:

The latest assessment of the Georges Bank winter flounder stock found that the 2014 SSB estimate, when adjusted for retrospective error (83% for SSB), is outside the 90% confidence interval of the unadjusted 2014 point estimate (NEFSC 2015d). Therefore, the 2014 SSB value used in the stock status determination was the retrospective-adjusted value of 2,883 MT (NEFSC 2015d), which is 43% of

the biomass target ($SSB_{MSY} = 6,700$) for an overfished stock. Therefore, the stock is considered to be overfished. As of December 31, 2015, NMFS listed Georges Bank winter flounder as “overfished” and rebuilding, in year 6 of a 7-year plan (NMFS 2015c). “Short-term projections of biomass were derived by sampling from a cumulative distribution function of recruitment estimates (1982–2013 YC) from the final run of the ADAPT VPA model. The annual fishery selectivity, maturity ogive, and mean weights-at-age used in the projection are the most recent 5-year averages (2010-2014). An SSB retrospective adjustment factor of 0.546 was applied in the projections” (NEFSC 2015d).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The 2014 F point estimate, when adjusted for retrospective error (–51%), is outside the 90% confidence interval of the unadjusted 2014 point estimate (NEFSC 2015d). Thus, the value used in the stock status determination was the adjusted value of $F = 0.778$, which is 145% of the overfishing threshold ($F_{MSY} = 0.536$) and therefore suggests that the stock is currently undergoing overfishing. Fishing mortality is scored as “high” concern (NEFSC 2015d).

Rationale:

The observed 2014 fully selected fishing mortality (F; fully selected ages (ages 4–6)) was estimated to be 0.379, which is 71% of the overfishing threshold ($F_{MSY} = 0.536$) (NEFSC 2015d).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries

characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WINTER FLOUNDER: GULF OF MAINE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low

Winter flounder has a low inherent vulnerability (34 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

Based on the most recent assessment of Gulf of Maine winter flounder in 2015, the stock biomass of fish larger than 30 cm is $B_{2014} = 4,655$ MT (NEFSC 2015g). But the Stock Assessment Review Committee (SARC) rejected the analytical model, and a biomass reference point could not be estimated, leaving the stock status unknown (NEFSC 2011) (NEFSC 2015g). As of December 31, 2015, NMFS listed Gulf of Maine winter flounder as not undergoing overfishing (NMFS 2015c). Due to the unknown stock status, we have scored abundance as “moderate” concern.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

The most recent assessment of Gulf of Maine winter flounder in 2015 indicated that the exploitation rate in 2014 was 0.06, which is 26% of the overfishing exploitation threshold proxy (E_{MSY} proxy = 0.23) (NEFSC 2015g) (NMFS 2015c). As of December 31, 2015, NMFS listed Gulf of Maine winter flounder as having an “unknown” fishing mortality (NMFS 2015c). Even though it is highly likely that fishing mortality is at or below a sustainable level and will not reduce stock productivity, a score of “low” concern has been chosen due to the NMFS listing.

Rationale:

A proxy value of the overfishing threshold was derived from a length-based yield per recruit analysis that assumes all fish above 30 cm are fully recruited to the fishery and that natural mortality is 0.3.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WINTER FLOUNDER: SOUTHERN NEW ENGLAND / MID-ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low

Winter flounder has a low inherent vulnerability (34 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The 2015 assessment of the Southern New England/Mid-Atlantic winter flounder stock estimated the 2014 spawning stock biomass (SSB) to be 6,151 MT, which is 23% of the biomass target (26,928 MT), and 46% of the biomass threshold for an overfished stock ($SSB_{\text{THRESHOLD}} = 13,464$ MT) (NEFSC 2015c). Since the stock is considered overfished, a score of “high” concern was awarded.

Rationale:

The Southern New England/Mid-Atlantic winter flounder stock is in year 3 of a 10-year rebuilding plan (NMFS 2015c).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2015 assessment of Southern New England/Mid-Atlantic winter flounder stock estimated fishing mortality (F) to be 0.16, which is 49% of the overfishing threshold ($F_{\text{MSY}} = 0.325$). Since 1981, SNE/MA recruitment has been declining; 2013 is the lowest in the time series, which is approximately 4% of the

estimated recruitment in 1981 (the highest in the time series). Although the 2014 SNE/MA recruitment estimate increased slightly, the overall stock productivity continues to decline. The stock was in a 10-year rebuilding plan, but did not meet its rebuilding target in 2014, in part due to low recruitment. In 2014, NOAA Fisheries partially implemented Framework Adjustment 50 to revise the rebuilding end date to 2023. It is possible that, although fishing mortality is below MSY, it may be above the level that will allow recovery under current environmental conditions. The stock remains vulnerable to heavy fishing pressure and habitat degradation, and has low genetic variability, which hinders its recovery (NEFSC 2015c). Since fishing mortality is below F_{MSY} , but recovery of the stock has not yet been achieved, we consider fishing mortality to be a “moderate” concern.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WITCH FLOUNDER

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Witch flounder (grey sole) has a high inherent vulnerability (68 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Witch flounder is overfished. The most recent assessment of witch flounder was published in 2012, and it indicated $SSB_{2010} = 4,099$ MT and $SSB_{MSY} = 10,051$ MT, so the stock was considered overfished with $B_{2010}/B_{MSY} = 0.408$ (NEFSC 2012).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The most recent assessment of witch flounder indicated $F_{2010} = 0.47$ and $F_{MSY} = 0.27$, so $F_{2010}/F_{MSY} = 1.74$, so overfishing was occurring (NEFSC 2012). But Amendment 16 to the NE Multispecies FMP, published in the U.S. Federal Register in 2010, is expected to rebuild the stock within a reasonable timeframe. Witch flounder is overfished and overfishing is occurring, but some management actions that are believed to be effective are in place to reduce or constrain fishing mortality. It is rated as “high” concern.

Rationale:

Amendment 16 to the NE Multispecies FMP will adopt a broad suite of management measures to achieve fishing mortality targets. Specific to witch flounder, a rebuilding plan has been proposed that would have a 75% likelihood of rebuilding the stock by 2015. To accomplish the reduction in fishing mortality, the amendment will expand the use of sectors that have their catch limited by a quota and will implement Accountability Measures (AMs) to prevent overfishing. In particular, these AMs include differential days-at-sea (DAS) counting to correct for over- or under-harvesting, and a transition in 2012 from an effort-control fishery to one managed through hard TACs (total allowable catch). In addition, this amendment will implement new requirements for establishing Allowable Biological Catch (ABC), annual catch limits (ACLs), and AMs for the stocks managed under the FMP (NMFS 2010b).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discards to landings ratio in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

YELLOWTAIL FLOUNDER: CAPE COD/ GULF OF MAINE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Yellowtail flounder has a medium inherent vulnerability (37 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The 2015 update on the yellowtail flounder stock assessment for Cape Cod-Gulf of Maine indicates that the 2014 spawning stock biomass (SSB) was estimated to be 1,695 MT, which is 32% of the biomass

target for an overfished stock (SSB_{MSY} proxy = 5,259). Since this stock is overfished, abundance is scored as “high” concern (NEFSC 2015e).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Based on the 2015 stock status update for the Cape Cod-Gulf of Maine yellowtail flounder stock, the 2014 fishing mortality (average for ages 4–5) was estimated to be 0.35, which is 125% of the overfishing threshold proxy (F_{MSY} proxy = 0.28) (NEFMC 2015). Since the stock is currently undergoing overfishing, fishing mortality is rated as high concern.

Rationale:

Fishing mortality had been declining since 2004 and was at its lowest point in the time series (NEFMC 2015). The stock is currently in year 11 of its 19-year rebuilding plan (end date of 2023) (NMFS 2015c). Management actions that appear to be effective are in place to reduce or constrain fishery mortality, but the stock is overfished and overfishing is occurring.

Amendment 16 to the NE Multispecies FMP adopted a broad suite of management measures to achieve fishing mortality targets. To accomplish the reduction in fishing mortality, the amendment expanded the use of sectors that have their catch limited by a quota and implemented accountability measures (AMs) to prevent overfishing. In particular, these AMs include differential DAS counting to correct for over- or under-harvesting, and a transition in 2012 from an effort-control fishery to one managed through hard TACs. In addition, this amendment implemented new requirements for establishing ABC, ACLs, and AMs for the stocks managed under the FMP (NMFS 2010a).

Framework 53 (FW53) is intended to incorporate status changes for groundfish stocks, set specifications for several groundfish stocks, and adjust management measures for commercial and recreational fisheries that catch groundfish stocks. This framework incorporates the results of new stock assessments into the setting of specifications, including catch limits for the U.S./Canada Resource Sharing Understanding and the distribution of ACLs to various components of the fishery (NEFMC 2015).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

YELLOWTAIL FLOUNDER: GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Yellowtail flounder has a medium inherent vulnerability (37 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The 2015 assessment of Georges Bank (GB) yellowtail flounder did not use a stock assessment model framework and therefore cannot make historical estimates of biomass. In addition, no reference points are defined, so status determination relative to reference points is not possible (TRAC 2015). But the 2014 survey biomass levels are similar to those observed in the mid-1990s when the stock was declared

collapsed (Stone et al. 2004), which indicates that GB yellowtail flounder is in a poor state. Recent catch is low relative to the estimated biomass, but catch curve analyses indicate high total mortality rates (TRAC 2015). Due to this, we have scored abundance as a “high” concern.

Rationale:

During the 2014 GB yellowtail flounder assessment, the TRAC agreed to discontinue use of the VPA assessment model and instead to use an empirical approach, based on resource survey catches, as the basis of catch advice.

In 2015, NEFMC wrote a proposal for consideration by NMFS to revise the configuration of the closed areas on Georges Bank to protect habitat and spawning fish. Whether these management measures, if implemented, would affect yellowtail flounder stock dynamics is unknown.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The 2015 assessment of Georges Bank (GB) yellowtail flounder did not use a stock assessment model framework and therefore cannot make historical estimates of fishing mortality rates. In addition, no reference points are defined, so status determination relative to reference points is not possible (TRAC 2015). Although recent catch is low relative to the estimated biomass, catch curve analyses indicate high total mortality rates (TRAC 2015). Due to the lack of reference points and high mortality, GB yellowtail flounder fishing mortality is considered “high” concern.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

YELLOWTAIL FLOUNDER: SOUTHERN NEW ENGLAND/MID-ATLANTIC**Factor 2.1 - Inherent Vulnerability**

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Yellowtail flounder has a “medium” inherent vulnerability (37 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Based on the 2015 updated yellowtail flounder stock assessment for the Southern New England/Mid-Atlantic, spawning stock biomass (SSB) in 2014 was estimated to be 502 MT, which is 26% of the biomass target for an overfished stock (SSB_{MSY} proxy = 1,959) (NEFSC 2015f). Because the stock is overfished, we have scored abundance as “high” concern.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

Based on the 2015 update to the Southern New England/Mid-Atlantic yellowtail flounder stock assessment, the 2014 fully selected fishing mortality was estimated to be 1.64, which is 469% of the overfishing threshold proxy (F_{MSY} proxy = 0.35) (NEFSC 2015f). Thus, fishing mortality is of “high” concern.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

Criterion 3: Management effectiveness

Management is separated into management of retained species (harvest strategy) and management of non-retained 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 or either the Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern = 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

Region / Method	Management of Retained Species	Management of Non-Retained Species	Overall Recommendation
United States Atlantic Gillnet, Bottom	3.000	3.000	Yellow(3.000)
United States Atlantic Trawl, Bottom	3.000	3.000	Yellow(3.000)

Factor 3.1: Harvest Strategy

Scoring Guidelines

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.

Factor 3.1 Summary

Factor 3.1: Management of fishing impacts on retained species							
Region / Method	Strategy	Recovery	Research	Advice	Enforce	Track	Inclusion
United States Atlantic Gillnet, Bottom	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective
United States Atlantic Trawl, Bottom	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective	Highly Effective	Moderately Effective	Highly Effective

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.

United States Atlantic, Gillnet, Bottom
United States Atlantic, Trawl, Bottom

Moderately Effective

The New England Fishery Management Council (NEFMC) manages the northeast skate complex under a fishery management plan (FMP) that has been in effect since 2003. This FMP prohibits possession of thorny, smooth, and barndoor skates due to their poor stock statuses; provides annual catch limits (ACLs) for skate wings and the bait fishery; requires reporting; and provides mechanisms for monitoring and enforcing these fisheries. The 2012–2013 update made changes to the allowable biological catch (ABC), the ACL, the annual catch target (ACT), and the total allowable landings (TAL). The ACT is set at 37,826 MT, which means the TAL is 24,088 MT after deducting the discard rate to account for bycatch results. The skate wing TAL is 66.5% of the entire complex’s TAL, which equates to 15,538 MT. As of January 2014, the NEFMC was in the process of developing Framework 2, which includes an updated ABC, ACL, ACT, and TAL based on the most recent science, and the updated ABC will likely be significantly lower than the 2012–2013 ABC (pers. comm., T. Curtis 2013). The directed fishery for skates is the bottom trawl fishery, but they are also incidentally caught with sink gillnets and scallop dredges. Winter skate wings are mostly landed as part of the multispecies groundfish fishery and less so by monkfish and limited access general category scallop vessels. Skates can be misidentified, but estimates from data taken from 2005–2010 show that the prohibitions on possession of thorny, barndoor, and

smooth skates are 98% effective and that mislabeling is not a large problem in U.S. ports (even though reliable landing information by skate species is not available). Enforcement agents are trained to correct mislabeled skate products (Federal Register 2011). Vessels fishing for winter skate wings must have a federally issued skate permit. They may also have a permit to fish for either Atlantic sea scallops, northeast multispecies, or monkfish; or be a limited-access multispecies vessel that fishes as part of an approved sector (Federal Register 2010). Depending on which permits they have, their possession limits differ. When 85% of the TAL for skate wings has been landed, the possession limit for all of these vessels is reduced to the incidental limit of 500 lb of wings, or 1,135 lb whole weight for the remainder of the fishing year, provided this does not prevent the total TAL from being landed. To help the thorny skate stock recover and assure that the other skate stocks maintain healthy biomass levels, the skate FMP focuses on controlling landings by prohibiting thorny skates from being retained and reducing catches of winter skate (NEFMC 2007). Additionally, the sea scallop, monkfish, and groundfish FMPs have the potential to impact the skate fishery because all of these fisheries spatially overlap with the skate fishery, and have relatively high levels of incidental catch of skates (NEFMC 2009b). All adjustments to these FMPs have focused on reducing overall fishing effort, so they cumulatively have likely had a positive effect on skate abundance. This factor is rated as “moderately effective.”

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderately Effective

Winter skate is not a stock of concern, but as noted above, it is mostly caught as an incidental species in the Northeast groundfish fishery, which also targets several species that are overfished and/or experiencing overfishing. Additionally, winter skate is only one of seven skate species in the Northeast skate complex. Thorny skate, which is included in the skate complex, is overfished and experiencing overfishing. Because the primary goal of the Magnuson-Stevens Act is to provide for the conservation and management of fisheries, the act prohibits overfishing and it mandates the development and implementation of rebuilding plans for overfished stocks. Rebuilding plans are required to be as short as possible, generally not to exceed 10 years, and take into account the status and biology of the stock, the needs of fishing communities, the interaction of the stock within the marine ecosystem, other environmental factors, and international agreements in which the United States participates (MSA §

304(e)(4) (NMFS 2010b). To help the thorny skate stock recover and assure that the other skate stocks maintain healthy biomass levels, the skate FMP focuses on controlling landings by prohibiting thorny skates from being retained and by reducing catches of winter skate (NEFMC 2007). Additionally, the sea scallop, monkfish, and groundfish FMPs have the potential to affect the skate fishery because these fisheries spatially overlap the skate fishery and have relatively high levels of incidental catch of skates (NEFMC 2009b). All adjustments to these FMPs have focused on reducing overall fishing effort and so cumulatively have likely had a positive effect on skate abundance (NEFMC 2009b). This factor is rated as “moderately effective.”

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Highly Effective

The Northeast Fisheries Science Center identified specific research priorities for skates in 2010–2014. These were identifying further stock definition, movements, mixing, and migration; better understanding life-history parameters of age, growth, maturity, and fecundity; researching composition and extent of discards and bycatch in the skate fishery, as well as discard mortality rates by gear type; improving reporting, including proper species identification; identifying fishing practices and gear modifications that could improve the species and size selectivity of gear; determining influence of physical factors on range and distribution; and examining trophic interactions between skates and other bottom-dwelling species in the same habitat (NEFMC 2009). The Northeast Fisheries Observer Program assigns observers to vessels of all fisheries in the Northeast, and the groundfish trawl fishery in New England also participates in an at-sea observer monitoring program, which included observers on 2% to 10% of trips during 2005 to 2008 (NMFS 2011). Currently, observer coverage targets are 25% for sector vessels and 17% for common pool vessels. As of March 2013, the average observer coverage on sector vessels was estimated at 20.5% for the 2012–13 fishing year, with coverage of 11% for the common pool (NEFOP 2013). Framework 2 (mentioned in section 3.1.1-01), which is under consideration as of January 2014, also includes revised VTR and dealer reporting codes for the wing fishery to help improve species specific reporting, to coordinate data collection, and to enhance the catch reporting system. This factor is rated as “highly effective.”

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Highly Effective

The NEFMC and Mid-Atlantic Fishery Management Council (MAFMC) have good records of incorporating scientific advice into their policies and management decisions, and the NEFMC's Science and Statistical Committee (SSC) is quick to utilize the latest information with which to update the skate FMP and multispecies FMP (Trzcinski, K. 2010). For example, when meeting to set the new ABC for winter skate in December 2013, the SSC approved and revised the discard mortality estimate for little, thorny, smooth, and winter skates caught by trawl gear. The estimate for winter skate discard mortality went from an assumed rate of 50% to 9%. Little skate discard mortality changed to 22%, smooth to 60%, and thorny to 23% (NEFMC 2013). The estimated mortality for skates caught with gillnets stayed at an assumed 50%. This factor is rated as "highly effective."

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Highly Effective

A variety of enforcement measures are in place in the New England groundfish fishery. All vessels fishing in the multispecies fishery are required to be fitted with a vessel monitoring system (VMS) (Federal Register 2006), which allows fishery officers to remotely monitor the location of each vessel. VMS systems not only enable fishery managers to monitor where catches are being taken, but also enable enforcement of spatial closures, of which there are a number in the Northwest Atlantic. Enforcement of fishery legislation at sea is a cooperative operation between coastal states, the NOAA Office of Law Enforcement (OLE), and the United States Coast Guard. OLE officers conduct dockside inspections and inspect fish processing plants (OLE webpage), while the Coast Guard occasionally inspects vessels at sea. OLE enforces fisheries legislation including minimum landing sizes, retention of prohibited species, and gear restrictions. Violation of such management measures can result in criminal

or civil actions and fines, loss of quota, or imprisonment for more serious cases. Under Amendment 16 of the Multispecies Fishery Management Plan, accountability measures (AMs) were established (Federal Register 2010). AMs are required to ensure accountability within the fishery and to prevent overfishing. Proactive AMs are designed to prevent ACLs from being exceeded, whereas reactive AMs are designed to correct any overages if they occur (Federal Register 2012). AMs can result in reduction or complete loss of quota for a sector that regularly or greatly exceeds its quota (Federal Register 2010). It is thought that loss of a community pool will encourage a greater level of self-management, thus improving compliance throughout the fishery. In the event that the TAL or ACL for the skate wing fishery is exceeded in any year, the AMs reduce future TALs, reduce the buffer between the ACL and ACT for the fishing year after the ACL is exceeded, and hold the regional administrator accountable for doing so (Federal Register 2010). This factor is rated as “highly effective.”

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderately Effective

Winter skate has not been overfished since before 1999, and cuts to groundfish limits greatly reduce chances that overfishing will occur. Because skate species managed under the skate FMP are caught in fisheries targeting other species managed under other FMPs, there are effects on the stocks that may be outside the control of the skate FMP; however, the same management body is responsible for these fisheries. Because some skate species are overfished and yet to recover, track record is considered to be “moderately effective.”

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Highly Effective

The NEFMC and MAFMC have an open and transparent policy that allows stakeholder participation and feedback through meetings and scoping hearings throughout their affected areas. Also, both councils utilize industry advisory panels that provide information during the development of FMPs. Public meeting schedules for the NEFMC and MAFMC are online at <http://www.nefmc.org/calendar/index.html> and <http://www.mafmc.org/meetings/meetings.htm>, respectively.

Bycatch Strategy

Factor 3.2: Management of fishing impacts on bycatch species						
Region / Method	All Kept	Critical	Strategy	Research	Advice	Enforce
United States Atlantic Gillnet, Bottom	No	No	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective
United States Atlantic Trawl, Bottom	No	No	Moderately Effective	Moderately Effective	Highly Effective	Highly Effective

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.).

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderately Effective

The main bycatch concerns in the fisheries that land skates are the capture of depleted groundfish stocks (including but not limited to cod, yellowtail flounder, and thorny skate) and marine mammals (including but not limited to North Atlantic right whale and harbor porpoise). The Northeast Skate Complex FMP contains several guidelines for reducing harmful interactions between fishing gear and associated catch, particularly for marine mammals and sea turtles. All vessels fishing for skate wings (under multispecies, spiny dogfish, and monkfish FMPs specifically) must adhere to the regulatory measures of the Harbor Porpoise Take Reduction Plan (HPTRP) and the Atlantic Large Whale Take Reduction Plan (ALWTRP) (NEFMC and MAFMC 2011). The HPTRP was established in 1999 to reduce the number of harbor porpoises that were injured or killed by gillnets (NOAA Fisheries 2012d). It focuses on area closures to reduce interactions during certain times of the year or in certain areas (including one in October 2012 (NMFS 2012d)) and the use of pingers on gillnets (to deter porpoises from approaching the nets). The HPTRP was updated by NMFS in 2010 to expand both seasonal closures and the areas in which pingers are required (NOAA Fisheries 2012d). The use of pingers, in particular, has been shown to substantially decrease bycatch of harbor porpoises (Palka et al. 2008b). Law enforcement and the gillnet fishing industry are currently working together to increase compliance and effectiveness of pinger use. The ALWTRP focuses on preventing negative interactions between large whales and fishing gear and is not unique to the groundfish, dogfish, or monkfish fishery. Protective measures focus on gear modifications such as sinking instead of floating lines and area closures, including the institution of short-term closures to protect right whales in the Gulf of Maine (Higgins, J. and G. Salvador 201) (NOAA

Fisheries 2012d). Until all of these measures have been put in place and have shown effectiveness, there is some uncertainty; therefore the bycatch management strategy is “moderately effective.”

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.

United States Atlantic, Gillnet, Bottom

Moderately Effective

A number of studies have been conducted to reduce the interactions of marine mammals and sea turtles with gillnets, which have resulted in the implementation of new guidelines regarding the use of pingers on gillnets (Culik et al. 2001).

Fishery observers are required in groundfish fisheries, with the exception of handgear, under the Multispecies FMP and by the MMPA and ESA (NMFS 2011). Observers are trained biologists who collect data on fishing activities onboard commercial vessels to provide robust data to support science and management programs. Observers in the Northeast Fisheries Observer Program (NEFOP) record weights of kept and discarded fish and crustacean species on observed hauls, as well as biological information (length, age, sex, and tags) from all species caught, including marine mammals and seabirds.

Currently, observer coverage targets are 25% for sector vessels and 17% for common pool vessels. As of March 2013, the average observer coverage on sector vessels was estimated at 20.5% for the 2012–13 fishing year, with coverage of 11% for the common pool (NEFOP 2013). Observer coverage has decreased since the 2010–11 season; however, current levels of observer coverage are higher than in 2006–2008, when the average was below 10% for groundfish trawl and gillnet fisheries in the Northeast (NMFS 2011). Due to the rarity of some bycatch species, the same level of observer coverage that is sufficient for monitoring retained species may not always be sufficient for monitoring bycatch species; similarly, a given level of coverage may be sufficient for a large fishery but not for a small one. The level of observer coverage aims to ensure precision in the catch levels of each managed stock, based on a methodology set out in the Standard Bycatch Reporting Methodology (SBRM). The SBRM was vacated by the courts because it contained discretions to be made that allowed observer coverage to be below that required to meet an acceptable level of precision ($CV < 30$) based on budget reasons. The questions surrounding the observer program and the appropriate level of coverage prevent the management system from achieving the highest possible score for scientific research and monitoring. This factor is rated as “moderately effective.”

Rationale:

Standard bycatch reporting methodology (SBRM) indicates that a simple percent observer coverage is not appropriate; rather, it indicates that the appropriate metric of coverage is the coefficient of variation (CV), or the ratio of the square root of the variance of the bycatch estimate (i.e., standard error) to the estimate itself. SBRM establishes a standard level of precision of $CV = 0.3$ (Federal Register 2008).

United States Atlantic, Trawl, Bottom**Moderately Effective**

Research is ongoing on the reduction of bycatch through use of trawl gear modifications, such as the haddock separator trawl, otherwise known as the Ruhle Trawl or Eliminator Trawl. This gear modification is based on the knowledge that haddock scare upwards, while cod do not. According to one study (Skrobo et al. 2010), use of the modified trawl significantly reduced bycatch species that remain low on the seafloor, such as flounders and cod. This gear most likely also reduces unwanted skate bycatch, because it is effective at targeting species that are startled upward, off of the seafloor.

Fishery observers are required in groundfish fisheries, with the exception of handgear, under the Multispecies FMP and by the MMPA and ESA (NMFS 2011). Observers are trained biologists who collect data on fishing activities onboard commercial vessels to provide robust data to support science and management programs. Observers in the Northeast Fisheries Observer Program (NEFOP) record weights of kept and discarded fish and crustacean species on observed hauls, as well as biological information (length, age, sex, and tags) from all species caught including marine mammals and seabirds.

Currently, observer coverage targets are 25% for sector vessels and 17% for common pool vessels. As of March 2013, the average observer coverage on sector vessels was estimated at 20.5% for the 2012–13 fishing year, with coverage of 11% for the common pool (NEFOP 2013). Observer coverage has decreased since the 2010–11 season; however, current levels of observer coverage are higher than in 2006–2008, when the average was below 10% for groundfish trawl and gillnet fisheries in the Northeast (NMFS 2011). Due to the rarity of some bycatch species, the same level of observer coverage that is sufficient for monitoring retained species may not always be sufficient for monitoring bycatch species; similarly, a given level of coverage may be sufficient for a large fishery but not for a small one. The level of observer coverage aims to ensure precision in the catch levels of each managed stock, based on a methodology set out in the Standard Bycatch Reporting Methodology (SBRM). The SBRM was vacated by the courts because it contained discretions to be made (based on budget reasons) that allowed observer coverage to be below that required to meet an acceptable level of precision ($CV < 30$). The questions surrounding the observer program and the appropriate level of coverage prevent the

management system from achieving the highest possible score for scientific research and monitoring. This factor is rated as “moderately effective.”

Rationale:

Standard bycatch reporting methodology (SBRM) indicates that a simple percent observer coverage is not appropriate; rather, it indicates that the appropriate metric of coverage is the coefficient of variation (CV), or the ratio of the square root of the variance of the bycatch estimate (i.e., standard error) to the estimate itself. SBRM establishes a standard level of precision of $CV = 0.3$ (Federal Register 2008).

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.

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Highly Effective

Scientific advice appears to be followed, particularly regarding the use of pingers and area closures, to decrease marine mammal takes. This factor is rated as “highly effective.”

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.

United States Atlantic, Gillnet, Bottom

Moderately Effective

The multispecies northeast fisheries participate in a VMS, which transmits time and position data to allow enforcement agencies to detect fishing vessels that may be fishing in closed areas. Enforcement of fishing regulations is provided at sea by the U.S. Coast Guard and on shore by the National Marine Fisheries Service and state agencies. However, there are some concerns over whether the use of pingers on gillnets is adequately enforced.

Enforcement may be somewhat weaker for bycatch species than for retained species. For instance, when a study demonstrated the effectiveness of acoustic pingers in reducing harbor porpoise bycatch (Kraus et al 1997), a take reduction plan was subsequently implemented in the fishery, and harbor porpoise bycatch decreased from above 1,500 animals per year prior to 1996 to below 500 animals per year during 1999–2001. But within several years of implementation, compliance decreased and bycatch of harbor porpoises started to increase (Orphanides 2012) (Orphanides 2012b). Outreach activities increased in 2006–07 to remind fishers about TRP requirements, and compliance subsequently increased, so bycatch started decreasing again (NMFS 2011), reaching a mean serious injury and annual mortality of 511 animals during 2005–2009 (Waring et al. 2013). But concerns about compliance remain.

Recently published data from 2009–2010 suggest that acoustic pinger deployment rates in the Gulf of Maine were just 43%, with full compliance (accounting for functionality as well) at only 6.7% (Orphanides 2012). Although observed deployment rates were higher in 2011–2012 (73% for Southern New England and 80% for the Gulf of Maine), improvement is still needed. Target bycatch rates for harbor porpoises continue to be exceeded, which is believed to be due to inadequate compliance with deployment regulations as well as malfunctioning pingers (Orphanides 2012b). This factor is rated as “moderately effective.”

United States Atlantic, Trawl, Bottom

Highly Effective

A variety of enforcement measures are in place in the New England groundfish fishery. All vessels fishing in the multispecies fishery are required to be fitted with a vessel monitoring system (VMS) (Federal Register 2006), which allows fishery officers to remotely monitor the location of each vessel. VMS systems not only enable fishery managers to monitor where catches are being taken, but also enable enforcement of spatial closures, of which there are a number in the Northwest Atlantic. Enforcement of fishery legislation at sea is a cooperative operation between coastal states, the NOAA Office of Law Enforcement (OLE), and the United States Coast Guard. OLE officers conduct dockside inspections and inspect fish processing plants (OLE webpage), while the Coast Guard occasionally inspects vessels at sea. OLE enforces fisheries legislation including minimum landing sizes, retention of prohibited species, and gear restrictions. Violation of such management measures can result in criminal or civil actions and fines, loss of quota, or imprisonment for more serious cases. Under Amendment 16 of the Multispecies Fishery Management Plan, accountability measures (AMs) were established (Federal Register 2010). AMs are required to ensure accountability within the fishery and to prevent overfishing. Proactive AMs are designed to prevent ACLs from being exceeded, whereas reactive AMs are designed to correct any overages if they occur (Federal Register 2012). AMs can result in reduction or complete loss of quota for a sector that regularly or greatly exceeds its quota (Federal Register 2010). It is thought

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

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

Region / Method	Gear Type and Substrate	Mitigation of Gear Impacts	EBFM	Overall Recommendation
United States Atlantic Gillnet, Bottom	3.00:Low Concern	0.25:Minimal Mitigation	3.00:Moderate Concern	Yellow (3.123)
United States Atlantic Trawl, Bottom	2.00:Moderate Concern	0.25:Minimal Mitigation	3.00:Moderate Concern	Yellow (2.598)

Justification of Ranking

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

Scoring Guidelines

- *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.

United States Atlantic, Gillnet, Bottom

Low Concern

Winter skate is found most commonly over sand and gravel substrate, and occasionally over mud (NOAA 2003), which are more resilient to disturbance from fishing activities. Because of this, it can be inferred that winter skate is mostly caught with gears fishing on these types of substrate. Effects on the seabed are expected to be limited to the impact of anchors on the substrate and minimal amounts of scouring during setting and hauling nets.

United States Atlantic, Trawl, Bottom

Moderate Concern

Winter skate is found most commonly over sand and gravel substrate, and occasionally over mud (NOAA 2003), which are more resilient to disturbance from fishing activities. Because of this, it can be inferred that winter skate is mostly caught with gears fishing on these types of substrate. Seafood Watch considers the impacts of trawls on sand, gravel and mud habitats to be of “moderate” conservation concern.

Rationale:

Concern over the effects of trawling on benthic ecosystems grew during the 1990s, and a host of scientific papers have since documented the damage to benthic communities resulting from these fishing methods. (For reviews, see Watling and Norse 1998, and Thrush and Dayton 2002). Bottom trawls not only remove an extensive amount of biomass, they destroy biogenic habitat structures such as sponges and tubes (Schwinghamer et al. 1988) (Thrush and Dayton 2002) (Watling and Norse 1998) (Dinmore et al. 2003). These impacts led to the comparison of dredging with forest clearcutting (Watling, L. and E. A. Norse 1998) (Zeller and Russ 2004). As with forest clearing, benthic ecosystems can be slow to recover, and recovery times will vary with the exact species, habitat, and depth considered (Watling, L. and E. A. Norse 1998) (Dinmore et al. 2003). The Georges Bank has been trawled for decades, and the impacts on the benthic megafauna on gravel habitat have been studied by Collie et al. (1997). They found an abundance of organisms, and biomass and species diversity were significantly greater at non-trawled sites when compared to trawled sites (Collie et al. 1997). In addition to removing

biomass and biogenic structures, mobile fishing gear (i.e., trawls) alter physical habitat. Even in sandy areas, where dredge impacts are expected to be minimal, experimental dredging has revealed significant changes to the physical habitat, such as the loss of topographic relief (Schwinghamer et al. 1988).

Factor 4.2 – Mitigation of Gear Impacts

Scoring Guidelines

- *+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.*

United States Atlantic, Gillnet, Bottom

Minimal Mitigation

There are ongoing measures to reduce fishing effort within the skate, monkfish, Northeast multispecies, and sea scallop FMPs. Additionally, there are five year-round closures designated through the multispecies FMP, five rolling closures in the Gulf of Maine, and a seasonal closure on Georges Bank. These closures are primarily designed to protect important spawning grounds and juvenile fish. There are few benthic areas protected specifically from gillnet fishing. This has not been considered necessary, because the impacts to bottom habitat from gillnet gear have been determined by the NEFMC to be minimal. Therefore, there is “minimal” mitigation of fishing gear impacts.

United States Atlantic, Trawl, Bottom

Minimal Mitigation

The alteration of marine habitats due to fishing gear can be reduced through the reduction of fishing effort or spatial closures that protect vulnerable habitats. There are a number of permanent and temporary spatial closures in place in the Gulf of Maine and Georges Bank. There are seven permanent

closures in place to protect essential fish habitat (EFH) from the impacts of bottom trawling, established under Amendment 13 of the multispecies FMP (NEFMC 2004). There are an additional five year-round closures designated through the multispecies FMP, along with five rolling closures in the Gulf of Maine and a seasonal closure on Georges Bank. These closures are primarily designed to protect important spawning grounds and juvenile fish. Therefore, there is “minimal” mitigation of fishing gear impacts.

Rationale:

The requirement that fisheries management plans minimize to the extent practicable the adverse effects of fishing on essential fish habitat was set forth in the Sustainable Fisheries Act of 1996 (SFA). Amendment 11 of the multispecies FMP established EFH for the species covered by the plan and established areas where bottom-tending gears were to be prohibited in order to protect the marine habitats (NEFMC & NMFS 1998). To mitigate and minimize potential damage to EFH, NEFMC has implemented spatial closures, introduced limited permit schemes, and placed restrictions on the gears that can be used when trawling (Orphanides, C.D. and G. M. Magnusson 2007). In addition to the year-round and rolling closures mentioned above, there are also restricted gear areas (RGAs), which provide protection from particular gear types (e.g., the Inshore Restricted Roller Gear Area). Approximately 20% of the Georges Bank and Gulf of Maine seabed is protected from trawling activities through the variety of closures, although only 9.7% of the seabed is permanently protected through EFH closures (NOAA 2013d). Framework Adjustment (FA) 48 to the MSFMP provides sectors with the opportunity to request exemptions to year-round fishing mortality area closures, which has raised concerns among fishing industry stakeholders and environmental groups pertaining to impacts on seabed habitat. But the rule set forth in FA48 prevents an exemption from being made to areas that overlap with closures created to protect essential fish habitat (Federal Register 2013).

Factor 4.3 – Ecosystem-Based Fisheries Management

Scoring Guidelines

- *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.*

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The groundfish gillnet fishery does catch some exceptional species, but there are efforts underway to assess the ecological roles they play in the ecosystem. Ecosystem-based management in the United States has been given recent attention with the new National Ocean Policy, established under Presidential order on July 19, 2010 (White House 2010). The New England Fishery Management Council (NEFMC) is beginning implementation of a 5-year strategy to transition to ecosystem-based management of fisheries; although the Mid-Atlantic Fishery Management Council (MAFMC) has not yet framed a comparable strategy, it is expected to do so shortly. Such management would replace individual management plans with holistic, integrated plans for defined ecological regions, with predator-prey relationships, competition, habitat status and gear impacts, and protected species all taken into account under the umbrella plan. Efforts are underway by the New England Fishery Management Council to develop ecosystem-based fishery management (EBFM) in three phases: establish goals and objectives; identify management and scientific requirements to implement EBFM in the region; and implement EBFM using quota-based management in all ecosystem production units (NEFMC 2011c). The impacts on the ecosystem and food web are considered to be “moderate” until implementation of the plan is underway.

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References

ASMFC. 2013. Species Management Overview: Spiny Dogfish. Interstate Fisheries Management Program Overview. July 2013. Commissioner Manual.

http://www.asmfc.org/files/commissionerManual/ISFMP/21_SpinyDogfish.pdf

ASMFC. 2012. Atlantic Sturgeon. Available at <http://www.asmfc.org/species/atlantic-sturgeon#stock>

Atlantic Sturgeon Status Review Team (ASSRT). 2007. Status Review of Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Report to National Marine Fisheries Service, Northeast Regional Office. February 23, 2007. 174 p.

Carlstrom, J., P. Berggren, F. Dinnetz, and P. Borjesson. 2002. Carlstrom, J., P. Berggren, F. Dinnetz, and P. Borjesson. 2002. A field experiment using acoustic alarms (pingers) to reduce harbour porpoise by-catch in bottom-set gillnets. *ICES J. Mar. Sci.* 59, 816-824.

Col, L. A., and C. M. Legault. 2009. The 2008 Assessment of Atlantic Halibut in the Gulf of Maine-Georges Bank Region. US Department of Commerce, Northeast Fisheries Science Center, Woods Hole, MA.

Collie J.S., Escanero G.A., Valentine P.C. 1997. Effects of bottom fishing on the benthic megafauna of Georges Bank. *Marine Ecology Progress Series*. 155:159-172.

Conant, T. A., P. H. Dutton, T. Eguchi, S. P. Epperly, C. C. Fahy, M. H. Godfrey, S. L. MacPherson, E. E. Possardt, B. A. Schroeder, J. A. Seminoff, M. A. Snover, C. M. Upite, and B. E. Witherington. 2009. Loggerhead Sea Turtle (*Caretta caretta*) 2009 Status Review Under the U.S. Endangered Species Act. Report of the Loggerhead Biological Review Team to the National Marine Fisheries Service. National Marine Fisheries Service.

Culik, B.M., S. Koschinski, N. Tregenza, and G.M. Ellis. 2001. Reactions of harbor porpoises *Phocoena phocoena* and herring *Culpea harengus* to acoustic alarms. *Mar. Ecol. Prog. Ser.* 211, 255-260.

Dinmore, T. A., D. E. Duplisea, B. D. Rackham, D. L. Maxwell and S. Jennings. 2003. Impact of a large-scale area closure on patterns of fishing disturbance and the consequences for benthic communities. *Ices Journal of Marine Science* 60(2): 371-380.

Federal Register. 2013. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery; Framework Adjustment 48. 50 CFR Part 648

Federal Register. 2012. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Multispecies Fishery; Framework Adjustment 47. 50 CFR Part 648. Available at <http://www.gpo.gov/fdsys/pkg/FR-2012-05-02/html/2012-10526.htm>

Federal Register. 2011. Listing Endangered and Threatened Wildlife and Plants; 90-Day Finding on Petitions To List the Thorny Skate (*Amblyraja radiata*) Under the Endangered Species Act. Vol. 76, No. 244, pp. 78891-78898.

Federal Register. 2010. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast Skate Complex Fishery; Amendment 3. 50 CFR Part 648.

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

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

Finkbeiner, E.M., Wallace, B.P., Moore, J.E., Lewison, R.L., Crowder, L.B., Read, A.J. 2011. Cumulative estimates of sea turtle bycatch and mortality in USA fisheries between 1990 and 2007. *Biological Conservation* 144: 2719-2727.

FishBase. 2013. www.fishbase.org

Fraser, Doug. 2010. Skate Fishing Quota Raised. capecodonline.com

Higgins, J. and G. Salvador. 2010. Guide to the Atlantic Large Whale Take Reduction Plan: An evolving plan to reduce the risk to North Atlantic large whales (right, humpback, and fin) posed by commercial trap/pot and gillnet fishing gear in the U.S. Atlantic Ocean. NOAA Fisheries Service. Available at: <http://www.nero.noaa.gov/whaletrp/plan/ALWTRPGuide.pdf>.

ICCAT. 2009. Report of the 2008 Shark Stock Assessments Meeting. Collect. Vol. Sci. Pap. ICCAT, 64(5): 1343-1491. <http://www.iccat.int/Documents/SCRS/DetRep/DET-SHK.pdf>

International Union for Conservation of Nature and Natural Resources (IUCN). 2013. The IUCN Red List of Threatened Species. <http://www.iucnredlist.org>

Keith, C. and Nitschke, P. 2010. Atlantic Wolffish -2010 Groundfish Update. Groundfish Assessment Updates 2012. pp. 650-721.

Kitts, A., E. Bing-Sawyer, J. Walden, C. Demarest, M. McPherson, P. Christman, S. Steinback, J. Olson, and P. Clay. 2011. 2010 final report on the performance of the Northeast Multispecies (groundfish) fishery (May2010-April 2011). Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

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

Frisk, M.G.; S.J.D. Martell; T.J. Miller; K. Sosebee. 2010. Exploring the population dynamics of winter skate (*Leucoraja ocellata*) in the Georges Bank region using a statistical catch-at-age model incorporating length, migration, and recruitment process errors. *Canadian Journal of Fish and Aquatic Sciences*. 67: 1-19.

Mandelman, J.W., Cicia, A.M., Ingram Jr., G.W., Driggers III, W.B., Coutre, K.M., Sulikowski, J.A. 2013. Short-term post-release mortality of skates (family Rajidae) discarded in a western North Atlantic commercial otter trawl fishery. *Fisheries Research*. 139: 76-84

NEFMC. 2015. Framework Adjustment 53 To the Northeast Multispecies FMP. In consultation with the Mid-Atlantic Fishery Management Council National Marine Fisheries Service. Submitted on February 20, 2015. <https://www.greateratlantic.fisheries.noaa.gov/regs/2015/March/15mulfw53eaweb.pdf>

NEFMC. 2013. Skate ABC and discard mortality rates. Memo to Science and Statistical Committee, Dec. 2, 2013.

NEFMC. 2012. Framework adjustment 47 to the Northeast multispecies fisheries management plan. 334pp.

NEFMC. 2012. Northeast Skate Complex Specifications Environmental Assessment Regulatory Impact Review and Initial Regulatory Flexibility Analysis. Available at <http://www.nefmc.org/skates/index.html>

NEFMC. 2012b. June 2012 TRAC: Eastern GB cod, EGB haddock, and GB yellowtail flounder. NEFMC, Plymouth, MA, September 26, 2012. Available at: http://www.nefmc.org/nemulti/council_mtg_docs/Sept%202012/10_JuneTRAC.pdf

NEFMC. 2011. 2012-2013 Northeast skate complex specifications and supplemental environmental assessment regulatory impact review and initial regulatory flexibility analysis. New England Fishery Management Council, Newburyport, Massachusetts.

NEFMC. 2011b. Monkfish Fishery Management Plan Framework Adjustment 7. Appendix II SARC 50 Monkfish Assessment Summary for 2010. 15pp.

NEFMC. 2011c. Ecosystem-Based Fishery Management for the New England Fisheries Management Council: Part 3. Scientific and Statistical Committee. Presentation to the Council in April 2013. Available at http://www.nefmc.org/tech/council_mtg_docs/April%202011/110427.SSC%20White%20Paper.EBFM.Mike%20Fogarty_Part%203.pdf

NEFMC. 2009. Final Amendment 3 to the Fishery Management Plan (FMP) for the Northeast Skate Complex and Final Environmental Impact Statement (FEIS) with an Initial Regulatory Flexibility Act Analysis. Available at [nefmc.org](http://www.nefmc.org).

NEFMC. 2009. New England Fishery Management Council Research and Data Needs, 2010-2014. www.nefmc.org

NEFMC. 2008. STOCK ASSESSMENT AND FISHERY EVALUATION (SAFE Report) REPORT And Affected Environment (FEIS) FOR SKATE AMENDMENT 3. <http://www.nefmc.org/skates/index.html>

NEFMC. 2007. Northeast Skate Complex Fishery Management Plan. Available at http://www.nefmc.org/skates/Plan%20summary%20_2_.pdf

NEFMC. 2004. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Multispecies Fishery; Amendment 13; Final Rule. 50 CFR part 648.

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

NEFMC and MAFMC. 1985. Fishery management plan, environmental impact statement, regulatory impact review, and initial regulatory flexibility analysis for the northeast multispecies fishery. Available at: http://nefmc.org/nemulti/fmp/gf_fmp.html.

NEFOP. 2013. Preliminary Estimate of Groundfish Observer/ At-Sea Monitor Coverage Rates. http://www.nefsc.noaa.gov/fsb/asm/coverage_web_report.pdf

NEFSC. 2015. Gulf of Maine haddock 2015 Assessment Update Report. Woods Hole, Massachusetts. Compiled September 2015. http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_HAD_GM_Assessment_Report_20150913.pdf

NEFSC. 2015b. Georges Bank haddock 2015 Assessment Update Report. Woods Hole, Massachusetts. Compiled September 2015. http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/Georges_Bank_haddock_Update_2015_09_02_101218.pdf

NEFSC. 2015c. Southern New England Mid-Atlantic Winter Flounder 2015 Assessment Update Report. National Marine Fisheries Service Northeast Fisheries Science Center Woods Hole, Massachusetts http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_FLW_SNEMA_OPERATIONAL_ASSESSMENT_REPORT_2015_09_03_143753.pdf

NEFSC. 2015d. Georges Bank Winter Flounder 2015 Assessment Update Report (draft working paper). National Marine Fisheries Service Northeast Fisheries Science Center Woods Hole, Massachusetts http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_FLW_GB_RPT.pdf

NEFSC. 2015e. Assessment update of Cape Cod-Gulf of Maine Yellowtail flounder. Draft working paper. NOAA, NMFS. Woods Hole, MA. http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_YEL_CCGM_RPT_20150904.pdf

NEFSC. 2015f. Assessment update of Southern New England-Mid Atlantic Yellowtail flounder. Draft working paper. NOAA, NMFS. Woods Hole, MA. http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_YEL_SNEMA_RPT_20150904.pdf

NEFSC. 2015g. Gulf of Maine Winter Flounder 2015 Assessment Update Report (draft working paper). National Marine Fisheries Service Northeast Fisheries Science Center Woods Hole, Massachusetts http://www.nefsc.noaa.gov/groundfish/operational-assessments-2015/Reports/2015_FLW_GM_RPT_Update_report_09_02_151631.pdf

NEFSC. 2013. Assessment Report - Monkfish (WP-1), 2013 Update.

NEFSC. 2013. 56th Northeast Regional Stock Assessment Workshop (56th SAW) Assessment Summary Report. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 13-04; 42 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://nefsc.noaa.gov/publications/>

NEFSC. 2012. Assessment or data updates of 13 Northeast groundfish stocks through 2010. Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2012b. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW): Assessment Summary Report. Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2012c. 53rd Northeast Regional Stock Assessment Workshop (53rd SAW): Assessment Summary Report. Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC 2012d. 54th Northeast Regional Stock Assessment Workshop (54th SAW) Assessment Report. Northeast Fisheries Science Center Reference Document 12-18. NOAA National Marine Fisheries Service, Northeast Fisheries Science Center, 166 Water St., Woods Hole, MA 02543

NEFSC. 2011. 52nd Northeast Regional Stock Assessment Workshop (52nd SAW): Assessment Report. Northeast Fisheries Science Center, National Marine Fisheries Service, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2010. 50th Northeast Regional Stock Assessment Workshop (50th SAW): assessment report. NOAA Fisheries Service, Woods Hole, Massachusetts.

NEFSC. 2008. Northeast Data Poor Stocks Working Group. 2009. The Northeast Data Poor Stocks Working Group Report, December 8-12, 2008 Meeting. Part A. Skate species complex, deep sea red crab, Atlantic wolffish, scup, and black sea bass. US Dept Commer, Northeast Fish Sci Cent Ref Doc. 09-02; 496 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026, or online at <http://www.nefsc.noaa.gov/nefsc/publications/>

NEFSC. 2008b. 47th Northeast Regional Stock Assessment Workshop (47th SAW). Northeast Fisheries Science Center, National Marine Fisheries Service, NOAA, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2008c. 47th Northeast Regional Stock Assessment Workshop (47th SAW). Northeast Fisheries Science Center, National Marine Fisheries Service, NOAA, US Department of Commerce, Woods Hole, Massachusetts.

NEFSC. 2007. 44th SAW Assessment Summary Report. Northeast Fisheries Science Center, National Marine Fisheries Service, NOAA, US Department of Commerce, Woods Hole, MA.

NEFSC. 2006. 44th Northeast Regional Stock Assessment Workshop (44th SAW): 44th SAW assessment report. US Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-10; 661 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

NMFS. 2015. Status of U.S. Fisheries. NOAA Fisheries - Office of Sustainable Fisheries. http://www.nmfs.noaa.gov/sfa/fisheries_eco/status_of_fisheries/archive/2015/fourth/q2-2015-stock-status-tables.pdf

NMFS. 2013. Status of U.S. Fisheries. NOAA Fisheries - Office of Sustainable Fisheries. Available at <http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm>

NMFS. 2012. Atlantic Sturgeon (*Acipenser oxyrinchus oxyrinchus*). Available at: <http://www.nmfs.noaa.gov/pr/species/fish/atlanticsturgeon.htm>.

NMFS. 2012b. Framework Adjustment 47 to the Northeast Multispecies FMP; Proposed Rule. P. 331. NOAA Administration, New England Fishery Management Council. Federal Register.

NMFS. 2012c. Fisheries Statistics. NMFS Fisheries Statistics Division (ST1), NOAA. Accessed 2012. <http://www.st.nmfs.noaa.gov/st1/>.

NMFS. 2012d. Northeast Region Bulletin. Northeast Sink Gillnet Fisheries: Implementation of the coastal Gulf of Maine consequence closure area. Available at: <http://www.nero.noaa.gov/nero/nr/nrdoc/12/12HPTRPConsequenceClosure.pdf>.

NMFS 2012e. Species of Concern: Atlantic Halibut. Factsheet. NOAA National Marine Fisheries Service.

NMFS. 2011. U.S. National Bycatch Report [W.A. Karp, L.L. Desfosse, and S.G. Brooke, Editors]. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/SPO/117C.

NMFS. 2010. Species of concern: Atlantic sturgeon, *Acipenser oxyrinchus oxyrinchus*. Available at: http://www.nmfs.noaa.gov/pr/pdfs/species/atlanticsturgeon_detailed.pdf.

NMFS. 2010b. Magnuson-Stevens Fishery Conservation and Management Act Provisions; Fisheries of the Northeastern United States; Northeast (NE) Multispecies Fishery; Amendment 16; Final Rule. Pages 93 in. NOAA National Marine Fisheries Service, US Department of Commerce, Federal Register, Vol. 75. Available at <https://www.federalregister.gov/articles/2013/07/11/2013-16644/magnuson-stevens-act-provisions-fisheries-of-the-northeastern-united-states-northeast-multispecies>

NMFS. 2009. Species of concern - Atlantic halibut, *Hippoglossus hippoglossus*. NOAA National Marine Fisheries Service. http://www.nmfs.noaa.gov/pr/pdfs/species/atlantichalibut_detailed.pdf.

NOAA. 2015. 2016 List of Fisheries. Updated September 30, 2015.
http://www.nmfs.noaa.gov/pr/interactions/fisheries/2016_list_of_fisheries_lof.html

FishWatch. 2013. Winter Skate. FishWatch U.S. Seafood Facts. www.fishwatch.org

NOAA Fisheries. 2013. Stock Assessment Report: Atlantic White-sided Dolphin (*Lagenorhynchus acutus*): Western North Atlantic Stock. <http://www.nmfs.noaa.gov/pr/sars/species.htm#porpoises>

NOAA Fisheries. 2013. Stock Assessment Report: Harbor Porpoise (*Phocoena phocoena phocoena*): Gulf of Maine/Bay of Fundy Stock. <http://www.nmfs.noaa.gov/pr/sars/species.htm#porpoises>

NOAA. 2013. Fin Whale (*Balaenoptera physalus*): Western North Atlantic Stock. Stock Assessment Report.

NOAA. 2013d. Proposed rule; request for comments. Taking of Marine Mammals Incidental to Commercial Fishing Operations; Harbor Porpoise Take Reduction Plan Regulations AGENCY: National Marine Fisheries Service (NMFS), National Oceanic and Atmospheric Administration (NOAA), Commerce.

NOAA Fisheries. 2012. Stock Assessment Report: North Atlantic Right Whale (*Eubalaena glacialis*): Western Atlantic Stock. <http://www.nmfs.noaa.gov/pr/sars/species.htm#porpoises>

NOAA Fisheries. 2012. Stock Assessment Report: Short Beaked Common Dolphin (*Delphinus delphis*): Western North Atlantic Stock. <http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012doco-wn.pdf>

NOAA. 2012. Stock Assessment Report: Humpback Whale (*Megaptera novaeangliae*): Gulf of Maine Stock. <http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2012whhb-gme.pdf>

NOAA. 2011. Stock Assessment Report: Long-finned Pilot Whale (*Globicephala melas melas*): Western Atlantic Stock. <http://www.nmfs.noaa.gov/pr/sars/species.htm#porpoises>

NOAA Fisheries. 2011. Stock Assessment Report: Short-finned Pilot Whale (*Globicephala macrorhynchus*): Western North Atlantic Stock.
<http://www.nmfs.noaa.gov/pr/sars/species.htm#porpoises>

NOAA. 2003. Essential Fish Habitat Source Document: Winter Skate, *Leucoraja ocellata*, Life History and Habitat Characteristics. NOAA Technical Memorandum NMFS-NE-179. Available at <http://nefsc.noaa.gov/publications/tm/tm179/>

NOAA Fisheries. 2013. Endangered and Threatened Marine Species.
<http://www.nmfs.noaa.gov/pr/species/esa/>

NOAA Fisheries. 2012. Loggerhead turtle (*Caretta caretta*). Office of protected resources. Available at: <http://www.nmfs.noaa.gov/pr/species/turtles/loggerhead.htm>.

NOAA Fisheries. 2012b. NE multispecies closed areas and US/Canada management area. Available at: <http://www.nero.noaa.gov/nero/fishermen/charts/mul1.html>.

NOAA Fisheries. 2012d. Harbor Porpoise Take Reduction Plan. Available at: <http://www.nero.noaa.gov/protected/porptrp/>.

NOAA/NMFS. 2006. SEDAR 11 Stock Assessment Report: Large Coastal Shark Complex, Blacktip and Sandbar Shark. Highly Migratory Species Management Division.

Orphanides, C.D., 2012. Update on Harbor Porpoise Take Reduction Plan Monitoring Initiatives: Compliance and Consequential Bycatch Rates from June 2009 through May 2010. Northeast Fisheries Center Reference Document 12-22; 21pp. Available at <http://nefsc.noaa.gov/nefsc/publications/crd/crd1222/>

Orphanides, C.D. 2012b. New England harbor porpoise bycatch rates during 2010-2012 associated with Consequence Closure Areas. Northeast Fisheries Science Center Reference Document 12-19. Available at <http://www.nefsc.noaa.gov/publications/crd/crd1219/>

Orphanides, C.D. and G. M. Magnusson. 2007. Characterization of the Northeast and Mid-Atlantic bottom and midwater trawl fisheries based on vessel trip report (VTR) data. Northeast Fisheries Science Center Reference Document 07-15. 127 pp. Available at: <http://www.nefsc.noaa.gov/publications/crd/crd0715/crd0715.pdf>.

Palka, D. L., C. D. Orphanides, and M. L. Warden. 2008. Summary of harbor porpoise (*Phocoena phocoena*) bycatch and levels of compliance in the Northeast and Mid-Atlantic gillnet fisheries after the implementation of the take reduction plan: 1 January 1999 – 31 May 2007. NOAA Technical Memorandum NMFS-NE-212.

Palka, D. L., M. C. Rossman, A. S. VanAtten, and C. D. Orphanides. 2008b. Effect of pingers on harbor porpoise (*Phocoena phocoena*) bycatch in the US Northeast gillnet fishery. *J. Cetacean Res. Manag.* 10:3, 217-226.

Rago, P. and K. Sosebee. 2013. Update on the Status of Spiny Dogfish in 2013 and Projected Harvests at the FMSY Proxy and Pstar of 40%. Mid Atlantic Fishery Management Council Scientific and Statistical Committee.

R. Brown, F. Serchuk, J. Weinberg, P. Rago, G. Shepherd, K. Sosebee. 2013. Update of Skate Stock Status Based on NEFSC Bottom Trawl Survey Data through Autumn 2012 and Spring 2013 (July 2, 2013). NOAA Memorandum for John K. Bullard, Regional Administrator, NER.

Rago, P., and K. Sosebee. 2011. Update on the Status of Spiny Dogfish in 2011 and Initial Evaluation of Alternative Harvest Strategies. Mid-Atlantic Fishery Management Council - Science and Statistical Committee.

Schwinghamer, P., D. C. Gordon, T. W. Rowell, J. Prena, D. L. McKeown and G. Sonnichsen. 1988. Effects of experimental otter trawling on surficial sediment properties of a sandy-bottom ecosystem on the Grand Banks of Newfoundland. *Conservation Biology* 12(6): 1215-1222.

Seafood Watch. 2013. *Seafood Watch Criteria for Fisheries*. Monterey Bay Aquarium.

SEFSC. 2006. *SEDAR 11 Large Coastal Sharks Assessment Workshop Report*. Southeast Fisheries Science Center.

Skrobe, L., K. Castro, D. Beutel, J. Knight. 2010. *Exploring Bycatch Reduction in the Haddock Fishery Through the Use of the Eliminator Trawl(TM) With Fishing Vessels in the 250 to 550 HP Range*. University of Rhode Island Fisheries Center Technical Report.

Sosebee, K. 2015. *Update of Skate Stock Status based on NEFSC Bottom Trawl Survey Data through Autumn 2014/Spring 2015*. NOAA Memorandum for John K. Bullard, Regional Administrator, GARFO.

Stone, H.H., S. Gavaris, C.M. Legault, J.D. Neilson, and S.X. Cadrin. 2004. Collapse and Recovery of the Yellowtail Flounder (*Limanda ferruginea*) Fishery on Georges Bank. *J. Sea Res.* 51: 261-270.

T. Miller, R. Muller, R. O'Boyle, A. Rosenberg. 2009. *Report by the Peer Review Panel for the Northeast Data Poor Stocks Working Group*. Prepared for Data Poor Assessment Working Group Northeast Fisheries Science Center NOAA/NMFS.

Terceiro, M. 2011. *Stock Assessment of Scup for 2011*. Northeast Fisheries Science Center, National Marine Fisheries Service, NOAA, US Department of Commerce, Woods Hole, Massachusetts.

TEWG (Turtle Expert Working Group). 2009. *An assessment of the loggerhead turtle population in the western North Atlantic Ocean*. NOAA Technical Memorandum NMFS-SEFSC-575. Available at: http://www.sefsc.noaa.gov/turtles/TM_575_TEWG.pdf.

Thrush, S. F. and P. K. Dayton. 2002. Disturbance to marine benthic habitats by trawling and dredging: Implications for marine biodiversity. *Annual Review of Ecology and Systematics* 33: 449-473.

TRAC. 2015. *Georges Bank Yellowtail Flounder*. TRAC Status Report 2015/03.

TRAC. 2011. *Georges Bank Yellowtail Flounder*. Transboundary Resources Assessment Committee - Fisheries and Oceans Canada (DFO) and NOAA Fisheries.

Trzcinski, K. 2010. *Reviewer Report to the Center for Independent Experts on the Monkfish, Sea Scallops and Pollock Benchmark Stock Assessment Review (SARC 50) held June 1- 5, 2010 in Woods Hole, Massachusetts*. 38pp.

Waring G.T., E. Josephson, K. Maze-Foley and P.E. Rosel (editors). 2015. *US Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2014*. NOAA Tech Memo NMFS NE 231; 361 p. doi: 10.7289/V5TQ5ZH0

Waring, G.T., Josephson, E., Maze-Foley, K., Rosel, P.E., Editors. 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2012. 10 Revised Stock Assessments.

Watling, L. and E. A. Norse. 1998. Disturbance of the seabed by mobile fishing gear: A comparison to forest clearcutting. *Conservation Biology* 12(6): 1180-1197.

Weinberg, J. 2013. 2013 Update Monkfish Presentation for Councils.

White House. 2010. Executive Order 13547 - Stewardship of the Ocean, Our Coasts, and the Great Lakes. Available at: <http://www.whitehouse.gov/the-press-office/executive-order-stewardship-ocean-our-coasts-and-great-lakes>

Appendix B

AMERICAN PLAICE: GULF OF MAINE/GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

High

American plaice has a high inherent vulnerability (66 out of 100)(FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

Low Concern

The most recent assessment of American plaice was published in 2012. It indicated that the spawning stock biomass in 2010 (SSB_{2010}) = 10,805 MT, and the threshold is 50% of the spawning stock biomass needed to achieve maximum sustainable yield (SSB_{MSY}), which is 18,398 MT. So the stock was not overfished, with $B_{2010}/B_{MSY} = 0.587$ (NEFSC 2012), and rebuilding (NMFS Status of Fisheries).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Very Low Concern

Since the 1970s, U.S. fisheries have accounted for the overwhelming majority (95%–100%) of landings of American plaice in the Gulf of Maine and Georges Bank. The most recent assessment of American plaice indicated that fishing mortality had been decreasing since the 1990s and, after adjusting for a retrospective pattern, was at a near-record low of fishing mortality rate (F) = 0.13 in 2010. With $F_{MSY} = 0.18$, $F_{2010}/F_{MSY} = 0.72$ and overfishing was therefore not occurring (NEFSC 2012).

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC BLACKTIP SHARK: ATLANTIC LARGE COASTAL SHARK COMPLEX

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

Blacktip shark has a high vulnerability with a score of 55 out of 100 (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

High Concern

Stock status is unknown and inherent vulnerability is high. The species is listed as “Near Threatened” on the International Union for the Conservation of Nature (IUCN) Red List (IUCN 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Low Concern

F is unknown, as is stock status, but results from one of the models used in the latest stock assessment (SEFSC 2006) show that this stock is considerably depleted. There is a targeted fishery for Atlantic blacktip sharks in the Mid-Atlantic and they are also caught as bycatch in gillnets and longlines. But the gillnet skate fishery does not target Atlantic blacktip shark, and is not a substantial contributor to blacktip shark mortality—bycatch numbers are not high. Because winter skates are caught with gillnets, it is possible that the fishery in the Mid-Atlantic adversely affects this population, but it is not believed to. The New England skate fishery does not overlap with the blacktip shark population.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC HALIBUT

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Inherent vulnerability of Atlantic halibut is very high (88 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The latest estimates of Atlantic halibut abundance show that biomass, $B_{2010} = 1,700$ MT, is well below the threshold reference point, $B_{\text{THRESHOLD}} = 24,000$ MT (NEFSC 2012). Atlantic halibut is considered a species of concern by NMFS (NMFS 2012e).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

Gulf of Maine/Georges Bank Atlantic halibut is in year 8 of a 52-year rebuilding plan (NMFS 2013). As of October 31, 2011, the National Marine Fisheries Service (NMFS) also had a possession limit of one fish per trip for Atlantic halibut. The most recent assessment of Atlantic halibut indicated $F_{2010} = 0.032$ and $F_{\text{MSY}} = 0.0731$, so $F_{2010}/F_{\text{MSY}} = 0.438$, and overfishing was therefore not occurring (NEFSC 2012). But F_{REBUILD} , the target fishing pressure if the stock is to be rebuilt by 2056, is 0.044 (Col and Legault 2009). So, although $F_{2010}/F_{\text{REBUILD}} = 0.73$, fishing mortality exceeded F_{REBUILD} in 6 of the last 10 years for which data were available, and the average value of F during this time was 0.0504, slightly above F_{REBUILD} (NEFSC 2012). It is likely that F_{REBUILD} is highly optimistic (see Rationale below). Because the halibut stock

is not officially considered overfished but fishing mortality has been fluctuating around $F_{REBUILD}$, and the rebuilding timeframe is both lengthy and somewhat uncertain, Seafood Watch deems fishing mortality of Atlantic halibut in the Gulf of Maine/Georges Bank a “moderate” concern.

Rationale:

No directed fishery exists for halibut in federal waters, although a limited halibut fishery is permitted in Maine’s state waters. Amendment 9 to the NE Multispecies fishery management plan (FMP) permits a one-fish possession limit (NMFS 2009). $F_{REBUILD}$ and the rebuilding timeframe may be highly optimistic for three reasons. First, the population model makes the unrealistic assumption that the population grows at its maximum rate, even though there are currently no indications that this is the case. Second, the model does not incorporate age structure, so the fact that the mean age of maturity for females is 7.3 years means that there will be a lag time of initial response to management measures and a slower rebuilding trajectory than projected. Third, the currently assessed Gulf of Maine/Georges Bank stock is likely a small portion of a larger U.S.-Canadian Atlantic halibut stock, because there is strong evidence that halibut are capable of both long distance movements and crossing United States-Canada boundaries in substantial numbers, and this dynamic is unaccounted for by the current model (Col and Legault 2009).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC POLLOCK: GULF OF MAINE/GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

Atlantic pollock has a high inherent vulnerability (59 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very Low Concern

The most recent assessment of pollock was the SARC 50 assessment in 2011, which indicated $B_{2010} = 196,000$ MT and $B_{MSY} = 91,000$ MT; the stock was therefore not overfished, with $B_{2010}/B_{MSY} = 2.15$ (NEFSC 2010) (NMFS 2012b).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Low Concern

The most recent assessment of pollock was the SARC 50 assessment in 2011, which indicated $F_{2010} = 0.070$ and $F_{MSY} = 0.25$, so overfishing was not occurring, with $F_{2010}/F_{MSY} = 0.28$ (NEFSC 2010) (NMFS 2012b). But there may be some uncertainty in this estimate, because without further understanding of size-based selectivity of fishing gears, the current stock model implies the existence of a large biomass of pollock, accounting for 35%–70% of the total, that neither current surveys nor the fishery has been able to confirm (NEFSC 2010).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC WHITE-SIDED DOLPHIN: WESTERN NORTH ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

High

This marine mammal species has a high vulnerability (Seafood Watch Criteria document, p. 9).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

High Concern

The status of the population relative to the optimum sustainable population (OSP) is unknown. The best estimate of abundance is 48,819 animals, although there is a possibility that seasonal variations in abundance occur and that future studies (2011–2015) may improve estimations (NOAA 2013b). White-sided dolphin is no longer considered a strategic stock in the Western North Atlantic because average annual human-related mortality between 2006 and 2010 does not exceed the potential biological removal (PBR) limit (NOAA 2013b).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Low Concern

The large mesh otter trawl was responsible for, on average, 142 white-sided dolphin mortalities per year between 2006 and 2010. This represents 47% of the PBR (304), which is not exceeded by cumulative fishing impacts.

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ATLANTIC WOLFFISH

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

Atlantic wolffish has a high to very high inherent vulnerability (67 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

High Concern

The most recent assessment of Atlantic wolffish was summarized in the groundfish assessment updates in 2012, which indicated SSB_{2010} was estimated at 505 MT. This is the equivalent of 29% of SSB_{MSY} proxy, which is 1,756 MT. The stock was therefore overfished (Keith and Nitschke 2012).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Low Concern

F_{2010} was estimated to be 0.07 and F_{MSY} proxy = 0.33, which means overfishing was not occurring (Keith and Nitschke 2012).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

BARNDOR SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Barndoor skate has a high inherent vulnerability (77 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

Barndoor skate is listed as “Endangered” on the IUCN Red List; however, this needs to be updated. It is not overfished. According to the 2012 update on the status of skate stocks (Brown et al. 2013):

“For barndoor skate, the 2009–2011 NEFSC autumn average survey biomass index of 1.08 kg/tow is above the biomass threshold reference point (0.78 kg/tow), and thus the species is not overfished, but is not yet rebuilt to B_{MSY} .” According to this information, we consider stock status to be a “low” concern.

Rationale:

“Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species. For barndoor skate, the B_{MSY} proxy is the average of 1963–1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.” (Brown et al. 2013)

Barndoor skate is listed as “Endangered” on the IUCN Red List (IUCN 2013); however, this needs to be updated. It is not overfished.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2010–2012 average survey biomass index of 1.22 kg/tow was higher than the previous 3-year average index (2009–2011) by 13%, and overfishing was not occurring (Brown et al. 2013). But barndoor skate is currently in the 11th year of its rebuilding plan and has not shown significant rebuilding so far. The exact rebuilding time period is unspecified in the Northeast Skate Complex FMP because of uncertainties about barndoor skate life history, but based on the long-lived, late maturing, and low fecundity nature of this species, rebuilding may take decades (NMFS 2012d). Annual catch limits should prevent fishing from increasing to unsustainable levels. All landings of barndoor skates are currently prohibited (NEFMC 2011a). Because overfishing is not occurring on barndoor skate but there is uncertainty in the estimate and rebuilding is not occurring, we consider fishing mortality to be a “moderate” concern.

Rationale:

“The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species.” (Brown et al. 2013)

For overfishing to be occurring, the 2009–2011 average index has to be below the 2008–2010 index by 20% for little, thorny, and winter skates; 30% for barndoor and smooth skates; 40% for clearnose skates; and 60% for rosette skates.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

BULL SHARK: ATLANTIC LARGE COASTAL SHARK COMPLEX**Factor 2.1 - Inherent Vulnerability**

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

Bull shark has a high inherent vulnerability (88 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

High Concern

Stock status is unknown and inherent vulnerability is high. The species is also listed as “Near Threatened” on the IUCN Red List (IUCN 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Very Low Concern

F is unknown but the skate fishery is not a substantial contributor to mortality and does not target the large coastal shark complex. Most sharks that are caught as bycatch are caught in pelagic longline fisheries, and less so in Mid-Atlantic gillnet fisheries. The New England skate fishery does not overlap with bull sharks.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

CLEARNOSE SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Clearnose skate has a high inherent vulnerability (57 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Clearnose skate is not overfished. According to the 2013 update on the status of skate stocks (Brown et al. 2013):

“For clearnose skate, the 2010–2012 NEFSC autumn average biomass index of 0.97 kg/tow is above both the biomass threshold reference point (0.33 kg/tow) and the B_{MSY} proxy (0.66 kg/tow), and hence

the species is not overfished.”

Rationale:

“Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species. For barndoor skate, the B_{MSY} proxy is the average of 1963–1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.” (Brown et al. 2013)

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2010–2012 average survey biomass index of 0.97 kg/tow was higher than the 2009–2011 average, so NMFS did not consider overfishing to be occurring for clearnose skate in 2013 (Brown et al. 2013). The use of a biomass index to determine fishing mortality results in a high level of uncertainty, and fishing mortality relative to maximum sustainable yield (MSY) is considered unknown. Seafood Watch considers fishing mortality to be a “moderate” conservation concern.

Rationale:

“The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species.” (Brown et al. 2013)

For overfishing to be occurring, the 2010–2012 average index has to be below the 2009–2011 index by 20% for little, thorny, and winter skates; 30% for barndoor and smooth skates; 40% for clearnose skates; and 60% for rosette skates.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

FIN WHALE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

The best abundance estimate for fin whales in the Western North Atlantic is 1,618 individuals (CV = 0.33), with a minimal population estimate of 1,234 (Waring et al. 2015). Abundance relative to the optimum sustainable population (OSP) is unknown, but the fin whale stock is strategic because it is

listed as “Endangered” under the ESA (Waring et al. 2015) and by the IUCN (IUCN 2015); therefore, we have rated this factor as “very high” concern.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Moderate Concern

The large mesh gillnet fishery is the only fishery within the scope of this report known to interact with fin whales in the Northwest Atlantic (NOAA 2015). The PBR for fin whales is 2.5 whales per year. Between 2008 and 2012, minimum annual human-caused mortality and serious injury to fin whales was 3.35 per year (Waring et al. 2015), which represents 134% of the PBR. But this value includes both incidental fishery interaction records and records of vessel collisions combined. For fishery interactions alone, mortality/serious injury was 1.55 per year (Waring et al. 2015), which is 62% of PBR, or moderate concern.

Rationale:

Annual rates calculated from detected mortalities are a biased representation of human-caused mortality; they represent a lower bound. Detected mortalities are haphazard and not the result of a designed sampling scheme, and therefore represent a minimum estimate of human-caused mortality (Waring et al. 2015).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

GREEN SEA TURTLE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

Green sea turtles are listed as “Threatened” in the North Atlantic by the U.S. Endangered Species Act (NOAA Fisheries 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Moderate Concern

There are some takes of green sea turtles in the sink gillnet fishery that targets groundfish and skates: however, estimates are unknown and observer coverage is low (Finkbeiner et al. 2011) (NMFS 2011). There is management in place to reduce turtle takes in the Northeast and Mid-Atlantic sink gillnet fisheries that is known to be effective for loggerhead turtles (Finkbeiner et al. 2011) and is expected to be effective for other species.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

HADDOCK: GEORGES BANK

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Haddock has a high inherent vulnerability (63 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Based on the 2015 stock assessment update for Georges Bank (GB) haddock, spawning stock biomass (SSB) in 2014 was estimated to be 225,080 MT, which is 208% of the biomass target (SSB_{MSY} proxy = 108,300 MT) (NEFSC 2015b). Since GB haddock are not overfished, abundance is rated as “very low” concern.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

The 2015 stock assessment update of Georges Bank haddock indicates that the 2014 fishing mortality (average for ages 5–7) was estimated to be 0.159, which is 41% of the overfishing threshold proxy (F_{MSY} proxy = 0.39) (NEFSC 2015b). Therefore, overfishing is not occurring and fishing mortality is ranked as “very low” concern.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

HADDOCK: GULF OF MAINE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Haddock has a high inherent vulnerability (63 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Based on the 2015 updated assessment of Gulf of Maine haddock, spawning stock biomass (SSB) in 2014 was estimated to be 10,325 MT, which is 223% of the biomass target (SSB_{MSY} proxy = 4,623). Therefore, the stock is not overfished and abundance is scored as “very low” concern (NEFSC 2015).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Based on the 2015 stock assessment update of Gulf of Maine haddock, the 2014 fully selected fishing mortality was estimated to be 0.257, which is 55% of the overfishing threshold proxy (F_{MSY} proxy = 0.468). The stock is not undergoing overfishing and is scored as “very low” concern (NEFSC 2015).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

HARBOR PORPOISE: GULF OF MAINE/BAY OF FUNDY

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

High Concern

The best current abundance estimate of the Gulf of Maine/Bay of Fundy harbor porpoise stock is 79,883 (CV = 0.32), while the minimum population estimate is 61,415. Harbor porpoise is no longer strategic, but is listed as a species of special concern for the Northeast sink gill net fishery (NMFS 2015) and is therefore scored as high concern.

Rationale:

The Northeast sink gill net fishery is listed as a Category I fishery in the 2016 List of Fisheries (LOF) because the annual mortality and serious injury to the harbor porpoise stock (Gulf of Maine/Bay of Fundy) exceeds 50% of the PBR level of harbor porpoise (NMFS 2015). A current population trend analysis has not been conducted for this species, but the current abundance estimate of 79,883 individuals is greater than, or on par with, previous stock estimates (Waring et al. 2015).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom**Moderate Concern**

PBR for the Gulf of Maine/Bay of Fundy harbor porpoise is 706. The total annual estimated average human-caused mortality is 683 harbor porpoises per year, which is derived from two components: 640 harbor porpoise per year (CV = 0.17) from U.S. fisheries using observer and Marine Mammal Authorization Program (MMAP) data, and 43 per year (unknown CV) from Canadian fisheries using observer data. The average annual harbor porpoise mortality and serious injury in the Northeast sink gillnet fishery from 2008–2012 was 439 (CV = 0.18). The bottom gillnet fishery contribution comes to 62% of PBR, and since this is a Category I fishery under the MMPA, fishing mortality is rated as “moderate” concern.

Factor 2.4 - Discard Rate**United States Atlantic, Gillnet, Bottom****20-40%**

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

HUMPBACK WHALE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

High Concern

The best abundance estimate for humpback whales in the Gulf of Maine (GOM) is 847 individuals (from the 2006 survey) with a minimum population set to the 2008 count (based on mark-recapture) of 823 individuals (Waring et al. 2015). The most recent available data suggests that the population in the Gulf of Maine is steadily increasing in size, which is consistent with an average increase in the wider North Atlantic population as a whole. Nevertheless, the population may be below the Optimum Sustainable Population (OSP) within the US EEZ (Exclusive Economic Zone) (Waring et al. 2015). Because it is unknown whether abundance is at a sustainable level, and because whales are considered to have a high vulnerability to fishing pressure, we have deemed abundance a “high” conservation concern.

Rationale:

The most recent line-transect survey (from 2011), which did not include the Scotian Shelf portion of the stock, produced an unrealistic estimate of abundance because at least 500 uniquely identifiable individual whales from the GOM stock were seen during the calendar year of that survey, and the actual population would have been larger because re-sighting rates of GOM humpbacks have historically been < 1 (Waring et al. 2015).

NOAA intends to revise the ESA listing for humpback whales in order to identify 14 Distinct Population Segments (DPS). Of these, 2 will be listed as Threatened, 2 as Endangered, and 10 others will be delisted/not warrant listing (NOAA 2015). The West Indies DPS includes whales (approximately 90%) whose breeding and feeding ranges take place in the North Atlantic (Gulf of Maine, Gulf of St.

Lawrence, West Greenland, and eastern Canada) (NOAA 2015). The West Indies DPS will not be included on the revised ESA list.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

High Concern

The average annual human-related mortality and serious injury rate exceeds the PBR (2.7 whales per year). Between 2008 and 2012, the minimum annual rate of mortalities due to U.S. fisheries was estimated to be 8.90 animals per year (Waring et al. 2015). The contribution of gillnet fisheries (the only fishery within the scope of this report known to have interactions with humpback whales) is unknown, but the Gulf of Maine population is a strategic stock and is one of the stocks that forms the basis of the Category I listing of the Northeast sink gillnet fishery (NMFS 2015). The Atlantic Large Whale Take Reduction Plan (ALWTRP) has been implemented to reduce the fishing mortality of humpback whales and other cetaceans in the MMPA, and includes gear restrictions, rules for net storage, and arrangement of lines to minimize entanglement (NMFS 2014). Because the PBR is exceeded and this fishery is Category I for humpback whale, but the species is currently managed by the ALWTRP, it is ranked as “high” concern.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

KEMP'S RIDLEY TURTLE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

Kemp's ridley turtle is listed as "Endangered" by the U.S. Endangered Species Act (NOAA Fisheries 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Moderate Concern

Most Kemp's ridley sea turtle takes in U.S. fisheries occur in the shrimp trawl fishery in the south (Finkbeiner et al. 2011); however, there are some takes in the sink gillnet fishery that targets groundfish and skates. Estimates of takes in this fishery are unknown and observer coverage is low (Finkbeiner et al. 2011) (NMFS 2011). There is management in place to reduce turtle takes in the Northeast and Mid-Atlantic sink gillnet fisheries that is known to be effective for loggerhead turtles (Finkbeiner et al. 2011) and is expected to be effective for other species.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

LEATHERBACK TURTLE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

Leatherback turtle is listed as Endangered by the U.S. Endangered Species Act (NOAA Fisheries 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Moderate Concern

There are some takes of leatherback sea turtles in the sink gillnet fishery that targets groundfish and skates; however, estimates are unknown and observer coverage is low (Finkbeiner et al. 2011) (NMFS 2011). There is management in place to reduce turtle takes in the Northeast and Mid-Atlantic sink gillnet fisheries that is known to be effective for loggerhead turtles (Finkbeiner et al. 2011) and is expected to be effective for other species.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

LITTLE SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Little skate has a moderate inherent vulnerability (44 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Little skate is not overfished. According to the 2013 update on the status of skate stocks (Brown et al. 2013):

“For little skate, the 2010–2012 and 2011–2013 NEFSC spring average biomass indices of 8.35 kg/tow and 7.11 kg/tow are above both the biomass threshold reference point (3.07 kg/tow) and the B_{MSY} proxy (6.15 kg/tow), and thus the species is not overfished and is above B_{MSY} .”

Rationale:

“Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species. For barndoor skate, the B_{MSY} proxy is the average of 1963–1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.” (Brown et al. 2013)

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2011–2013 average survey biomass index of 7.11 kg/tow was less than 20% below the 2010–2012 average of 8.35 kg/tow, so NMFS did not consider overfishing to be occurring for little skate in 2013 (Brown et al. 2013). The use of a biomass index to determine fishing mortality results in a high level of uncertainty, and fishing mortality relative to maximum sustainable yield (MSY) is considered unknown. Seafood Watch considers fishing mortality to be a “moderate” conservation concern.

Rationale:

“The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species.” (Brown et al. 2013)

For overfishing to be occurring, the 2010–2012 average index has to be below the 2009–2011 index by 20% for little, thorny, and winter skates; 30% for barndoor and smooth skates; 40% for clearnose skates; and 60% for rosette skates.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

LOGGERHEAD TURTLE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Very High Concern

Loggerhead sea turtles are listed as “Threatened” in the Northwest Atlantic Ocean by the U.S. Endangered Species Act (NOAA Fisheries 2013).

Rationale:

Loggerhead sea turtle nesting numbers have declined in all but one of the nine major rookeries that likely contribute turtles to the population in the Northwest Atlantic, though the cause of the decline could be related to a number of factors, including recruitment failures in previous years, increased nesting of first-time females (which have fewer broods with fewer eggs), ship strikes, and fishing mortalities (TEWG (Turtle Expert Working Group) 2009).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Moderate Concern

Bycatch is a significant threat facing loggerhead turtles in the Mid-Atlantic, particularly from gillnets, longlines, and trawl gear (Conant et al. 2009). Besides the shrimp trawl fishery, which is responsible for the largest share of fishery-related loggerhead turtle mortality in the U.S. Atlantic, the Mid-Atlantic directed finfish trawl fishery and the Mid-Atlantic gillnet fishery also capture loggerhead sea turtles. The Mid-Atlantic federally managed bottom otter trawl fishery had an estimated average annual bycatch of 616 loggerhead turtles during 1996–2004 (Conant et al. 2009) (NMFS 2011), while the Mid-Atlantic gillnet fishery had an annual average of 300–400 loggerhead sea turtle interactions during 1990–2007, resulting in an annual mortality rate of 200 loggerheads prior to new regulations and 100 loggerheads after new regulations were in place (Finkbeiner et al. 2011). Because these two gear types in the Mid-Atlantic account for a substantial share of the fishing-related mortality of this threatened stock, but management measures (seasonal and area closures) that are effective in constraining mortality are in place (Finkbeiner et al. 2011), Seafood Watch deems fishing mortality on loggerhead sea turtles to be a “moderate” concern in this fishery. Zero loggerhead turtle bycatch was recorded during 2001–2005 in the New England otter trawl and gillnet fisheries (NMFS 2011).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

MONKFISH

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

Monkfish has a high inherent vulnerability (72 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Low Concern

Monkfish stocks are currently classified as not overfished, and both northern and southern stock biomass are above targets. In the north, B_{2011} was 60,480 MT, which is above the 2013 updated B_{TARGET} of 46,074 MT; and in the south, B_{2011} was 111,100 MT, which is above the B_{TARGET} of 71,667 MT (Weinberg 2013) (NEFSC 2013b). But incomplete information on the life-history characteristics of monkfish, unknown discards during the 1980s, and consistent overestimation of biomass in the past

create a level of uncertainty in the stock assessment, and stock sizes could be overestimated (Trzcinski 2010) (NEFSC 2013b) (NEFMC 2011b).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Low Concern

The 2011 fishing mortality estimates were 0.08 in the northern management area and 0.11 in the southern management area (F_{TARGET} is 0.40); fishing mortality has declined in both areas since 2003. But there is considerable uncertainty in the model used to predict fishing mortality levels (Weinberg 2013) (NEFSC 2010).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

OCEAN POUT: NORTHWESTERN ATLANTIC COAST

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

High

Ocean pout has a high inherent vulnerability (67 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

High Concern

The most recent assessment of ocean pout was published in 2012, and it indicated B_{2010} index proxy = 0.41 kg/tow and B_{MSY} index proxy = 4.94 kg/tow, so the stock was overfished with $B_{2010}/B_{MSY} = 0.083$ (NEFSC 2012).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Moderate Concern

The most recent assessment of ocean pout was published in 2012, which indicated $F_{2010} = 0.31$ and F_{MSY} proxy = 0.76, so $F_{2007}/F_{MSY} = 0.41$, and overfishing was therefore not occurring (NEFSC 2012). But because catch and exploitation ratios remain at or near record-low levels, stock size has not increased from its own record-low level, suggesting that it may be in a depensatory state. Discards are believed to exceed landings, due mainly to a lack of market (NEFSC 2012), and are less than 1% of landed weight in the otter trawl and longline fisheries (NMFS 2011).

Rationale:

Historically, the majority of ocean pout landings have been taken using otter trawl gear; however, in 2010, otter trawl landings dropped to less than 1% of all landings, with fish and lobster pots contributing

over 85% of landings for the year (NEFSC 2012). During 2006–2010, large-mesh otter trawl fisheries also accounted for 62%–93% of ocean pout discards (NEFSC 2012).

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

PILOT WHALE, LONG-FINNED: WESTERN NORTH ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

This marine mammal species has a high vulnerability (Seafood Watch Criteria document, p. 9).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High Concern

The best estimate for population size of long-finned pilot whales (LFPWs) in U.S. waters in the western North Atlantic (southern Gulf of Maine to the upper Bay of Fundy and the Scotian Shelf) is 26,535 individuals (CV = 0.35), with a minimum population size of 19,930 (Waring et al. 2015). LFPWs are not listed as a strategic stock by the Marine Mammal Protection Act; however, data are not available throughout the species' range and there is no information on global abundance trends (Taylor et al. 2008). Because population trends are uncertain and inherent vulnerability is high, abundance is scored as a "high" concern.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Very Low Concern

From 2008 to 2012, annual human-caused mortality and serious injury for LFPWs was 17.6% of PBR (35 animals), with 0.6 attributable to the Northeast bottom gillnet fishery (Waring et al. 2015). Because cumulative fishing mortality does not exceed PBR and the impact of the gillnet fishery is < 1% of PBR, we consider the impact a "very low" concern.

Previously, both LFPWs and short-finned pilot whales (SFPW)s were considered together—because they are difficult to differentiate at sea, which leads to uncertainties in the stock assessment. New information shows that, south of Cape Hatteras, most pilot whale sightings are expected to be SFPWs, while north of $\approx 42^{\circ}\text{N}$, most pilot whale sightings are expected to be LFPWs (Waring et al. 2015). LFPWs and SFPWs overlap spatially along the mid-Atlantic shelf break between New Jersey and the southern flank of Georges Bank (Payne and Heinemann 1993) (NMFS unpublished data).

Rationale:

NMFS considers the pelagic longline fishery, along with the Northeast midwater trawl and Northeast groundfish fisheries, to have the most direct impact on LFPWs. The pelagic longline fishery, the Mid-Atlantic midwater trawl, and Mid-Atlantic groundfish fisheries are considered to have the most direct impacts on SFPWs (Waring et al. 2015). The pelagic longline fishery is classified as a Category I fishery while the trawl fisheries are classified as Category II fisheries under the Marine Mammal Protection Act.

NMFS convened a take reduction team in 2005 to address bycatch in the pelagic longline fishery and published a final rule in 2009 based on the team's recommendations, implementing a special research area, gear modifications, outreach material, observer coverage, and encouraging captains' communications regarding interactions (NMFS 2009c). But no comparable action has been taken to reduce mortality in the otter trawl fisheries. Pilot whales are not caught in significant numbers in the Northeast gillnet fishery (one pilot whale, unidentified as to species, was caught in this fishery in 2010).

United States Atlantic, Trawl, Bottom

Low Concern

From 2008 to 2012, annual human-caused mortality and serious injury for LFPWs was 17.6% of PBR (35 animals), with 15.6% of the PBR attributed to the northeast bottom trawl (31 animals) (Waring et al. 2015). Because average mortality for LFPWs was between 10%–50% of the PBR (199 for LFPWs), fishing mortality was scored as “low” concern.

Previously, both LFPWs and SFPWs were considered together—because they are difficult to differentiate at sea, which leads to uncertainties in the stock assessment. New information shows that, south of Cape Hatteras, most pilot whale sightings are expected to be SFPWs, while north of $\approx 42^{\circ}\text{N}$, most pilot whale sightings are expected to be LFPWs (Waring et al. 2015). LFPWs and SFPWs overlap spatially along the mid-Atlantic shelf break between New Jersey and the southern flank of Georges Bank (Payne and Heinemann 1993) (NMFS unpublished data).

Rationale:

NMFS considers the pelagic longline fishery, along with the Northeast midwater trawl and Northeast groundfish fisheries, to have the most direct impact on LFPWs. The pelagic longline fishery, the Mid-Atlantic midwater trawl, and Mid-Atlantic groundfish fisheries are considered to have the most direct impacts on SFPWs (Waring et al. 2015). The pelagic longline fishery is classified as a Category I fishery while the trawl fisheries are classified as Category II fisheries under the Marine Mammal Protection Act. NMFS convened a take reduction team in 2005 to address bycatch in the pelagic longline fishery and published a final rule in 2009 based on the team's recommendations, implementing a special research area, gear modifications, outreach material, observer coverage, and encouraging captains' communications regarding interactions (NMFS 2009c). But no comparable action has been taken to reduce mortality in the otter trawl fisheries. Pilot whales are not caught in significant numbers in the Northeast gillnet fishery (one pilot whale, unidentified as to species, was caught in this fishery in 2010).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

ROSETTE SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Rosette skate has a medium inherent vulnerability (54 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

For rosette skate, the 2012–2014 NEFSC autumn average biomass index of 0.048 kg/tow is above the biomass threshold reference point of 0.024 kg/tow, and is at B_{MSY} (0.048 kg/tow) (Sosebee 2015). Rosette skate is not considered overfished, and is a low conservation concern because the stock assessment uses a survey index as a proxy for B_{MSY} .

Rationale:

Biomass reference points are based entirely on NEFSC survey data, because reliable landings and discard information are not available by skate species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species (Brown et al. 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

Based on the 2015 stock status update for rosette skate, the 2012–2014 autumn average biomass index is above the 2011–2013 index by 14.6% (Sosebee 2015). The use of a biomass index to determine fishing mortality results in a high level of uncertainty, and fishing mortality relative to maximum sustainable yield (MSY) is considered unknown. Seafood Watch considers fishing mortality to be a “moderate” conservation concern.

Rationale:

“The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species.” (Brown et al. 2013)

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

SCUP**Factor 2.1 - Inherent Vulnerability**

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

Medium

Scup has a medium inherent vulnerability (38 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

Very Low Concern

According to the latest stock assessment $B/B_{MSY} = 2.02$, and NMFS lists scup as not overfished (NMFS 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Very Low Concern

Fishing mortality in 2010 was $F = 0.040$, with a 50% probability that F was between 0.032 and 0.048. This level of fishing mortality is substantially below the threshold reference point $F_{MSY} = F_{40\%} = 0.177$, and $F_{2010}/F_{MSY} = 0.226$ (Terceiro, M. 2011).

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

SHORT-BEAKED COMMON DOLPHIN: WESTERN NORTH ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

High

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

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

High Concern

Stock status is unknown and inherent vulnerability is high. The minimum population size for the short-beaked common dolphin was believed to be 52,893 animals in 2011 (NOAA 2012c). The Optimum Sustainable Population (OSP) has not been calculated for this stock, so it is not possible to determine whether abundance is at a sustainable level.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Very Low Concern

The Mid-Atlantic bottom trawl fishery regularly interacts with common dolphins, and incidental takes are recorded. This is a Category II fishery for these takes. The average annual mortality of common dolphins due to the bottom trawl fishery was 20 between 2006 and 2010 (NOAA 2012c). Cumulative fishing impacts are approximately 31% (164 per year, with PBR at 529) of the PBR (NOAA 2012c).

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

SILVER HAKE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Trawl, Bottom

Medium

Silver hake (whiting) has a medium inherent vulnerability (54 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Trawl, Bottom

Low Concern

In the 2010 silver hake stock assessment, SSB_{2009} was estimated to be 23,000 MT. According to the report, “Silver hake is overfished when the three-year moving average of the fall survey weight per tow (i.e., the biomass threshold) is less than one half the B_{MSY} proxy, where the B_{MSY} proxy is defined as the average observed from 1973–1982. The most recent estimates of the biomass thresholds are 3.21 kg/tow for the northern stock and 0.83 kg/tow for the southern stock.” (NEFSC 2011)

The northern stock’s 3-year mean biomass index was 6.20 kg/tow, which was above the management threshold (3.21 kg/tow) and below the target (6.42 kg/tow), which means it is not overfished (NEFSC 2011).

The southern stock’s 3-year mean biomass index was 1.11 kg/tow, which was above the management threshold (0.83 kg/tow) and below the target (1.65 kg/tow), which means it is not overfished (NEFSC 2011).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Trawl, Bottom

Very Low Concern

Based on the 2010 silver hake stock assessment, overfishing was not occurring. According to the report, “Overfishing occurs when the ratio between the catch and the arithmetic fall survey biomass index from the most recent three years exceeds the overfishing threshold. The most recent estimates of the overfishing threshold are 2.78 kt/kg for the northern stock and 34.19 kt/kg for the southern stock of silver hake.” (NEFSC 2011)

The northern stock’s 3-year mean exploitation index was 0.20 kt/kg, which was below the overfishing threshold (2.78 kt/kg) (NEFSC 2011).

The southern stock’s 3-year mean exploitation index was 5.87 kt/kg, which was below the overfishing threshold (34.19 kt/kg) (NEFSC 2011).

Factor 2.4 - Discard Rate

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

SMOOTH SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Medium

Smooth skate has a moderate inherent vulnerability (49 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Low Concern

According to the 2013 update on the status of skate stocks (Brown et al. 2013):

“For smooth skate, the 2010-2012 NEFSC autumn average biomass index of 0.23 kg/tow is above the biomass threshold reference point (0.134 kg/tow) and thus the species is not overfished but is not yet rebuilt to B_{MSY} .” Using this information, we consider stock status as “low” concern.

Rationale:

“Biomass reference points are based entirely on NEFSC survey data since reliable landings and discard information are not available by species. For all species but barndoor, the B_{MSY} proxy is defined as the 75th percentile of the appropriate survey biomass index time series for that species. For barndoor skate, the B_{MSY} proxy is the average of 1963–1966 autumn survey biomass indices since the survey did not catch barndoor for a protracted period.” (Brown et al. 2013)

Smooth skate is listed as “Endangered” on the IUCN Red List. This needs to be updated; however, smooth skate is not overfished (rebuilding) and overfishing is not occurring.

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2010–2012 NEFSC autumn survey biomass index average of 0.23 kg/tow was above the 2009–2011 average by 1%, so NMFS did not consider overfishing to be occurring for smooth skate in 2013 (Brown et al. 2013). The use of a biomass index to determine fishing mortality results in a high level of uncertainty, and fishing mortality relative to maximum sustainable yield (MSY) is considered unknown. The fishery is in year 4 of a 10-year rebuilding plan (NMFS 2015c). Biomass has fluctuated around the threshold value without any indication of long-term recovery or decline and is still in danger of becoming overfished (NEFMC 2011a). Annual catch limits prevent fishing from increasing to unsustainable levels, and all landings of smooth skate are prohibited (NEFMC 2011a). Seafood Watch considers fishing mortality to be a “moderate” conservation concern.

Rationale:

“The fishing mortality reference points are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average CV of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species.” (Brown et al. 2013)

For overfishing to be occurring, the 2010–2012 average index has to be below the 2009–2011 index by 20% for little, thorny, and winter skates; 30% for barndoor and smooth skates; 40% for clearnose skates; and 60% for rosette skates.

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

SPINY DOGFISH: NORTHWEST ATLANTIC

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Spiny dogfish has a high inherent vulnerability (69 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

Spiny dogfish is not overfished (NMFS 2013). SSB in 2011 was estimated to be 373.56 million lbs and has exceeded the target of 351.23 million lbs for 4 years in a row. But the stock has experienced record low

recruitment from 1997 to 2003 and this should cause SSB to decrease in the future (ASMFC 2013). This should be managed by reduced rates of fishing (F).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very Low Concern

The estimated fishing mortality rate in 2010 was 0.093, with sampling distributions suggesting there was almost no chance that the fishing mortality threshold rate, which was revised to 0.325, was exceeded. The fishing mortality rate was also lower than the revised target fishing mortality rate of 0.207. Moreover, fishing pressure has shifted away from its mid-1990s bias toward female dogfish, further reducing the impact of fishing mortality on the population (Rago and Sosebee 2011). In the fourth quarter of 2011, NMFS listed spiny dogfish as not experiencing overfishing (NMFS 2013).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

THORNY SKATE

Factor 2.1 - Inherent Vulnerability

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

High

Thorny skate has a high inherent vulnerability (FishBase vulnerability score of 70) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Very High Concern

The 2015 update to the skate stock assessment indicates that the thorny skate average biomass index (0.13 kg/tow) is well below the biomass threshold reference point of 2.06 kg/tow, and therefore lists thorny skate as overfished (Sosebee 2015). Thorny skate is considered “Critically Endangered” in U.S. waters by the IUCN Red List (globally the species is listed as “Vulnerable”). Seafood Watch considers abundance of thorny skate to be a “very high” conservation concern.

Rationale:

For thorny skate, the 3-year (2012–2014) average survey biomass of 0.13 kg/tow shows an increase on the previous 3-year average, but is only 3.1% of the B_{MSY} target of 4.13 kg/tow. This stock is 12 years into the rebuilding period (end date of 2028), yet it continues to decline without any signs of rebuilding. To ensure that an overfished species will achieve target levels, skate regulations require the Council to take management action (i.e., prioritizing research into thorny skate population dynamics, among actions to halt the decline of thorny skate biomass) (Sosebee 2015).

Thorny skate is currently a Species of Concern, but a new petition has been submitted to the ESA in May 2015 to have the species listed; it is currently being evaluated by NOAA (Sosebee 2015).

Biomass reference points are based entirely on NEFSC survey data because reliable landings and discard information are not available by species. For all skate species but barndoor, the B_{MSY} proxy is defined as

the 75th percentile of the appropriate survey biomass index time series for that species (Brown et al. 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

Moderate Concern

The 2012–2014 index is higher than the 2011–2013 index by 8.7%, therefore NMFS states that overfishing is not occurring for thorny skate (Sosebee 2015). The use of a biomass index to determine fishing mortality results in a high level of uncertainty, and fishing mortality relative to maximum sustainable yield (MSY) is considered unknown.

Annual catch limits are designed to prevent impacts of fishing from increasing to unsustainable levels, and all landings of thorny skate are prohibited (NEFMC 2011a). Nevertheless, together with the other skate species, thorny skate is frequently taken as bycatch and discarded by vessels targeting groundfish. As a result, otter trawling is the principal source of fishing mortality for all skates discussed in this report (Sosebee 2015). Seafood Watch considers fishing mortality to be a “moderate” conservation concern.

Rationale:

The fishing mortality reference points for skates are based on changes in survey biomass indices. If the three-year moving average of the survey biomass index for a skate species declines by more than the average coefficient of variation (CV) of the survey time series, then fishing mortality is assumed to be greater than F_{MSY} and overfishing is occurring for that skate species (Brown et al. 2013).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

United States Atlantic, Trawl, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.

WHITE HAKE: GULF OF MAINE / GEORGES BANK**Factor 2.1 - Inherent Vulnerability**

Scoring Guidelines (same as Factor 1.1 above)

United States Atlantic, Gillnet, Bottom

High

White hake has a high inherent vulnerability (72 out of 100) (FishBase 2013).

Factor 2.2 - Stock Status

Scoring Guidelines (same as Factor 1.2 above)

United States Atlantic, Gillnet, Bottom

Low Concern

White hake is not overfished according to the most recent stock assessment (2012/2013) (NEFSC 2013). This is a change from the previous stock status. Spawning stock biomass (SSB) in 2011 is estimated to be 26,877 MT, which is 83% of the revised SSB_{MSY} proxy (32,400 MT) (NEFSC 2013).

Factor 2.3 - Fishing Mortality

Scoring Guidelines (same as Factor 1.3 above)

United States Atlantic, Gillnet, Bottom

Very Low Concern

The 2011 F is estimated to be 0.13, which is below (66% of) the revised F_{MSY} proxy (0.20) (NEFSC 2013).

Factor 2.4 - Discard Rate

United States Atlantic, Gillnet, Bottom

20-40%

The discard to landings ratios in the fisheries are as follows (NMFS 2011b).

Sink gillnet: 22.8%

Bottom trawl: 47.8%

Rationale:

The discard to landings ratios above are calculated averages from the Northeast Region fisheries characteristics of the U.S. National Bycatch Report. Each represents a ratio of the full discard biomass to the full biomass of landings of all species in the fishery.