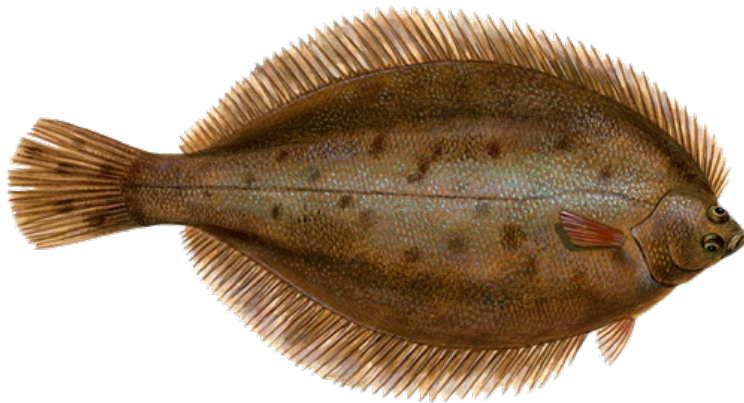


The Safina Center
at Stony Brook University
AND
Monterey Bay Aquarium
Seafood Watch®

Winter flounder (Maritimes)

Pseudopleuronectes americanus



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Maritimes/Northwest Atlantic

Bottom trawls

Published April 01 2016, Reviewed November 20, 2019 – see Appendix A for more information

Seafood Watch Consulting Researcher

Disclaimer

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Seafood Watch Standard used in this assessment: Standard for Fisheries vF2

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About The Safina Center

The Safina Center (formerly Blue Ocean Institute) translates scientific information into language people can understand and serves as a unique voice of hope, guidance, and encouragement. The Safina Center (TSC) works through science, art, and literature to inspire solutions and a deeper connection with nature, especially the sea. Our mission is to inspire more people to actively engage as well-informed and highly motivated constituents for conservation.

Led by conservation pioneer and MacArthur fellow, Dr. Carl Safina, we show how nature, community, the economy and prospects for peace are all intertwined. Through Safina's books, essays, public speaking, PBS television series, our Fellows program and Sustainable Seafood program, we seek to inspire people to make better choices.

The Safina Center was founded in 2003 by Dr. Carl Safina and was built on three decades of research, writing and policy work by Dr. Safina.

The Safina Center's Sustainable Seafood Program

The Center's founders created the first seafood guide in 1998. Our online seafood guide now encompasses over 160-wild-caught species. All peer-reviewed seafood reports are transparent, authoritative, easy to understand and use. Seafood ratings and full reports are available on our website under *Seafood choices*. tsc's sustainable seafood program helps consumers, retailers, chefs and health professionals discover the connection between human health, a healthy ocean, fishing and sustainable seafood.

- Our online guide to sustainable seafood is based on scientific ratings for more than 160 wild-caught seafood species and provides simple guidelines. Through our expanded partnership with the Monterey Bay Aquarium, our guide now includes seafood ratings from both The Safina Center and the Seafood Watch® program.
- We partner with Whole Foods Market (WFM) to help educate their seafood suppliers and staff, and provide our scientific seafood ratings for WFM stores in the US and UK.
- Through our partnership with Chefs Collaborative, we created *Green Chefs/Blue Ocean*, a free, interactive, online sustainable seafood course for chefs and culinary professionals.
- Our website features tutorials, videos, blogs, links and discussions of the key issues such as mercury in seafood, bycatch, overfishing, etc.

Check out our Fellows Program, learn more about our Sustainable Seafood Program and Carl Safina's current work at www.safinacenter.org .

The Safina Center is a 501 (c) (3) nonprofit organization based in the School of Marine & Atmospheric Sciences at Stony Brook University, Long Island, NY. www.safinacenter.org admin@safinacenter.org | 631.632.3763

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

The Safina Center and Seafood Watch define 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 and the Safina Center have 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 assesses winter flounder (*Pseudopleuronectes americanus*) caught with bottom trawls in Canada's groundfish fishery in the Maritimes region.

The status of winter flounder in the Maritimes region is unclear since no population assessment of winter flounder has been conducted. Scientific research surveys indicate that the abundance of the western sub-population (Division 4X) has fluctuated around the long-term abundance average since 2000, while the abundance of the eastern sub-population (Division 4VW) has been below the long-term abundance average. Nearly all fishing for winter flounder occurs in the western area (4X).

The winter flounder bottom trawl fishery also catches and retains Atlantic cod, haddock, and low amounts of other flatfish. Atlantic cod are considered endangered in the Maritimes region and fishing levels on this species are too high. In addition, the fishery may have some bycatch of skates and wolffish, both of which are species of concern. The fishery's overall effect on other species is of high concern.

The Department of Fisheries and Oceans Canada (DFO) manages winter flounder and other groundfish species through total allowable catch limits and several other measures, but management results have been mixed.

Bottom trawls cause moderate to high damage to the habitats where winter flounder live. Managers have made limited progress toward implementing an ecosystem-based management approach but the winter flounder fishery is not expected to have large ecosystem effects.

Final Seafood Recommendations

SPECIES FISHERY	CRITERION 1: Impacts on the Species	CRITERION 2: Impacts on Other Species	CRITERION 3: Management Effectiveness	CRITERION 4: Habitat and Ecosystem	OVERALL RECOMMENDATION
Blackback Maritimes/Northwest Atlantic Bottom trawls Canada Maritimes Fishery	Yellow (2.644)	Red (1.000)	Yellow (3.000)	Yellow (2.598)	(2.130)

Scoring Guide

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

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

- **Best Choice/Green** = Final Score >3.2, and no Red Criteria, and no Critical scores
- **Good Alternative/Yellow** = Final score >2.2-3.2, and neither Harvest Strategy (Factor 3.1) nor Bycatch Management Strategy (Factor 3.2) are Very High Concern², and no more than one Red Criterion, and no Critical scores
- **Avoid/Red** = Final Score ≤2.2, or either Harvest Strategy (Factor 3.1) or Bycatch Management Strategy (Factor 3.2) is Very High Concern or two or more Red Criteria, or one or more Critical scores.

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

Introduction

Scope of the analysis and ensuing recommendation

This report focuses on winter flounder (*Pseudopleuronectes americanus*) caught with bottom trawls in Canada's groundfish fishery in the Maritimes region. Bottom trawls account for >99% of the winter flounder Maritimes catch. Winter flounder caught in other regions of Canada is primarily sold for bait, rather than for human consumption, so those fisheries are not covered in the assessment.

Species Overview

Winter flounder is a coastal flatfish found in the northwest Atlantic from southern Labrador to Georgia. They live in shallow waters (< 100 m) on soft or moderately hard bottom habitats (DFO 2005a). They often bury their whole body in the bottom sediments (Klein-MacPhee 2002)(Pereira et al. 1999). Winter flounder will move seasonally between offshore and inshore habitat depending on temperature and food availability (Pereira et al. 1999).

Winter flounder are one of many species caught in the Canadian Maritimes groundfish fishery. The fishery is managed by the Department of Fisheries and Oceans (DFO) Canada. Winter Flounder are managed as part of a 'flatfish' species complex that also includes American plaice, yellowtail flounder, and witch flounder. There are two flatfish management units in the Maritimes region, a western component (Division 4X) and an eastern component (Division 4VW). In the western component, management was recently changed to manage winter flounder with their own annual catch limit (1,600 mt) and bycatch allowances for other species. In the eastern component, there is an aggregate flatfish annual catch limit (1,000 mt), with a 10% winter flounder bycatch limit (DFO 2015e).

Production Statistics

Winter flounder catches are often combined with other flatfish species in the Maritimes Region, though in recent years there has been more of an effort to separate catches by species.

Catches of all Maritimes flatfish species (winter flounder, American plaice, yellowtail flounder, and witch flounder) in the early 1990's were around 12,000-13,000 mt, but catches have since been declining. Since 2004, catches have hovered around 2,000 mt. In 2014, 1,964 mt of flatfish were landed (DFO 2015m). Most of the flatfish catch is taken in the western area (4X), with <500 mt coming from the eastern area (4VW) (DFO 2015n)(DFO 2015b). In recent years, winter flounder has accounted for the majority of the flatfish catch, followed by witch flounder, American plaice, and yellowtail flounder.

From 2007 to 2014 reported catches of winter flounder ranged from 800-1,600 mt. Unspecified flatfish catches ranged from 100-300 mt from 2007-2011, but have been <100 mt since 2012. Nearly all of the winter flounder catch is reported to come from the western area (4X) (DFO Science Branch 2016, personal communication). Winter flounder is primarily caught with bottom trawls, though a small amount (<1%) may be caught as bycatch in bottom gillnet fisheries (not covered in this assessment)(DFO 2015b).

Importance to the US/North American market.

The National Marine Fisheries Service reports imports and exports of all flounder species together. In 2013, the US imported approximately 16,000 mt of flounder. The majority (62.5%) was imported from China (10,000 mt), followed by Canada (3,000 mt) and Argentina (1,500 mt). In 2014 the US imported approximately 12,500 mt of flounder and again the majority was imported from China (NMFS 2015a). There are no reported exports of flounders for these years.

U.S. landings of all Atlantic flounders (summer, winter, witch, and yellowtail) totaled 11,350 mt in 2013 and 9,270 mt in 2014. Landings of only winter flounder were 2,750 mt in 2013 and 2,000 mt in 2014. Additionally, 35,000 mt and 50,000 mt of Arrowtooth flounder were landed by the U.S. on the Pacific coast in 2013 and 2014, respectively (NMFS 2015b).

Common and market names.

Winter flounder are also known as blackback flounder.

Primary product forms

Winter flounder caught in the Maritimes are primarily sold as fresh and frozen blocks and fillets but can also be used for lobster bait.

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: Impacts on the species under assessment

This criterion evaluates the impact of fishing mortality on the species, given its current abundance. The inherent vulnerability to fishing rating influences how abundance is scored, when abundance is unknown.

The final Criterion 1 score is determined by taking the geometric mean of the abundance and fishing mortality scores. The Criterion 1 rating is determined as follows:

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

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

Criterion 1 Summary

BLACKBACK				
Region Method	Inherent Vulnerability	Abundance	Fishing Mortality	Score
Maritimes/Northwest Atlantic Bottom trawls Canada Maritimes Fishery	3.00: Low	3.00: Moderate Concern	2.33: Moderate Concern	Yellow (2.64)

No population assessment of winter flounder has been conducted but information on abundance trends is available from scientific research surveys. There are two winter flounder sub-populations in the Maritimes region: a western sub-population (Division 4X) and an eastern sub-population (Division 4VW). However, nearly all winter flounder fishing occurs in the western area. Overall, abundance and fishing mortality on winter flounder are of moderate concern.

Criterion 1 Assessment

SCORING GUIDELINES

Factor 1.1 - Inherent Vulnerability

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

Factor 1.2 - Abundance

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

Factor 1.3 - Fishing Mortality

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

BLACKBACK

Factor 1.1 - Inherent Vulnerability

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Low

Fishbase has assigned a low vulnerability score of 34 out of 100 to winter flounder (Froese and Pauly 2015). Winter flounder typically reach sexual maturity at 20-30 cm (8-12 in) in length and 2-4 years of age. Winter flounder spawn in winter and spring in shallow waters. Females can produce anywhere from 100,000 to over 3 million eggs. The eggs settle to the bottom and may be found on a variety of substrate types, including sand, mud, and gravel (Pereira et al. 1999). Winter flounder can grow to a maximum size of 64 cm (2 ft) and can live to 15+ years of age (Froese and Pauly 2015)(Pereira et al. 1999). Winter flounder are opportunistic feeders and are relatively high-level predators within the food chain (Froese and Pauly 2015). They prey on molluscs, crustaceans and fish eggs (DFO 2005a).

Factor 1.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

No population assessment has been conducted for winter flounder in the Maritimes region. However, scientific research surveys have been conducted in this region since 1970 and provide information on abundance trends for winter flounder. Abundance information is provided in relation to the short-term average (2007-2011), medium-term average (1997-2011), and long-term survey average (1970-2011)(DFO 2015a).

The abundance index in the western region (4X), where most fishing for winter flounder occurs, was 2,673 mt in 2014, which is lower than the short-term (7,297 mt), medium-term (5,361 mt) and long-term (3,577 mt) averages. The abundance of winter flounder has fluctuated from year to year, but has shown an overall increasing trend since the 1980's, and has remained above or around the long-term average since 2000. In 2014 abundance declined from the high 2012 and 2013 levels (DFO 2015a).

In the eastern region (4VW) the abundance index was 431 mt in 2014, which is below the short-term (571 mt), medium term (535 mt), and long-term (892 mt) averages. Abundance of winter flounder in this region was low in the 1970's and early 1980's, high in the 1990's, and then declined again in the early 2000's and has remained below the long-term average since (DFO 2015a).

Winter flounder caught in the survey range from 10 to 40 cm in length. In the western region, the lengths of winter flounder have remained varied and stable over time, while in the eastern region, the lengths of winter flounder are skewed toward smaller sizes relative to the long-term average (DFO 2015a).

Because winter flounder has a low vulnerability to fishing, abundance relative to target abundance reference points is unknown, and abundance in the western area where most fishing for winter flounder occurs, appears stable, we have awarded a moderate concern score.

Justification:

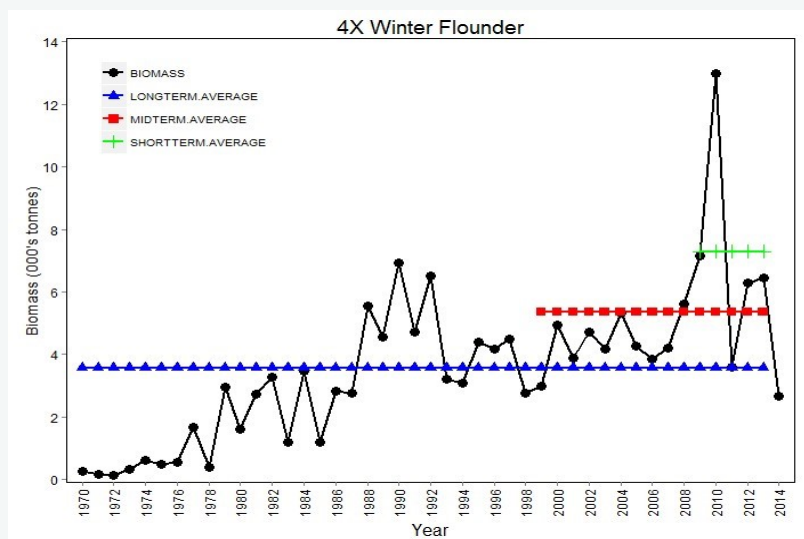


Figure 1 Biomass index for Winter Flounder in the western area (4X) from the Maritimes summer research vessel survey, represented by the black line with solid circles. The dark blue line with the solid triangles indicates the long-term survey average (1970-2013). The red line with the solid squares represents the medium-term 15 year average (1999-2013). The green line with the crosses represents the short-term 5 year average (2009-2013) (DFO 2015a)

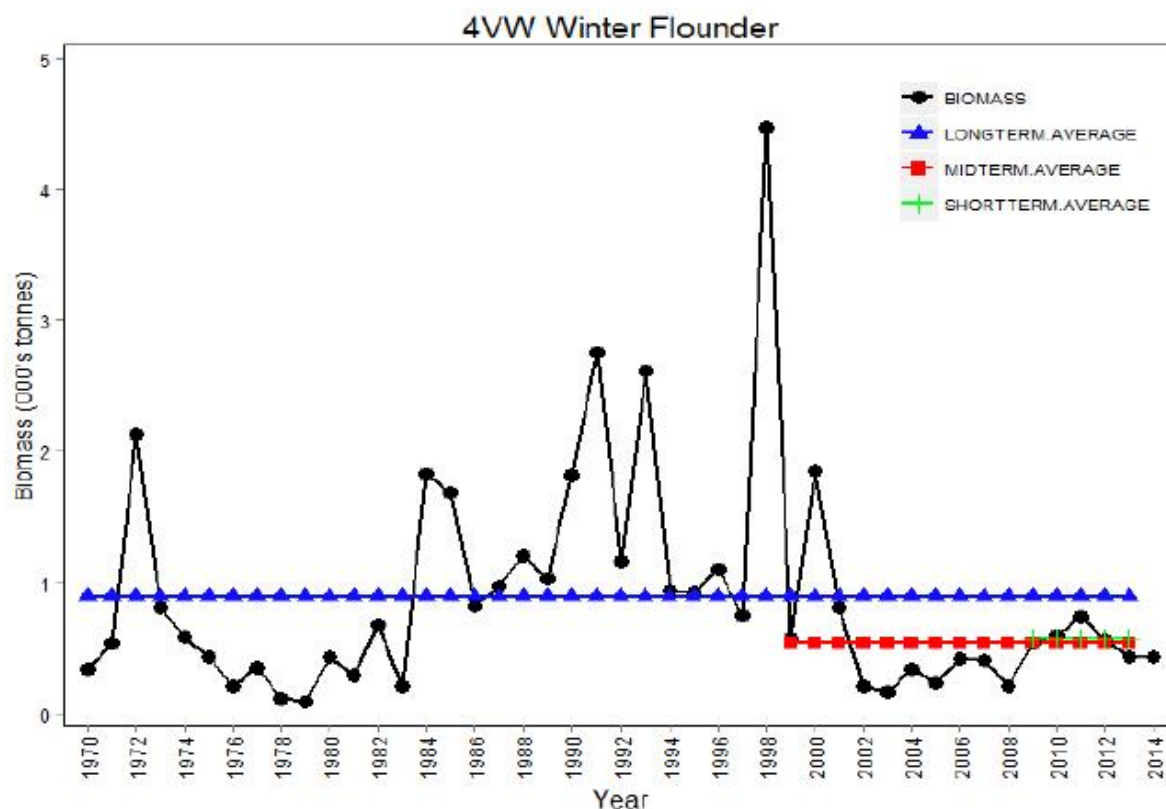


Figure 2 *Biomass index for Winter Flounder in the eastern area (4VW) from the Maritimes summer research vessel survey, represented by the black line with solid circles. The dark blue line with the solid triangles indicates the long-term survey average (1970-2013). The red line with the solid squares represents the medium-term 15 year average (1999-2013). The green line with the crosses represents the short-term 5 year average (2009-2013) (DFO 2015a).*

Factor 1.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

No population assessments have been conducted on winter flounder in the Maritimes region so fishing mortality on this species is unknown.

Flatfish catches have often been combined, but in recent years more of an effort has been made to separate catches by species. From 2007-2014, total annual flatfish catches have ranged from 1,400 to 2,300m t (DFO 2015m), while reported winter flounder catches have ranged from 800 to 1,600 mt. Over this period, unspecified flatfish catches ranged from 60 to 300 mt (DFO Science Branch, personal communication). For the 2015-2016 fishing season, a total allowable catch limit of 1,600 mt has been set for winter flounder in the western area (4X)(previously a catch limit has been set for all flatfish combined). In the eastern area (4VW) a total allowable catch limit of 1,000 mt has been set for all flatfish combined with a 10% bycatch limit (~100 mt) for winter flounder (DFO 2015e).

We have awarded a moderate concern score because fishing mortality on winter flounder is unknown but management measures to control fishing are in place.

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 A.

BLACKBACK					
Maritimes/Northwest Atlantic Bottom Trawls Canada Maritimes Fishery					
Subscore:	1.000	Discard Rate:	1.00	C2 Rate:	1.000
Species Stock	Inherent Vulnerability	Abundance	Fishing Mortality	Subscore	
Atlantic cod	1.00:High	1.00:Very High Concern	1.00:High Concern	Red (1.000)	
American plaice	1.00:High	1.00:Very High Concern	3.67:Low Concern	Red (1.916)	
Winter skate	1.00:High	2.00:High Concern	2.33:Moderate Concern	Red (2.159)	
Wolffish (unspecified)	1.00:High	2.00:High Concern	2.33:Moderate Concern	Red (2.159)	
Yellowtail flounder	2.00:Medium	3.00:Moderate Concern	2.33:Moderate Concern	Yellow (2.644)	
Haddock	2.00:Medium	4.00:Low Concern	2.33:Moderate Concern	Yellow (3.053)	

Main species considered under this criterion were determined from catch composition data (1986-2013) for trips where fishermen identified targeting winter flounder or where winter flounder made up the majority of the catch, as well as from limited at-sea observer studies.

In the targeted winter flounder bottom trawl fishery, winter flounder account for about two-thirds of the total

retained catch. The main other retained species are Atlantic cod and haddock, each contributing to about 11% of the catch. No other species contributed to more than 5% of the catch (DFO Science Branch, personal communication). Catches of other flatfish (American plaice, yellowtail flounder, witch flounder) are reported to be low. However, because American plaice are considered "threatened" they were included in the assessment. Yellowtail flounder is also included in the assessment because overall catches of yellowtail flounder are low, so the winter flounder fishery could still be a significant contributor to its mortality, and there is concern about the abundance of yellowtail flounder in the western portion of the Maritimes. Other species of concern caught in low numbers and included in the assessment are winter skate and wolffish. Both skates and wolffish have been reported to be discarded in bottom trawl fisheries for groundfish (MSC 2010)(Gavaris et al. 2010). Dogfish is also a common discard in bottom trawl fisheries for groundfish, but dogfish is not considered a species of concern, so it was not included in the assessment.

Because the winter flounder fishery in the Maritimes primarily occurs on the western Scotian Shelf (Division 4X), ratings for the above species are based on their status in this area. The lowest scoring species is Atlantic cod, because Atlantic cod are considered "endangered" and fishing levels on cod remain too high.

Criterion 2 Assessment

SCORING GUIDELINES

Factor 2.1 - Inherent Vulnerability

(same as Factor 1.1 above)

Factor 2.2 - Abundance

(same as Factor 1.2 above)

Factor 2.3 - Fishing Mortality

(same as Factor 1.3 above)

ATLANTIC COD

Factor 2.1 - Inherent Vulnerability

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High

Fishbase has assigned a high vulnerability score of 67 out of 100 to Atlantic cod (Froese and Pauly 2015). Atlantic cod reach sexual maturity between 45 and 60 cm in size and between 5 and 8 years of age. Atlantic cod can grow to 180 cm in length and live to 20+ years of age. Atlantic cod are prolific spawners; females can produce several million eggs at a time (DFO 2013c). Atlantic cod are high-level predators within the food chain (Froese and Pauly 2015).

Factor 2.2 - Abundance

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Very High Concern

In 2003, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determined that the

Atlantic cod population in the Maritimes region was a species of "special concern". In 2010, Atlantic cod was re-assessed and the Maritimes region was split into two populations, the Laurentian South population and the Southern population. Both populations were considered "endangered" due to a decline in abundance and an increase in natural mortality (COSEWIC 2010). We have therefore rated this factor very high concern.

Justification:

The Laurentian South cod population is made up of three management units: 1) resident population (4Vn), 2) southern Gulf of St. Lawrence (4TVn) and 3) eastern Scotian Shelf (4VsW). The population of resident cod has been recovering but cod abundance is still at only 25% (2,250 mt) of the limit abundance reference point (8,400 mt) (DFO 2011a). According to the 2011 population assessment, the southern Gulf of St. Lawrence population was at its lowest abundance on record (61 years) and was still declining. The abundance of sexually mature cod (2008-2010 average) was 37% of the mid to late 1990's average and 10% of the mid 1980's average. The estimated abundance was 39,500 mt, which is well below the limit abundance reference point of 80,000 mt. The abundance of cod in the eastern Scotian Shelf has increased rapidly in recent years and was above the limit reference point (50,000 mt) and approaching the long term average of 75,000 mt in 2009. However, since 2009 the population has once again declined (DFO 2015a).

The Southern population is made up of two management units: 1) western Scotian Shelf and Bay of Fundy (4X and 5Y) and 2) eastern Georges Bank (5Z). The abundance of this cod population has declined since the early 1990's. Cod abundance in the western Scotian Shelf/Bay of Fundy has been below the limit abundance level of 24,000 mt since 2000. In 2010, cod abundance was estimated at 10,600 mt (DFO 2011b), and a recent update indicates that abundance has continued to remain at a very low level since 2010 (DFO 2015k).

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High Concern

In the eastern Scotian Shelf (4VsW), directed fishing for Atlantic cod was closed in 1993. Atlantic cod are only allowed to be taken as bycatch and fishing mortality rates are now very low. Several management measures have been put in place to protect Atlantic cod. However, natural mortality on Atlantic cod is very high in this area. The population is expected to decline and then stabilize at a low level, even with no fishing. Fishing mortality rates on the resident Atlantic cod population (4Vn) are also only due to bycatch and those levels are low. Current fishery removals of Atlantic cod in Divisions 4VW are not expected to impede the survival or recovery of this species (DFO 2011a).

Fishing mortality rates on cod in the southern Scotian Shelf and Bay of Fundy (4X5Y) have been greatly reduced from the very high fishing levels in the early 1990's. However, fishing mortality has continued to remain above the target fishing level (DFO 2011b)(DFO 2015k). In 2011, as a result of scientific advice, managers reduced the total allowable catch for cod by 45% to 1650 mt, a level that was expected to allow for rebuilding. However, a recent assessment update indicates that this has not occurred and that the cod population continues to remain in very poor shape. It has been recommended that catches be reduced to the lowest possible level (DFO 2015k). The new total allowable catch for cod is 1,650 mt over two years (DFO 2015e).

Although management has taken action to reduce fishing on cod, since fishing levels on cod in the western area remain high, we have awarded a high concern score.

Factor 2.4 - Discard Rate

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

There is limited information on discards in the Maritimes groundfish trawl fishery. Fishermen reported discards relative to retained catches are low (DFO 2015o). Limited at-sea-observer data also indicates that discards in the bottom trawl fishery are low. From 2002-2006 at-sea-observers sampled 5-17% of the Maritimes groundfish bottom trawl fishery, though most sampling occurred in the Georges Bank area, not on the Scotian Shelf. In 2006, 17% of the catch was sampled and an estimated 1,410 t of fish were discarded while 16,359 t of fish were landed, corresponding to a discard to landings ratio of 8.6% (Gavaris et al. 2010). We have therefore awarded a score of <20%.

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	Harvest Strategy	Bycatch Strategy	Score
Maritimes/Northwest Atlantic Bottom trawls Canada Maritimes Fishery	3.000	3.000	Yellow (3.000)

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Harvest Strategy

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

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

Factor 3.1 Summary

FACTOR 3.1 - MANAGEMENT OF FISHING IMPACTS ON RETAINED SPECIES							
Region Method	Strategy	Recovery	Research	Advice	Enforce	Track	Inclusion
Maritimes/ Northwest Atlantic Bottom trawls Canada Maritimes Fishery	Moderately Effective	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective	Moderately Effective	Moderately 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.

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

Winter flounder are one of many species caught in the Canadian Maritimes mixed-species groundfish fishery. The fishery is managed by the Department of Fisheries and Oceans (DFO) Canada. General regulations for this fishery include catch limits, gear restrictions, reporting requirement, catch verification, area and seasonal closures, and bycatch protocols (DFO 2015e).

Since 1994, winter Flounder have been managed as part of the 'flatfish' species complex which includes American plaice, yellowtail flounder, and witch flounder. There are two flatfish management units in the Maritimes region, a western component (Division 4X) and an eastern component (Division 4WV). Separate total allowable catch limits (TAC) are set for each management unit. This division is considered to likely be appropriate for winter flounder, while its appropriateness for the other flatfish species remains uncertain (DFO 1997a)(DFO 1997b). Nearly all fishing for winter flounder, however, occurs in the western area (4X). In the western area, previously there was a combined flatfish TAC of 2,000 mt. However, for the 2015-16 season, a catch limit of 1,600 mt has been set only for winter flounder and there is now a 10% bycatch limit for each American plaice and yellowtail flounder and a 20% bycatch limit for witch flounder. In the eastern area, there is a combined flatfish TAC of 1,000 mt, with a 500 mt catch cap for American plaice and a 10% bycatch limit for winter flounder for the 2015-2016 season (DFO 2015e). In the past, it has been reported that the established catch limits have not really limited the catch of flatfish species, since they have never been attained and since they have been aggregate catch limits rather than species-specific (DFO 1997c)(DFO 2000) (DFO 2002a).

Management regulations are also in place for cod and haddock, which are retained in this fishery. In the eastern region, cod and haddock are only permitted to be caught as bycatch (DFO 2015e). There is a 5% daily bycatch allowance for each of these species and a 2% overall cap when fishing for flatfish, redfish, or pollock. (DFO 2015b). In the western region, there is a catch limit of 5,100 mt for haddock and a catch limit of 1,650 mt for cod over a two year period (DFO 2015e).

While several management regulations are in place, management effectiveness has been mixed. Some populations (i.e., American plaice, Atlantic cod) have not been maintained at adequate levels. Additionally, for winter flounder no abundance or fishing targets have been defined, and it remains unclear if the established catch limits are appropriate. For these reasons we have awarded a moderately effective score.

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.

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

There is concern about the status of some species caught in this fishery. The Committee of the Status of Endangered Wildlife in Canada (COSEWIC) has classified Atlantic cod as "endangered" and American plaice as "threatened". The Committee on the Status of Endangered Wildlife in Canada consists of an independent body of scientific advisors who perform species assessments and recommend species for listing under Canada's Species At Risk Act. The Species at Risk Act was established in 2003 to conserve, protect and help recover threatened and endangered species. Once a species is listed, recovery strategies and action plans must be created (Waples et al. 2013). Unfortunately, the Canadian Government does not always follow the recommendations by COSEWIC and often chooses not to list fish species under the Species at Risk Act because of socioeconomic concerns (Waples et al. 2013). Neither Atlantic cod nor American plaice has yet to be listed under Canada's Species At Risk Act. However, the Department of Fisheries and Oceans Canada (DFO) has conducted recovery potential assessments for Atlantic cod and American plaice and managers have implemented measures to limit fishing on these species (DFO 2015e)(DFO 2011a)(DFO 2011b)(DFO 2011c) (DFO 2012c). However, fishing remains a threat to the recovery of these species, and more precautionary measures may be needed. We have therefore awarded a moderately effective score.

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.

MARITIMES/ NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

The Department of Fisheries and Oceans (DFO) monitors and collects information on the groundfish fisheries through the At-sea Observer Program (though observer coverage has been very low), the Dockside Monitoring Program (DMP), and Vessel Monitoring Systems (VMS) (DFO 2011b)(DFO 2012d)(DFO 2013e). Fishers are also required to fill out logbooks to record information about their catch and fishing effort (DFO 2012e). In the past catches of flatfish species have often been combined, but fishermen are now required to report catches by species.

The Department of Fisheries and Oceans Canada (DFO) has conducted scientific research surveys in the Maritimes region since 1970 to evaluate the abundance of groundfish species. Trends in abundance, biomass and size of groundfish (Atlantic cod, haddock, white hake, silver hake, pollock, redfish, Atlantic halibut, flatfish, smooth, thorny, barndoor, winter and little skate, Atlantic wolffish, monkfish and longhorn sculpin) are determined through these surveys (DFO 2015a). The information collected in these surveys is used for management recommendations. However, no formal assessments have been conducted for winter flounder.

Population assessments have been conducted for American plaice, Atlantic cod and haddock.

Although fishery and abundance data is collected, management of winter flounder has been hindered by the lack of formal population assessments and the failure to collect species-specific data. We have therefore awarded only a moderately effective score.

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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

The Canadian Science Advisory Secretariat provides scientific advice to the Department of Fisheries and Oceans Canada. For winter flounder and other flatfish species, scientific advice is based on the results of fish abundance surveys. Scientists use the information from these surveys to provide management recommendations and to determine which populations need review in upcoming years (DFO 2002b)(DFO 2015a). With the exception of American plaice, there have been no published assessments for flatfish species in recent years. However, in past assessments of flatfish species, scientists advised managers to identify flatfish catches to the species level and set species-specific catch limits, rather than aggregate catch limits (DFO 1997a)(DFO 1997b)(DFO 1997c). Only recently have managers made some effort to do this (DFO 2015e). Since 2013, all groundfish license holders have been required to separate flounders by species. While it has taken time for fishermen to comply with this requirement, by 2015 almost all flounders were reported by species and compliance is expected to improve. We have awarded a moderately effective score.

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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Highly Effective

In Canada, the Department of Fisheries and Oceans Canada (DFO) is in charge of enforcing fisheries management regulations set in place. The DFO fisheries officers monitor fishing activity through land patrol, at sea inspections and air surveillance (DFO 2013b). DFO also uses vessel monitoring systems, video monitoring, radar and satellite monitoring to identify illegal fishing (DFO 2013b). The Maritimes region has about 140 enforcement officers, about 40% of which are dedicated to enforcing regulations in the groundfish fishery (MSC 2010). The DFO also relies on education and other awareness activities to improve compliance with fisheries laws and encourages the general public to report violations (MSC 2010)(DFO 2013b). Since regulations are regularly enforced and there are no known compliance issues, we have awarded a highly effective score.

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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

Management measures in place for flatfish and other groundfish have had mixed results in the long term maintenance of populations (DFO 2015a). Species such as American plaice and Atlantic cod continue to remain depleted (DFO 2011a)(DFO 2011b)(DFO 2011c). Additionally, the status of winter flounder and other flounders remains uncertain because there have been no formal population assessments. We have awarded a moderately effective score.

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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

The Department of Fisheries and Oceans Canada (DFO) provides opportunities for stakeholders to be involved in the management process. DFO works with a diverse range of stakeholder groups and individuals including local communities, fishery biologists, enforcement personnel, international organizations, aboriginal groups with fishing and resource rights, commercial aquaculture and wild fishery organizations, companies, and provincial counterparts with shared resource management responsibilities. Stakeholder involvement is established through regular consultation with interested parties and through public meetings (DFO 2008)(MSC 2010). However, because it is unclear how the opinions of stakeholders are used in the decision making process, we have awarded only a moderately effective score.

Factor 3.2 - Bycatch Strategy

SCORING GUIDELINES

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

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

are known to be regular components of bycatch and are substantially impacted by the fishery

FACTOR 3.2 - BYCATCH STRATEGY						
Region Method	All Kept	Critical	Strategy	Research	Advice	Enforce
Maritimes/Northwest Atlantic Bottom trawls Canada Maritimes Fishery	No	No	Moderately Effective	Moderately Effective	Moderately Effective	Highly Effective

Subfactor 3.2.2 – 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.).

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

Several management strategies are also in place to reduce the impacts on bycatch species. Fishermen participating in the Canadian groundfish fishery are required to retain all groundfish, with the exception of dogfish, sculpin, skate and some undersized fish (DFO 2016). Additionally, if a fishing fleet's catch of undersize fish exceeds 15% of the catch, a temporary closure is put into place (DFO 2013d). Conservation Harvesting Plans designate the total bycatch of species that can be taken on each trip in percentage terms relative to the total catch (DFO 2015e). Species that are listed as Threatened or Endangered under Canada's Species at Risk Act (e.g. wolffish) are to be released immediately, and recovery strategies must be developed for these species (Kulka et al. 2007). Some gear modifications have also been tested and introduced to Canadian fisheries (Fuller et al. 2008). Despite these various management strategies, there is not enough data available to know how effective these strategies are. We have therefore awarded a moderately effective score.

Subfactor 3.2.3 – 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

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

Canada has an At-Sea Observer Program in place, which puts certified private-sector observers aboard fishing vessels to collect catch information, including information on bycatch and discards. However, coverage rates for most fisheries are too low and intermittent to have a high degree of confidence in the bycatch/discard data collected. Observer coverage rates in the groundfish fisheries in Division 4X and 4VW have ranged from 0-3% (Gavaris et al. 2010)(DFO 2011b). Observer coverage rates for the groundfish fisheries in nearby Georges Bank are higher (8-33%). Advice on the adequate percentage of observer coverage for this fishery is not available. Some scientists have suggested a coverage rate of 20% is needed to estimate bycatch of common

species and 50% to estimate bycatch of rare species (Babcock et al. 2003). We have awarded a moderately effective score since only limited data on bycatch and discards is collected in this fishery.

Subfactor 3.2.4 – 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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderately Effective

See harvest strategy for more information.

Subfactor 3.2.5 – 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.

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Highly Effective

See harvest strategy for more information.

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	Score
Maritimes/Northwest Atlantic Bottom trawls Canada Maritimes Fishery	2.00: Moderate Concern	0.25: Minimal Mitigation	3.00: Moderate Concern	Yellow (2.598)

Criterion 4 Assessment

SCORING GUIDELINES

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

- *5 (None) - Fishing gear does not contact the bottom*
- *4 (Very Low) - Vertical line gear*
- *3 (Low)—Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom longline, trap) and is not fished on sensitive habitats. Bottom seine on resilient mud/sand habitats. Midwater trawl that is known to contact bottom occasionally (*
- *2 (Moderate)—Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Bottom seine except on mud/sand*
- *1 (High)—Hydraulic clam dredge. Dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 (Very High)—Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

Factor 4.2 - Mitigation of Gear Impacts

- *+1 (Strong Mitigation)—Examples include large proportion of habitat protected from fishing (>50%) with gear, fishing intensity low/limited, gear specifically modified to reduce damage to seafloor and modifications shown to be effective at reducing damage, or an effective combination of 'moderate' mitigation measures.*
- *+0.5 (Moderate Mitigation)—20% of habitat protected from fishing with gear or other measures in place to*

limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing.

- *+0.25 (Low Mitigation)—A few measures are in place (e.g., vulnerable habitats protected but other habitats not protected); there are some limits on fishing effort/intensity, but not actively being reduced*
- *0 (No Mitigation)—No effective measures are in place to limit gear impacts on habitats*

Factor 4.3 - Ecosystem-Based Fisheries Management

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

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

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

Bottom trawls are large nets that are dragged along the seafloor. They can have a large negative impact on bottom habitats (NOAA 2002). Bottom trawling can remove and/or destroy bottom structures, stir up the sediment, and alter bottom communities (NOAA 2002)(Fuller et al. 2008). Fishing for winter flounder and other flatfish species typically occurs over soft bottom or moderately hard-bottom habitats (DFO 2005a), which tend to recover faster from damage caused by bottom trawling compared to rocky or coral reef habitats (Fuller et al. 2008). We have awarded a moderate concern score.

Factor 4.2 - Mitigation of Gear Impacts

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Minimal Mitigation

The Department of Fisheries and Oceans Canada establishes marine protected areas (MPA) through the Oceans Act. Within Atlantic Canada, there are five MPA's; two of these MPAs, the Gully and Musquash Estuary, are located within the Maritimes region. The Gully is a submarine canyon located off the coast of Newfoundland, east of Sable Island (DFO 2014b)(DFO 2015g)(DFO 2015h). The Musquash Estuary is an estuary located southwest of Saint John, New Brunswick in the Bay of Fundy (DFO 2015g). There are additional ecosystem measures in place to protect cold-water coral species in the Maritimes region (DFO 2015l), and there are also a few area/seasonal closures for this fishery (DFO 2002b)(DFO 2015e)(DFO 2016).

The MPAs and other areas closures do not provide much protection to winter flounder habitats, so we have only awarded a score of minimal mitigation.

Factor 4.3 - Ecosystem-Based Fisheries Management

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

The continental shelf of Atlantic Canada and New England is one of the most productive marine ecosystems and fishing grounds in the world. Due to an increase in fishing pressure in the last fifty years, species abundances and species composition have been dramatically altered. Total fish biomass has been greatly reduced in this region (Fogarty and Murawski 1998), and the Atlantic Canadian fishery now relies on invertebrate species such as lobster, crab, scallop and shrimp (Fuller et al. 2008). In addition to fishing impacts, natural and anthropogenic environmental impacts (e.g., temperature shifts) may also be resulting in changes to the ecosystem. Separating the effects of fishing and the effects of environmental changes may be close to impossible.

In order to address these issues, Canada has begun to make strides towards an ecosystem based fisheries management approach. Currently DFO has a Sustainable Fisheries Framework. This Framework is made up of 1) conservation and sustainable use policies, which incorporate precautionary and ecosystem based approaches and 2) planning and monitoring tools, such as Integrated Fisheries Management Plans (DFO 2009b). The Department of Fisheries and Oceans Canada (DFO) has developed a set of objectives necessary for an ecosystem based approach and is working on fulfilling these objectives through the Strategic Program for Ecosystem-Based Research and Advice (SPERA). SPERA undertakes research projects to 1.) assess ecosystem impacts of human activities, 2.) assess and report on ecosystems and 3.) develop tools for implementing the ecosystem approach (DFO 2014d). DFO also has an Ecosystem Science Framework, which aims to create a better understanding of the cumulative impacts of human activities in Canadian waters and to provide a framework for integrating science activities (DFO 2014e).

Within the Maritimes region, there is an Ecosystem Management Branch that provides a leading role in fulfilling DFO mandates to manage and protect ocean habitats and species at risk (DFO 2014b). A Regional Ocean Plan for the Maritimes has been developed to support an integrated approach to managing marine activities and resources (DFO 2015j).

We have awarded a moderate concern score because although Canada is working on ecosystem based management for their fisheries, most of the work is still in the research and planning stages.

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

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Appendix A: Extra By Catch Species

WINTER SKATE

Factor 2.1 - Inherent Vulnerability

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High

FishBase has assigned a high inherent vulnerability score of 62 out of 100 to winter skate (Froese and Pauly 2015). Winter skate are slow growing, reaching lengths of 110 cm and living up to 30 years. They reach sexual maturity between the ages of 7 and 13 years and at a length of 50 to 75 cm. Winter skate spawn in late summer/early fall and can lay between 6 and 50 eggs/year (COSEWIC 2005). Within the food chain, they are a high-level predator.

Factor 2.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High Concern

In 2005, the Eastern Scotian Shelf population (4VW) of winter skate was determined to be "threatened" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). The abundance of mature individuals on the Eastern Scotian Shelf is estimated to have declined by more than 90% since the early 1970's (COSEWIC 2005)(DFO 2005b). Additionally, since the mid-1980's, the area occupied by winter skate appears to have declined significantly. Despite these large abundance declines, the Government of Canada chose not to list this species under the federal Species at Risk Act, primarily due to socioeconomic concerns (Government of Canada 2010). Abundance information from research surveys indicates that winter skate abundance in this region remains very low (DFO 2015a).

The Western Scotian Shelf-Bay of Fundy-Georges Bank population of winter skate was determined to be a species of "special concern" due to the species vulnerable life history characteristics (COSEWIC 2005). Scientific research surveys show that abundance of winter skate on the western Scotian Shelf has fluctuated greatly from year to year, with no overall trend (DFO 2015a).

Because the winter flounder fishery is most likely to interact with the Scotian Shelf-Bay of Fundy-Georges Bank winter skate population, we have awarded a high concern score.

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

There used to be a directed fishery for winter skate in the eastern Scotian Shelf (4VW), but now all fishing for winter skate is limited to bycatch. Bycatch in groundfish fisheries and fisheries for invertebrates is considered a primary threat to this species in Canadian waters (COSEWIC 2005). However, the fishing mortality of winter skate due to bycatch in groundfish fisheries has been reduced in recent years due to dramatic reductions in

fishing effort. Landings of skates in the winter flounder fishery are low (DFO Science Branch, personal communication), but limited at-sea-observer studies suggest this species may be a frequent discard in bottom trawl fisheries for groundfish (MSC 2010)(Gavaris et al. 2010). There have been no recent assessments of winter skate to determine if current fishing levels are sustainable or not. Due to a lack of information, we have rated fishing mortality on winter skate a moderate concern.

Factor 2.4 - Discard Rate

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

There is limited information on discards in the Maritimes groundfish trawl fishery. Fishermen reported discards relative to retained catches are low (DFO 2015o). Limited at-sea-observer data also indicates that discards in the bottom trawl fishery are low. From 2002-2006 at-sea-observers sampled 5-17% of the Maritimes groundfish bottom trawl fishery, though most sampling occurred in the Georges Bank area, not on the Scotian Shelf. In 2006, 17% of the catch was sampled and an estimated 1,410 t of fish were discarded while 16,359 t of fish were landed, corresponding to a discard to landings ratio of 8.6% (Gavaris et al. 2010). We have therefore awarded a score of <20%.

AMERICAN PLAICE

Factor 2.1 - Inherent Vulnerability

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High

Fishbase assigns a high vulnerability score of 66 out of 100 to American plaice. American plaice are high-level predators within the food web and can live up to 30 years (Froese and Pauly 2015). Females grow more quickly than males and are larger than males at any given age. The age and size at which American plaice reach sexual maturity varies by geographic location and has declined over time. In Canada, female American plaice use to not reach sexual maturity until 10-15 years of age (33-55 cm in length). However, now females may reach maturity at 5-9 years of age (25-45 cm in length). Males use to reach sexual maturity between 4-7 years of age (20-30 cm), but the age and size at maturity for males has also declined (COSEWIC 2009). American plaice spawn near the bottom, but once the eggs are fertilized, they become buoyant and rise up in the water column. Females can spawn several hundred thousand eggs at a time (COSEWIC 2009).

Factor 2.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Very High Concern

Canada's Committee on the Status of Endangered Wildlife in Canada (COSEWIC) have determined that American plaice in the Maritimes region (Scotian Shelf, Bay of Fundy, and Gulf of St. Lawrence) are "threatened", due to large (67-86%) declines in abundance over a 36 year period (COSEWIC 2009). American plaice is currently under consideration for listing under Canada's Species at Risk Act.

Subsequent to this COSEWIC assessment, the Division of Fisheries and Oceans Canada conducted an assessment to define abundance reference points/targets for American Plaice on the Scotian Shelf (4XVW). The accepted reference points are based on fish numbers rather than fish weights (biomass). The reference points based on fish numbers suggest that Scotian Shelf American plaice is much healthier than the COSEWIC assessment indicates (DFO 2012c). However the appropriateness of these reference points remains unclear, and this assessment only considered a portion of the Maritimes population. Research surveys conducted since 1970 indicate that the 2014 abundance of American plaice (in terms of weight) in Divisions 4X and 4VW is at an all-time low and far below the historical average (DFO 2015a).

We have awarded a very high concern score based on the COSEWIC determination that American plaice in the Maritimes region are "threatened."

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Low Concern

In the past, overfishing on American plaice was considered the major cause of this species decline (COSEWIC 2009). Since the 1990's fishing effort has been declining but there has been no sign of recovery for American plaice. The lack of recovery may be in part due to increased natural mortality on adult plaice (COSEWIC 2009) (DFO 2011c).

Current fishing mortality on American plaice is uncertain. Because flatfish catches have often been combined, it is difficult to get an accurate picture of American plaice catches. Based on reported catches of American plaice and catches of unspecified flounders, it is estimated that American plaice catches have been very low in the eastern area (4VW) in recent years (<30 mt) and around 130-240 mt in the western area (4X) (DFO 2012c). Reported catches of American plaice (and unspecified flatfish) on trips targeting winter flounder have been low (<10 mt), suggesting that the winter flounder fishery is a low contributor to fishing mortality on this species (DFO Science Branch, personal communication).

A 2011 Recovery Potential Assessment determined that there is a 25% to 38% chance that American plaice in Division 4X and 4VW will continue to decline over the next 48 years, depending on various fishing rates (catch of 0-750 mt) (DFO 2011c). Previously there has been a combined total allowable catch limit for all flatfish species in these areas, however for the 2015-2016 season, some species-specific catch limits have been established. In the eastern area (4VW), there is a flatfish total allowable catch (TAC) of 1,000 mt with a 500 mt cap for American plaice (DFO 2015e). In the western area (4X), a catch limit of 1,600 mt has been set only for winter flounder, with a 10% bycatch limit (~160 mt) for American plaice (DFO 2015e). It remains unclear if these catch limits are low enough to allow for the recovery of American plaice.

While fishing mortality on American plaice is uncertain, because the winter flounder fishery likely contributes to a low proportion of the total mortality, we have awarded a low concern score.

Factor 2.4 - Discard Rate

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

There is limited information on discards in the Maritimes groundfish trawl fishery. Fishermen reported discards relative to retained catches are low (DFO 2015o). Limited at-sea-observer data also indicates that discards in the bottom trawl fishery are low. From 2002-2006 at-sea-observers sampled 5-17% of the Maritimes groundfish bottom trawl fishery, though most sampling occurred in the Georges Bank area, not on the Scotian Shelf. In 2006, 17% of the catch was sampled and an estimated 1,410 t of fish were discarded while 16,359 t of fish were landed, corresponding to a discard to landings ratio of 8.6% (Gavaris et al. 2010). We have therefore awarded a score of <20%.

HADDOCK

Factor 2.1 - Inherent Vulnerability

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Medium

Fishbase has assigned a moderate vulnerability score of 47 out of 100. Haddock begin to reach sexual maturity between 2 and 3 years of age and around 35 cm in size. Females produce up to 3 million eggs a year (DFO 2012c). Haddock can live to 20 years of age and grow to a maximum size of 112 cm in length (DFO 2012c). Haddock are high-level predators within the food chain (Froese and Pauly 2015).

Factor 2.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Low Concern

A population assessment of the western Scotian Shelf and Bay of Fundy (4X5Y) haddock population was last conducted in 2012. Estimates of abundance based on research surveys indicate that abundance has been fairly stable over the last decade, fluctuating around the long-term average (DFO 2012b)(DFO 2015a). Recent recruitment (= amount of new fish entering population) has been variable, with poor year classes during 2007 and 2008 and large year classes in 2009 and 2010. The target abundance level or the biomass at maximum sustainable yield (BMSY) is estimated to be 52,000 mt. A limit abundance reference point of 40% of BMSY (20,800 mt) and upper abundance reference point of 80% of BMSY (41,600m t) were suggested. The current abundance of haddock is considered to likely be in between the limit and upper abundance reference points and in the "cautious zone" (DFO 2012b).

No recent population assessment has been conducted for haddock in the eastern area (4VW) of the Maritimes. However, scientific research surveys conducted in this region since 1970 provide information on abundance trends. Abundance of haddock has fluctuated greatly over the years, being low in the 1970's,

moderately high in the 1980's, and low again in the 1990's. During much of the 2000's abundance fluctuated around the long-term average, but in recent years has declined to below average levels. As of 2014, the abundance index was 33,409 mt, which is well below the short-term (61,887 mt, 2009-2013), medium-term (63,212 mt, 1999-2013), and long-term (59,104 mt, 1970-2013) abundance averages (DFO 2015a). Past assessment of haddock in the early 2000's indicated the population was dominated by small individuals and exhibited poor growth (i.e. fish were under-weight and under-length) (DFO 2002b)(DFO 2004). The current population appears to still be dominated by small individuals (DFO 2015a).

Although abundance of haddock is low in the eastern area, because the winter flounder fishery primarily occurs in the western Scotian Shelf and haddock in this area are not overfished, a low concern score is awarded.

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

The 2012 assessment of the western Scotian Shelf/Bay of Fundy (4X5Y) haddock population did not provide an estimate of the current fishing mortality rate. A target fishing mortality reference point of 0.25 has been suggested but further review is required (DFO 2012b). The total allowable catch (TAC) for haddock in the eastern Scotian Shelf/Bay of Fundy was 7,000 mt from 2006 to 2009, lowered to 6,000 mt for 2010 and 2011 and to 5,100 mt in 2012 (DFO 2012b). Catches have been lower than the catch limit, averaging approximately 5,700 mt since 2005.

In the eastern area of the Maritimes (4VW), there is a moratorium on targeted fishing for haddock, as well as a 5% daily bycatch limit and a 2% overall cap for haddock when fishing for flatfish (DFO 2015b)(DFO 2015e).

We have awarded a moderate concern score because fishing mortality rates are unknown.

Factor 2.4 - Discard Rate

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

There is limited information on discards in the Maritimes groundfish trawl fishery. Fishermen reported discards relative to retained catches are low (DFO 2015o). Limited at-sea-observer data also indicates that discards in the bottom trawl fishery are low. From 2002-2006 at-sea-observers sampled 5-17% of the Maritimes groundfish bottom trawl fishery, though most sampling occurred in the Georges Bank area, not on the Scotian Shelf. In 2006, 17% of the catch was sampled and an estimated 1,410 t of fish were discarded while 16,359 t of fish were landed, corresponding to a discard to landings ratio of 8.6% (Gavaris et al. 2010). We have therefore awarded a score of <20%.

WOLFFISH (UNSPECIFIED)

Factor 2.1 - Inherent Vulnerability

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High

There are three species of wolffish in Canada's waters: northern wolffish, spotted wolffish, and Atlantic wolffish, but northern and spotted wolffish are considered rare in the Maritimes region. Wolffish are considered highly vulnerable to fishing, with FishBase vulnerability scores ranging from 67 to 80 (Froese and Pauly 2015). Wolffish typically reach sexual maturity at 5-7 years, live to 20 plus years of age, and grow to 150-180 cm in length (Kulka et al. 2007)(Simpson et al. 2012)(COSEWIC 2012a)(COSEWIC 2012b). Wolffish are demersal egg layers and top predators.

Factor 2.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

High Concern

Northern and spotted wolffish were designated as "threatened by the Committee on the Status of Endangered Wildlife (COSEWIC) in Canada in 2001 and Atlantic wolffish were designated as "special concern" in 2000. These classifications were maintained after a re-evaluation was conducted in 2012 (COSEWIC 2012a) (COSEWIC 2012b)(COSEWIC 2012c). All three species are listed under Canada's Species At Risk Act. Abundance surveys for these species in the Maritimes region are conducted. The abundance of Atlantic wolffish has declined since the mid-1990's. The two other species, northern and spotted, are not frequently caught in this region and there is no real trend in abundance estimates (DFO 2014f). We have awarded a high concern score based on the status of Atlantic wolffish, since this is the species most likely to interact with the winter flounder fishery.

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

Fishing mortality for wolffish is unknown, but a 2007 study indicated that the exploitation index (catch/relative biomass) was low for all wolffish species from 1995-2002 (Kulka et al. 2007). Currently, northern and spotted wolffish must be released if caught; only Atlantic wolffish may be retained. Reported catches of wolffish in the winter flounder fishery have ranged from <1 to 45 mt, with very low catches in recent years (DFO Science Branch, personal communication). However, large number of wolffish may be discarded at sea and not adequately reported (Gavaris et al. 2010)(COSEWIC 2012c)(Simpson et al. 2012). Survival of discarded Atlantic wolffish is thought to be high. Wolffish are protected under Canada's Species at Risk Act, and a recovery strategy/management plan is in place for these species (Kulka et al. 2007)(DFO 2013f). We have awarded a moderate concern score.

Factor 2.4 - Discard Rate

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

There is limited information on discards in the Maritimes groundfish trawl fishery. Fishermen reported discards relative to retained catches are low (DFO 2015o). Limited at-sea-observer data also indicates that discards in the bottom trawl fishery are low. From 2002-2006 at-sea-observers sampled 5-17% of the Maritimes groundfish bottom trawl fishery, though most sampling occurred in the Georges Bank area, not on the Scotian Shelf. In 2006, 17% of the catch was sampled and an estimated 1,410 t of fish were discarded while 16,359 t of fish were landed, corresponding to a discard to landings ratio of 8.6% (Gavaris et al. 2010). We have therefore awarded a score of <20%.

YELLOWTAIL FLOUNDER

Factor 2.1 - Inherent Vulnerability

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Medium

Fishbase has assigned a medium vulnerability score of 37 out of 100 to yellowtail flounder (Froese and Pauly 2015). Yellowtail flounder reach sexual maturity between 4 and 7 years of age and at around 30 cm in length. Yellowtail flounder can grow to a maximum size of 60 cm and live up to 12 years. They are broadcast spawners, laying their eggs on or near the sea floor. Females produce between 350,000 and 4,570,000 eggs, which float to the surface after fertilization (DFO 2015d). Within the food web they are a moderate-level predator (Froese and Pauly 2015).

Factor 2.2 - Abundance

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

No formal population assessment has been conducted for yellowtail flounder in the Maritimes region. However, scientific research surveys have been conducted in this region since 1970 and provide information on abundance trends for yellowtail flounder. In the western portion of the Maritimes (4X), where the winter flounder fishery is concentrated, abundance of yellowtail flounder has dramatically declined in recent year to 120 mt, which is far below the long-term (1970-2013) average of 660 mt (DFO 2015a). In the eastern portion of the Maritimes (4VW), abundance declined during the 1990's into the early 2000's, but has been increasing since and is currently around the long-term average abundance level (13,570 mt) (DFO 2015a). The population structure of yellowtail in the Maritimes remains uncertain (DFO 1997b).

Because of the uncertain abundance of yellowtail flounder in relation to target abundance reference goals combined with the species medium vulnerability to fishing, we have awarded a moderate concern

score.

Factor 2.3 - Fishing Mortality

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

Moderate Concern

No formal population assessments have been conducted for yellowtail flounder in the Maritimes and no estimates of fishing mortality on this species are available. Flatfish catches have often been combined, but there has been an effort in recent years to separate catches by species. From 2007-2014, reported annual flatfish catches of yellowtail flounder have generally been <50 mt, but catches may be greater than this since not all flatfish catches have been determined to the species level (catches of unspecified flounders have ranged from 60-300 mt). On trips targeting winter flounder, reported catches of yellowtail flounder (as well as unspecified flounders) have been low (<15 mt) (DFO Science Branch, personal communication).

In the eastern region (Division 4VW), there is an aggregate flatfish total allowable catch (TAC) of 1,000 mt (DFO 2015e). In the western region, there has previously been a combined flatfish catch limit, but for the 2015-2016 season a catch limit of 1,600 mt has been set for winter flounder and there is a 10% bycatch limit (~160 mt) for yellowtail flounder (DFO 2015e).

Because fishing mortality on yellowtail flounder is uncertain and the contribution to mortality by the winter flounder fishery is also uncertain, we have awarded a moderate concern score.

Factor 2.4 - Discard Rate

MARITIMES/NORTHWEST ATLANTIC

Bottom Trawls | Canada | Maritimes Fishery

< 20%

When fishing for groundfish all groundfish species must be retained, with a few exceptions. Sculpin, spiny dogfish and skates, are allowed to be discarded. In addition, Atlantic halibut less than 81 cm must be discarded (DFO 2016). Atlantic halibut have a high post release survival rate (Neilson et al. 1989). Non-groundfish species reported to be discarded in the bottom trawl groundfish fisheries include wolffish, sharks, and lobster (Gavaris et al. 2010)(MSC 2010)(DFO 2015o).

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Appendix B: Updates to Winter Flounder Report

This report was reviewed for any significant stock status and management updates to the fishery on November 20, 2019. None were found that would indicate the final rating is no longer accurate.