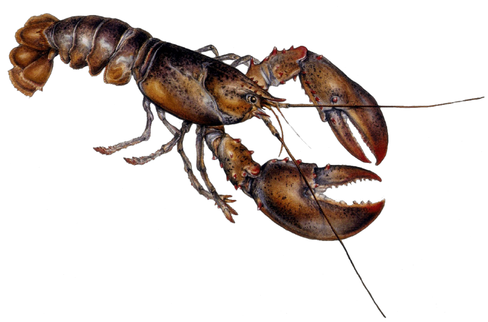
American Lobster

Homarus americanus



Canada: Northwest Atlantic

Pots

Report ID 1001

September 6, 2022

Seafood Watch Standard used in this assessment: Fisheries Standard v3

Table of Contents

About Seafood Watch

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

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

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

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

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

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

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

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

Guiding Principles

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

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

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

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

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

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

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

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

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

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

Summary

This report provides an analysis and recommendations for the commercial fishery for American lobster (*Homarus americanus*), hereafter referred to as "lobster," in Atlantic Canada. The Canadian fishery takes place from Newfoundland and Labrador (north) to New Brunswick (south), and includes Quebec, Prince Edward Island, and Nova Scotia. In Canada, lobster is harvested exclusively with traps (pots).

For Criterion 1, one of the assessed lobster stocks is scored Yellow and the other nine areas are scored Green. Generally, stocks are considered healthy and abundant, although there is some uncertainty due to the lack of fishery-independent data in some areas.

The lowest-scoring Criterion 2 species include herring, which is assessed because of its use as bait in the lobster fishery. Several endangered and threatened species are at risk of capture or entanglement in lobster fishing gear, including the endangered North Atlantic right whale. The majority of whale sightings occur in the Bay of Fundy and the Gulf of St. Lawrence.

Overall, management is scored Red. There is a mixture of management measures, which are mostly effort-based. There are concerns for several aspects of the lobster management system, particularly regarding the persistence of high exploitation rates, reliance on new recruits, a lack of fishery-independent data to determine abundance and fishing mortality, a reliance on landings data as a proxy for abundance, a lack of observer studies, and difficulties with enforcement. Recent improvements include increases in minimum legal sizes and a reduction in effort in some areas. Of greatest concern is the management of interactions with North Atlantic right whale. Although improvements have been made annually since 2018 to reduce these interactions, the entanglement of North Atlantic right whale in fishing gear and associated mortalities remain above a sustainable level and the contribution from the lobster fishery is unknown.

Lobster traps present a moderate impact on ocean bottom habitat, and the resilience of bottom habitat to these effects is considered moderate to high, depending on the specific substratum. At present, there is no evidence that the fishing method or the removal of Atlantic lobster has severe habitat or ecosystem effects. Given that lobster pots are considered to have relatively benign effects on habitat, particularly when compared with mobile gear, there are few measures to reduce or mitigate the effects of fishing practices on habitat.

In summary, all Atlantic Canadian lobster fisheries receive an overall recommendation of Avoid (i.e., Red).

Final Seafood Recommendations

SPECIES | FISHERY	CRITERION 1 TARGET SPECIES	CRITERION 2 OTHER SPECIES	CRITERION 3 MANAGEMENT	CRITERION 4 HABITAT	OVERALL RECOMMENDATION
American lobster | Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)	4.284	1.000	1.000	3.464	**Avoid (1.963)**
American lobster | Northwest Atlantic | Pots | Canada | Southwest Nova Scotia	4.284	1.000	1.000	3.464	**Avoid (1.963)**
American lobster | Northwest Atlantic | Pots | Canada | LFAs 27-32	4.284	1.000	1.000	3.464	**Avoid (1.963)**
American lobster | Northwest Atlantic | Pots | Canada | LFA 33	3.413	1.000	1.000	3.464	**Avoid (1.854)**
American lobster | Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island	3.318	1.000	1.000	3.464	**Avoid (1.841)**
American lobster | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence	3.318	1.000	1.000	3.464	**Avoid (1.841)**
American lobster | Northwest Atlantic | Pots | Canada | Bay of Fundy	3.318	1.000	1.000	3.464	**Avoid (1.841)**
American lobster | Northwest Atlantic | Pots | Canada | The Gaspe Peninsula	3.318	1.000	1.000	3.464	**Avoid (1.841)**
American lobster | Northwest Atlantic | Pots | Canada | The Magdalen Islands	3.318	1.000	1.000	3.464	**Avoid (1.841)**
American lobster | Northwest Atlantic | Pots | Canada | Newfoundland and Labrador	2.644	1.000	1.000	3.464	**Avoid (1.740)**

Summary

All lobster fisheries in Atlantic Canada are scored Avoid. The main concerns identified are interactions with endangered and threatened species, including turtles and whales, the failure of by-catch management measures to reduce these interactions to an acceptable level, high exploitation rates, and a lack of appropriate data-limited indicators to determine the stock status in some of the lobster fisheries (particularly Newfoundland and Labrador).

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 Concern[2], 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.

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

Introduction

Scope of the analysis and ensuing recommendation

This report provides an analysis and recommendation for the commercial fisheries for American lobster (*Homarus americanus*), hereafter referred to as lobster, in Atlantic Canada using traps or pots with vertical lines. The Canadian fishery takes place from Newfoundland and Labrador (north) to New Brunswick (south), and includes Quebec, Prince Edward Island, and Nova Scotia. Lobster fisheries are managed regionally and divided into a number of lobster fishing areas (LFAs). The recommendations in this report cover the following LFAs:

Region	LFAs
Newfoundland and Labrador	3–14
Quebec North Shore and Anticosti Island	15–18
The Gaspe Peninsula	19–21
Magdalen Islands	22
Southern Gulf of St. Lawrence	23–26AB
LFAs 27–32	27–32
LFA 33	33
Southwest Nova Scotia	34
Bay of Fundy	35–38
Offshore	41

There is an emerging fishery using 'on-demand' or 'ropeless' trap systems which are not assessed in this report.

<u>Acronyms</u>

BMSY	The biomass needed to produce MSY	IFMP	Integrated Fisheries Management Plan
CL	Carapace length	LFA	Lobster fishing area
CPUE	Catch per unit effort	LRP	Limit reference point
DFO	Fisheries and Oceans Canada	MLS	Minimum legal size
DMR	Department of Marine Resources	MSC	Marine Stewardship Council
EA	Enterprise Allocation	MSY	Maximum sustainable yield
EBSA	Ecologically and biologically significant area	NL	Newfoundland and Labrador
ECOLF	Eastern Canada Offshore Lobster Fishery	PA	Precautionary approach
ETP	Endangered, Threatened, or Protected	PEI	Prince Edward Island
FFAW	Fish, Food and Allied Workers	PSA	Productivity-susceptibility analysis
FL	Fork length	SAM	Size-at-maturity
FRCC	Fisheries Resource Conservation Council	SPA	Sequential population analysis
FSCP	Fisheries Science Collaborative Program	SSB	Spawning stock biomass
FSRS	Fishermen and Scientists Research Society	TAC	Total allowable catch
HAB	Harmful algal blooms	URP	Upper reference point
HCRs	Harvest control rule	USR	Upper stock reference
HFA	Herring fishing area	VMS	Vessel monitoring system
IdlM	Iles-de-la-Madeleine Lobster		

Species Overview

Lobster is a large-bodied crustacean distributed from the most southern tip of Labrador south to Cape Hatteras, North Carolina. It can be found from the intertidal zone out to onshore areas of approximately 500 m depth, although it is most common from 4 to 50 m. Once mature, many lobsters make seasonal movements from deeper, winter areas to shallower, warmer, summer areas for hatching eggs, mating, and growth. The migration distances vary based on location and oceanography; for example, migration east of

Cape Sable Island/Shelburne (LFA 33–34) is generally restricted to the near shore, and the distances will vary, depending on the bottom depths and water temperatures. Cold waters in the deeper areas just offshore restrict these movements.

The Canadian lobster fishery is managed by Fisheries and Oceans Canada (DFO), which divides the lobster fishing region into 45 Lobster Fishing Areas (LFAs), numbered from 1 to 41 (Figure 1). Over time, some have been divided (e.g., LFA 14 A, B, C) or are now jointly fished under licenses from neighboring LFAs (e.g., LFA 37). The geographical scope of lobster stock assessments varies in Canadian waters, with some stocks assessed at the LFA level (e.g., LFA 41) while others are assessed at a more regional level (e.g., southern Gulf of St. Lawrence, LFAs 23–25, LFA 26A, and LFA 26B).

Inshore lobster fisheries in Canada are managed mostly using a variety of input controls (who, how, when, and where fishing can occur) and some output controls (what can be removed). Input controls include license limits, maximum number of traps per license, fishing seasons, and gear requirements (e.g., pots must be a certain size and require escape gaps to allow undersized lobsters to escape), while output controls include protection of egg-bearing (ovigerous) females, and minimum and maximum lobster size limits. Some LFAs are classified as "recruitment fisheries," meaning that they depend heavily on new recruits to the fishery (the size of which depends on the LFA's minimum legal size). Present conditions of environmental variables are believed to be positive for recruitment in the region, given the high number of recruits present in the commercial fishery.

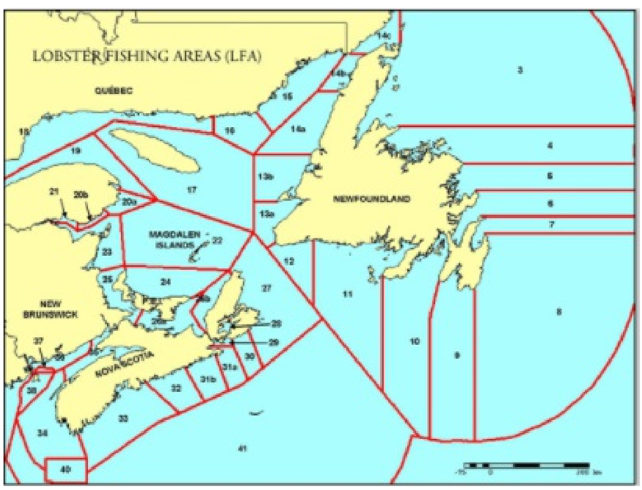

Figure 1: Lobster fishing areas in the Canadian Atlantic. Taken from [https://www.dfo-mpo.gc.ca/fisheries-peches/sustainable-durable/fisheries-peches/lobster-homard-eng.html.](https://www.dfo-mpo.gc.ca/fisheries-peches/sustainable-durable/fisheries-peches/lobster-homard-eng.html)

Production Statistics

The main producers of lobster are Nova Scotia and Maine (U.S.). Maine is the largest landings producer within the United States, yielding 44,410 mt in 2020 (NMFS 2022). In comparison, Canada produced 68,070 mt in 2020 (DFO 2021g).

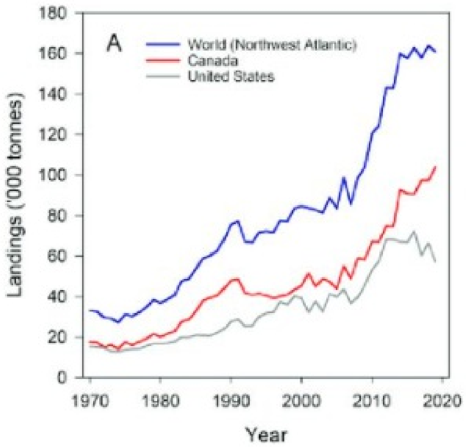

Figure 2: Global landings of American lobster (*Homarus americanus*). Also shown are the individual contributions of the United States and Canada. Taken from (Hvingel et al. 2021).

Importance to the US/North American market.

Lobster, although fished during specifically regulated seasons in Canada, is generally available year-round from facilities where lobsters are kept at low temperatures and can be distributed to buyers around the world. In addition, many lobsters are imported from the U.S. for processing or storage, and can be later moved back to the U.S. for sale. Though the U.S. has a year-round fishery, landings during the winter typically are low.

In 2021, Canada exported 97,282 mt (DFO 2021o) of lobster worldwide with a value of CAD 3.26B (DFO 2021o), making lobster Canada's most valuable seafood product. Around 69% of Canadian lobster exports are destined for the United States (CAD 2.25B in 2020), followed by Asia (China, South Korea, and Japan) and the European Union (DFO 2021o). Some of these exports include lobster that was originally imported from the U.S.; it is unclear how much these re-exports contribute to overall exports.

Common and market names.

Lobster is marketed as lobster, Atlantic lobster, Canadian lobster, American lobster, and Northern lobster.

Primary product forms

Lobster is most commonly sold live because this is when it is most valuable. Smaller lobsters ("canners") are cooked and either frozen whole in "popsicle packs" or shelled for meat. Canners are above the minimum legal size (MLS) but below 82.5 mm and are only fished in LFAs 23, 24, 25, and 26A (in the southern Gulf of St. Lawrence), where size-at-maturity (SAM) is lower than in other regions. Most lobsters caught in the waters of Nova Scotia, Newfoundland and Labrador, and Quebec go to the live market and to the United States, where they in turn may be shipped to Europe and Asia via airports in New York and Boston. The lobster-processing industry is concentrated in New Brunswick and Prince Edward Island. Lobster tails and claws are sometimes sold separately, and uncooked lobster may also be frozen whole.

Assessment

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

Criterion 1: Impacts on the species under assessment

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

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

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

Guiding principles

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

Criterion 1 Summary

AMERICAN LOBSTER			
REGION / METHOD	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Northwest Atlantic | Pots | Canada | LFAs 27-32	3.670: Low Concern	5.000: Low Concern	Green (4.284)
Northwest Atlantic | Pots | Canada | LFA 33	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northwest Atlantic | Pots | Canada | Bay of Fundy	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northwest Atlantic | Pots | Canada | The Magdalen Islands	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

Criterion 1 Assessments

SCORING GUIDELINES

Factor 1.1 - Abundance

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

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

Factor 1.2 - Fishing Mortality

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

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

American lobster

Factor 1.1 - Abundance

Northwest Atlantic | Pots | Canada | Bay of Fundy

Low Concern

Stock status in the Bay of Fundy (LFAs 35–38) is described using modeled commercial catch per unit effort (CPUE) relative to reference points (DFO 2021i). In LFA 35, CPUE has remained high since 2011, and the current 3-year running median CPUE (3.90 kg/trap haul [TH]) is more than double the upper stock reference (USR) (1.62 kg/TH) (DFO 2021i). A similar trend has been observed in LFA 36, where the current 3-year running median CPUE (3.91 kg/TH) is double the USR (1.36 kg/TH) and has remained high since 2013 (DFO 2021i). In LFA 38, CPUE trends indicated an increase in biomass from 2013 to 2014, and have remained high since. The current 3-year running median CPUE is 4.78 kg/TH, which is more than double the USR (1.91 kg/TH) (DFO 2021i). The USRs are set at 80% of the biomass at carrying capacity (K), based on the median CPUE during a period of high productivity (2011–2018). It is unclear how these reference points relate to biomass at maximum sustainable yield or other estimates of a sustainable population.

Secondary indicators of abundance include a recruit abundance index from scallop surveys in the region. Recruit abundance in LFA 35 has increased in recent years, and in LFA 36 it has been high and stable since 2011 (DFO 2021i). Recruit abundance in LFA 38 has increased in recent years following a 4-year period of low density (DFO 2021i). Lobsters have a medium vulnerability to fishing activities in the Bay of Fundy (see productivity-susceptibility analysis below), and abundance indicators are positive in all LFAs. Therefore, Seafood Watch scores the abundance of lobster in this region a low concern.

Justification:

Productivity-Susceptibility Analysis

All values are taken from (Criquet et al. 2015a).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 8–10 years	2
Average maximum age	>25 years	3
Fecundity	5,000–66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2.2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Spatial scale determined to be between 15% and 30%, not affected by other fisheries	2
Vertical overlap Considers all fisheries	High overlap; benthic species targeted by traps set on the seafloor	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score		**1.875**

$V = v(P^2 + S^2)$

$V = v(2.2^2 + 1.875^2)$

$V = v(4.84 + 3.516)$

$V = v8.356$

$V = 2.891^*$ = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | LFA 33

Moderate Concern

Stock status in LFA 33 is primarily described using unmodelled CPUE (measured in kg/trap haul [TH]) (DFO 2022d). Catch rate data from 1990 to 2016 were used to define an upper stock reference (USR) and limit reference point (LRP); the median catch rate of the time series was identified as a proxy for B_{MSY}, and the USR and LRP were set at 80% and 40% of this proxy, respectively. For much of the early time series, CPUE fluctuated just above the USR, before a rapid increase in stock biomass from 2007 to 2015. CPUE has declined since the 2017–18 fishing seasons; however, it remains at a high level, with the 3-year running median CPUE for the 2020–21 season (0.89 kg/TH) being much greater than the USR (0.28 kg/TH) (DFO 2022d). Secondary indicators of abundance include landings, which have decreased from a peak in 2016 but are still above the time-series average, and the recruitment-trap survey, where catches of legal and sub-legal lobsters have decreased in the most recent seasons (DFO 2022d). This decrease in lobsters in the recruitment-trap survey may be due to reduced habitat availability during warmer years, such as 2012 (DFO 2022d). Lobster has a medium vulnerability to fishing activities in LFA 33 (as indicated in the productivity-susceptibility analysis below), and abundance indicators show a mixture of positive (CPUE) and negative (landings, recruitment-trap survey) results. Therefore, Seafood Watch scores lobster abundance in LFA 33 a moderate concern.

Justification:
<u>Productivity-Susceptibility Analysis</u>

All values are taken from (Criquet et al. 2015a).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 8–10 years	2
Average maximum age	>25 years	3
Fecundity	5,000–66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2.2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Spatial scale determined to be between 15% and 30%, not affected by other fisheries	2
Vertical overlap Considers all fisheries	High overlap; benthic species targeted by traps set on the seafloor	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score		**1.875**

$V = v(P^2 + S^2)$

$V = v(2.2^2 + 1.875^2)$

$V = v(4.84 + 3.516)$

$V = v8.356$

V = 2.891* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Low Concern

Since 1985, the annual catch of lobsters in LFA 41 has been limited by a total allowable catch (TAC) of 720 t (DFO 2022h). Stock status is determined through commercial biomass surveys and reproductive potential, based on fishery-independent data from four surveys (DFO 2022h). Reference points have been defined for both indicators (upper stock reference and limit reference points) and recent data show that current estimates are above the USR for all indicators.

Stock indicators for LFA 41 are above the USR for all indicators, but there is some uncertainty regarding how the USRs relate to a level consistent with maximum sustainable yield. Therefore, abundance is a low concern.

Justification:

The biomass of commercially available lobsters (above the minimum landing size) is estimated from four fishery-independent multispecies surveys, and the 3-year running median is compared to the reference points to determine stock health (DFO 2022h). The upper stock reference (USR) is defined as 40% of the median during the high productivity period between 2000 and 2015. The stock is considered to be in a healthy condition when three of the four surveys demonstrate a 3-year running median greater than the respective USR. Currently, the indices from all four surveys are greater than their respective USRs (see Figure 3), as they have been since 2002, resulting in a healthy stock condition (DFO 2022h).

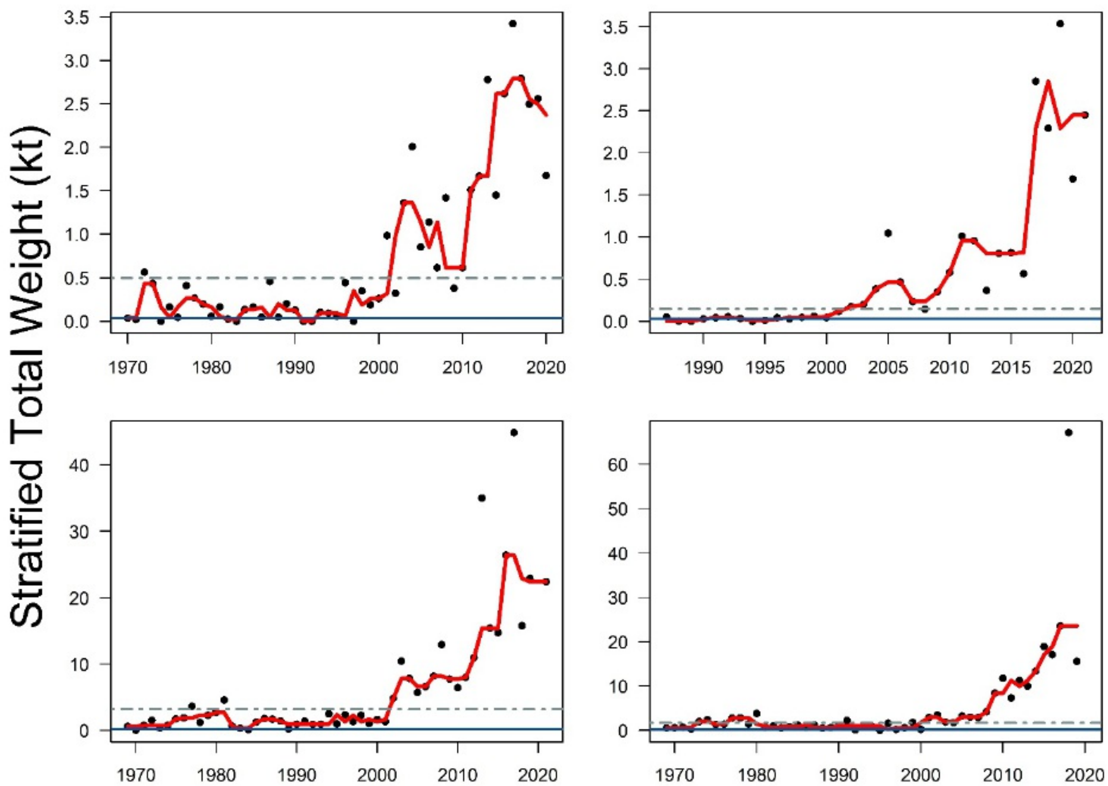

Figure 3: Commercial biomass time series along with the 3-year running median (red line), compared to limit reference indicator (LRI, solid blue line) and upper stock indicator (USI, dot-dash grey line). Top row: left—DFO Summer Research Vessel Scotian Shelf survey; right—DFO Spring Research Vessel Georges Bank survey. Bottom row: left—NEFSC Spring survey; right—NEFSC Autumn survey. Note: Different scales are used on both the x-axis and y-axis, and there are missing years for some panels.

The reproductive potential of lobsters in LFA 41 is an index that combines female abundance at size, fecundity at size, and size at maturity to represent an estimate of total egg production for the stock (DFO 2022h). Where sufficient data are available, upper and lower boundaries have been established to gauge the significance of changes to egg production relative to long-term medians over time. Reproductive potential is above the upper boundary in all surveys and is at or near historical highs (see Figure 4) (DFO 2022h). Increasing abundance is believed to be the main driver of increased reproductive potential, despite a decrease in median lobster size during the 2017 stock assessment (DFO 2022h).

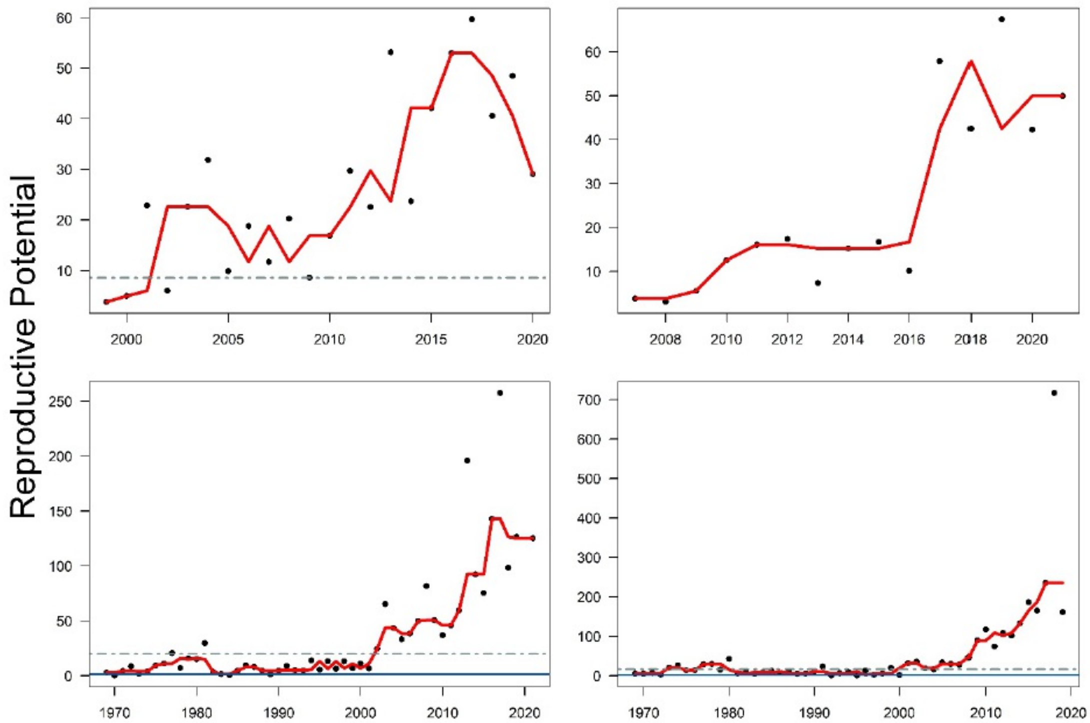

Figure 4: Reproductive potential in millions of eggs estimated from the four surveys covering LFA 41, along with the 3-year running median (solid red line). Lower bounds are represented by solid blue lines and upper bounds by dot-dash grey lines. No bounds are identified for the Georges Bank DFO survey, and only upper bounds are identified for the Summer Research Vessel Survey due to the brevity of the time series. Top row: left—DFO Summer Research Vessel Scotian Shelf survey; right—DFO Spring Research Vessel Georges Bank survey. Bottom row: left—NEFSC Spring survey; right—NEFSC Autumn survey. Note: Different scales are used on both the x-axis and y-axis, and there are missing years for some panels.

Northwest Atlantic | Pots | Canada | LFAs 27-32

Low Concern

Stock status in LFAs 27–32 is described using commercial catch rates and comparing the 3-year running median to the USR and LRP. The USR and LRP are set at 80% and 40% of the B_{MSY} proxy, which is the median catch rate of the 1990–2016 time series (DFO 2021j). Except for LFA 28, all LFAs show an increasing CPUE (and therefore biomass) trend over the last 20 years, with a small decrease from 2019 to 2020. In all LFAs 27–32, the 3-year running median CPUE is greater than the USR (see Figures 5 and 6). But, there is uncertainty regarding the appropriateness of the USR because it is below the level that is expected to achieve MSY.

Secondary indicators of abundance include recruitment trap survey indices of both legal and sub-legal lobsters. In most LFAs, the indicators for both size groups have been increasing over the last decade, with slight decreases in 2020 (DFO 2021j). Because abundance indicators are generally positive in all LFAs and lobsters have a medium vulnerability to fishing activities in the region (see productivity-susceptibility analysis below), Seafood Watch scores the abundance of lobster in LFAs

27-32 a low concern.

Justification:

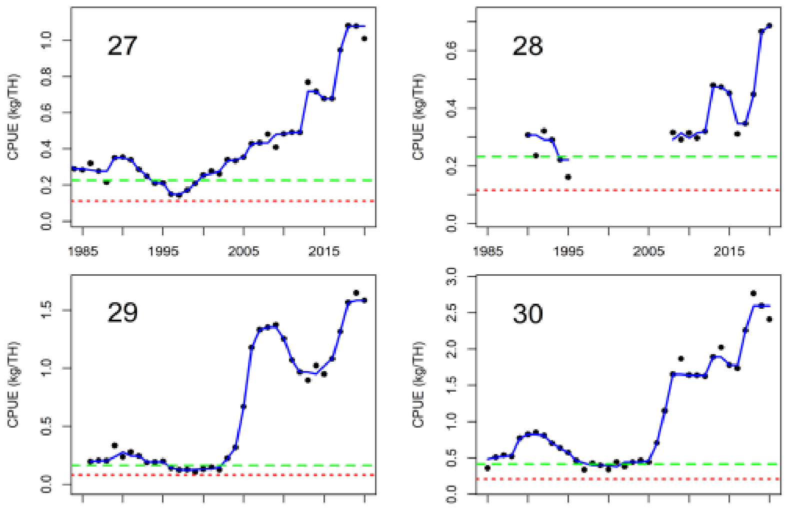

Figure 5: Time series of commercial catch rates in kg/trap hauls (black points), along with the 3-year running median (solid blue line). The horizontal lines represent the upper stock reference (dashed green line) and limit reference point (dotted red line). Limited data and privacy rules (disallowing the showing of information for <5 fishers) account for the apparent data gap in LFA 28. Note: Different scales are used on y-axes (from DFO 2021j).

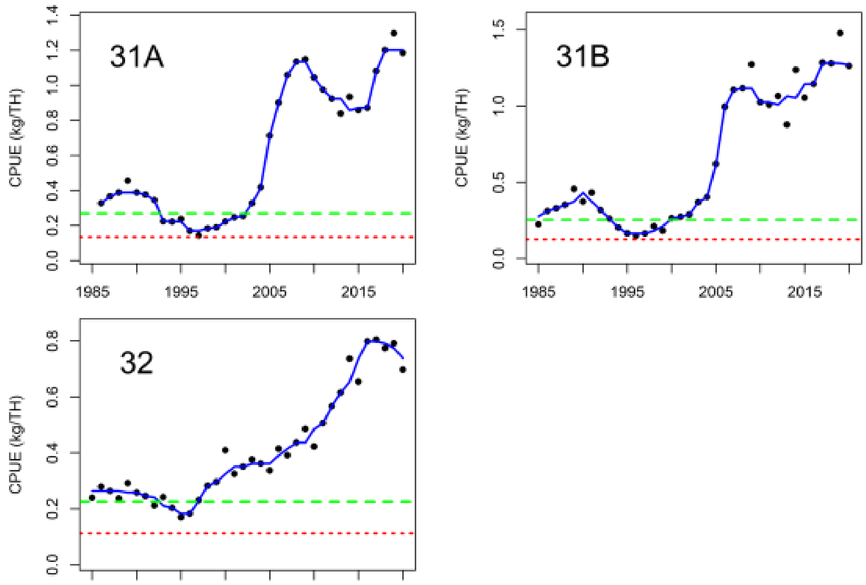

Figure 6: Time series of commercial catch rates in kg/trap hauls (black points), along with the 3-year running median (solid blue line). The horizontal lines represent the upper stock reference (dashed green line) and limit reference point (dotted red line). Note: Different scales are used on y-axes (from DFO2021j).

Productivity-Susceptibility Analysis

All values are taken from (Criquet et al. 2015a).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 8–10 years	2
Average maximum age	>25 years	3
Fecundity	5,000–66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2.2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Spatial scale determined to be between 15% and 30%, not affected by other fisheries	2

Vertical overlap Considers all fisheries	High overlap; benthic species targeted by traps set on the seafloor	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score		**1.875**

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{(2.2^2 + 1.875^2)}$

$V = \sqrt{(4.84 + 3.516)}$

$V = \sqrt{(8.356)}$

V = 2.891* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Moderate Concern

The status of the stock relative to reference points for Newfoundland and Labrador (LFAs 3 to 12, 13 A & B, and 14 A–C) is unknown. Four assessment regions have been defined and the stocks were last assessed in the 2019 assessment: Northeast (LFAs 3 to 6), Avalon (LFAs 7 to 10), South Coast (LFAs 11 and 12), and West Coast (LFAs 13 and 14) (DFO 2021a).

In the South and West Coast regions, CPUE has increased steadily since 2004, while it remains low in the Northeast and Avalon regions (DFO 2021a). This trend is mirrored in total landings, which have increased recently from approximately 1,900 t in 2010 to 4,400 t in 2019, the highest level in a century (DFO 2021a), with the majority of landings coming from the North and West Coast regions (DFO 2021a). Preliminary data suggest that landings have continued to increase, reaching 4,984 mt in 2021 (DFO 2022b). The Newfoundland and Labrador fishery is a recruitment fishery, with few lobsters surviving beyond the first molt class (DFO 2021a).

Seafood Watch deems abundance a moderate concern: although CPUE data suggest that abundance is stable, there are no other data-limited assessments to support this conclusion, and lobsters have a medium vulnerability to fishing pressure in this area (as indicated by the productivity-susceptibility analysis below).

Justification:
The key indicators used in Newfoundland and Labrador are landings, mean CPUE, and the relative survival fraction. The assessment uses fishery-dependent data from the following sources: reported landings, DFO logbooks, Fish, Food and Allied Workers Union (FFAW) index logbooks, and at-sea sampling data (DFO 2021a). Uncertainties exist due to many factors, including the assessment only using fishery-dependent data and without accounting for local sales, poaching, or other sources of mortality and environmental conditions (Pezzack et al. 2015)(DFO 2021a).

In all areas, there has been a sharp decline in lobster abundance above the MLS, indicating that the fishery is a recruitment fishery (DFO 2021a).

Productivity-Susceptibility Analysis

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	5 to 12 years/7 to 10 years (generation time) (Tremblay et al. 2012b)	2
Average maximum age	>30 years (Lawton, P. and Lavalli, K.L. 1995)	3
Fecundity	10,000 to 100,000 eggs (Waddy et al. 1995)	2
Reproductive strategy	Brooder (Factor 1995)	2
Trophic level	3.07 (Eddy et al. 2017)	2
Density dependence (invertebrates only)	No dispensatory or compensatory dynamics demonstrated or likely (Lawton, P. and Lavalli, K.L. 1995)	2
Productivity score total		**2.167**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Unknown	3
Vertical overlap Considers all fisheries	High overlap	3
Selectivity of fishery Specific to fishery under assessment	The species is targeted. Juveniles are likely to escape from escape vents, though berried females compose about 20% of the catch (Criquet et al. 2015a); in addition, undersized, ovigerous, and v-notched females cannot be retained (DFO 2016b).	2
Post-capture mortality Specific to fishery under assessment	Post-capture mortality is unknown in this region.	3
Susceptibility score		**2.325**

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{(2.167^2 + 2.325^2)}$

$V = \sqrt{(4.709 + 5.406)}$

$V = \sqrt{(10.115)}$

V = 3.178* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island

Low Concern

The lobster fishery along the North Shore of Quebec occurs in lobster fishing areas 15, 16, and 18, and around Anticosti Island in LFA 17. Stock status is assessed in LFAs 15, 16, and 17B; there is insufficient information to assess stock status in LFA 18 (DFO 2019a). Abundance indicators include landings data and daily logbooks, which are mandatory in LFAs 15 and 16 since 2007 and in LFA 17B since 2004 (DFO 2019a). Catch-per-unit effort (CPUE) in LFAs 15 and 16 has increased from 0.50 kg/trap in 2015 to 0.63 kg/trap in 2018, and was above the 24-year average (0.27 kg/trap) (DFO 2019a). The average size of lobsters caught in LFAs 15 and 16 has remained stable at 97 to 98 mm in recent years (except 2013) and there has been an increase in the percentage of jumbo lobsters (>127 mm CL); however, due to the low number of lobsters measured, there is a substantial amount of uncertainty in these data (DFO 2016q)(DFO 2019a). In LFA 17B, CPUE was 3.41 kg/trap, an increase from 2011 (2.57 kg/trap) and the highest level since 2006 (DFO 2019a). In sub-area LFA18D, CPUE increased from 2.91 kg/trap in 2015 to 4.20 kg/trap in 2018 and was higher than the 2012–2017 average (1.98 kg/trap) (DFO 2019a). The mean size of commercial lobsters in LFA 17B and LFA 18D decreased by 2 mm and 4 mm, respectively, between 2015 and 2018, which is explained partly by the increase in recruitment over the three-year period and is supported by the increase in CPUE (DFO 2019a). Lobster is considered to have a medium vulnerability in this region (as indicated in the productivity-susceptibility analysis below), and most abundance indicators are positive. Therefore, Seafood Watch considers abundance a low concern.

Justification:

Productivity-Susceptibility Analysis:

Scoring Guidelines

1. Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2. Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(S1 \times S2 \times S3 \times S4) - 1/40] + 1.$

3. Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = v(P^2 + S^2)$

PSA score = 3.181. For this reason, the species is deemed high vulnerability (based on PSA scoring tool). Detailed scoring of each attribute is shown below.

Productivity Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Average age at maturity	5 to 12 years/7 to 10 years (generation time) (Tremblay et al. 2012b)	2
Average maximum age	>30 years (Lawton, P. and Lavalli, K.L. 1995)	3
Fecundity	10,000 to 100,000 eggs (Waddy et al. 1995)	2
Reproductive strategy	Brooder (Factor 1995)	2
Trophic level	3.07 (Eddy et al. 2017)	2
Density dependence	No dispensatory or compensatory dynamics demonstrated or likely (Lawton, P. and Lavalli, K.L. 1995)	2
Productivity Score (2 + 3 + 2 + 2 + 2 + 2) ÷ 6 = 2.167		

Susceptibility Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Areal Overlap	Areal overlap for this area is unknown	3
Vertical Overlap	High overlap	3
Selectivity of fishery	Species is targeted. Juveniles are likely to escape from escape vents, and although berried females comprise about 20% of the catch (Criquet et al. 2015a) they are required to be released.	2
Post-capture mortality	Post-capture mortality is unknown in this region, retained species	3
Susceptibility score [((3 x 3 x 2 x 3) - 1) ÷ 40] + 1 = 2.325		

$V = v(P^2 + S^2)$

$V = v(2.167^2 + 2.325^2)$

$V = v(4.709 + 5.406)$

$V = v\ 10.115$

<u>V = 3.178* = Medium Vulnerability</u>

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Low Concern

The most recent assessment of lobster in the southern Gulf of St. Lawrence (sGSL; LFAs 23, 24, 25, 26A, and 26B) was published in 2019. The 2019 assessment used a variety of fishery-dependent and fishery-independent data to generate a broad overview of trends in the stock's abundance and production. Multiple indicators (SCUBA, larvae collectors, landings) were used in all LFAs to assess stock status. The preliminary landings for 2017 show that the landings are well above the precautionary approach's upper stock reference (USR) (DFO 2019d). Indicators suggest that lobster abundance is high in all LFAs, except for subregion 26AD, which appears to be an area of relatively low productivity (DFO 2019d). Landings are more than three times the long-term median and the highest of the time series (DFO 2019d). Fishery-independent recruitment indicators also indicate significant increases. Fishery-dependent data are also positive, with CPUE of berried females and pre-fishery recruits in their highest range for most areas (DFO 2019d). Although improvements in logbook requirements were implemented in 2014, there is still concern over the accuracy and availability of catch data. This is due to some uncertainty associated with nonrecorded lobster catches, which are due to other legal sales, personal consumption, and potential illegal fishing (DFO 2016t)(DFO 2019d). But, there is no indication that the proportion of nonrecorded catches vs. recorded catches has changed, because fisheries-dependent (e.g., landings) and fisheries-independent (e.g., trawl survey, SCUBA survey) indicators all indicate an increasing trend in abundance.

The PSA demonstrates that lobster has a medium vulnerability to fisheries in this region. Data-limited methods suggest that the stock is experiencing mostly positive trends. Therefore, Seafood Watch deems abundance a low concern.

Justification:

Landings from all LFAs (32,524 t) are significantly higher than the USR (13,798 t) (DFO 2019d). Landings have increased since the last assessment (e.g., by 35% in LFA 25) and have reached or exceeded historical levels. Increased protection of highly fecund large females has been conducive to increased egg production and recruitment (DFO 2016t). Most LFAs have collected data using at-sea sampling programs for data on lobster size (carapace length, CL), sex, egg stage, and number of traps and their locations. Other data programs included a recruitment-index program and fishery-independent surveys such as trawl, SCUBA, and bio-collectors to determine patterns of post-larval settlement (DFO 2019d).

<u>Productivity-Susceptibility Analysis:</u>

Scoring Guidelines

1. Productivity score (P) = average of the productivity attribute scores (p1, p2, p3, p4 (finfish only), p5 (finfish only), p6, p7, and p8 (invertebrates only))

2. Susceptibility score (S) = product of the susceptibility attribute scores (s1, s2, s3, s4), rescaled as follows: $S = [(S1 \times S2 \times S3 \times S4) - 1/40] + 1$.

3. Vulnerability score (V) = the Euclidean distance of P and S using the following formula: $V = \sqrt{(P^2 + S^2)}$

PSA score = 2.891. For this reason, the species is deemed high vulnerability (based on PSA scoring tool). Detailed scoring of each attribute is shown below. All values are taken from (Criquet et al. 2015a).

Productivity Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Average age at maturity	50% mature at 7–8 years	2
Average maximum age	>25 years	3
Fecundity	5,000-66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predates on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score	**(2 + 3 + 2 + 2 + 2) ÷ 5 = 2.2**	

Susceptibility Attribute	**Relevant Information**	**Score (1 = low risk, 2 = medium risk, 3 = high risk)**
Areal overlap Considers all fisheries	Spatial scale of the fishery is estimated to be between 15% and 30% of stocks distribution; no other fisheries affect the stock.	2
Vertical overlap Considers all fisheries	High overlap	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score	**[((2 × 3 × 2 × 3) − 1) ÷ 40] + 1 = 1.875**	

$V = \sqrt{(P^2 + S^2)}$

$V = \sqrt{(2.2^2 + 1.875^2)}$

$V = \sqrt{(4.84 + 3.516)}$

$V = \sqrt{8.356}$

V = 2.891* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | Southwest Nova Scotia

Low Concern

The inshore waters off Southwest Nova Scotia, LFA 34, produce the highest landings of all LFAs in Canada, accounting for ˜20% of all Canadian landings and 10% of North American landings (DFO 2022c). In LFA 34, the primary indicator for stock abundance is commercial biomass from fishery-independent surveys. The 3-year running median commercial biomass (lobsters = 82.5 mm carapace length, excluding berried females) is above the upper stock reference (USR) in all four surveys and has been at a very high level relative to the time-series average in recent years; however, there have been some declines (DFO 2022c). It is unclear how USRs relate to a maximum sustainable yield, resulting in some uncertainty about whether or not the reference points are appropriate. The four different survey indices all show positive results, and lobster has a medium vulnerability to fishing activities in LFA 34 (as described in the productivity-susceptibility analysis below). Therefore, Seafood Watch scores abundance of lobster in LFA 34 a low concern.

Justification:

Productivity-Susceptibility Analysis

All values are taken from (Criquet et al. 2015a).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 8–10 years	2
Average maximum age	>25 years	3
Fecundity	5,000–66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2.2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Spatial scale determined to be between 15% and 30%, not affected by other fisheries	2
Vertical overlap Considers all fisheries)	High overlap; benthic species targeted by traps set on the seafloor	3

Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score		**1.875**

$V = v(P^2 + S^2)$

$V = v(2.2^2 + 1.875^2)$

$V = v(4.84 + 3.516)$

$V = v\ 8.356$

<u>V = 2.891* = Medium Vulnerability</u>

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | The Gaspe Peninsula

Low Concern

In the Gaspe peninsula region, stock status is monitored using abundance demographic, fishing pressure, and stock productivity indicators (fishing pressure is discussed in Factor 1.2 of the Seafood Watch standards) (DFO 2019b). Landings for the Gaspe region increased between 2015 (1,844 t) and 2018 (2,315 t) and were 116% higher than the 1993–2017 average of 1,107 t (DFO 2019b). Similarly, CPUE from commercial sampling increased across the entire Gaspe region from 2015 to 2018 (DFO 2019b).

The lobster stock in LFAs 19 to 21 is considered healthy because it is above both the limit reference point (LRP) and upper reference point (URP). These reference points are based on landings from a productive period (1985 to 2009), such that the LRP is set at 325 t and the URP is set at 650 t. The URP is considered to be 80% of B_{MSY}, and there is uncertainty associated with using landings as reference points. But, current landings are significantly higher than the URP, at 2,315 t (DFO 2019b). Abundance indicators are positive in the Gaspe region and lobster has a medium vulnerability to fishing activities (see productivity-susceptibility analysis below). Therefore, Seafood Watch scores the Gaspe region lobster stocks a low concern.

Justification:

In LFA 20, CPUE was 0.87 kg/trap in 2015, an increase from 0.55 kg/trap in 2011 and above the 25-year average of 0.37 kg/trap (DFO 2019b). The mean size and weight of lobster in LFA 20 have remained stable at 88 mm and 0.59 kg, respectively, since 2011 (DFO 2019b). CPUE in the fall fishery in LFA 21B increased from 2.54 kg/trap in 2015 to 4.41 kg/trap in 2018, which was one of the highest values recorded since the fishery began in 2001 (DFO 2019b). The average size of lobster in LFA 21B has decreased from around 102.0 mm to 92.8 mm in the spring fishery, and from 97.0 mm to 92.7 mm in the fall fishery (DFO 2019b); however, there are limited data from this LFA, making size structure difficult to interpret. In LFA 19C, there has been a decrease in the proportion of jumbo lobster in the catch from 2.2% in 2015 to 2.0% in 2018 (DFO 2019b). Average size (and weight) of lobster landed in LFA 19C have also decreased from 97.0 mm (0.751 kg) in 2015 to 95.9 mm (0.724 kg) in 2018 (DFO 2019b). Productivity indicators are only available for LFA 20, where the abundance of berried females has been increasing since 2011; theoretical egg production in 2018 was 8.6 times higher than the 1994–1996 average. Pre-recruits abundance in LFA 20 was 16% higher in 2018 than in 2015, suggesting that landings will continue to increase in the short term.

Productivity-Susceptibility Analysis

All values are taken from (Criquet et al. 2015c).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 7–8 years	2
Average maximum age	10–25 years	2
Fecundity	5,000–66,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Spatial scale determined to be >30%, not affected by other fisheries	3
Vertical overlap Considers all fisheries	High overlap; benthic species targeted by traps set on the seafloor	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 20% of the catch) and good handling and release practices can maximize post-release survival.	3

Susceptibility score		**2.325**

V = v(P^2 + S^2)

V = v(2^2 + 2.325^2)

V = v(4 + 5.406)

V = v 9.406

V = 3.067* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Northwest Atlantic | Pots | Canada | The Magdalen Islands

Low Concern

In the waters around the Magdalen Islands, LFA 22, stock status is monitored using abundance, demographic, fishing pressure, and stock productivity indicators. In LFA 22, the CPUE in 2018 was 1.48 lobsters per trap, which was higher than in 2015 (0.82 lobsters per trap) (DFO 2019c). In terms of weight, CPUE in 2018 (0.98 kg/trap) was higher than both 2015 and the series average (0.46 kg/trap) (DFO 2019c). A slight increase in the size of lobsters landed has been seen from 2011 to 2015, and the trawl survey suggests that the average size is stable (DFO 2019c). Size structure is dominated by the incoming recruit molt class (83–95 mm for males, and 83–93 mm for females). Landings were 4,757 t in 2018, which exceeds the URP of 1,750 t (80% B_{MSY}); therefore, the DFO considers the stock to be healthy in this LFA. There is some uncertainty over the appropriateness of the reference points, due to the use of average landings and because the URP is below MSY; however, landings are significantly higher than the URP (DFO 2019c).

Additional indicators including stock productivity are generally positive, with theoretical egg production 3.9 times greater in 2018 than the 1994–1996 average and demographic indicators showing that the average size of commercial lobsters has increased (DFO 2021j). Because abundance indicators are generally positive, and lobster has a medium vulnerability to fishing activity in LFA 22 (see productivity-susceptibility analysis below), Seafood Watch scores abundance of lobster a low concern.

Justification:

Productivity-Susceptibility Analysis

All values are taken from (Murray et al. 2013).

Productivity Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Average age at maturity	50% mature at 7–8 years	2
Average maximum age	>25 years	3
Fecundity	5,000–35,000; dependent on size	2
Reproductive strategy	Brooder	2
Trophic level	Generalist feeder, predating on invertebrates and dead animals. Trophic level = 3.2	2
Productivity score total		**2.2**

Susceptibility Attribute	Relevant Information	Score (1 = low risk, 2 = medium risk, 3 = high risk)
Areal overlap Considers all fisheries	Stock is fished across most of its range, but is not affected by other fisheries	3
Vertical overlap Considers all fisheries	High overlap; benthic species targeted by traps set on the seafloor	3
Selectivity of fishery Specific to fishery under assessment	The species is regularly caught in the traps, but traps are highly selective for a fraction of the population. Smaller individuals are able to leave through escape vents, and the diameter of the entrance ring may prevent access to the largest individuals.	2
Post-capture mortality Specific to fishery under assessment	Retained species. Berried females are returned (estimated to be 30% of the catch) and good handling and release practices can maximize post-release survival.	3
Susceptibility score		**2.325**

$V = v(P^2 + S^2)$

$V = v(2.2^2 + 2.325^2)$

$V = v(4.84 + 5.406)$

$V = v\ 10.246$

V = 3.201* = Medium Vulnerability

* Values shown are rounded to three decimal places for display purposes; actual values result in the vulnerability score presented when entered into the formula.

Factor 1.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | Bay of Fundy

Moderate Concern

In the Bay of Fundy, relative fishing mortality is determined using DFO Summer RV Survey commercial biomass estimates and landings to show changes in removals relative to survey indices. Estimates of relative fishing mortality showed a decrease from the late 1990s to the early 2000s, an increase to 2010, followed by a decline to 2013, where it has remained low but variable since (DFO 2021i). Reference points for relative fishing mortality have not been defined for the Bay of Fundy, so it is uncertain whether or not the current fishing effort is sustainable; however, there are no indicators that overfishing is taking place. Therefore, Seafood Watch scores fishing mortality in the Bay of Fundy lobster fishery a moderate concern.

Northwest Atlantic | Pots | Canada | LFA 33

Low Concern

The exploitation rate is estimated using the continuous change in ratio (CCIR) method (see Justification) and compared to the removal reference (RR). The 3-year running median CCIR exploitation rate for the 2020–21 season was 0.47, which is below the RR of 0.83; since 2013, the 3-year median exploitation has been relatively stable at around two-thirds of the level of RR (DFO 2022d). Because exploitation rates are below the target and have been for several years, Seafood Watch scores fishing mortality a low concern.

Justification:

The continuous change in ratio method uses recruitment trap data to reflect trends in exploitation by modeling the change in the proportion of legal lobsters (≥82.5 mm carapace length) relative to sub-legal lobsters (70–82.5 mm carapace length) (DFO 2022d). The recruitment traps are independent of the fishery but are placed in the fishing grounds such that they reflect the population that is being harvested (DFO 2020a). The removal reference (RR) was defined slightly higher than the maximum modeled CCIR exploitation rate by taking the 75% quartile of the posterior distribution (DFO 2022d). Regionally, lobster stocks are considered to be in a highly productive state due to favorable environmental conditions, so the RR is considered to be set at a lower level than F_{MSY} (DFO 2022d).

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Low Concern

LFA 41 is the only LFA with a total allowable catch (TAC). The TAC has remained at 720 t since its introduction in 1985. The TAC has been breached on occasion but, in recent years, the TAC has been managed on a 3-year cycle allowing for overages and carryover of unused TAC (DFO 2020e). There are no reference points to determine whether or not fishing mortality is at a sustainable level, and the most recent stock assessments do not provide an estimate of fishing mortality or exploitation rate (DFO 2018n)(DFO 2022h). The TAC has been in place since 1985, and abundance is increasing with a very low probability of falling into the caution zone (DFO 2022h). Although there are no available estimates of fishing mortality, all available information demonstrates that the fishery is not negatively affecting the lobster stock, so a low concern score is given.

Justification:

Available information suggests that fishing mortality is low and declining. The most recent assessments suggest that the fishery does not appear to be negatively affecting the stock's abundance, reproductive potential, or size structure, and that the size structure is dominated by mature lobsters and has remained relatively stable in recent years (DFO 2015f)(DFO 2018n)(DFO 2022h).

Previously, in the absence of fishing mortality reference points, the mean number of females per tow = 140 mm carapace length (CL) in the summer trawl survey and the median female size have acted as proxies for exploitation rates. The mean number of female lobsters per tow proxy has been increasing in the most recent estimate (DFO 2016f), though the median female size indicator has not been updated since 2014 (DFO 2016f) in (DFO 2014b).

LFA 41 has experienced decreased fishing effort in recent years. This is because of a recent demand in efficient catch and TAC collection, increased lobster abundance, and a lack of activity in the Jonah crab fishery (Blyth-Skyrme et al. 2015a).

Alternative sources of mortality have not been considered, although the region enforces a prohibition on landing lobster by-catch from mobile gear, so there is a high level of survival assumed for discarded lobsters, and mobile gears are considered unlikely to present a significant source of mortality (Blyth-Skyrme et al. 2015a).

LFA 41 is managed by an Integrated Fisheries Management Plan (IFMP) that comprises eight licenses and a TAC of 720 tonnes (t). The TAC is based on landings and has not changed since its establishment in 1985. LFA 41 is the only lobster fishery in Canada managed with a TAC (Blyth-Skyrme et al. 2015a).

There are no direct estimates of the exploitation rate for the LFA 41 stock, but the limit placed on catches by the TAC and an increasing index of abundance suggest that fishing mortality is low and declining relative to previous years (Figure 6 in (DFO 2014b)).

As a proxy for exploitation rate, DFO uses the large female size indicator (LFSI). The LFSI is based on the mean number of females >140 mm CL caught per tow in trawl surveys; the LFSI shows an increasing trend for Areas 4X and 5Z over the last several years, and recent values are well above DFO's upper boundaries. For 2015, the 3-year moving average is 2.79 (well above the upper boundary, and a slight increase from 2014) (DFO 2016f).

Exploitation is also evaluated via the median female size indicator, taken from female lobsters caught in trawl surveys. For the years in the available time series, median female sizes have been well above the lower boundary (the estimated length at 50% maturity), and furthermore have remained above DFO's upper boundary (the midpoint between the median size for the time series and the lower boundary) (Figures 11 and 12 in (DFO 2014b)). The median sizes of trap-caught females from at-sea samples likewise have remained well above the lower boundary and generally above the upper boundary; recent values are generally lower than in past years and, in some locations, are less than the upper boundary but greater than the lower (Figure 13 in {DFO2014b}). Fishery-independent data suggest that catch rates are their highest on record during summer and winter surveys (DFO 2014a).

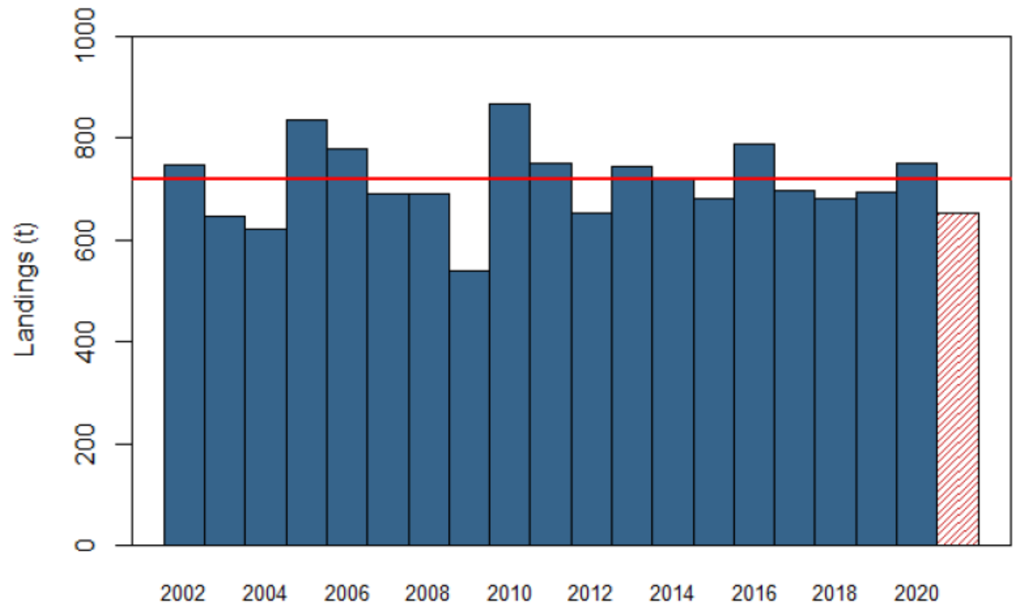

Figure 7: Landings (t) for Lobster Fishing Area 41 from 2002–2021 against a total allowable catch (TAC) of 720 t. The horizontal red line denotes the TAC. Note: Red bar (hash marks) for 2021 landings indicates incomplete data. From (DFO 2022h).

Northwest Atlantic | Pots | Canada | LFAs 27-32

Low Concern

The exploitation rate is estimated using the continuous change in ratio (CCIR) method (see Justification) and compared to the removal reference (RR). The 3-year running median CCIR exploitation rate was below the RR for all LFAs 27–32 (Figure 8) (DFO 2021j). Because exploitation rates are below the target and have been for several years, Seafood Watch scores fishing mortality a low concern.

Justification:

The continuous change in ratio method uses recruitment trap data to reflect trends in exploitation by modeling the change in the proportion of legal lobsters (≥82.5 mm carapace length) relative to sub-legal lobsters (70–82.5 mm carapace length). The recruitment traps are independent of the fishery but are placed in the fishing grounds such that they reflect the population that is being harvested (DFO 2020a). The removal reference (RR) was defined slightly higher than the maximum modeled CCIR exploitation rate by taking the 75% quartile of the posterior distribution (DFO 2022d). Regionally, lobster stocks are considered to be in a highly productive state due to favorable environmental conditions, so the RR is considered to be set at a lower level than FMSY (DFO 2022d).

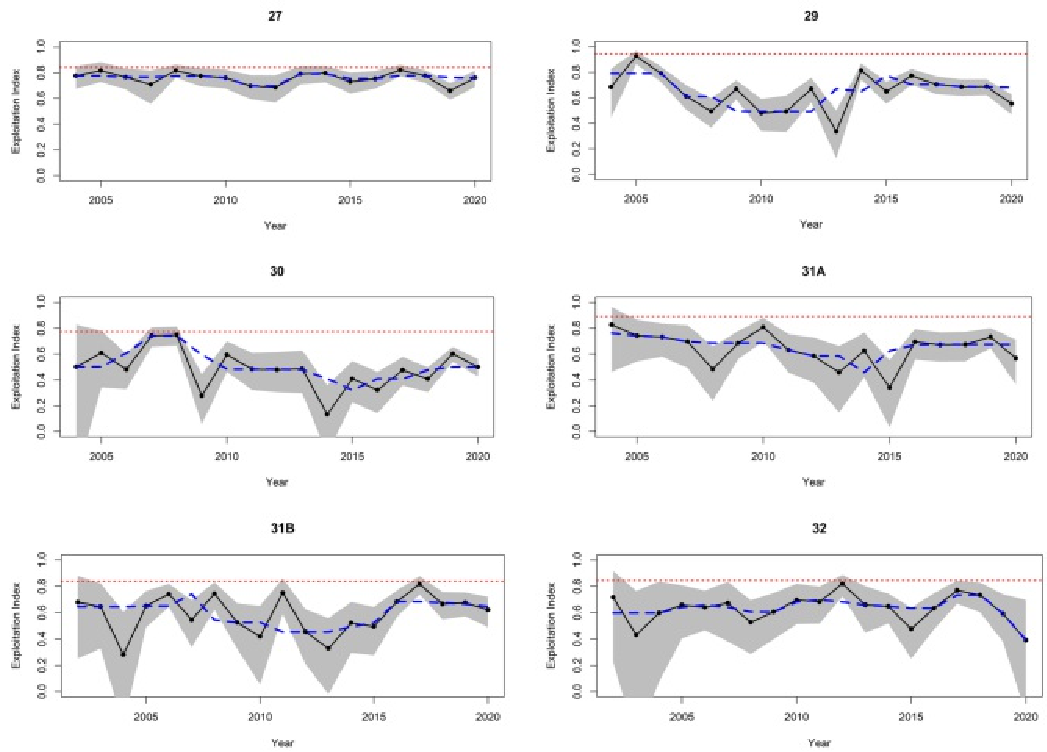

Figure 8: Time series of continuous change in ratio exploitation indices (black), 3-year running median (blue), with removal reference (dotted red line). 95% credible intervals are shaded. From (DFO 2021j).

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Moderate Concern

The most recent stock assessment for Newfoundland and Labrador lobster stocks (2021) does not include estimates of fishing mortality or exploitation rate (DFO 2021a). The size frequency distribution of the lobster stocks shows sharp declines above the minimum landing size, indicating that few lobsters survive beyond the first molt stage after entering the fishery (82.5–92.0 mm for females, 82.5 mm–95.0 mm for males) (DFO 2021a); such patterns indicate a high exploitation rate and reliance upon annual recruits into the fishery. Because fishing mortality relative to a sustainable level is essentially unknown, a score of moderate concern is given.

Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island

Moderate Concern

Fishing pressure is not estimated for LFAs 15–18 because there is no longer any at-sea sampling or fishery-independent surveys in the area (DFO 2019a). Because the fishing mortality or exploitation rate is unavailable, a score of moderate concern is given.

Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

Moderate Concern

In the southern Gulf of St. Lawrence, fishing pressure is monitored by estimating the proportion of empty traps and nominal effort (expressed as the number of licenses or traps) (DFO 2019d). Data from the at-sea sampling program and recruitment index program show that, in most LFAs, the proportion of empty traps is typically below 20%, and that this rate has remained stable since the previous assessment in 2012 (DFO 2019d). This stability suggests that fishing pressure is not adversely affecting the lobster stocks in the region; however, it is unclear whether fishing mortality is below a sustainable level. Fishing mortality in the southern Gulf of St. Lawrence is considered a moderate concern.

Northwest Atlantic | Pots | Canada | Southwest Nova Scotia

Low Concern

In LFA 34, relative fishing mortality is determined using commercial survey biomass estimates and landings to show changes in removals relative to survey indices, providing an index of fishing mortality that is compared to a removal indicator (RI) to determine whether or not fishing mortality is at an appropriate level (DFO 2022c). In recent years, lobster abundance has increased at a faster rate than landings, resulting in a decrease in relative fishing mortality. In all four surveys, the 3-year running median fishing mortality is lower than the respective RIs (Figure 9), indicating that overfishing is not occurring (DFO 2022c). Therefore, Seafood Watch scores fishing mortality in LFA 34 a low concern.

Justification:

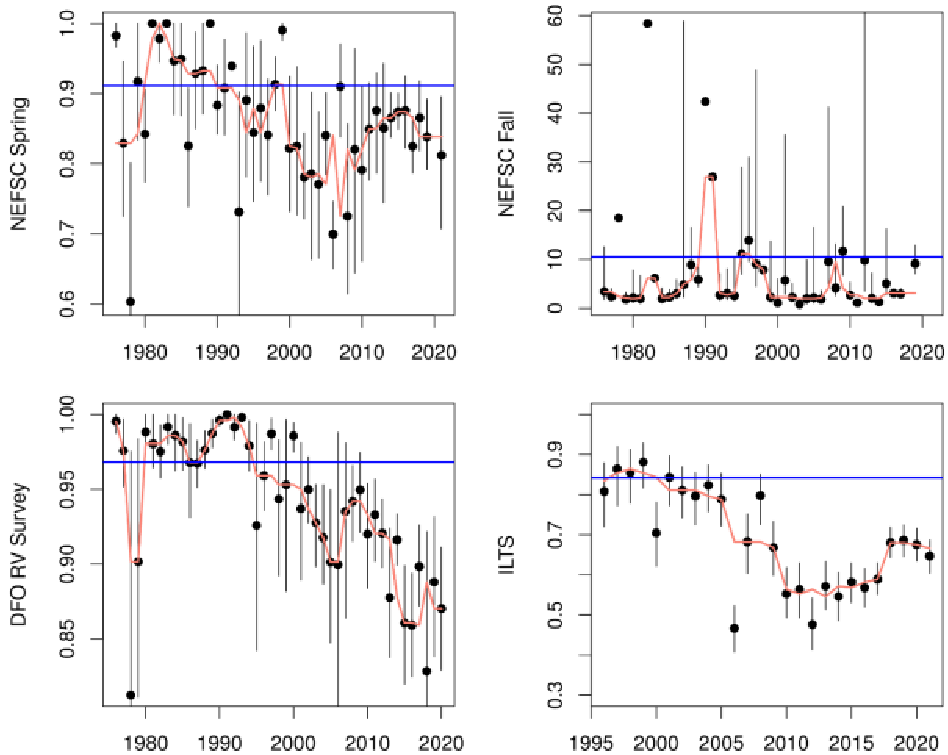

Figure 9: Relative fishing mortality in LFA 34 from landings divided by trawl survey commercial biomass estimates from the NEFSC Spring, NEFSC Fall, DFO RV survey, and Inshore Lobster Trawl Survey (ILTS). The red line is the 3-year running median. The blue line represents the removal indicator for each respective survey. From (DFO 2022b).

Northwest Atlantic | Pots | Canada | The Gaspe Peninsula

Moderate Concern

Exploitation rates are unavailable for LFAs 19 and 21. In LFA 20, the exploitation rate for 2015–17 is estimated to be 76.1%, which is lower than the previous estimate for 2011–14 (81%) but remains relatively high (DFO 2019b). There are no established reference points for fishing mortality for lobster stocks in the Gaspe region, so it is unknown whether or not current exploitation rates are sustainable. Therefore, Seafood Watch scores fishing mortality a moderate concern.

Northwest Atlantic | Pots | Canada | The Magdalen Islands

Moderate Concern

In LFA 22, the exploitation rate in the south decreased from 66.5% in 2011–14 to 61.1% in 2015–17, while the exploitation rate in the north was relatively stable at 62.4% (DFO 2019c). In the south, the exploitation rate in 2017 was lower than the 1985–2016 series average (67.5%); in the north, it was higher than the series average (61%) (DFO 2019c). There are no established reference points for fishing mortality in LFA 22, so it is uncertain whether current exploitation rates are sustainable. Therefore, Seafood Watch scores fishing mortality a moderate concern.

Criterion 2: Impacts on Other Species

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

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

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

Guiding principles

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

Criterion 2 Summary

Criterion 2 score(s) overview

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

AMERICAN LOBSTER			
REGION / METHOD	SUB SCORE	DISCARD RATE/LANDINGS	SCORE
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | LFAs 27-32	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | LFA 33	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | Bay of Fundy	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | The Magdalen Islands	1.000	1.000: < 100%	Red (1.000)
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador	1.000	1.000: < 100%	Red (1.000)

Criterion 2 main assessed species/stocks table(s)

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

NORTHWEST ATLANTIC | POTS | CANADA | BAY OF FUNDY			
SUB SCORE: 1.000	DISCARD RATE: 1.000		SCORE: 1.000
SPECIES	ABUNDANCE	FISHING MORTALITY	SCORE
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Cusk	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
White hake	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

NORTHWEST ATLANTIC | POTS | CANADA | LFA 33			
SUB SCORE: 1.000	DISCARD RATE: 1.000		SCORE: 1.000
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Cusk	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	2.330: Moderate Concern	5.000: Low Concern	Green (3.413)

NORTHWEST ATLANTIC | POTS | CANADA | LFA 41 (OFFSHORE)			
SUB SCORE: 1.000	DISCARD RATE: 1.000		SCORE: 1.000
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Cusk	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Northern bottlenose whale	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
White hake	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
Jonah crab	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)
American lobster	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | POTS | CANADA | LFAS 27-32			
SUB SCORE: 1.000	DISCARD RATE: 1.000		SCORE: 1.000
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Cusk	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | POTS | CANADA | NEWFOUNDLAND AND LABRADOR			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	2.330: Moderate Concern	3.000: Moderate Concern	Yellow (2.644)

NORTHWEST ATLANTIC | POTS | CANADA | QUEBEC NORTH SHORE AND ANTICOSTI ISLAND			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

NORTHWEST ATLANTIC | POTS | CANADA | SOUTHERN GULF OF ST LAWRENCE			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

NORTHWEST ATLANTIC | POTS | CANADA | SOUTHWEST NOVA SCOTIA			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Cusk	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
White hake	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	5.000: Low Concern	Green (4.284)

NORTHWEST ATLANTIC | POTS | CANADA | THE GASPE PENINSULA			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

NORTHWEST ATLANTIC | POTS | CANADA | THE MAGDALEN ISLANDS			
SUB SCORE: 1.000	DISCARD RATE: 1.000	SCORE: 1.000	
SPECIES	**ABUNDANCE**	**FISHING MORTALITY**	**SCORE**
Atlantic herring	1.000: High Concern	1.000: High Concern	Red (1.000)
North Atlantic right whale	1.000: High Concern	1.000: High Concern	Red (1.000)
Fin whale	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Leatherback turtle	1.000: High Concern	3.000: Moderate Concern	Red (1.732)
Atlantic cod	1.000: High Concern	5.000: Low Concern	Yellow (2.236)
American lobster	3.670: Low Concern	3.000: Moderate Concern	Green (3.318)

Species considered in Criteria 2 are either endangered, threatened, or protected (ETP), or represented >5% of the catch, or are used for bait.

The data sources used to determine whether or not a species was an ETP species were either listed under the Species at Risk Act (SARA), assessed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as special concern, threatened, or endangered, or listed as “Critically Endangered,” “Endangered,” “Vulnerable,” or “Near Threatened” by the International Union for the Conservation of Nature (IUCN). By-catch species were determined from independent by-catch studies or from studies conducted by the Department of Fisheries and Oceans, Canada (DFO).

The species that can be retained in lobster fisheries vary by LFA and can include rock crab, Jonah crab, green crab, sculpin, and cunner (see Table 2 in Criterion 3); however, the amount that is retained is generally low. Therefore, this report will not assess these retained species.

Management measures are implemented that reduce the risk of the lobster fishery on whale species (DFO 2022f). But, interactions with whales have been reported. The North Atlantic right whale is listed as "Endangered" under both the Canadian Species at Risk Act (SARA) and the United States Endangered Species Act (ESA) (Hayes et al. 2018), so it is assessed in this report. Fin whale is also assessed in this report because it is listed as a species of "Special Concern" by SARA (since 2005) (DFO 2017x) and as "Endangered" by the IUCN (Reilly et al. 2013). Though the level of concern for fin whale entanglement in fishing gear has been considered "low" (Table 1; (DFO 2017x)), it has been assessed for all areas because there are signs that some whale species' distributions are changing (Pace et al. 2017).

The Western North Atlantic humpback (*Megaptera novaeangliae*) population and minke whale are not assessed in this report. The humpback whale is listed as "Not at Risk" in the last COSEWIC report (COSEWIC 2003) but its SARA status is "Special Concern" (DFO 2018a). Minke whale is not assessed in this report because it is not listed as threatened or endangered under the ESA, and the Canadian East Coast stock is not considered strategic under the United States Marine Mammal Protection Act (MMPA) (Hayes et al. 2017). It is considered "Not at Risk" by COSEWIC (DFO 2018b). The minimum detected average annual mortality and serious injury in Canadian fisheries between 2010 and 2014 was well below the calculated potential biological removal (PBR) (Hayes et al. 2017). Although mortality relative to PBR was low, much of the entanglement-related mortality for minke whale occurred within an "unassigned" country, and detected interactions in the strandings and entanglement data "represent a minimum estimate" (Hayes et al. 2018).

In addition to species caught alongside lobster in the pot fisheries, consideration of species used as bait is also described here. A variety of species is used as bait, but the most prominent are herring, mackerel, and rock crab. There are a number of commercial herring fisheries along the Atlantic coast of Canada. It is not possible to determine the source of herring used as bait in most regions, so herring is assessed collectively for most fisheries. But in the southern Gulf of St. Lawrence (sGSL), there is a gillnet fishery specifically to provide bait for all license holders with fisheries requiring bait. In sGSL, the bait fishery can be used by license holders to provide bait for their own lobster, rock crab, tuna, and/or snow crab fishing activities; it is prohibited to sell catches from a bait license. Although it is possible for a harvester to fish their own bait, most buy their baits from their lobster buyer, who also offers the service of providing bait (Criquet et al. 2021). This is one of the only regions where data on bait are available. This fishery is included separately to reflect the impact of this activity on stocks in the region.

Mackerel has been used as bait in the lobster fishery in recent years; however, in 2022, the commercial and bait fisheries for mackerel in the Canadian Atlantic were closed due to poor stock status (DFO 2022m). Because mackerel is currently not available from this region, we have not included it in this assessment.

For all fisheries, the North Atlantic right whale and herring limit the score for Criterion 2. North Atlantic right whale limits the score due to its high vulnerability, depleted population, and the potential to interact with this gear type (considering its low population levels). Herring abundance has been a cause of concern in the West Coast of Newfoundland spring fishery, as has fishing mortality with respect to reference points.

Reference points may not be appropriate for this species because it is a forage fish.

For the offshore trap fishery in LFA 41, the potential interaction with North Atlantic right whale and leatherback turtle limits the score for Criterion 2, along with concerns regarding the use of herring as bait.

Criterion 2 Assessment

<u>SCORING GUIDELINES</u>

Factor 2.1 - Abundance
(same as Factor 1.1 above)

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

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

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

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

Atlantic cod

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). Survey biomass for cod in NAFO region 4X5Yb, which is the population most likely to interact with lobster fisheries in Southwest Nova Scotia and the Bay of Fundy, has remained at a very low level since 2010, is in the critical zone, and the current outlook for the stock is poor (DFO 2021n). Because of the "Endangered" determination from COSEWIC and the depleted stock status in this region, abundance is a high concern.

Justification:

The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population.

In 2010, Atlantic cod was reassessed and COSEWIC split the Maritimes Region 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), and this status remains (SARA 2021a). The Atlantic cod Laurentian South and Southern populations are under consideration for listing under the Species at Risk Act (SARA).

Northwest Atlantic | Pots | Canada | LFA 33

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). Therefore, Seafood Watch deems Atlantic cod a high concern.

Justification:

The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population. Several of the more viable stocks are seeing small improvements in stock health (DFO 2012b) but, in general, most stocks have yet to see significant rebuilding.

In 2010, Atlantic cod was reassessed and COSEWIC split the Maritimes Region 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), and this status remains (SARA 2021a). The Atlantic cod Laurentian South and Southern populations are under consideration for listing under the SARA.

Cod abundance has been fluctuating at a historically low level since 2010 with little sign of recovery

(DFO 2015a). The 4X5Yb cod stock assessment of spawning stock biomass found that SSB = 10,600 t, which is below the limit reference point (LRP) of 24,000 t (DFO 2015a).

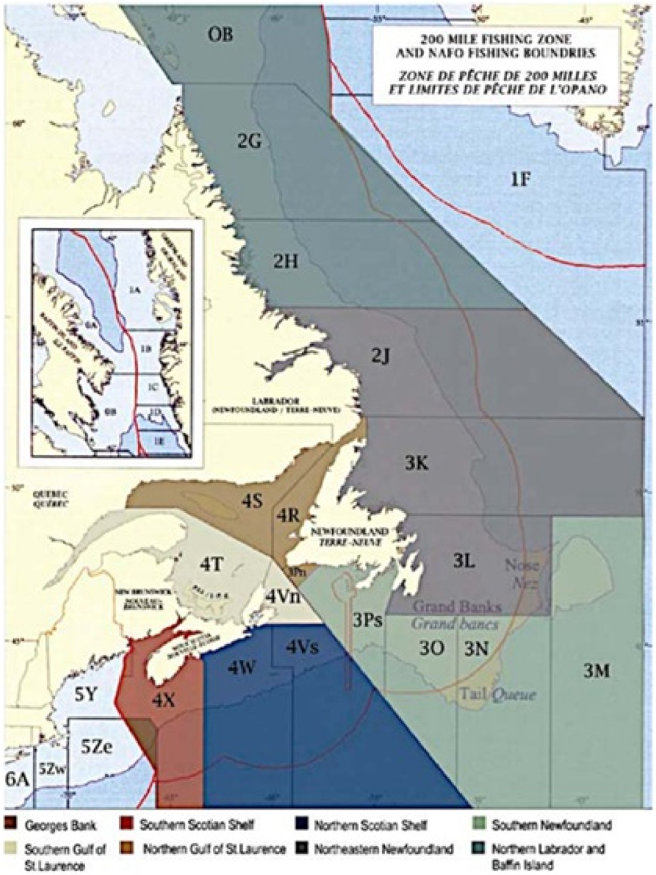

Figure 10: Distribution of Atlantic cod in NAFO management areas: 3Ps, 3Pn, 4RS, 4X, 4V, 4W, 5Y, and 5Z. Source (DFO 2015h).

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). Therefore, Seafood Watch deems Atlantic cod a high concern.

Justification:

The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population. Several of the more viable stocks are seeing small improvements in stock health (DFO 2012b) but, in general, most stocks have yet to see significant rebuilding.

In 2010, Atlantic cod was reassessed and COSEWIC split the Maritimes Region 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), and this status remains (SARA 2021a). The Atlantic cod Laurentian South and Southern populations are under consideration for listing under the SARA.

LFA 41 has seen a significant decline in abundance of Atlantic cod, parallel to increasing natural mortality in the 4X component (Blyth-Skyrme et al. 2015a).

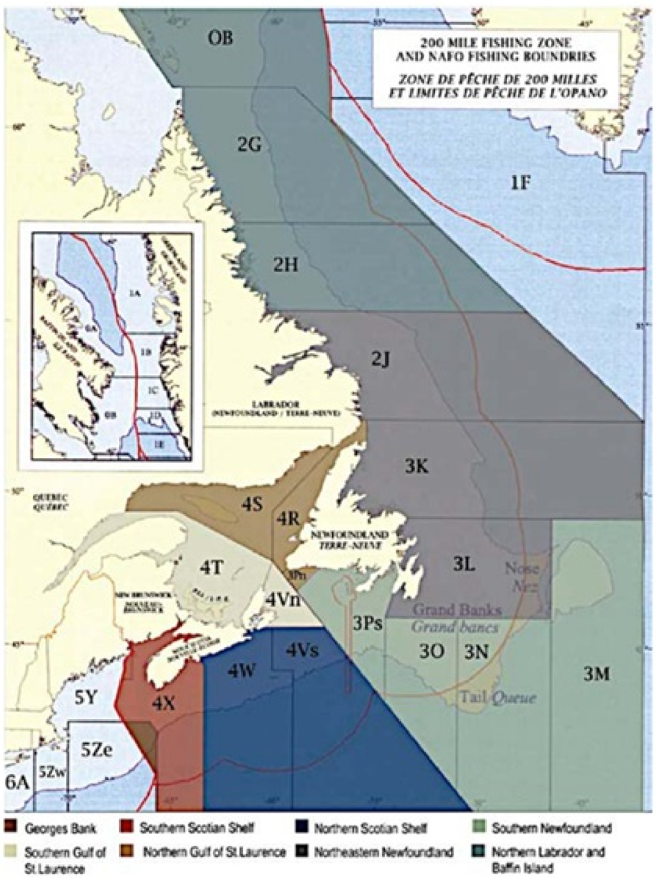

Figure 11: Distribution of Atlantic cod in NAFO management areas: 3Ps, 3Pn, 4RS, 4X, 4V, 4W, 5Y, and 5Z. Source (DFO 2015h).

Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). Therefore, Seafood Watch deems Atlantic cod a high concern.

Justification:

The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population. Several of the more viable stocks are seeing small improvements in stock health (DFO 2012b) but, in general, most stocks have yet to see significant rebuilding.

In 2010, Atlantic cod was reassessed and COSEWIC split the Maritimes Region 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), and this status remains (SARA 2021a). The Atlantic cod Laurentian South and Southern populations are under consideration for listing under the SARA. The Atlantic cod Laurentian South DU includes cod from NAFO management areas 4Vn and 4VsW, which overlap with LFAs 27–32.

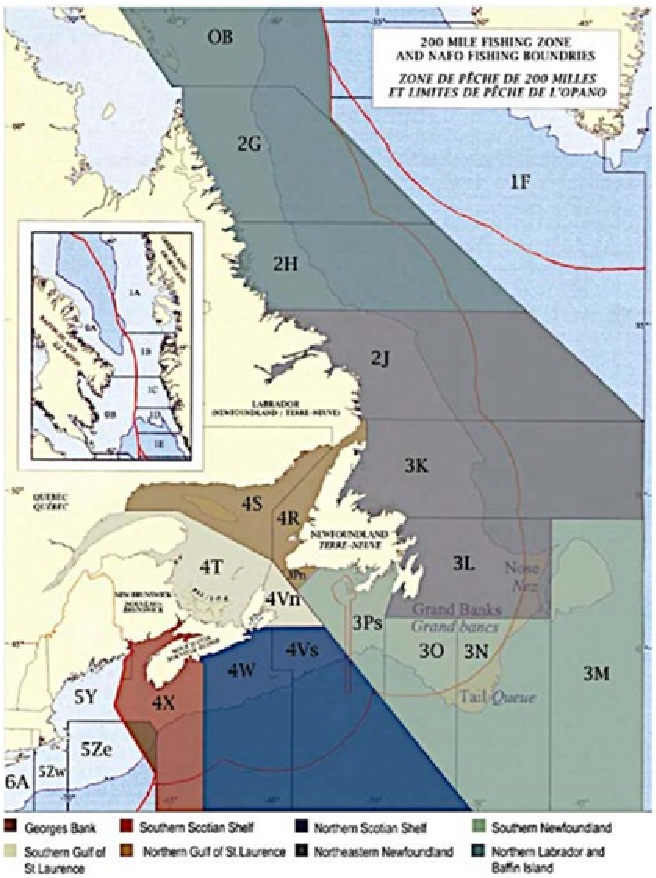

Figure 12: Distribution of Atlantic cod in NAFO management areas: 3Ps, 3Pn, 4RS, 4X, 4V, 4W, 5Y, and 5Z. Source (DFO 2015h).

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). Therefore, Seafood Watch deems Atlantic cod a high concern.

Justification:
The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population. Several of the more viable stocks are seeing small improvements in stock health (DFO 2012b) but, in general, most stocks have yet to see significant rebuilding.

In 2010, Atlantic cod was reassessed and COSEWIC split the Maritimes Region 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), and this status remains (SARA 2021a). The Atlantic cod Laurentian South and Southern populations are under consideration for listing under the SARA.

Atlantic cod in the Newfoundland and Labrador region (includes 2GH, 2J3KL, and 3NO) was determined to be "Endangered" in 2003 by the COSEWIC. In 2010, COSEWIC reassessed the status of this population and confirmed the "Endangered" status (COSEWIC 2010). This status also remains (DFO 2016w). They also determined that the Laurentian North population, which includes part of the southern Newfoundland area (subdivision 3Ps) and the nGSL (3Pn4RS), is "Endangered."

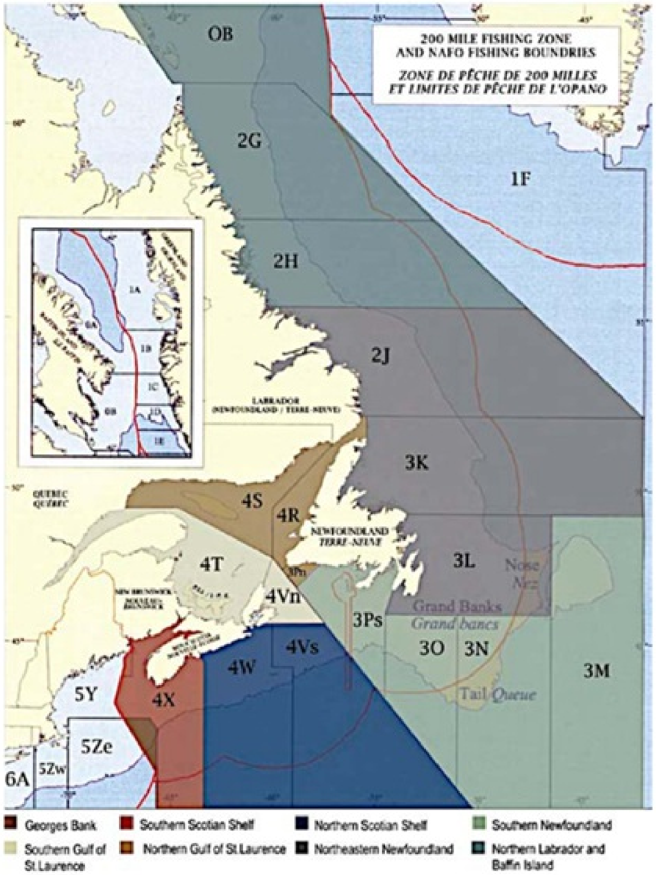

Figure 13: Distribution of Atlantic cod in NAFO management areas: 3Ps, 3Pn, 4RS, 4X, 4V, 4W, 5Y, and 5Z. Source (DFO 2015h).

Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). The 3Pn4RS population is considered to be stable at a low level of abundance. Virtual population analysis showed that spawning stock biomass decreased to its lowest level in 20 years in 2019 (11,774 mt) (DFO 2019h), well below the limit reference point (116,000 mt).

Because COSEWIC has determined cod to be "Endangered" in eastern Canada and the 3Pn4RS stock is depleted, a score of high concern is given.

Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

High Concern

Atlantic cod in eastern Canada has been assessed as "Endangered" by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) (COSEWIC 2010). In this region, there has been a steady decline in abundance since 1997, with spawning stock biomass (SSB) in 2018 estimated at 13,900 mt, a 69-year time-series low and 17% of the limit reference point (LRP) (DFO 2019f). Because of the depleted status of cod in the Gulf of St. Lawrence, Seafood Watch deems the abundance of Atlantic cod a high concern.

Justification:

The Atlantic cod stocks in eastern Canada have suffered extreme biomass declines; therefore, a moratorium was implemented in the early 1990s to reduce pressure on the population. Several of the more viable stocks are seeing small improvements in stock health (DFO 2012b) but, in general, most stocks have yet to see significant rebuilding.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Low Concern

North of the Laurentian Channel, the largest threat to the recovery of cod is fishing mortality, yet south of the Laurentian Channel, increased natural mortality rates have overtaken fishing mortality as the primary threat (COSEWIC 2010). Although the by-catch of cod in commercial fisheries contributes to overfishing concerns (COSEWIC 2010), recent information suggests that lobster traps catch Atlantic cod infrequently (<1% of observed trap hauls) (den Heyer et al. 2010) and, more recently in eastern Nova Scotia, cod was estimated to represent only 0.18% of the total catch weights (Criquet et al. 2015b). In a three-year SARA by-catch project, cod represented 1% of the lobster catch in LFA 34 (Criquet et al. 2015b). As a condition of the fishing license, all cod caught in the lobster fishery must be returned to the water as soon as possible, in a manner causing the least harm possible. Because there are few recently calculated fishing mortality values for all the cod stocks (Steneck et al. 2004) in eastern Canada, but lobster fishing forms a low contribution to total mortality (particularly compared to other gears), it is not deemed a substantial contributor to fishing mortality of cod. Therefore, it is deemed a low concern across all lobster fishing areas.

Atlantic herring

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

The herring fisheries in Canada do provide bait for domestic fisheries, including the snow crab and lobster fisheries, and this analysis focuses on those. (Herring is also imported by bait suppliers (pers. comm., Todd Williams, during technical review); further information on this may allow for a more detailed analysis here.) There are 10 herring stocks targeted by Canadian fisheries, all of which were included in relatively recent DFO stock assessments (see Justification). Only two have both an LRP and USR (spring and fall spawners in Southern Gulf of St. Lawrence); one of those is in the critical zone, and the other is in the cautious zone and declining. One other (SW Nova Scotia and Bay of Fundy) has an LRP, and the latest assessment found current biomass to be at that point. Where they were available, data-limited indicators appear to be mixed (see Justification).

Most Canadian Atlantic herring stocks are at low abundance or declining, or are of unknown status. Therefore, abundance is considered a high concern.

Justification:

Most Atlantic herring fisheries in Canada have only a limit reference point, if they have any reference points. LRPs are usually based on multiyear average spawning stock biomass (SSB) levels for particular years. Although various fishery-independent and fishery-dependent collection methods were used to create these reference points, some data indicators are highly uncertain, due to low data availability for certain years or very low abundance of Atlantic herring.

- West Coast of Newfoundland: Spring spawners and fall spawners. Reference points not defined (rejected in 2020) (DFO 2022d).
- East and South Newfoundland and Labrador: Reference points not defined. Stock status index based on gillnet research survey catch rates declining trend through the 2000s, with a slight increase in 2017 (DFO 2019f).
- Southern Gulf of Saint Lawrence: Critical zone for spring spawners since 2002 (77% of the LRP in 2021), cautious zone for fall spawners since 2017 (171% of the LRP in 2021, SSB declining since 2011) (DFO 2022e).
- Quebec North Shore (Division 4S): Reference points not defined. Acoustic index of the spring spawners increasing since 2018, while fall spawners have remained relatively stable (DFO 2021e).
- SW Nova Scotia and Bay of Fundy: Biomass has been relatively stable in recent years (2011 to 2016) but declined to the LRP in 2017 (DFO 2018c).
- Offshore Scotian Shelf: Reference points not defined (DFO 2018c).
- Coastal Nova Scotia: Reference points not defined. Acoustic surveys show biomass

increases in recent years in Little Hope and Eastern Shore. Other areas (Glace Bay and Bras d'Or Lakes) have no indicators but are assumed to be low abundance (DFO 2018c).

- SW New Brunswick: Reference points not defined (DFO 2018c).

Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

High Concern

The main commercial herring fisheries found in Canadian waters are 1) West Newfoundland (4R stocks); 2) E and SE Newfoundland (3KLPs stocks); 3) sGSL (4TVn stocks); 4) nGSL (4S stock); and 5) Southwest Nova Scotia and the Bay of Fundy (complex of stock 4VWX). Stock assessments use a variety of fishery-dependent and -independent data. It is not possible to determine the source of herring used as bait in most regions; therefore, herring is assessed collectively for most fisheries. But, in the southern Gulf of St. Lawrence, there is a gillnet fishery specifically to provide bait for the lobster fishery. This fishery is included separately to reflect the impact of this activity on stocks in the region.

Southern Gulf of St. Lawrence/Northwest Atlantic, gillnet

Spring component: spawning stock biomass (SSB) has been below 22,000 t since 2004 (in the critical zone) and was estimated to be 12,44 6mt in 2018 (DFO 2018s); however, uncertainty is high (Figure 12 in (DFO 2016c)). With zero removals of the stock between 2018 and 2019, models suggest that SSB will only increase slightly, with a very high probability that the stock will remain in the critical zone (DFO 2018s). The stock's growth is limited by low recruitment rates and declines in abundance attributable to warmer waters, incompatible seasons of plankton production and spawning (Bourne et al. 2015), and declining weight-at-age results (DFO 2018s).

Fall component: The median estimate of SSB at the start of 2018 was 112,000 mt. The probability of SSB being below the upper reference point (URP) (172,000 t) at the beginning of 2017 and 2018 was 98% and 97%, respectively (DFO 2018s). Historically, the median estimate of SSB has generally been in the healthy zone (SSB > 172,000 t) but has been in the cautious zone since 2015 (DFO 2018s). This is partly due to poor recruitment at age 4 herring and reduced weight-at-age, for which the reasons are unknown (DFO 2018s).

Because the spring component is below the LRP abundance (under current conditions) and the fall spawning component is below the URP and declining for the southern Gulf of St. Lawrence, herring is deemed a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | Bay of Fundy

Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

Fishing mortality relative to reference points appropriate for forage species is unknown for all Canadian Atlantic herring stocks. The only stock to have even a provisional harvest decision rule is the southern Gulf of St. Lawrence; the catch has exceeded that level since 1999 for spring spawners, and in the 1990s, 2000s, and then again in 2020–2021 for fall spawners. This stock (specifically the fall spawners) accounts for a significant portion of the total herring catch. The other stocks have data-limited assessments with mixed outcomes (see Table 1).

Because fishing mortality is essentially unknown relative to a sustainable level, but the two stocks that are best understood appear to be subject to excessive fishing mortality, and the contribution of the bait fisheries to total mortality across stocks is unknown, we have awarded a high concern.

Justification:

Atlantic herring is commonly used as bait in lobster fisheries throughout eastern Canada. Although catches of bait are required to be recorded in harvester logbooks for the Atlantic herring fishery, compliance is reportedly low, so estimates of Atlantic herring harvest for bait were not available (DFO 2018b).

Table 1: Stock assessment data points and information of relevance to understanding fishing mortality and the contribution of that mortality from bait catches.

Stock	Information	Reference
West Coast of Newfoundland	TACs and exploitation rates in recent years have declined for both stocks, and 2021 levels were very low (<20% of the TAC had been taken, and <5% based on actual catch due to the presence of too many juveniles). Assessment indicates maintenance of TAC should not pose significant risk to stocks. Total TAC = 20,000 mt. Bait TAC = 50 mt.	(DFO 2022d)
East and South Newfoundland and Labrador	TACs = 12,842 mt, 42% of which was landed in 2017 and 2018. Total estimated bait catch was 1,192 mt in 2017 and 675 mt in 2018.	(DFO 2019f)
Southern Gulf of St. Lawrence	Fishing mortality has exceeded the provisional harvest decision rule of the PA Framework for the sGSL since 1999 (spring spawners) and most of the 1990s, early 2000s, and 2020–2021 (fall spawners). Total landings were 603/403 mt for 2020/2021 for the spring spawners, and around 10,065/10,834 mt for the fall spawners. Total bait use from the spring spawners is unknown (stock assessment did not specify for fall spawners).	(DFO 2022e)
Quebec North Shore (Division 4S)	Current catch levels are not likely to pose a significant short-term risk to herring stocks. Bait catch not quantified. Total TAC 4,000 mt, increased to 4,500 mt in 2019. Average catch 2011–2018 was 3,515 mt, decreasing since then to 1,482 mt in 2020.	(DFO 2021e)
SW Nova Scotia and Bay of Fundy, Offshore Scotian Shelf, Coastal Nova Scotia, SW New Brunswick	Bait catch not quantified. SW NS and BoF: 2016–2017 TAC = 42,500 mt, total catch = 39,430 mt.	(DFO 2018c)

Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

High Concern

Southern Gulf of St. Lawrence/Northwest Atlantic, gillnet

Spring component: Although herring catches for bait are expected to be much lower than those for the commercial fishery, there are great uncertainties among catches. Catches in these fisheries are meant to be recorded in logbooks, but logbook returns have been low, exacerbating the uncertainty found in assessments. The fishing mortality rate has declined over time to an average of 0.18 (exploitation rate of 0.16) through the period 2013 to 2015 for herring aged 6 to 8 years. Fishing mortality is now low compared to historical mortality rates; however, this is still considered to be high for a stock in the critical zone (DFO 2016c).

Fall component: The average fishing mortality rate on ages 5 to 10 has declined to an average of 0.19 (exploitation rate of 17%) since 2012. Fishing mortality rates have historically exceeded the reference removal rate (F = 0.32 for the healthy zone from the mid-1990s to 2010), but were below the reference level since 2011. If 2015 landings were continued for TACs in 2016 and 2017 (28,000 t), the probability of exceeding the removal rate reference was 42% (DFO 2016c).

Fishing mortality has fluctuated in both fisheries and has been low in recent years or below the reference level, but there is major uncertainty in results, and mortality rates are still considered too high in the spring component; therefore, Seafood Watch deems fishing mortality a high concern.

Cusk

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

High Concern

Cusk is caught as by-catch in the lobster fishery and is considered "Endangered" under COSEWIC (COSEWIC 2012b). It is not listed under the SARA, but is currently under consideration. In the last stock assessment update (2021), based in the 4VWX5Z region, the current 3-year geometric mean (2019 to 2021) of the cusk biomass index was estimated to be 13.8 kg, which is slightly above the limit reference point (LRP) (13.3 kg) (DFO 2022e). Cusk has remained above the LRP since 2008 (DFO 2014j). The LRP is set at 40% of the MSY proxy, which in turn was set at the average commercial catch per unit effort (CPUE) during a period before the decline in CPUE (1986–1992) (Harris et al. 2012). Because of its conservation status, Seafood Watch scores cusk abundance a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 33

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Moderate Concern

Cusk caught in lobster pots must be discarded; as a result, lobster fisheries are no longer a main source of landings, and landings have been declining in recent years (at 165 mt in 2016 in area 4VWX5Z (DFO 2017k)) (DFO 2016n). Groundfish longline and lobster pots are considered to be the greatest threats (using recorded landings and discard data, respectively) (DFO 2014g). There is a lack of recent evidence to show that cusk by-catch in lobster fisheries has reduced across all areas: the most recent data are from 2009 and show that cusk by-catch in LFA 34 represented around 44.38% of cusk landings from area 4X5YZ (DFO 2016n).

The last stock assessment showed that mean cusk CPUE is at or above the LRP for the last 3 years {Kinnie 2001}, but considers that the population can sustain these levels of fishing mortality, because its population has fluctuated largely with no trends for 14 years (DFO 2014b)(Criquet et al. 2015a).

Subsequent discarding of cusk in lobster fisheries is "likely" to represent a significant proportion of total catches of cusk across all fisheries (COSEWIC 2012b). The lobster fishery is potentially still a substantial contributor to cusk mortality in some areas. In the absence of data regarding recent by-catch of cusk in the Maritimes, this cannot be determined. Fishing mortality relative to reference points is not known for the fisheries. Therefore, by-catch of cusk is scored a moderate concern.

Justification:

The recent COSEWIC assessment states that overfishing remains the most important threat to cusk. There is essentially no directed fishing for the species, but in years previous to the last assessment, approximately 500 t/year were landed in fisheries for cod, haddock, pollock, and Atlantic halibut (COSEWIC 2012b). Although cusk landings are highest in the Maritimes Region, landings in the Gulf and Newfoundland are minimal (DFO 2014c).

Cusk represents a small proportion of lobster by-catch: Pezzack et al. (2014) estimated that cusk represented 8 t (0.03%) of by-catch in LFAs 27 to 33 and 219 t (1.1%) in LFA 34. From 2000 to 2010, cusk by-catch varied between 215 t and 255 t in LFA 34; catches in LFA 33 were generally <10 t/year during this period (COSEWIC 2012b).

Cusk by-catch in LFA 34 in 2009 was 219.5 t while cusk landings in 2009 for 4X5YZ (LFA 33 to 40) were 535 t (DFO 2016n). But, cusk landings have been steadily decreasing in recent years from 1,018 mt in 2007 to 189 mt in 2015 (DFO 2017k).

Mortality rates of cusk caught in lobster traps were, at a minimum, 49% and 86% for LFA 34 and LFA 41, respectively; these estimates are likely low, considering the potential for post-release mortality of remaining cusk (Harris, L.E. and Hanke, A.R. 2010).

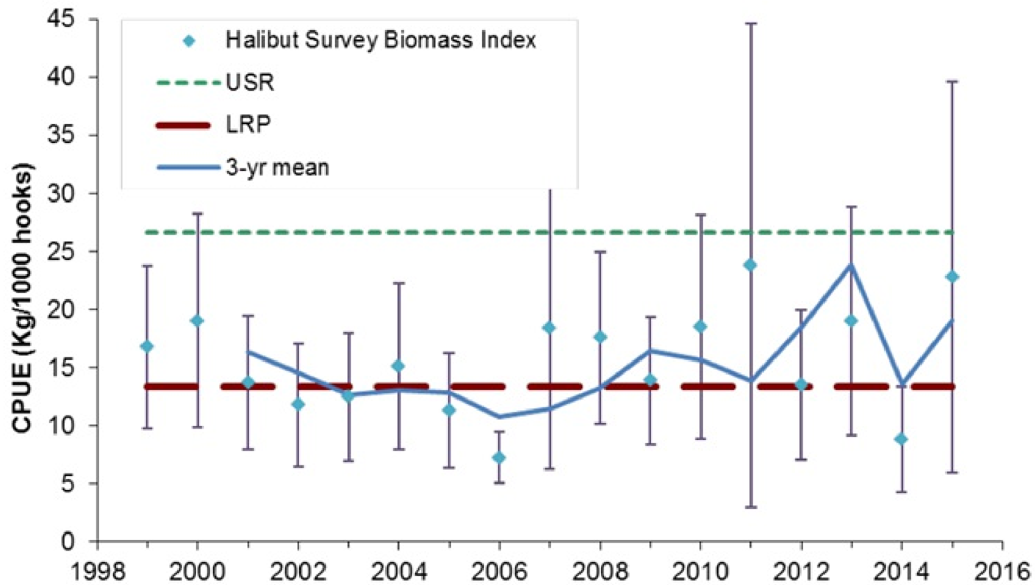

Figure 14: The green dashed line represents the upper stock reference (USR), the red dotted line represents the limit reference point (LRP), the blue diamonds represent the biomass for the cusk in the habitat survey (with 95% confidence interval), and the heavy blue line represents the 3-year geometric mean of the index. Source (DFO 2016n).

Fin whale

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

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

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | LFAs 27-32

Moderate Concern

From 2014 to 2018, the minimum annual rate of human-caused mortality and serious injury to fin whale (2.35 per year total, inclusive of 1.55 due to fisheries interactions that comprised 0.60 in Canadian waters and 0.95 unknown but first reported in United States waters) did not exceed the potential biological removal (PBR) (11 individuals per year) (Hayes et al. 2021). It is difficult to quantify entanglements due to limited observer coverage and it is recognized that these values are biased low, with uncertainty regarding the magnitude of the bias. Entanglement rates for fin whale are expected to be higher than currently reported because traditional reporting relies upon vessel-based photography, which may not identify entanglement scars for species that do not show their flukes as often (for example, fin and blue whales compared to humpback whale) {Ramp et al. 2021}. The management plan for fin whale in Atlantic Canada lists fisheries entanglement as a low to moderate threat to the population (DFO 2016b). But, there is evidence to suggest that mortalities are higher than currently quantified. In 2017, at least five carcasses were spotted in the southern Gulf of St. Lawrence (during aerial surveys looking for North Atlantic right whale), one of which was entangled in fishing gear; these carcasses do not appear to have been considered in the most recent marine mammal stock assessment {COSEWIC 2019}(Hayes et al. 2021). Although cumulative fisheries mortality is <50% of PBR, there is substantial uncertainty regarding the true level of entanglement and subsequent serious injury and mortality, so fishing mortality is considered a moderate concern.

Jonah crab

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Moderate Concern

Jonah crab is caught as by-catch in the Maritimes Region offshore fisheries (LFA 41) and there is no current active fishery in this region. The stock was last assessed in 2009 based on fishery-dependent logbook and dockside monitoring data (including catch, effort, and location data) (Pezzack et al. 2011). Because of data uncertainty, there is no reliable estimate for abundance and thus no evidence that the stock is either above or below a sustainable level. Catch per unit effort (CPUE) data indicated an overall declining trend in abundance (1999–2006; see Figure 15), which could be due to fishing pressure during the fishery's initial years (beginning in 1995); however, these data are uncertain because they may have been affected by factors that were not evaluated, including temperature, molt state, and movements of the fishing fleet. Additional abundance indices are acquired from DFO RV surveys, but little is known about the behavior of Jonah crab and its ability to redistribute, which would be required to provide robust abundance estimates from these data (Pezzack et al. 2011). Because abundance in relation to reference points and conservation goals is unknown and the species has a medium vulnerability (PSA = 2.68, see Justification), stock status is rated a moderate concern.

Justification:

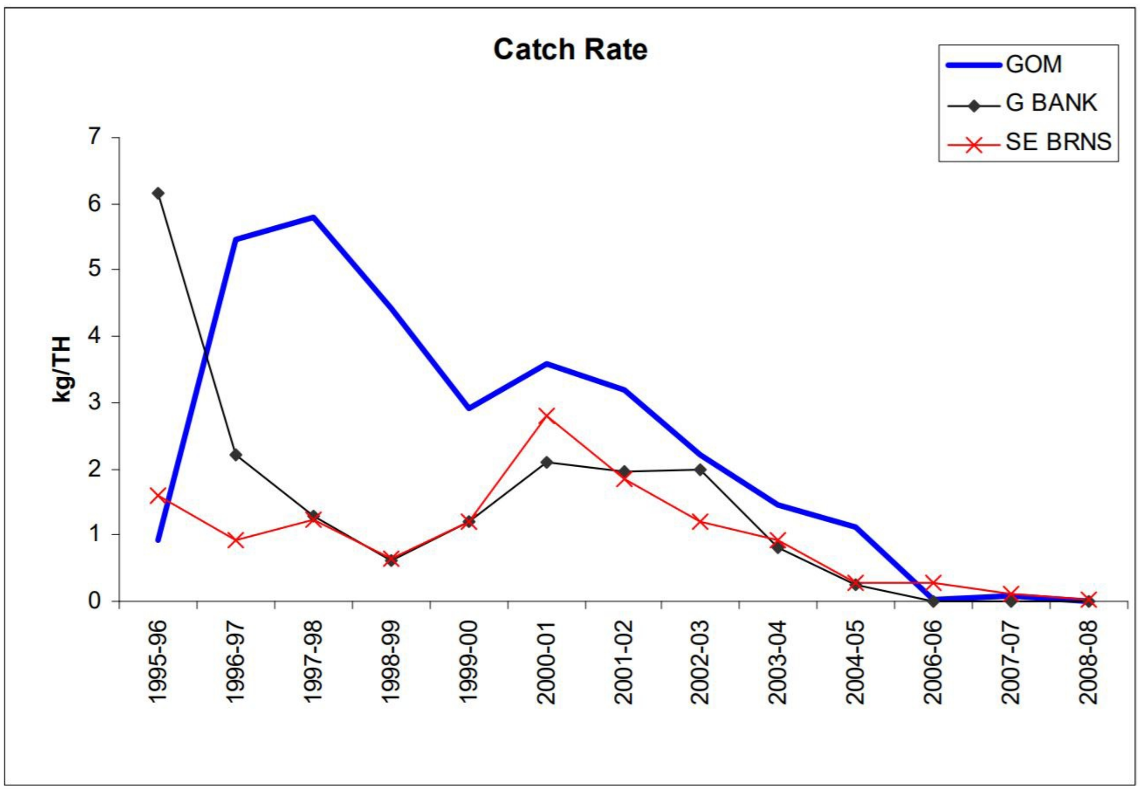

Figure 15: Jonah crab CPUE (Kg/TH) and for Gulf of Maine, Georges Bank, and SE Browns (Pezzack et al. 2011).

This species has a moderate vulnerability (PSA = 2.68).

Productivity	Relevant Information	Score

Average age at maturity	1–4 years*	1
Average maximum age	8 years*	2
Fecundity	800,000 eggs (300,000 to 1,600,000)	1
Reproductive Strategy	Egg brooder	2
Trophic Level	2.5	1

* Best available estimate using a proxy in the same genus *Cancer* spp., based on Atlantic rock crab life history.

References for productivity table: (Bigford 1979)(Campbell and Eagles 1983)(Shields 1991)(Steneck et al. 2004)

Susceptibility	Relevant Information	Score
Areal overlap	Default score, sufficient data not available	3
Vertical overlap	Default score, sufficient data not available	3
Selectivity of fishery	Species is targeted and/or by-catch but FMP requires escape gaps	2
Post-capture mortality	Retained species or used as bait	3

References for susceptibility table: {DFO 2016}(DFO 2020f)

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Moderate Concern

There are no estimates of fishing mortality relative to reference points for Jonah crab in the Bay of Fundy inshore fisheries (LFAs 34–38) or the Gulf of Maine offshore fishery (LFA 41). In the 2017–2018 season, 210 mt of Jonah crab were landed as retained by-catch in the inshore lobster fishery, with the majority (75%) of Jonah crab landed in LFA 34 (DFO 2020f)(Criquet et al. 2021). Jonah crab is the most commonly encountered by-catch species in the offshore lobster fishery (LFA 41)(Cook et al. 2020). In recent years, by-catch levels have declined in this fishery overall and the average by-catch of crab species combined in the offshore lobster fishery (LFA 41) for 2015–2017 was 2 mt (Knapman et al. 2019). Catch per unit effort (CPUE) data from the 2010 stock assessment in LFA 41 indicate that the original total allowable catch (TAC) of 720 t (implemented 1995 through 2010, when it was reduced to 540 t) was not sustainable and that population declines began at the inception of the Jonah crab fishery in 1995; however, there are uncertainties associated with these data. Fluctuations in CPUE relative to oceanographic conditions, molt state, and movement were not evaluated. The current TAC for Jonah crab in LFA 41 is 270 t (since 2017) (DFO 2020g). Because fishing mortality relative to reference points based on biological information is unknown, it is considered a moderate concern.

Leatherback turtle

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula

Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

High Concern

The Northwest Atlantic population of leatherback turtle is listed as "Endangered" under the SARA, which has a recovery strategy (Atlantic Leatherback Turtle Recovery Team 2006) and action plan (DFO 2020g) for the species. This population is also listed by the International Union for the Conservation of Nature (IUCN) Red List as "Endangered" (The Northwest Atlantic Leatherback Working Group 2019) and is listed in CITES under Appendix I (Criquet et al. 2015a). Because of the species' conservation status, Seafood Watch deems leatherback turtle abundance a high concern.

Justification:

Leatherback turtle is protected in Canada under the SARA. It nests predominantly in Trinidad, French Guiana, and Costa Rica (Stewart et al. 2013), but migrates to Atlantic Canadian waters to forage. The majority of turtles are present from June to November. The leatherback turtle is a specialist animal that feeds largely on jellyfish (Heaslip et al. 2012) and other soft-bodied invertebrates (Atlantic Leatherback Turtle Recovery Team 2006).

A study in Nova Scotia found that, although there was considerable annual variation, abundance appears stable; however, it is unclear whether this is representative of other areas of Canada or of the North Atlantic population as a whole (Archibald and James 2016). A recent assessment of the North Atlantic population by the IUCN found nesting numbers to be decreasing, at approximately 23,010 nests/year to 2017, compared to past estimates of approximately 58,000 nests/year (The Northwest Atlantic Leatherback Working Group 2019)(The Northwest Atlantic Leatherback Working Group 2019 Supp).

Recent research using telemetry data has identified that leatherback turtle uses a large geographic area throughout the Canadian Atlantic, with two key areas of important habit identified: (1) Gulf of St. Lawrence, particularly the southeastern Gulf and waters east of Cape Breton Island; and (2) Burin Peninsula, waters to the south and east of the peninsula including parts of Placentia Bay (DFO 2020h). The study also identified seasonal movement in Canadian waters, with a general movement from the southwest to the northeast. Leatherback turtle enters Scotian Shelf waters from June to July, before moving to more northerly foraging areas in the Gulf of St. Lawrence and Placentia Bay by late summer and fall. In September and October, leatherback turtle begins to migrate southward (DFO 2020h).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFAs 27-32

Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Moderate Concern

There is a dearth of reliable information due to a lack of observer coverage for the lobster fisheries. Rough estimates of leatherback turtle mortality rates for fixed-gear fisheries are 20% to 70% (DFO 2013h).

A study evaluating the causes of leatherback turtle entanglements estimated that, of 205 reported turtle entanglements, 85% were reported to be alive and successfully released. But, the reports show strong biases toward reporting successful releases, and the study found that the number of deaths resulting from entanglements in fixed-gear fisheries has been "grossly underestimated"; the true mortality rate is unknown. Pot fisheries account for over 44% of entanglements in fishing gear, and inshore lobster pot gear was the second most commonly reported fishing gear. Though pot fisheries often cannot be attributed to their specific type (e.g., lobster, crab, or whelk), leatherback turtle has been reported entangled in the offshore lobster fishery (Hamelin et al. 2017).

Seasonal distribution of leatherback turtle suggests that there is little overlap with lobster fisheries, because most fishing seasons have ended before it arrives during its seasonal migration (Hamelin et al. 2017)(DFO 2020h), except for LFA 25, where the lobster season is open into October, and along the Scotian Shelf, where fisheries are open during June as leatherback turtle begins to appear (Hamelin et al. 2017)(DFO 2020h). But, the seasonal distribution of leatherback turtle varies from year-to-year and can lead to the species being present when lobster fisheries are taking place (Hamelin et al. 2017).

Because the level of fishing mortality is unknown but is known to occur in lobster fisheries in Canadian waters, Seafood Watch deems fishing mortality a moderate concern.

Justification:

The proportion of entangled leatherback turtles found alive versus dead is not known; however, because inshore lobster gear is normally checked daily, many turtles are released alive. Entanglement around the neck and/or repeated rolling, which is a response to entanglement that results in additional wraps of line around the limbs, etc., can prove fatal, even in a short time, particularly when turtles are initially caught at low tide. Once entangled, turtles are typically unable to free themselves, and even if they do break free, they exhibit reduced feeding efficiency, impaired locomotion, exertion myopathy, and deadly infections. The true mortality rate is unknown, but mortality is assumed to be higher among fixed gear-associated interactions compared to other gears (Hamelin et al. 2017).

North Atlantic right whale

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

North Atlantic right whale (NARW) is a highly vulnerable endangered, threatened, or protected (ETP) species that migrates annually from calving grounds in the southeastern United States to feeding grounds in the northeast United States and southeast Canada during the spring, summer, and fall months (NOAA 2020e)(DFO 2020c). Known feeding grounds include the Gulf of St. Lawrence (GSL) and the Maritimes Region (Figure 14, (NOAA 2020e)). Acoustic data and visual surveys describe an increase in annual North Atlantic right whale presence in the GSL starting in 2015 (Simard et al. 2019)(DFO 2020c)(Bourque et al. 2020). Feeding activities by North Atlantic right whale in the Maritimes Region may have decreased, based on acoustic data (available in 2004–2005 and since 2013) and sightings data (available for 21 years) (Figures 16 and 17) (Bourque et al. 2020)(DFO 2020c). The two figures also show the high density of North Atlantic right whale in the Gulf of St. Lawrence, which typically occurs during the summer months in recent years. Observations of North Atlantic right whale in the Maritimes Region and around Newfoundland are lower than in the Gulf of St. Lawrence; however, observation survey effort (both visual and acoustic) is much lower in these regions. Following the introduction of passive acoustic monitoring in the region, this species has been detected off Newfoundland, particularly Placentia Bay, in 2017, 2018, and 2019 (DFO 2020c). The inclusion of the 10-fathom and 20-fathom contours in Figure 16 shows that NARW observations are greatly reduced in shallow water. Although most lobster fishing effort is concentrated in areas shallower than 20 fathoms and the perceived risk to North Atlantic right whale may be reduced, there are still observations of NARW in waters less than 20 fathoms deep, so there is not an absence of risk. A recent study found that, even though systematic surveys had not identified North Atlantic right whale in waters shallower than 20 fathoms in 2019, the species had been reported in waters that were shallow in 2019 (DFO 2020c). In 2017, at least 17 North Atlantic right whale mortalities occurred (12 in Canadian waters), and in 2018, there were 3 mortalities (all in United States waters) (NOAA 2020f). Fishery entanglements and ship strikes were the two identified causes for these mortalities (Daoust et al. 2017)(NOAA 2020f).

The NARW population has been declining in recent years (Figure 18) (Pettis et al. 2021). Minimum abundance from the most recent stock assessment was estimated at 364 individuals (best estimate 368) (Hayes et al. 2022), while the best estimate of the population from the North Atlantic Whale Consortium was 336 individuals at the end of 2020 (Pettis et al. 2022). There are fewer reproductive females producing fewer calves each year, with experts estimating that there are 88 or fewer reproductively active females remaining (Pettis et al. 2022){NOAA 2022c}. In 2020, North Atlantic right whale was downgraded to "Critically Endangered" by the IUCN (Cooke 2020).

Because the North Atlantic right whale is listed as "Endangered" by the SARA, COSEWIC, and ESA, and as "Critically Endangered" by the IUCN, abundance is considered a high concern.

Justification:

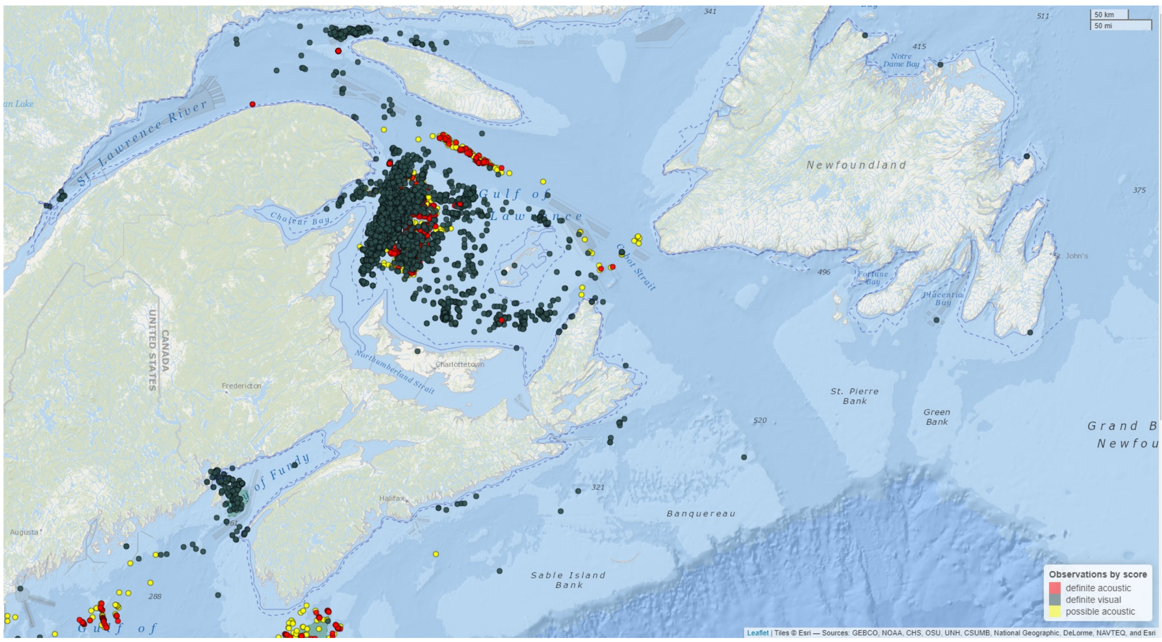

Figure 16: North Atlantic right whale observation in Atlantic Canada from February 1, 2017 to January 31, 2022 as displayed on Whale Map. Definite acoustic (red dots), possible acoustic (yellow dots), and definite visual (green dots) observations are shown, along with the 10-fathom contour (solid line) and 20-fathom contour (dashed line). From https://whalemap.org/WhaleMap/

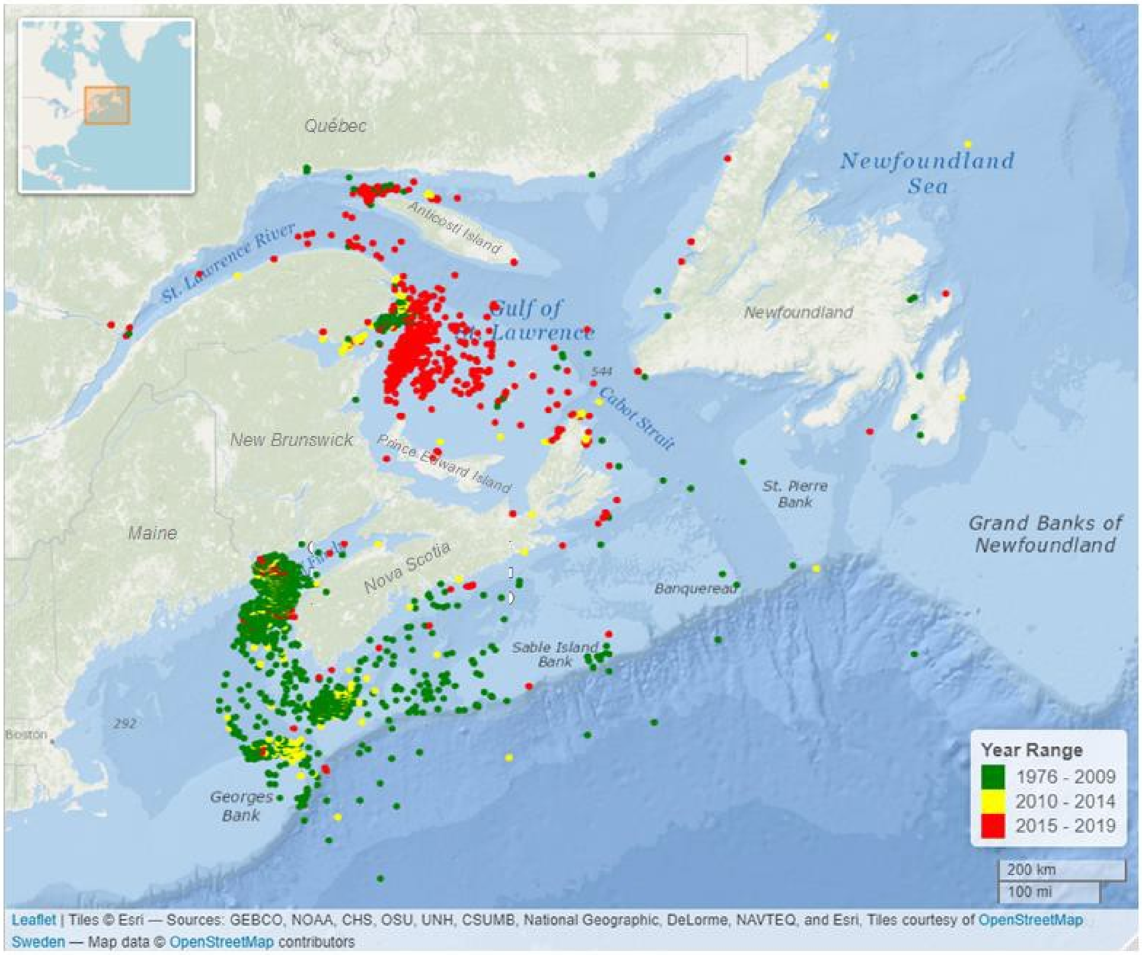

Figure 17: North Atlantic right whale sightings in the Gulf of St. Lawrence and Bay of Fundy from 1976 to 2009 (green dots), 2010 to 2014 (yellow dots), and 2015 to 2019 (red dots) (Bourque et al. 2020). Sightings are based on the North Atlantic Right Whale Consortium Sightings Database 03/04/2020 (Anderson Cabot Center for Ocean Life at the New England Aquarium, Boston, MA). Disclaimer: it is not known whether areas of the map without sightings are because of whale absence or lack of surveillance. This map does not include right whale acoustic detections.

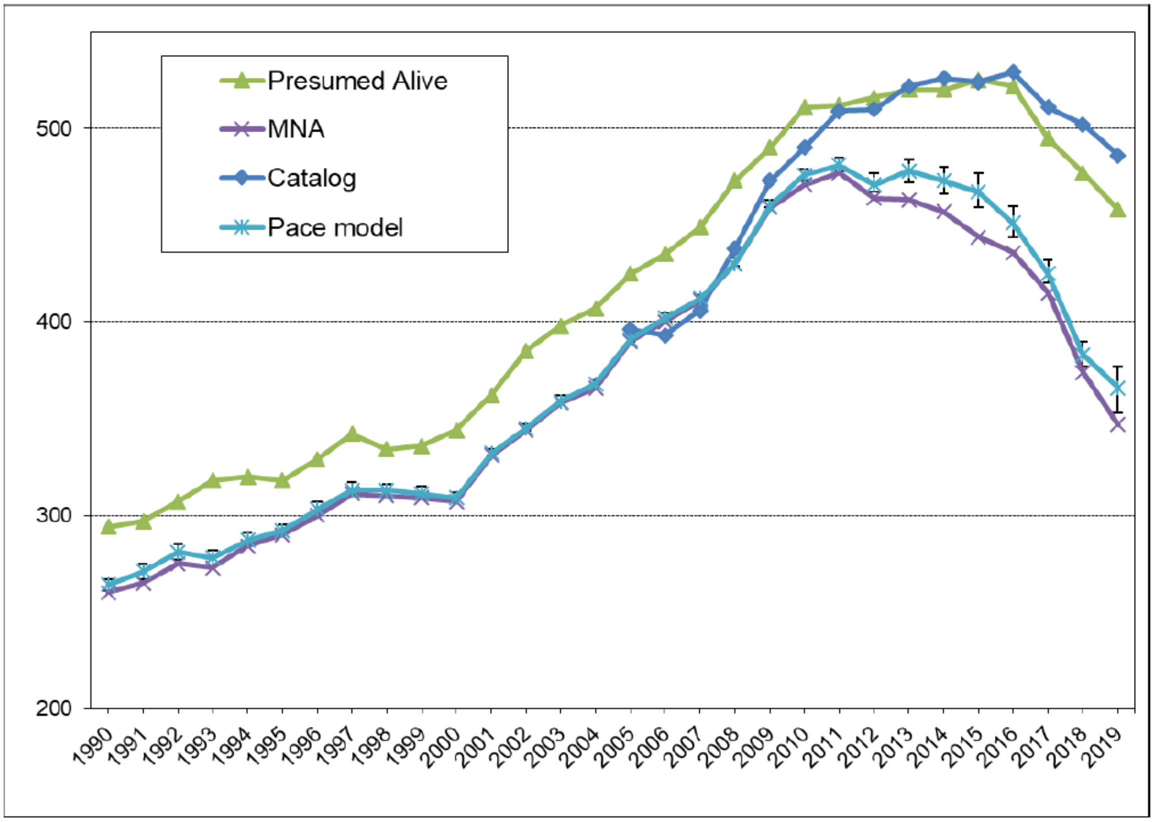

Figure 18: North Atlantic right whale population estimates using four different models, 1990–2019 (Pettis et al. 2021).

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Southern Gulf of St. Lawrence Stock | Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | LFAs 27-32

High Concern

The western Atlantic stock of the North Atlantic right whale (NARW) is listed as "Endangered" under the Canadian Species at Risk Act (SARA) and is considered a strategic stock under the United States Marine Mammal Protection Act (MMPA), because annual serious injuries and mortalities (SIMs) (7.7 from all sources, 5.7 attributed to fisheries entanglement during 2015–2019) exceed the potential biological removal (PBR) (0.7 whales) (Hayes et al. 2022). From 1980 to 2018, a total of 1,617 entanglement events, based on scarring or attached gear, have been documented in North Atlantic right whales; however, only 130 of these events had attached gear (Knowlton et al. 2012)(Hamilton et al. 2020). Due to a lack of information from these attached gear cases, it is often not possible to assign entanglements to a particular fishery or country. Documented entanglements from 2015 to 2019 involving pot/trap gear or unidentified gear are all attributed to unknown fisheries, of which the lobster fishery may be a part. Annual SIMs attributed to entanglements in pot/trap gear in Canadian fisheries were 1.95 (279% of PBR), while none were attributed to pot/trap gear in United States fisheries (Hayes et al. 2022). Serious injuries and mortalities first seen in the United States but not attributable to country were 2.65 (379% of PBR), and those first seen in Canada but not attributable to country were 1.05 (150% of PBR) (Hayes et al. 2022).

Vessel strikes and entanglement (from pot/trap and anchored gillnet fisheries) are the two leading causes of SIMs to North Atlantic right whale, with entanglements increasing over the past decade (see Figure 19) (Moore 2019). Rope strengths have increased in recent decades (based on data from 1994 to 2010), leading to reduced escape success from entangling gear (Knowlton et al. 2016). Because of limited observation coverage, it is likely that the number of entanglements is severely underestimated, with an estimated 64% of all mortalities (1990-2017) going undetected (Pace et al. 2021). Based on mark-recapture studies through photo identification, <50% of entanglement-related mortality is estimated to be detected, with these same studies demonstrating that 59% of North Atlantic right whales have been entangled more than once (83% at least once), and new scars from entanglement are observed annually for at least 26% of the observed population (Knowlton et al. 2012).

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

An Unusual Mortality Event is in effect (since June 2017) for North Atlantic right whale, which includes 34 mortalities (21 in Canada and 13 in the United States, based on the location of stranding, not the location of mortality) through December 2021 (NOAA 2022). Mortalities are attributed to a combination of human interactions including vessel strikes and rope entanglement (final results are pending; however, preliminary investigations list 11 suspected as vessel strikes, 9 suspected as entanglement, 13 as pending or unknown causes, and 1 as perinatal mortality) (NOAA 2022) (see Figure 19).

In Atlantic Canada, between 2008 and 2014, there were 18 recorded interactions between North Atlantic right whale and fishing gear. In most cases (78%), the gear type could not be identified; however, 11% of the interactions were known to be with pot/trap gear (DFO 2016y). In 2017, 12 dead North Atlantic right whales were identified in the Gulf of St. Lawrence, and of the 7 necropsies performed, 2 were determined to have died from entanglement in fishing gear (Daoust et al. 2018). In 2019, a total of nine North Atlantic right whales were found dead in Canadian waters (Bourque et al. 2020). Necropsies were performed on five of these whales, determining that four died due to vessel strikes, and one cause was undetermined (Bourque et al. 2020). There were no entanglement-related mortalities identified in Canadian waters in 2020 or 2021; however, a whale (#4615) was seen entangled in the Gulf of St. Lawrence in 2021, and this incident is currently listed as a serious injury (NOAA 2022).

North Atlantic right whale is not uniformly distributed across Canadian waters and is more likely to be found in water depths greater than 20 fathoms (37 m) (DFO 2020c), so interactions are considered to be more likely in some areas than others; for example, there are few reported sightings in the Newfoundland and Labrador and East Cape Breton regions. But, these areas have relatively lower levels of surveillance and monitoring (likely because of low levels of historical abundance), and there are concerns that, as the distribution of whales changes, both spatially and temporally, the occurrence of whales and interactions with fishing gear will not be identified. Observed numbers of whales around Newfoundland are low; however, they have been identified in these waters and are within the range of their preferred prey, *Calanus finmarchicus* (Durette-Morin 2021). Although whales may not be found as frequently in shallower waters, they have been reported there and may transit through shallow waters to access deeper foraging areas; further, though this occurrence may be lower, it does not result in an absence of risk because risk is a product of whale occurrence and fishing activity (DFO 2019i). In the eastern Gulf of Maine, North Atlantic right whale distribution shifts appear driven by climate change and correlated with altering prey distribution (Record et al. 2019). Since approximately 2010, there have been decreased North Atlantic right whale sightings in the Bay of Fundy and Roseway Basin south of Nova Scotia and increased sightings in the Gulf of St. Lawrence. There are concerns that, in most years, the foraging habitat in the Gulf of St. Lawrence may have insufficient prey biomass for successful North Atlantic right whale reproduction (Kershaw et al. 2020)(Gavrilchuk 2021). Unlike the United States lobster fishery, Canadian lobster fisheries have relatively short seasons; however, there is a known overlap between these fisheries and North Atlantic right whale distribution (Johnson et al. 2021).

The Canadian Species at Risk Act (SARA) states that it is illegal to "kill, harm, harass, capture or take an individual of a wildlife species that is listed as an extirpated species, an endangered species or a threatened species" (Minister of Justice, Canada 2002), meaning that any entanglement that results in harm to a North Atlantic right whale is illegal under Canadian law. Cumulative SIMs far exceed PBR and entanglements due to unknown fisheries are considered a significant contributor. Until there is more specific information available regarding which fisheries are responsible for the unattributed entanglements, Seafood Watch considers that all relevant fisheries that may overlap with NARW pose risks. Based on the available information and the significant risks to NARW, Canadian lobster fisheries cannot be considered sustainable, and fishing mortality is scored a high concern.

Justification:

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

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

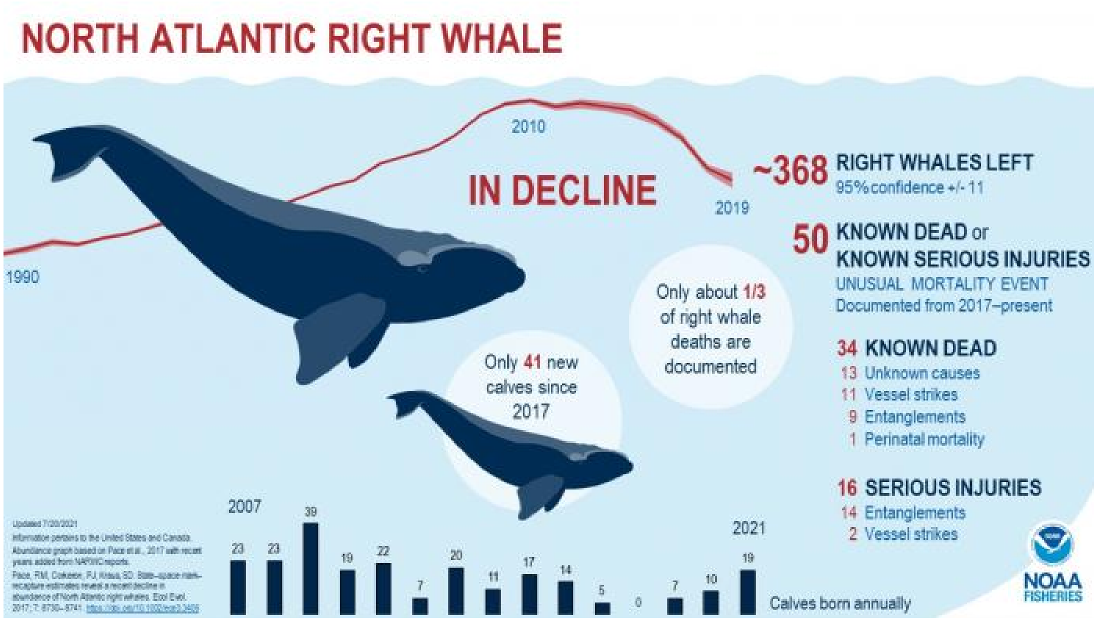

Figure 19: An infographic showing best estimates of current North Atlantic right whale population numbers and causes of death during the current Unusual Mortality Event, 2017–present. {NOAA 2021}

* PBR (potential biological removal) is defined by the U.S. Marine Mammal Protection Act as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." Although it has no relevance to Canadian law, it is used as an indicator of impact in Seafood Watch assessments, per the Seafood Watch Standard for Fisheries.

Northern bottlenose whale

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

High Concern

The Scotian Shelf population of Northern bottlenose whale is listed as "Endangered" under the Canadian Species at Risk Act (SARA) (COSEWIC 2011). The most recent population estimate is 143 animals (O'Brien and Whitehead 2013). Because of the endangered status of the Northern bottlenose whale, a score of high concern is given for abundance.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Low Concern

Northern bottlenose whale is typically found in waters 800–1,500 m deep along the continental shelf slope. The Scotian Shelf population depends heavily on three canyon areas: the Gully, Shorthand Canyon, and Haldimand Canyon (COSEWIC 2011). These areas are to the north of the area fished by the LFA 41 lobster fishery (Blyth-Skyrme et al. 2015a), although the species is known in areas close to the fishery (Wimmer and Whitehead 2004). Entanglement in fishing gear is considered a primary threat to the Scotian Shelf population; however, there are no known interactions with the lobster fishery (observed interactions are with squid trawls and longline fisheries) (Blyth-Skyrme et al. 2015a), and the fishery typically takes place in waters shallower than those frequented by this species. Because there is a limited chance of interaction between the lobster fishery and Northern bottlenose whale in this area, a low concern score is given.

White hake

Factor 2.1 - Abundance

Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

High Concern

The Atlantic and northern Gulf of St. Lawrence population of white hake is considered "Threatened" by COSEWIC and the southern Gulf of St. Lawrence population is "Endangered" (COSEWIC) (SARA

2021b). Both populations are currently being considered for listing under the Species at Risk Act (SARA 2021b).

In Division 4Z5Z (which covers much of the Southwest Nova Scotia and Bay of Fundy fishery), recruitment of juveniles remains high over the past two decades. Adult abundance is above the recovery target (where abundance targets correspond to an increase to sustained abundance at or above 40% B_{MSY}) when current fishing rates continue. Across all sizes, there has been a 68% reduction over the 31 years when surveys were conducted. Adult and juvenile abundance has fluctuated dramatically over the study period. Recent DFO advice suggests that white hake biomass is expected to increase under recent fishing mortality rates (DFO 2016k).

Because of the species' conservation status, Seafood Watch deems abundance a high concern.

Factor 2.2 - Fishing Mortality

Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Low Concern

Adult white hake is reported to be rarely encountered through the trap fishery (Benoît et al. 2011). The majority of white hake is caught in trawl and bottom-set gillnet and longline fisheries (Simon et al. 2012).

In the NAFO management area 4X5Zc, around 600 t of white hake were landed in 2014 (DFO 2016k). The LFA 34 lobster fishery caught ≈223 kg of white hake in 2009–2010 (DFO 2014d), while ≈1,200 t of white hake were caught in the 4X5Zc in this period (DFO 2016k). This corresponds to ≈0.02% of white hake catches. The relative fishing mortality of white hake is below the long-term average since 2005.

The precise amount of white hake caught in the lobster fishery compared to white hake landings is unknown; however, the lobster fishery is not considered a substantial contributor to white hake mortality. Therefore, fishing mortality is considered a low concern.

Justification:

Within the Southwest Nova Scotia and Bay of Fundy area, division 4X5Zc has an 84% probability of maintaining spawning stock biomass (SSB) above the recovery target under current fishing mortality, which is a similar probability encountered when F = 0. The primary source of mortality in division 4X5Zc was natural mortality. This was suggested due to the occurrence of high mortality estimates, while maintaining low relative fishing mortality values (DFO 2016k).

Factor 2.3 - Discard Rate/Landings

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

< 100%

Bait is usually herring from Division 4VWX, and is equal to 37% of lobster landings (Blyth-Skyrme et al. 2015b).

Observer programs in LFA 41 have recorded discard rates of lobster averaging 14%, but this increases to 44% in inshore areas due to a higher proportion of undersized or berried females (Blyth-Skyrme et al. 2015b). Another study found that the majority of lobsters caught in the fishery are large mature lobsters (over the minimum landing size), so sublegal-sized lobsters are not normally at risk of being caught (DFO 2014d).

Non-lobster by-catch equated to around 5.6% in the by-catch study in 2012 (Blyth-Skyrme et al. 2015b). As a result, the bait plus discards to landings ratio is <100%, so this region retains a score of 1.

Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Bay of Fundy

< 100%
Throughout the Maritimes Region (which includes LFAs 27 to 38), bait comprises the following species and amounts: mackerel, 8,153 t; rock crab, 5,512 t; and herring, 7,601 t; totaling 21,266 t in 2012 (Criquet et al. 2015b). Throughout this season, 40,862 t of lobster were landed in the Maritimes Region {Criquet, G. and Brêthes, J.C. 2016a}. Therefore, mackerel, herring, and rock crab represented 20%, 19%, and 13%, respectively, of lobster landings. Overall bait use represented 52% of lobster landings.

In previous by-catch studies conducted in LFAs 27 to 33, no by-catch species composed 5% or more of the lobster catch. In another study, the non-lobster portion of the total catch ranged from 1.5% in LFA 31b to 13% in LFA 33 (DFO 2014d).

But, discarded volumes of lobster can be greater than the volume harvested: in previous studies, 127% (LFA 27), 79% (LFA 32), and 22% to 25% (LFAs 30–31b) of the volume harvested was discarded (DFO 2014d). Lobster is assumed to have a high survival rate: traps are designed to avoid capturing juveniles, and berried females are usually released alive (Criquet et al. 2015b). But in these studies, sub-legal lobster represented a large volume of lobster discards (90% in LFAs 27, 33, and 34; 72% to 79% in LFAs 30–31b; and 53% in LFA 32). In LFA 27, the minimum legal size has increased from 77.5 mm in 2007 and is currently at 82.5 mm, which has increased the number of discards; however, discard mortality is assumed to be near zero (Criquet, G. and Brêthes, J. 2017a).

Bait use is approximately 50% of landings, lobster discard mortality is thought to be close to zero, and by-catch of nontarget species is at most 13%, so a total discard and bait use of <100% is assumed.

Justification:
To determine discard mortality, more studies are required to understand discard mortality of sublegal-sized lobsters. Natural mortality changes depend on many factors including lobster size (Tremblay et al. 2013), and tagging studies show that multiple captures may increase the damage

and stress to molting lobsters (a process that undersized lobsters frequently undergo) (Pezzack et al. 2014). When lobsters have finished molting, they have a soft shell and experience higher levels of mortality (Blyth-Skyrme et al. 2015b).

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

< 100%

There is no discard and bait study for the region. In the absence of discard studies, studies of similar fisheries in other regions have found non-lobster by-catch rates between 5% (Criquet et al. 2015b) and 17% (Criquet et al. 2015c) and lobster discard volumes of up to 127% of harvested volumes in LFA 27 (DFO 2014d). Post-capture mortality of lobster is assumed to be near zero (Criquet, G. and Brêthes, J. 2017a); therefore, if they are discarded, most are likely to survive except soft-shell lobsters, which have higher mortality rates (Blyth-Skyrme et al. 2015b).

Other fisheries in Atlantic Canada likely have a bait plus discards-to-landings ratio below 100%; therefore, this region retains a score of 1.

Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands

< 100%

A by-catch study in the Gaspe Peninsula and the Magdalen Islands region estimated that the level of by-catch varied between management areas. In the northern Gaspe area (LFA 19C), by-catch was estimated at 27 t, which was approximately 120% of the lobster landings in the region during the same period. In the southern Gaspe area (LFA 20), by-catch was estimated at 121 t, which was approximately 15% of the weight of lobster landings, while in the Magdalen Islands (LFA 22), by-catch was estimated at 710 t, which was approximately 27% of the weight of the lobster landings in the same area (Gendron and Duluc 2012). Lobster landings have increased since the Gendron and Duluc (2021) study, and this may not be a true representation of current by-catch levels; however, it is the most recent study for this region.

There are no known bait use studies in the region, but in neighboring fisheries (including the Gaspé Peninsula Marine Stewardship Council [MSC]), assessments record that bait usually comprises mostly mackerel (75%), southern Gulf of St. Lawrence fall-spawning herring, and some rock crab (Criquet et al. 2015c), where rock crab equated to around 1% of lobster landings. In the Gaspésie MSC fishery, 823 t of mackerel bait were recorded to have been used in 2016 while 1,926 t of lobster were landed (Criquet, G. and Brêthes, J. 2017b), which equates to nearly 43% of landings. Bait use has apparently decreased over the past 10 years. In 2012, it was estimated to equal around 92% of the lobster catch and, from DFO e-log data from 2015, bait use was considered to form around 62% of lobster catches {Criquet, G. and Brêthes, J.C. 2016b}.

Because by-catch and bait use are broadly expected to be below the weight of lobster landed from the region as a whole, a by-catch and bait use modifier of 1 is applied.

Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

< 100%

In the Southern Gulf of St. Lawrence region, mackerel and herring are the main bait species. In the Prince Edward Island MSC fishery, herring and mackerel baits represented 1,907 t and 1,687 t, respectively (totaling 3,594 t) in 2012. For the same area (PEI MSC fishery), 12,180 t of lobster were landed in 2012 (Criquet, G. and Brêthes, J. 2016c). Therefore, bait use represented 30% of lobster landings.

Around 95% of by-catch in the fishery is the target species, and most discards are released alive; e.g., berried females and rock crab (Criquet et al. 2015b). As a result, the bait plus discards-to-landings ratio is assumed to be <100%, so this region retains a score of 1.

Northwest Atlantic | Pots | Canada | Southwest Nova Scotia

< 100%

Throughout the Maritimes Region (which includes LFAs 27 to 38), bait comprises the following species and amounts: mackerel, 8,153 t; rock crab, 5,512 t; and herring, 7,601 t; totaling 21,266 t in 2012 (Criquet et al. 2015b). Throughout this season, 40,862 t were landed in the Maritimes Region {Criquet, G. and Brêthes, J.C. 2016a}. Therefore, mackerel, herring, and rock crab represented 20%, 19%, and 13%, respectively, of lobster landings. Overall bait use represented 52% of lobster landings.

The non-lobster catch is 14% in LFA 34 (DFO 2014d). Discards of lobster in LFA 34 represent between 70% (Worcester 2013) and 74% (Table 3 in (DFO 2014d)), mostly undersize lobsters (97%) (DFO 2013c). The discard mortality of lobsters is assumed to be near zero (Criquet, G. and Brêthes, J. 2017a); therefore, dead discards of lobster are assumed to be low.

The bait plus discards-to-landings ratio is likely to be under 100%; therefore, the score is multiplied by 1.

Justification:

To determine discard mortality, more studies are required to understand discard mortality of sublegal-sized lobsters. Natural mortality changes depend on many factors including lobster size (Tremblay et al. 2013), and tagging studies show that multiple captures may increase the damage and stress to molting lobsters (a process that undersized lobsters frequently undergo) (Pezzack et al. 2014). When lobsters have finished molting, they have a soft shell and experience higher levels of mortality (Blyth-Skyrme et al. 2015b).

Criterion 3: Management Effectiveness

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

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

The Criterion 3 rating is determined as follows:

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

Rating is Critical if Management Strategy and Implementation is Critical.

Guiding principle

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

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

Criterion 3 Summary

FISHERY	MANAGEMENT STRATEGY	BYCATCH STRATEGY	RESEARCH AND MONITORING	ENFORCEMENT	INCLUSION	SCORE
Northwest Atlantic | Pots | Canada | Bay of Fundy	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | LFA 33	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)	Highly effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**

Northwest Atlantic | Pots | Canada | LFAs 27-32	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence	Highly effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia	Moderately Effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula	Highly effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**
Northwest Atlantic | Pots | Canada | The Magdalen Islands	Highly effective	Ineffective	N/A	N/A	N/A	**Red (1.000)**

Criterion 3 Assessment

SCORING GUIDELINES

Factor 3.1 - Management Strategy and Implementation

Considerations: What type of management measures are in place? Are there appropriate management goals, and is there evidence that management goals are being met? Do manages follow scientific advice? To achieve a highly effective rating, there must be appropriately defined management goals, precautionary policies that are based on scientific advice, and evidence that the measures in place have been successful at maintaining/rebuilding species.

Factor 3.2 - Bycatch Strategy

Considerations: What type of management strategy/measures are in place to reduce the impacts of the fishery on bycatch species and when applicable, to minimize ghost fishing? How successful are these management measures? To achieve a Highly Effective rating, the fishery must have no or low bycatch, or if there are bycatch or ghost fishing concerns, there must be effective measures in place to minimize impacts.

Factor 3.3 - Scientific Research and Monitoring

Considerations: How much and what types of data are collected to evaluate the fishery's impact on the species? Is there adequate monitoring of bycatch? To achieve a Highly Effective rating, regular, robust population assessments must be conducted for target or retained species, and an adequate bycatch data collection program must be in place to ensure bycatch management goals are met.

Factor 3.4 - Enforcement of Management Regulations

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

Factor 3.5 - Stakeholder Inclusion

Considerations: Are stakeholders involved/included in the decision-making process? Stakeholders are *individuals/groups/organizations that have an interest in the fishery or that may be affected by the management of the fishery (e.g., fishermen, conservation groups, etc.). A Highly Effective rating is given if the management process is transparent, if high participation by all stakeholders is encouraged, and if there a mechanism to effectively address user conflicts.*

Factor 3.1 - Management Strategy And Implementation

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Highly effective

Management of the offshore lobster and Jonah crab fishery (LFA 41) differs in many ways from the inshore lobster fisheries. There is no season to speak of, with access to fishing year-round. There are also no trap limits or size specifications, although most traps are similar to those used in inshore fisheries (DFO 2022l). The offshore fishery is managed primarily through output controls, including a TAC of 720 mt for lobster and 270 mt for Jonah crab, and minimum legal sizes of 82.5 mm CL for lobster and 130 mm carapace width (CW) for Jonah crab (DFO 2022l). The minimum legal size for lobster is currently below the size at which 50% of females will reach maturity (92 mm CL); however, the median size-at-capture is currently above this threshold (DFO 2022l). There is also a ban on the retention of egg-bearing and v-notched female lobsters. The number of licenses available to fish in LFA 41 is limited to eight for lobster and eight for Jonah crab (DFO 2022l). Escape vents are required in all traps, with two options available: two circular vents not less than 57.2 mm in diameter, or one rectangular vent not less than 127 mm in width and 44 mm in height (DFO 2022l).

The stock status of lobster in LFA 41 is monitored using two primary indicators: survey biomass and reproductive potential. Reference points have been developed to define "healthy," "cautious," and "critical" zones, based on the combined information of survey biomass indices from four fishery-independent surveys. Reproductive potential is tracked separately from biomass and is intended to signal potential changes in future productivity (DFO 2022l). A harvest control rule has been developed such that, if the lobster population were to fall into the cautious zone, a series of management actions will be taken (from DFO 2022l):

1. Request that DFO Science, with support from industry and with reference to the reproductive and contextual indicators, identify whether there are factors (environmental, change in fishery strategy, change in data collection) that explain the change in survey biomass.

2. Evaluate whether the 3-year quota flexibility measures (carry forward/back) should continue.

3. Consider undertaking a stock assessment or science response earlier than would be scheduled in the typical 5-year cycle.

4. Introduce management measures to reduce the removal rate in order to promote stock rebuilding to the healthy zone, if it is confirmed that the decline in the indicators is a real change in stock health. Actions will be established in consultation with the industry, will be evaluated annually, and will include at least one of the following:

a. Size and sex controls (minimum size, window size, maximum size, v-notching);

b. Area controls (closed areas);

c. Landing controls (quota reduction).

Other actions may also be introduced.

Because a precautionary framework and harvest control rule have been established, there is monitoring of stock status, and management measures have been implemented to limit the impact of the fishery on lobster and crab populations in the region, harvest management is considered highly effective.

Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Moderately Effective

Management of the lobster fishery in LFAs 3–14C is conducted by Fisheries and Oceans Canada (DFO) through an Integrated Fishery Management Plan (IFMP) (DFO 2021k). The lobster season restricts harvesting to protect lobsters during molting and reproduction phases, and though the dates may change year to year, the season typically closes no later than mid-July, when molting beings (DFO 2021k). The maximum number of fishing days varies by LFA (56–72 days), but has been fixed in each following consultation with the industry in the 1990s. To further limit fishing effort, some LFAs (4A, 4B, 10, 13B, 14A, 14B, and 14C) have implemented a "no fishing on Sunday" measure, reducing the number of potential trap hauls in a season. Lobster fishers in the Newfoundland and Labrador Region are permitted to use a specific number of traps; the number of traps varies by LFA and by the license holder. Trap limits are enforced through a tagging scheme (DFO 2021k), where each fisher is provided a specific number of tags and each trap must have a tag attached. Any lost traps must be reported within 48 hours of fishers becoming aware of the loss, and any lost tags can be replaced on a one-to-one basis.

Fishers are required to complete logbooks under Section 61 of the Canadian Fisheries Act; fishers have to record information regarding fishing catch and effort, including location, date, time, sets, gear type, the weight of fish caught, and by-catch (DFO 2021k).

In order to protect egg-bearing (berried) females and increase egg production, a v-notching scheme is in place in Newfoundland (implemented in western Newfoundland in 1994 and extended to all of Newfoundland in 1996) (DFO 2021k). The v-notching of lobsters is voluntary and, under the IFMP, all fishers are authorized to do so; all v-notched lobsters must be returned to the ocean (DFO 2021k). Because the v-notch may take several molts to grow out, it can protect female lobsters beyond the initial brood when they were notched. Egg production is further protected through a series of closed areas (DFO 2021k).

In Newfoundland and Labrador, no one may fish for lobster with any gear other than a trap (also referred to locally as a pot), and the dimensions of the trap are limited to a maximum 125 cm in length, 90 cm in width, and 50 cm in height (DFO 2021k). Each trap must contain an escape panel no less than 89 mm in height and 152 mm in width, to allow juvenile lobsters to escape the trap.

The lobster populations in the Newfoundland and Labrador region are monitored using fishery-dependent data, and stock assessments are published regularly, most recently in 2021 (DFO 2021a). But reference points have not been developed in this region, and a precautionary approach has yet to be implemented. Stock assessments do not include estimates of absolute abundance; instead, they rely upon proxy indicators of stock abundance, demographics, productivity, and/or exploitation. The main data source is landings data from logbooks (DFO 2021a). Landings data host uncertainties, and by themselves are not considered a sensitive indicator of biomass (DFO 2011b).

There have been some decreases in exploitation in some regions (e.g., Newfoundland). In the Avalon region (LFAs 7–10), reported landings have steadily declined since the early 1990s and nominal effort throughout the region decreased by 45% since 2006, because of license and trap reductions, fewer active fishers, and shorter seasons (DFO 2016b). Despite reductions in effort, Newfoundland and Labrador fisheries are regarded as recruitment fisheries (DFO 2021a), where a large proportion of the stock is sub-legal size; therefore, more needs to be done to reduce the risk of recruitment failure (DFO 2016b)(DFO 2015s). Few lobsters survive beyond the minimum legal size (MLS).

There is a lack of fishery-independent data to determine the abundance and fishing mortality in some fisheries. There is a mixture of management measures to protect the stock; however, there is a need for increased precaution, and the ongoing concerns regarding high exploitation rates result in a conclusion that management is moderately effective.

Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island

Moderately Effective

Lobster fisheries in the Quebec North Shore and Anticosti Island region (LFAs 15–18) are managed through a series of effort controls. There are a limited number of licenses available (66 for LFA 15, and 9 for LFA 16; access to sub-area 18I is limited to license holders of LFA 16) (DFO 2022i). The fishing season is limited to 11 weeks (sub-areas 17A–B, and 18BCDGH) and 12 weeks (LFAs 15, 16, and sub-area 18I) in this region, with the 2022 fishery open from May 16 to August 8 (DFO 2022j). Harvest of lobsters is permitted using traps only, and the number and dimensions of traps in LFAs 15, 16, and 18 are limited to either 175 traps with the dimensions 124 cm x 90 cm x 50 cm (type 1), or 250 traps with the dimensions 92 cm x 71 cm x 50 cm (type 2) (DFO 2022i). In sub-area 17A, 35 type 1 or 50 type 2 traps may be used, while in sub-area 17B, license holders are permitted to use 210 type 1 traps or 300 type 2 traps (DFO 2022k). Each trap must bear a valid tag with a unique identification number. Escape vents are required with two options available: two circular vents not less than 65 mm in diameter, or one rectangular vent not less than 127 mm in length and 46 mm (LFAs 16 and 17) or 47 mm (LFAs 17A, 17B, and 18) in height (DFO 2019a). Soaking time for traps is limited to a maximum of 72 hours (DFO 2022i). A logbook must be completed for each trip, and only vessels less than 15.2 m total length may be used to harvest lobster (DFO 2022i). A minimum legal size is in place (82 mm CL for LFAs 15 and 16, 83 mm CL for LFAs 17A, 17B, and 18); however, this is below the size at which female lobsters are expected to reach maturity in the region (90 mm CL) (DFO 2019a). Sub-area 17A is also managed through a total allowable catch (TAC) of 4,536 kg (DFO 2022k).

The stock status of lobsters in the Quebec North Shore and Anticosti Island region are monitored using fishery-dependent data from landings recorded on processing plant slips, and catch rates of legal-sized lobsters obtained from dockside monitoring and logbooks (DFO 2019a). Fishing pressure and productivity are not assessed in this region due to a lack of at-sea sampling or fishery-independent data. A precautionary framework has not been developed for these fisheries, and there is generally little data on lobster populations in the region (DFO 2019a). But, available abundance indicators are positive, and lobster populations appear to be in good condition (DFO 2019a).

Because there are management measures in place that appear to be maintaining healthy lobster populations, but there is a lack of a precautionary framework in place, harvest management is considered moderately effective.

Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence

Highly effective

The lobster fishery in the southern Gulf of St. Lawrence region is managed through an Integrated Fishery Management Plan (IFMP) that contains a number of effort controls (DFO 2014i). Management of the lobster fishery in the southern Gulf of St. Lawrence follows a precautionary approach. Reference points have been developed and implemented that define the stock as being within a "healthy zone," "cautious zone," or "critical zone."

In LFAs 23, 24, 26A, and 26B, the fishing season typically takes place from April 30 to July 1, while a portion of LFA 26A is open between May 7 and July 8, and LFA 25 has a later season between August 9 and October 10 (DFO 2014i). In any given year, the timing of the fishing season may be adjusted due to ice and weather conditions. Minimum legal sizes (which vary by LFA) have been implemented to protect juvenile lobsters (DFO 2014i) and ensure that 50% of lobsters have reached maturity before entering the fishery {Comeau & Savoie 2002}. A "window size" is implemented in LFAs 23, 24, and 26A (115 mm to 129 mm), and a maximum legal size in LFA 25 (115 mm CL) to protect highly fecund female lobsters (DFO 2020j). Fishing effort is managed through trap limits, with fishers authorized to use the number of traps specified on their license, and that number varies by LFA (DFO 2020j). Traps must meet certain maximum dimension requirements and include a biodegradable panel (DFO 2014i). To minimize the catch of juvenile lobster, escape vents are to be used; the vent size varies, depending on the minimum legal lobster size for the LFA (DFO 2020j). To minimize the capture of large lobsters (to protect reproductive capacity), there are restrictions on the size of the entrance hoop (152 mm in LFAs 23, 25, 26A-2, and 26B North) (DFO 2020j).

Lobster populations in the southern Gulf of St. Lawrence are monitored using fishery-dependent abundance indicators (landings and CPUE) and fishery-independent abundance indicators (bottom trawl survey and SCUBA survey). These indicators are compared against the aforementioned precautionary framework to inform management decisions. Currently, most indicators show a positive change from the previous stock assessment, and recent landings are either above long-term medians or at historical highs (DFO 2019d).

Because targets have been set and a precautionary approach implemented for the management of the lobster populations in the southern Gulf of St. Lawrence region, and the current indicators suggest that the stock is healthy and productivity will continue, the harvest strategy is considered highly effective.

Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32

Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Bay of Fundy

Moderately Effective

The lobster fisheries in the Maritimes Region (LFAs 27–38) are managed through a series of controls designed to moderate fishing mortality on lobsters (LFA-specific measures are outlined in Table 2 in the Justification) (DFO 2020f). There is limited entry into the lobster fishery through licensing. Trap limits for each LFA constrain fishing effort. Minimum legal sizes protect juvenile lobsters; however, in some LFAs, there are lobsters below the size at 50% maturity (e.g., LFAs 31B, 32–34) (DFO 2020f). Closed windows protect mid-sized female lobsters in some LFAs, and berried females are to be released to protect reproductive potential. V-notching of lobsters is required in LFAs 31B and 32, while the mandatory release of all v-notched lobsters is required in all LFAs except 27 and 31A (DFO 2020f). Fishing seasons protect spawning, molting, and extrusion periods. A precautionary approach for the Maritimes fisheries has not been implemented but is currently under development (DFO 2020f).

Landings-based reference points were adopted for each LFA in 2012 (DFO 2020f). The primary stock indicator in LFAs 27–33 is the commercial catch rate from logbooks. Reference points were developed for each using the average catch rate (kg/trap haul) from 1990 to 2016 (DFO 2020f). For LFAs 34 and 35–38, landings are the primary stock indicator. The median landings from 1985 to 2009 have been adopted as a proxy for B_{MSY} (DFO 2020f). Additional primary and contextual indicators are used in some LFAs because landings-based indicators can be uncertain. In LFAs 27–33, landings, effort, and catch rates of sub-legal (70 to <82.5 mm CL) and legal-sized (≥82.5 mm CL) lobster are monitored. In LFA 34, the mean number of lobsters per standard tow from a lobster trawl survey is used. In LFAs 35–38, the number of lobsters per tow in the summer research vessel survey is used (DFO 2020f).

There is a mixture of management measures to protect lobster populations in the Maritimes Region; however, a precautionary framework has yet to be fully implemented and the minimum legal size is below the size at 50% maturity in some LFAs, resulting in a conclusion that management is moderately effective.

Justification:

Table 2: Current management measures for the Maritimes Region. Reproduced from (DFO 2020f).

LFA	Season	Trap Limit	Minimum Legal Size (mm CL)	Other Measures
27	May 15 to July 15	275	82.5	
28	April 30 to June 30	250	84	Max. entrance hoop 153 mm
29	April 30 to June 30	250	84	Max. entrance hoop 153 mm
30	May 19 to July 20	250	82.5	Max. CL 135 mm (females)
31A	April 29 to June 30	250	82.5	Closed window (females) 114–124 mm
31B	April 19 to June 20	250	82.5	V-notching
32	April 19 to June 20	250	82.5	V-notching
33	Last Monday in Nov. to May 31	250	82.5	
34	Last Monday in Nov. to May 31	375/400	82.5	

35	Oct. 14 to Dec. 31 and last day in Feb. to July 31	300	82.5	
36	2nd Tues. Nov. to Jan. 14 and March 31 to June 29	300	82.5	
37	2nd Tues. Nov. to Jan. 14 and March 31 to June 29			
38	2nd Tues. Nov. to June 29	375	82.5	
38B	June 30 to Friday before 2nd Tues. in Nov.	375	82.5	

Northwest Atlantic | Pots | Canada | The Gaspe Peninsula

Highly effective

The lobster fishery in the Gaspe Peninsula region is managed through an Integrated Fishery Management Plan (IFMP) that contains a number of effort controls (DFO 2018p). Management of the lobster fishery in the Gaspe Peninsula follows a precautionary approach. Reference points have been developed and implemented that define the stock as being within a "healthy zone," "cautious zone," or "critical zone." When the stock is in the "healthy zone," no new management measures will be introduced unless an advisory committee decides otherwise. If the stock is in the "cautious zone," management measures will be added iteratively over 6 years, aimed at bringing the stock into the "healthy zone." If the stock enters the "critical zone," more restrictive measures to reduce capture will be introduced, including partial closures (DFO 2018p).

In LFAs 19–21, the fishing season typically takes place between late April and early June and, though the timing may vary from year to year, the season runs for a fixed period of 71 days in LFA 19 and 69 days in LFAs 20A, 20B, and 21 (DFO 2021m). Minimum (83 mm CL) and maximum (145 mm CL) legal sizes have been implemented to protect juvenile lobsters and highly fecund larger lobsters (DFO 2021m). Fishing effort is managed through trap limits, with fishers authorized to use the number of traps specified on their license to a maximum of 250 traps in LFA 19, and between a minimum of 235 traps and a maximum of 335 traps in LFAs 20 and 21. Traps must meet certain maximum dimension requirements, which vary by LFA and by construction material (metal or wood/hybrid), and each trap must be fitted with an annual tag with a valid unique identification number (used to enforce trap limits) (DFO 2021m). To minimize the catch of juvenile lobster, escape vents are to be used with two options available: two circular vents not less than 65 mm in diameter, or one rectangular vent not less than 127 mm in length and 46 mm in height (DFO 2021m). Hauling frequency is also managed, with no gear being left unattended for more than 72 hours, and traps hauled and baited a maximum of once per day. Electronic logbook reporting is mandatory in LFAs 19–21 (DFO 2021m). The possession of v-notched female lobsters is prohibited; they must be returned to the ocean if caught (DFO 2021m).

In LFA 21B, there is a fall season fishery that is open for 14 days (DFO 2021l). Lobster harvest is restricted to lobsters larger than 83 mm in carapace length (CL) and smaller than 145 mm CL. The number of traps that each fisher can use is limited and varies from 8 to 67 per operator, for a total of 235 traps (DFO 2021l). There are two different styles of trap that can be used: a wooden trap (92 cm × 61 cm × 46 cm) or a metal trap (92 cm × 54 cm × 39 cm). All traps must have a tag with a unique identification number (used to enforce trap limits) and contain escape vents (with the same configurations as noted for LFAs 19–21). Hauling restrictions are in place consistent with those identified for LFAs 19–21. There is 100% dockside monitoring of all lobster harvest for this fishery, and fishers are required to complete fishing logs, with the optional use of electronic logbook reporting (DFO 2021l). The possession of v-notched female lobsters is prohibited (DFO 2021l). A number of management measures have been introduced to minimize the risk to North Atlantic right whale, which are discussed in Factor 3.2.

The lobster populations in the Gaspe Peninsula region are monitored using abundance, demographic, fishing pressure, and stock productivity indicators (DFO 2019b). The precautionary approach described above is applied to commercial landings, with the URP set at 80% of the average landings between 1985 and 2009, a period that saw two large cohorts pass through the fishery (DFO 2019b). Fishing pressure indicators have decreased in recent years but remain high at 76% in LFA 20 (DFO 2019b). The average size of lobsters in LFAs 19–21 is relatively large (95.8 mm in LFA 19 and 88 mm in LFA 20), suggesting that the fishery in this region is less reliant on annual recruits.

Because targets have been set and a precautionary approach implemented for the management of the lobster populations in the Gaspe Peninsula region, and the current indicators suggest that the stock is healthy and productivity will continue, the harvest strategy is considered highly effective.

Northwest Atlantic | Pots | Canada | The Magdalen Islands

Highly effective

Management of the lobster fishery in the Magdalen Islands region (LFA 22) has taken place using a precautionary approach since 2012 (DFO 2018q). The precautionary approach guides management actions depending on the stock status, because decision rules are made in response to the goals of the management strategy; in the case of lobster, it is to maintain stock productivity through strong, continued egg production (DFO 2012i). Reference points have been developed and implemented that define the stock as being within a "healthy zone," "cautious zone," or "critical zone." When the stock is in the "healthy zone," no new management measures will be introduced unless an advisory committee decides otherwise. If the stock is in the "cautious zone," management measures will be added iteratively over 9 years that are aimed at bringing the stock into the "healthy zone." If the stock enters the "critical zone," more restrictive measures to reduce capture will be introduced, including partial closures and the introduction of a quota system (DFO 2018q).

To control and monitor catches, regulations are in place for fishing vessel length, characteristics of the lobsters caught, fishing schedule, number of hauls, and the number and characteristics of fishing gear. The lobster fishery in the Magdalen Islands is a 9-week fishery during the spring; the specific opening times can change, but currently, the season opens the Monday closest to May 10, with gear set the preceding Saturday (DFO 2018q). All lobsters below the minimum legal size (83 mm CL) and all egg-bearing females must be released. Hauling of traps is not permitted on the day they are set or on Sundays, and hauling of traps may only occur between 5 a.m. and 9:30 p.m. (except on the final two days of the season) (DFO 2018q). Only vessels less than 15.24 m (50 ft) overall length may be used to harvest lobster (DFO 2018q). Each fisher is limited to 273 traps, each of which must bear a valid tag. To minimize the catch of juvenile lobster, escape vents are to be used with two options available: two circular vents not less than 65 mm in diameter, or one rectangular vent not less than 127 mm in length and 47 mm in height (DFO 2018q). A logbook must be completed for each fishing day, providing information on the fishing activities including the date, the position of the last trap haul, the total amount of lobster caught, the total amount of male rock crab kept, and by-catch by species (DFO 2018q).

The lobster populations in the Gaspe Peninsula region are monitored using abundance, demographic, fishing pressure, and stock productivity indicators (DFO 2019c). Indicators come from two main sources: at-sea sampling that has been conducted since 1985, and a fishery-independent trawl survey that has taken place since 1995 to the south of the Islands (DFO 2019c). Demographic indicators have been stable since the minimum legal size was increased in 2003, with size structure truncated and dominated by the incoming recruit class (83–95 mm CL for males, and 83–93 mm CL for females). This is indicative of a recruit-based fishery and high exploitation rates, which are currently above 60% (DFO 2019c).

Because targets have been set and a precautionary approach implemented for the management of the lobster populations in the Magdalen Islands region, and the current indicators suggest that the stock is healthy and productivity will continue, the harvest strategy is considered highly effective.

Factor 3.2 - Bycatch Strategy

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Ineffective

By-catch in lobster fisheries is generally low, with target species making up 90% of the catch (den Heyer et al. 2010). The main management measures to reduce the risk to by-catch species include gear mitigation, traps that have size/material requirements and are fitted with escape vents and biodegradable panels to reduce the risk of ghost fishing (DFO 2011b), and time-area closures to reduce impacts on endangered, threatened, and protected species (ETP).

Some species, including rock crab, Jonah crab, green crab, sculpin, and cunner, can be retained (Table 4). The amount that is retained is very low for some species, e.g., sculpin (Table 4). Developments in escape gap mechanisms are considered effective in reducing rock crab by-catch in lobster traps (Criquet, G. and Brêthes, J. 2017a)(Criquet, G. and Brêthes, J. 2017c).

Species of concern caught in the Canadian lobster fishery include wolffish (spotted and northern), cod, and cusk. Despite the conservation status of cod and the wolffishes caught in lobster traps, they represent a quite low level of by-catch, and therefore have been scored as low concern in Criteria 2. But, cusk was scored as a moderate concern due to its higher proportion of catch rates in Maritime lobster fisheries. Wolffishes are protected under the Species at Risk Act (SARA), which prohibits landing the species and requires that they be safely returned to the water if caught alive (Table 4).

The Canadian lobster fisheries can interact with large marine fauna such as whales and turtles. Of particular concern, entanglement in fishing gear is considered to be a major threat to population persistence of the endangered North Atlantic right whale (NARW) (Moore 2019){NOAA Fisheries 2021}. Historic entanglement mitigation measures have included timing fishing seasons to minimize overlap with whale migration times, trap and license limits to minimize the number of entanglement lines in the water, mandatory reporting of ETP species interactions, a recovery strategy, and an action plan addressing the threat of fisheries interactions {Fisheries and Oceans 2021}.

Despite these measures, there was an increase in NARW deaths in 2017 (12 NARW deaths in Canada attributed to vessel strikes, fisheries entanglement, and unknown sources). Some of the 12 North Atlantic right whale mortalities observed in the Gulf of St. Lawrence in 2017 were confirmed to be the result of entanglement in snow crab fishing gear (Daoust et al. 2017). Other entanglements and mortalities in recent years were attributed to unknown fisheries, because gear marking was not sufficient to identify the source of the entangling gear.

In response to the increase in the observed NARW entanglements, DFO has implemented a suite of measures since 2018 (see Justification). These have been designed to:

- Improve understanding of impacts, to improve mitigation strategies (e.g., increased surveillance via aircraft, drones, and underwater gliders and acoustic devices; reporting of lost gear and marine mammal interactions by fishers; and gear marking)
- Reduce entanglement risk and impacts (e.g., static and dynamic closures in the GoSL snow crab fishery in 2018, later expanded to all fixed gear fisheries; funding and permitting of ropeless gears and weak links; funding disentanglement efforts).

Few analyses have been conducted on the effectiveness of these measures to reduce fishing mortality to below PBR. A NOAA study concluded that the closures in place in United States and Canadian fisheries by the end of 2018 were expected to be effective regionally but may not be sufficient to allow recovery of North Atlantic right whale (Hayes et al. 2018). A recent publication by (Cole et al. 2021) found that these same closures in the GoSL snow crab fishery led to the displacement of effort to areas outside the closed areas, producing a higher threat of entanglement in these new areas. The authors note that, although there was a lower quota and reduced trap limit in 2018 than in 2017, fishing effort did not change. Most recently, a risk analysis commissioned by DFO (Cole and Brillant 2021) found an entanglement risk reduction of 61.3% in the GoSL snow crab fishery from 2018 to 2021 (the authors did not evaluate other crab fisheries or the lobster fishery). The authors concluded that, though the efforts and accomplishments to date are commendable, they are not enough to ensure the survival of the North Atlantic right whale. The authors are currently working on a more comprehensive risk analysis of the GoSL snow crab fishery, which will likely result in different risk reduction values than in the published report. They are also planning to expand the assessment to other fixed gear fisheries in the future (pers. comm., Alexandra Cole, July 29, 2022).

In the meantime, there continue to be entanglements in Canadian fisheries (e.g., NARW #4615, which was entangled in the Gulf of St. Lawrence in 2021 and is currently listed as a serious injury) {NOAA 2022a}, and mortalities due to entanglements in unidentified fisheries, which could originate in either Canadian or United States waters (e.g., NARW #1226, "Snake Eyes," which was seen entangled in the Gulf of St. Lawrence and later found dead off Long Island, NY in 2019) {NOAA 2022a}. Currently, an average of 3.7 North Atlantic right whales are known to be seriously injured or killed each year by unidentified fisheries (Hayes et al. 2022). Until it becomes clear which fisheries are responsible, all fisheries that overlap with North Atlantic right whale migrations and are known to entangle the species are potential sources of entanglements, which may result in mortalities.

Ghost Gear

DFO has implemented a number of measures and efforts to mitigate the impacts of lost ("ghost") gear, as part of a broader government commitment to reduce the impacts of plastics in the oceans (see Justification). Many of these are applicable to snow crab, lobster, and Atlantic crab fisheries, including requiring biodegradable panels, requiring that lost gear is reported, and conducting and funding efforts to reduce gear loss and retrieve gear when it is lost.

Although by-catch in lobster fisheries is relatively low, a number of species at risk are likely caught. In particular, although there are no known interactions between rock crab, Jonah crab, or lobster fisheries in Canada, the impact of fisheries on North Atlantic right whale far exceeds the potential biological removal for the species and is dominated by impacts from unknown fisheries, of which Canadian crab and lobster fisheries may be a part. By-catch management is therefore considered ineffective at reducing the impact of fishing on nontarget species.

Justification:
Crabs: The Atlantic rock and Jonah crab attract varying levels of management across regions. There have been no studies regarding post-release survival, though this is assumed to be high when there are short handling times (Blyth-Skyrme et al. 2015a). Since 2010, there has been a decline in the Jonah crab commercial fishery due to decreased catch rates and market demand (Bedford Institute of Oceanography 2015). The directed rock crab fishery is managed using effort control (number of licenses, individual trap allocation, restrictions on gear characteristics, and limited fishing seasons), with individual catch allocations, a minimum landing size (MLS), and females cannot be landed. Individual trap allocations are not based on the stock status or biomass estimates (DFO 2016x).

Turtle: The leatherback turtle has been listed as "Endangered" through SARA since 2003 (DFO 2013h). During most years, the fishery is managed for time, area, and effort such that the inshore lobster fisheries are less likely to interact with leatherback turtle. The lobster season is usually approaching the closed season by the time leatherback turtle arrives. However, the Scotian Shelf and LFA 25 remain open when leatherback turtle densities are higher, resulting in entanglements. In some years, when turtles arrive early or leave the area late, more entanglements have occurred; e.g., in 2014, leatherback turtles were late in leaving the southern Gulf of St. Lawrence, resulting in entanglements in Northumberland Strait (LFA 25) (Hamelin et al. 2017). The number of turtles killed by the fixed-gear fishery is "grossly underestimated"; there is not enough evidence to show that current management is effective at sufficiently reducing the risk of interactions (Hamelin et al. 2017).

Whales: General management strategies are that all interactions with ETP species are reported;

there is a recovery strategy for North Atlantic right whale; there are management plans; and the lobster fisheries are managed through seasons, area closures, and effort (e.g., licenses/traps), resulting in reduced capture of marine mammals. However, all license holders in area 38B (Grey Zone) are eligible to fish from June to November, which overlaps with the months when North Atlantic right whale is present in the Bay of Fundy (p. 158; (Criquet et al. 2015b)). Ropes are currently too strong for whales to release themselves; ropes have been increasing in strength over time (Knowlton et al. 2016). Meanwhile, the North Atlantic right whale population and health have declined, with reproductive health decreasing (e.g., (Stewart et al. 2021)). The survival of entangled North Atlantic right whale is low (Robbins et al. 2015). Analysis of rope strengths in fishing gear removed from 72 entangled large whales representing four species showed clear patterns that smaller whale species and whales of younger age cannot successfully break free from the stronger ropes (Knowlton et al. 2016). Therefore, to reduce the risk of harming North Atlantic right whale, the potential interactions through overlapping lobster fisheries and NARW distribution need to be monitored, and improved management measures (such as those advised below) need to be implemented (DFO 2016z).

Measures to protect NARW by year (taken verbatim from (DFO 2022)):

2018

- Introduced static and dynamic fishery area closures
- Introduced case-by-case measures to address sightings of three or more whales or a mother and calf anywhere in Atlantic Canada and Quebec
- Introduced new mandatory requirements for harvesters to report lost gear and all marine mammal interactions
- Introduced new measures to reduce rope and to better track buoys
- Introduced new gear marking requirements for harvesters in Crab Fishing Area 12
- Changed the Marine Mammal Regulations to ensure vessels stay at least 100 m from whales
- Invested in new whale detection technologies and new acoustic technologies, through the Oceans Protection Plan
- Supported industry-led pilot projects on new gear modifications to prevent entanglements
- Invested $1 million per year (permanent) to support marine mammal response activities
- Logged 2,500 flight hours

2019

- Amended the static fishery closure area to cover an area where 90% of right whales were spotted in 2017
- Expanded the dynamic fishery closure area to cover the entire Gulf of St. Lawrence
- Introduced new temporary fishery closure restrictions in shallow waters (less than 20 fathoms)
- Organized a gear retrieval operation in the Gulf of St. Lawrence, which removed over 100 traps and almost 10 km (6 miles) of rope
- Invested an additional $1.2 million over 4 years to support Marine Mammal Response activities
- Increased surveillance via aircraft, drones, and underwater gliders and acoustic devices.

- Logged 3,000 flight hours

2020

- Introduced a new season-long closure area protocol
- Expanded the dynamic fishery closure area into the Bay of Fundy
- Introduced mandatory gear markings for all fixed gear fisheries in Eastern Canada
- Authorizing ropeless gear trials in closed areas
- Created a $8.3 million Ghost Gear Fund, to assist in the retrieval and recycling of harmful ghost gear from the oceans. This program helped facilitate the removal of 63 tonnes of ghost gear in Atlantic Canada.
- Logged over 2,500 flight hours

2021

- Modified closure protocols for greater certainty on the continued presence of whales in closed areas
- Established a new technical working group for harvesters, right whale experts, and departmental officials
- Invested an additional $8.4 million in the Ghost Gear Fund, with a focus on ghost gear retrieval in the Gulf of St. Lawrence
- Invested an additional $8 million over 2 years through Nature Legacy to increase capacity to detect North Atlantic right whales in near real-time
- Launched the $20 million Whale Safe Gear Adoption Fund to help harvesters transition to whalesafe gear (i.e., weak breaking points or links) by 2023. This fund also supports ropeless/rope-on-demand technologies.
- Logged over 2,800 flight hours

2022

- Maintaining 2021 closure protocols
- Working with harvesters, fishery by fishery, to implement mandatory whalesafe gear requirements by 2023
- Increasing the number of near real-time acoustic devices for monitoring and detection

Table 4: Species caught in Canadian lobster fisheries and related management measures by region.

Species	Retained Species	Management
Quebec & nGSL		
Rock crab	Yes	In Gaspésie, rock crab is usually discarded (Criquet, G. and Brêthes, J. 2017b) and likely survives, since invertebrates usually have very high survival rates. The region (Quebec and nGSL) has a conservation harvest plan that aims to protect the trophic links in the fishery (Criquet, G. and Brêthes, J. 2017b). The last stock assessment was published in 2018 (DFO 2018r). The impact of fisheries is uncertain and more information is needed on the impact of by-catch within the lobster fishery (DFO 2018r).

sGSL		
Rock crab	Yes	In the sGSL, rock crab landings have been required to be recorded in logbooks since 2014 (Criquet, G. and Brêthes, J. 2017a). A recent sGSL by-catch study showed no immediate mortality for discarded rock crab {Criquet and Brêthes 2017a}. Only male rock crab can be retained in the sGSL (Criquet, G. and Brêthes, J. 2017c). The directed rock crab fishery has a management plan (Criquet, G. and Brêthes, J. 2017c).
Cunner	Yes	Although cunner is allowed to be retained, it is usually discarded, and in a way that causes the least harm (Criquet, G. and Brêthes, J. 2017c). Additionally, in a 2015 by-catch study conducted in the sGSL, no immediate mortality was observed among by-catch species (Criquet, G. and Brêthes, J. 2017c). In LFA 22, any fish caught incidentally must be returned to the water, and, if the fish is still alive, with as little harm as possible (DFO 2015q). In the sGSL, cunner landings have been required to be recorded in logbooks since 2014 (Criquet, G. and Brêthes, J. 2017a).
Sculpin	Yes	Although sculpin is allowed to be retained, it is usually discarded, and in a way that causes the least harm (Criquet, G. and Brêthes, J. 2017c). Additionally, in a 2015 by-catch study conducted in the sGSL, no immediate mortality was observed among by-catch species (Criquet, G. and Brêthes, J. 2017c). In LFA 22, any fish caught incidentally must be returned to the water, and, if the fish is still alive, with as little harm as possible (DFO 2015q). In the sGSL, sculpin landings must be recorded in logbooks since 2014 (Criquet, G. and Brêthes, J. 2017a).
Wolffish	No—SARA species	Wolffish (spotted and northern) do not inhabit the PEI lobster fishery waters (Criquet, G. and Brêthes, J. 2017a), and northern wolffish is rarely found in the Gulf of St. Lawrence (COSEWIC 2001). There are no management measures per se to reduce the catch of threatened species. Under the Species at Risk Act (SARA), wolffish are not allowed to be landed and must be returned to the water (DFO 2017n).
Maritimes		
Rock crab	Yes (Criquet, G. and Brêthes, J. 2017a)	It is illegal to retain female rock crab (DFO 2011b). License holders are required to record crab use for bait on reporting documents. All crab landings must be reported on the crab monitoring document (DFO 2011b). The Maritimes Region has a conservation strategy to keep fishing mortality at a moderate level for by-catch species (DFO 2011b). License holders in all Maritimes LFAs may retain male rock crab by-catch for bait (DFO 2011b). Under license conditions and actual fishing practices, rock crab is the only retained species in the New Brunswick and Nova Scotia lobster fishery (Criquet, G. and Brêthes, J. 2017a).
Jonah crab	LFA 34–38 only (DFO 2020f)	Jonah crab can only be retained when ≥130 mm in LFAs 34 to 38 {Criquet and Brêthes 2017}. It is illegal to retain female Jonah crab (DFO 2011b). License holders are required to record crab use for bait on reporting documents. All crab landings must be reported on the crab monitoring document (DFO 2011b). The Maritimes Region has a conservation strategy to keep fishing mortality at a moderate level for by-catch species (DFO 2011b).
Green crab	Yes (Criquet, G. and Brêthes, J. 2017a)	Green crab is an invasive species (DFO 2018f). License holders in all Maritimes LFAs may retain green crab by-catch for bait (DFO 2011b).
Cunner	Yes (Criquet, G. and Brêthes, J. 2017a)	Cunner can only be retained when ≥10 cm (LFA 27). Under license conditions and actual fishing practices, rock crab is the only retained species in the New Brunswick and Nova Scotia lobster fishery (Criquet, G. and Brêthes, J. 2017a).
Sculpin	Yes (Criquet, G. and Brêthes, J. 2017a)	Sculpin is not usually a retained species (Criquet, G. and Brêthes, J. 2017a). Therefore, it requires little management. Under license conditions and actual fishing practices, rock crab is the only retained species in the New Brunswick and Nova Scotia lobster fishery (Criquet, G. and Brêthes, J. 2017a). License holders in all Maritimes LFAs may retain sculpin by-catch for bait (DFO 2011b).
Cusk	No	There are no management measures per se to reduce the catch of threatened species (cusk, cod, wolffish). Compared with the by-catch in other fisheries, the by-catch of cusk in the lobster fisheries is regarded as low (Harris, L.E. and Hanke, A.R. 2010). Cusk is not allowed to be landed and must be returned to the water (DFO 2013l).
Wolffish	No—SARA species	There are no management measures per se to reduce the catch of threatened species (cusk, cod, wolffish). The wolffish are returned to the sea with care as soon as possible (Criquet, G. and Brêthes, J. 2017a). Under the Species at Risk Act (SARA), northern wolfish and spotted wolffish are not allowed to be landed and must be returned to the water {DFO 2013}.
Cod	No	Cod are not allowed to be landed and must be returned to the water (DFO 2013l).

Canadian measures to reduce the impact of ghost gear (unless otherwise cited, the information below is from the DFO Ghost gear website (DFO 2021f))

- All snow crab, lobster, and Jonah/Atlantic crab traps must use biodegradable twine in some portion of the pots' netting to reduce crab mortality in ghost gear (based on a review of all of the available IFMPs for these fisheries)

- In 2018, the Canadian government joined the Global Ghost Gear Initiative
- In 2019, the Canadian Coast Guard conducted a 3-day ghost gear retrieval operation in the GSL. The goal was to help prevent entanglements with marine mammals, and increase the sustainability of Canada's Atlantic fisheries. 100 snow crab traps and 9 km of rope were removed during this operation (DFO 2020j); however, reports from participants in this effort indicate DFO did not permit all observed ghost gear to be collected upon request, and a North Atlantic right whale was entangled in the area shortly thereafter (pers. comm., Amy Knowlton, September 21, 2020).
- In 2019, DFO created the Canadian Ghost Gear Program, which runs from 2020 to 2022. To date, the fund has funded 49 projects, for a total of CAN 16.7 million. Of these, 45 were located in Canada and 4 were international. A number of them focused on gear loss prevention and gear retrieval in crab and lobster fisheries in Atlantic Canada. As of April 2022, DFO reports 7,342 units of gear with a total weight of 1,295 tonnes were retrieved from Canada's waters (east and west coast combined), in addition to 153 km of rope.
- Since 2020, reporting of lost and retrieval of previously reported lost gear has been mandatory in all Canadian commercial fisheries. Fish harvesters and authorized retrievers can use PDF forms or an online Fishing Gear Reporting System to report lost gear.
- In 2020, DFO hosted a Gear Innovation Summit with the aim of exploring whale-safe fishing technologies and strategies, as well as methods designed to reduce and mitigate the risk of abandoned, lost, and discarded fishing gear {DFO 2020l}. The summit was about raising awareness, and did not attempt to focus on solutions or recommendations.

Factor 3.3 - Scientific Research And Monitoring

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

N/A

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

Factor 3.4 - Enforcement Of Management Regulations

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

N/A

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

Factor 3.5 - Stakeholder Inclusion

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

N/A

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

Criterion 4: Impacts on the Habitat and Ecosystem

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

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

Guiding principles

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

Rating cannot be Critical for Criterion 4.

Criterion 4 Summary

FISHERY	FISHING GEAR ON THE SUBSTRATE	MITIGATION OF GEAR IMPACTS	ECOSYSTEM-BASED FISHERIES MGMT	SCORE
Northwest Atlantic | Pots | Canada | Bay of Fundy	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | LFA 33	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | LFAs 27-32	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula	Score: 3	Score: 0	Low Concern	Green (3.464)
Northwest Atlantic | Pots | Canada | The Magdalen Islands	Score: 3	Score: 0	Low Concern	Green (3.464)

Lobster traps present low to moderate effects on seafloor habitats, and the resilience of bottom habitat to these effects is considered moderate to high, depending on the specific substratum. At present, there is no evidence that the fishing method or the removal of Atlantic lobster has severe habitat or ecosystem effects. Given that lobster traps are considered to have relatively benign effects on habitat, particularly when compared with mobile gear, there are few measures to reduce or mitigate effects of fishing practices on habitat. Measures in place include gear design (biodegradable panels, buoyant groundlines, and mesh sizes), fishing seasons, marine protected areas (MPAs), designated critical habitat, voluntary measures to prevent ghost fishing, and laws to ensure that endangered, threatened, or protected (ETP) species are released carefully and quickly to the water when caught. There are few studies to ensure that fishing practices are causing minimal impact to habitat and ecosystems, and those that have been completed are small scale.

Criterion 4 Assessment

<u>SCORING GUIDELINES</u>

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

- *5 - Fishing gear does not contact the bottom*
- *4 - Vertical line gear*
- *3 - Gears that contacts the bottom, but is not dragged along the bottom (e.g. gillnet, bottom*

longline, trap) and is not fished on sensitive habitats. Or bottom seine on resilient mud/sand habitats. Or midwater trawl that is known to contact bottom occasionally. Or purse seine known to commonly contact the bottom.

- *2 - Bottom dragging gears (dredge, trawl) fished on resilient mud/sand habitats. Or gillnet, trap, or bottom longline fished on sensitive boulder or coral reef habitat. Or bottom seine except on mud/sand. Or there is known trampling of coral reef habitat.*
- *1 - Hydraulic clam dredge. Or dredge or trawl gear fished on moderately sensitive habitats (e.g., cobble or boulder)*
- *0 - Dredge or trawl fished on biogenic habitat, (e.g., deep-sea corals, eelgrass and maerl)*
  Note: When multiple habitat types are commonly encountered, and/or the habitat classification is uncertain, the score will be based on the most sensitive, plausible habitat type.

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

- *+1 —>50% of the habitat is protected from fishing with the gear type. Or fishing intensity is very low/limited and for trawled fisheries, expansion of fishery's footprint is prohibited. Or gear is specifically modified to reduce damage to seafloor and modifications have been shown to be effective at reducing damage. Or there is an effective combination of 'moderate' mitigation measures.*
- *+0.5 —At least 20% of all representative habitats are protected from fishing with the gear type and for trawl fisheries, expansion of the fishery's footprint is prohibited. Or gear modification measures or other measures are in place to limit fishing effort, fishing intensity, and spatial footprint of damage caused from fishing that are expected to be effective.*
- *0 —No effective measures are in place to limit gear impacts on habitats or not applicable because gear used is benign and received a score of 5 in factor 4.1*

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

- *5 — Policies that have been shown to be effective are in place to protect species' ecological roles and ecosystem functioning (e.g. catch limits that ensure species' abundance is maintained at sufficient levels to provide food to predators) and effective spatial management is used to protect spawning and foraging areas, and prevent localized depletion. Or it has been scientifically demonstrated that fishing practices do not have negative ecological effects.*
- *4 — Policies are in place to protect species' ecological roles and ecosystem functioning but have not proven to be effective and at least some spatial management is used.*
- *3 — Policies are not in place to protect species' ecological roles and ecosystem functioning but detrimental food web impacts are not likely or policies in place may not be sufficient to protect species' ecological roles and ecosystem functioning.*

- *2 — Policies are not in place to protect species' ecological roles and ecosystem functioning and the likelihood of detrimental food impacts are likely (e.g. trophic cascades, alternate stable states, etc.), but conclusive scientific evidence is not available for this fishery.*
- *1 — Scientifically demonstrated trophic cascades, alternate stable states or other detrimental food web impact are resulting from this fishery.*

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

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Score: 3

The trap fishery has contact with the seabed. In Canada, lobsters are caught using traps that are generally thought to have low to moderate effects on the habitat {Fuller et al. 2008}. Given that lobster traps are not deployed year-round, that their location changes from season to season, and that the majority of the fishery occurs in a relatively high energy environment (i.e., inshore), impacts on the seafloor, compared to bottom trawling gears, are considered to be low. The spatial extent of these impacts is also considered to be small relative to mobile fishing gears. The fishery footprint of LFA 34 has been calculated to be <0.1% of the whole area per year, and <2% in the inshore area {DFO 2013e}. The fishery footprint in LFAs 35 to 38 is calculated at less than 0.05% of the total area (Criquet et al. 2015a).

Various sources show that substrates in Atlantic Canada comprise a mixture of sand, mud, gravel, and rock habitats in the Bay of Fundy (Shaw et al. 2012), German Bank (Todd, B.J., and Kostylev, V.E., 2011), sGSL (Mateo et al. 2017), SW Newfoundland (Shaw 2012), and Scotian Shelf (Fader et al. 2004). These habitats are not particularly sensitive. For this reason, a score of 3 is given.

Justification:

The impact on the local flora and fauna will vary according to the nature of the sediment (e.g., sand, hard gravel, soft clay/silt), presence of a slope, extent of water movement, etc. The bulk of the lobster fishery takes place inshore where water movement is high; thus, it may be expected that the damage of traps to the seafloor is small, because organisms in this region have adapted to regular disturbances.

The main damage caused to the habitat is through crushing organisms when traps are dropped to the seafloor, dragged along the bottom due to storms, or pulled to the surface (Chuenpagdee et al. 2003). Vulnerable habitats such as corals receive significantly more damage when traps are dragged across the seabed, as opposed to crushing {Shester, G. and Micheli, F. 2011}. Crushing and dragging can occur when retrieving traps or in strong currents (Criquet et al. 2015c)(Criquet et al. 2015a). There is minimal dragging of traps when they are hauled correctly, but this will depend on sea conditions. Traps are usually heavy enough to minimize movement due to bottom currents (Pezzack et al. 2009).

Relative to the size of impact of mobile fishing gears, the damage caused by lobster traps is expected to be minimal. Several reviews conclude that it would be small, but could increase with the density and frequency of traps being hauled (Pezzack et al. 2009). A study conducted in southern England and western Wales found that, after 4 weeks of fairly intensive fishing for crabs and lobsters using traps, there were no obvious detrimental effects to the abundance of the species studied {Eno 2001}. The study concluded that the direct impact of the traps on bottom flora and fauna was likely to be less important than the intensity and frequency of bottom contact. The location of lobster traps is likely to vary with the season, so repeated impact in a particular area is unlikely, allowing areas to recover from any damage.

But there are specific habitats that are fundamental to the survival of ETP species (discussed in Criterion 2). SARA has designated areas of "critical habitat" to ensure the survival and recovery for species such as wolffish, which are caught predominantly in sand, shell, and rock habitats. The fishery does operate in some essential fish habitats (EFH), though limited by depth, which protects deep EFH (often inhabited by deepwater species such as wolffish) (DFO 2008a).

The Canadian lobster fishery comprises areas of either low sensitivity (southwest Nova Scotia) or low to intermediate sensitivity (e.g., edges of Georges Bank) (Blyth-Skyrme et al. 2015a). The footprint of the fishery has declined through time due to a decrease in the number of hauls, allowing recovery for vulnerable habitats. Previous studies have noted recoveries among vulnerable species when given time to recover (Eno et al. 2001).

Factor 4.2 - Modifying Factor: Mitigation of Gear Impacts

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)
Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Score: 0

There is insufficient mitigation of the potential impact of lobster pots and traps to reach the moderate mitigation score. Some mitigation measures have been implemented, including biodegradable trap panels, conservation areas (one MPA protects coral communities and others prevent fishing on vulnerable deepwater habitats {DFO 2007}), fishing seasons that provide the habitat with time to recover, and effort limits (through limited entry). But conservation areas do not cover a substantial proportion of the LFAs and their efficacy has not yet been proved. Also, uncertainty exists around where critical habitats are and the efficacy to protect them. Therefore, it is deemed that no mitigation is applied.

Justification:
Some regions have sufficient data to determine that a lobster fishery poses a low risk to the habitat. This is partly attributable to their adoption of management measures. The Government of Canada currently protects 14.66% of its marine and coastal areas (DFO 2022g). Conservation areas have been implemented for many reasons, including to protect lobsters (Table 3), to protect coral communities (Blyth-Skyrme et al. 2015a), or to reduce the impact of gear conflicts. Conservation areas in Eastern Canada are shown in Figures 20, 21, and 22, and 19 MPAs and marine refuges have been implemented to protect juvenile lobster (such as those in Les Demoiselles nursery, Plaisance Bay in the Magdalen Islands, and the Magdalen Islands lagoons). Conservation areas to protect lobster habitat include Saguenay Fjord Upstream, where all otter trawl fishing is prohibited. But these areas do not cover a substantial proportion of the regions and they have not yet been proved as effective at mitigating lobster fishing impacts on habitats.

Table 3: List of marine protected areas and marine refuges relevant to Canadian fisheries for American lobster (DFO 2021e)(DFO 2021f)

Province	Name	Approximate Size (km^2)	Purpose (with respect to the American lobster fishery)
Gulf of St. Lawrence	Banc des Americains Marine Protected Area	1,000	Preserve and protect benthic habitat; promote recovery of at-risk whales and wolffish.
Gulf of St. Lawrence	Basin Head Marine Protected Area	9	Maintain overall integrity of Basin Head lagoon ecosystem; maintain quality of the environment for *Chondrus crispus.*
Gulf of St. Lawrence	Beauge Bank Sponge Conservation Area	215	Protect coldwater sponges.
Gulf of St. Lawrence	Central Gulf of St. Lawrence Coral Conservation Area	1,284	Protect coldwater corals.
Gulf of St. Lawrence	East of Anticosti Island Sponge Conservation Area	939	Protect coldwater sponges.
Gulf of St. Lawrence	Eastern Gulf of St. Lawrence Coral Conservation Area	423	Protect coldwater corals.
Gulf of St. Lawrence	Eastern Honguedo Strait Coral and Sponge Conservation Area	2,338	Protect coldwater corals and sponges.
Gulf of St. Lawrence	Jacques-Cartier Strait Sponge Conservation Area	346	Protect coldwater sponges.
Gulf of St. Lawrence	North of Bennett Bank Coral Conservation Area	821	Protect coldwater corals.
Gulf of St. Lawrence	Parent Bank Sponge Conservation Area	530	Protect coldwater sponges.
Gulf of St. Lawrence	Scallop Buffer Zones—SFAs 21, 22, 24	5,835	Protect juvenile lobsters and their habitat.
Gulf of St. Lawrence	Slope of Magdalen Shallows Coral Conservation Area	335	Protect coldwater corals.
Gulf of St. Lawrence	South-East of Anticosti Island Sponge Conservation Area	845	Protect coldwater sponges.
Gulf of St. Lawrence	Western Honguedo Strait Coral Conservation Area	496	Protect coldwater corals.
Newfoundland and Labrador	Division 3O Coral Closure	10,422	Protect coldwater corals.
Newfoundland and Labrador	Eastport Marine Protected Area	2	Maintain and protect a viable population of American lobster through habitat protection and sustainable resource use; ensure the conservation of endangered and threatened species.
Newfoundland and Labrador	Gilbert Bay Marine Protected Area	60	Conservation and protection of the Gilbert Bay ecosystem.
Newfoundland and Labrador	Hatton Basin Conservation Area	42,459	Conserve sensitive benthic areas.

Newfoundland and Labrador	Hopedale Saddle Closure	15,411	Protect coldwater corals and sponges and contribute to long-term biodiversity conservation.
Newfoundland and Labrador	Seven Lobster Area closures in Trout River, Shoal Point, Penguin Islands, Gooseberry Island, Glovers Harbour, Mouse Island, and Gander Bay	94	Protect the area to increase lobster spawning and egg production.
Newfoundland and Labrador	Laurentian Channel Marine Protected Area	11,580	Protect corals and sea pens from human activity including fishing; protect the survival and recovery of leatherback turtle by reducing the risk of entanglement.
Newfoundland and Labrador	Northeast Newfoundland Slope Closure	55,353	Protect coldwater corals and sponges and contribute to long-term biodiversity conservation.
Quebec	Magdalen Islands lagoons (six overlapping closures)	136	Protect lobster habitat.
Quebec	Les Demoiselles nursery (Plaisance Bay), Magdalen Islands	0.3	Protect habitat nursery ground for juvenile lobster.
Scotian Shelf	Corsair and Georges Canyons Conservation Area	8,797	Protect coldwater corals.
Scotian Shelf	Emerald Bay and Sambro Bank Sponge Conservation Area	260	Protect *Vazella pourtalesi* glass sponges.
Scotian Shelf	The Gully Marine Protected Area	2,363	Minimize harmful impacts of human activities on cetaceans; minimize impacts on benthic habitats.
Scotian Shelf	Jordan Basin Conservation Area	49	Protect coldwater corals.
Scotian Shelf	Lophelia Coral Conservation Area	15	Protect *Lophelia pertusa* coral reef.
Scotian Shelf	Musquash Estuary Marine Protected Area	7	Maintain productivity of harvested species; maintain biodiversity.
Scotian Shelf	Northeast Channel Coral Conservation Area	391	Protect coldwater corals.
Scotian Shelf	St. Anns Bank Marine Protected Area	4,364	Conserve and protect benthic and demersal habitats; conserve and protect areas of high biodiversity; conserve and protect biological productivity.
Scotian Shelf	Western/Emerald Banks Conservation Area	10,234	Support productivity objectives for groundfish species of aboriginal, commercial, and/or recreational importance, particularly NAFO Division 4VW haddock; manage the disturbance of benthic habitat that supports juvenile and adult haddock and other groundfish species.

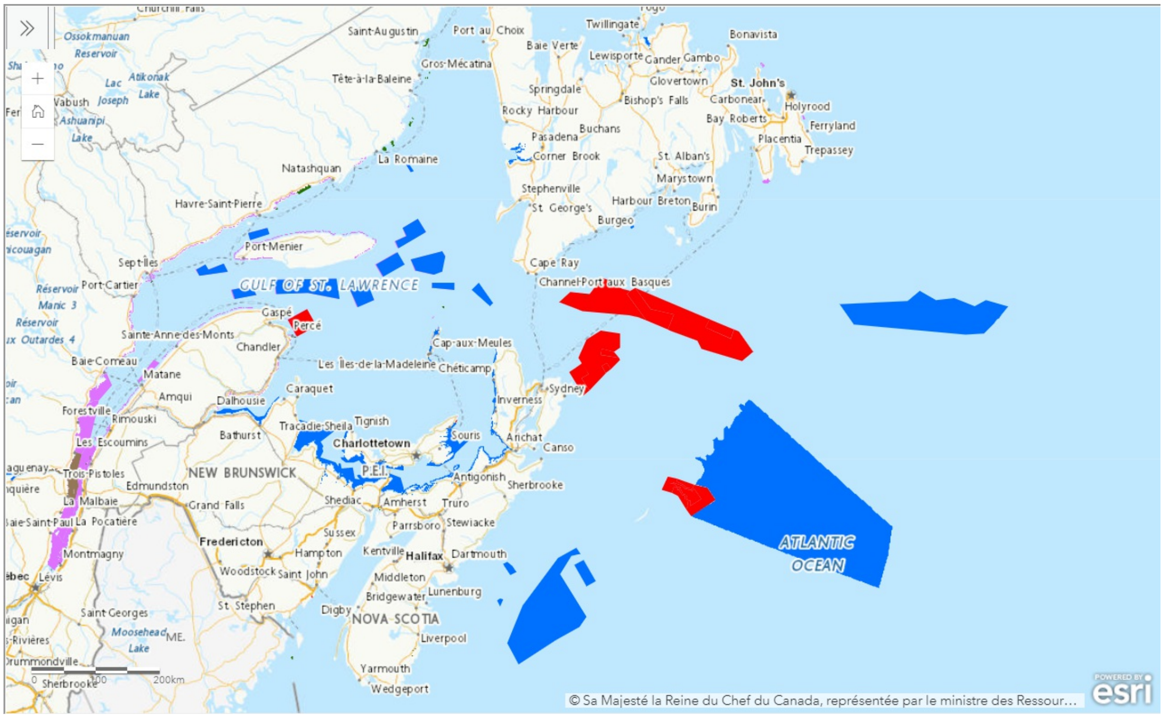

Figure 20: Map of Marine Protected Areas (red), Marine Refuges (blue), Marine Parks (brown), and other marine conservation areas (magenta). From https://www.dfo-mpo.gc.ca/oceans/maps-cartes/conservation-eng.html Accessed 23rd July 2022.

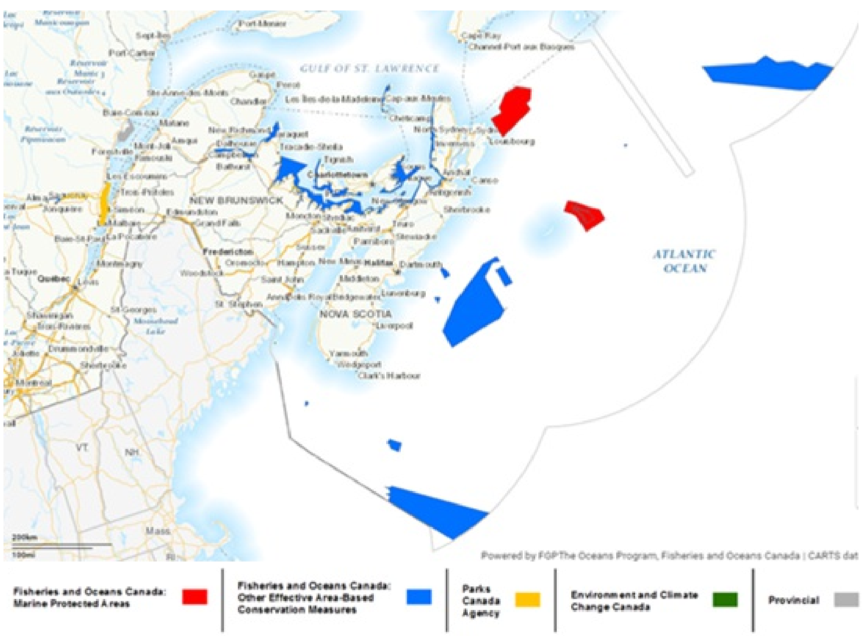

Figure 21: MPAs in Eastern Canada. (DFO 2017v)

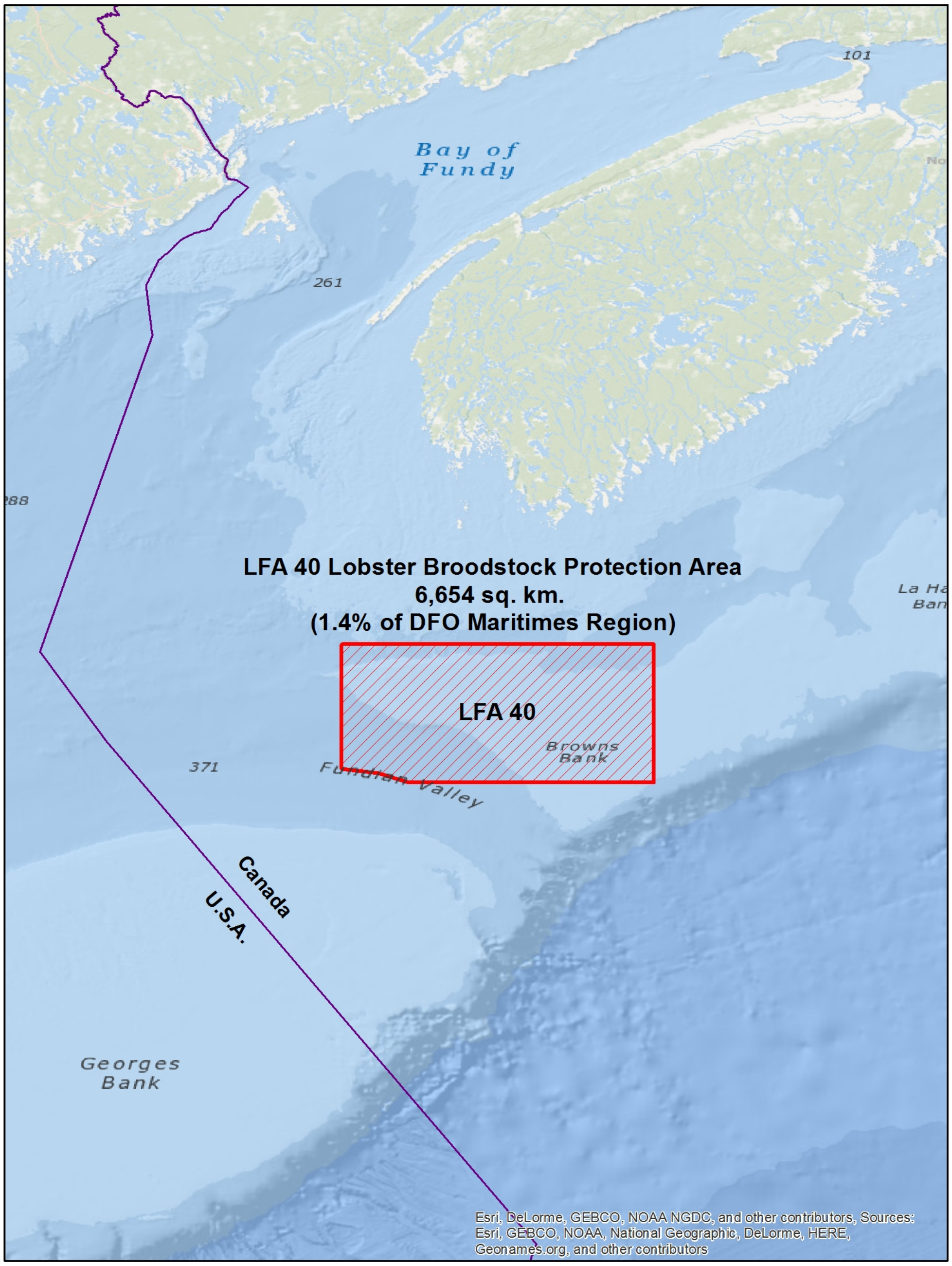

Figure 22: LFA 40 (6,654 km^2), which was closed in 1979 to protect lobster broodstock. LFA 40 represents 1.4% of the total area of DFO Maritimes Region (475,174 km^2).

Factor 4.3 - Ecosystem-based Fisheries Management

Northwest Atlantic | Pots | Canada | LFA 41 (Offshore)

Northwest Atlantic | Pots | Canada | Southwest Nova Scotia
Northwest Atlantic | Pots | Canada | LFAs 27-32
Northwest Atlantic | Pots | Canada | LFA 33
Northwest Atlantic | Pots | Canada | Quebec North Shore and Anticosti Island
Northwest Atlantic | Pots | Canada | Southern Gulf of St Lawrence
Northwest Atlantic | Pots | Canada | Bay of Fundy
Northwest Atlantic | Pots | Canada | The Gaspe Peninsula
Northwest Atlantic | Pots | Canada | The Magdalen Islands
Northwest Atlantic | Pots | Canada | Newfoundland and Labrador

Low Concern

Although some recent stock assessments include brief overviews of relevant ecological issues, there is a general dearth of scientific research regarding the relationships between the lobster fisheries and marine ecosystems. Potentially important avenues through which the lobster fisheries and marine ecosystems may affect each other include the effect of reduced groundfish predation on lobsters and the effects of lobster bait on lobsters and benthic trophic relationships.

The lobster fishery does not catch species that play exceptional ecological roles, but recent research indicates that the lobster fisheries' relationship to broader ecosystem processes may still be multifaceted. Fisheries-mediated reductions in groundfish, especially Atlantic cod (Steneck et al. 2004), may have released lobster from predation pressure and facilitated increased lobster abundance in the Canadian Gulf of Maine (Boudreau, S. and Worm, B. 2010). Lobster fisheries' use of bait may be an avenue for ecosystem effects: in the American Gulf of Maine lobster fishery, lobster bait may subsidize growth of sub-legal lobsters (Grabowski et al. 2010).

Lobster stock assessments for both inshore and offshore stocks incorporate ecosystem attributes that are both quantitative and qualitative (Bundy et al. 2017); these sections identify avenues by which the lobster fishery and the larger marine ecosystem may interact. These sections may include rough estimates of lobster fisheries' seafloor footprints and the effect of other species on lobster mortality (Tremblay et al. 2013). Some lobster assessments also include sections on the identity and estimated weights of species caught incidentally in the lobster fisheries.

The fishery catches endangered, threatened, and protected (ETP) species (including wolffish and leatherback turtle); although there are spatial measures applied to the fishery, including MPAs to protect vulnerable habitats and deepwater areas, the efficacy of these measures has not been assessed. Management measures are designed to reduce the risk of fishing on habitats, reduce ghost fishing, and reduce capture and mortality of ETP species; such measures include area closures, trap requirements, technical conservation measures, and invasive species management (see Justification for details).

The lobster fisheries are scored a low concern for ecosystem-based fishery management, based on Seafood Watch requirements for fisheries, because policies exist to protect ecosystem functioning, though the ecological roles of lobster are not yet understood well enough to ensure that management effectively protects any ecological roles. There is spatial management, though it has not been proved effective in protecting ecosystem functioning.

Justification:
The lobster fisheries are considered highly unlikely to cause serious or irreversible harm to the ecosystem structure and function. Management measures include:

- Precautionary management and conservation measures are in place to protect other species within the food web; such as protected areas for mammals and a network of MPAs (DFO 2017s).
- Trap reduction programs, e.g., in the sGSL (DFO 2017t).
- Protecting broodstock by v-notching to protect egg-bearing female lobsters and hence eggs from predation, and enforcing an MLS and a female size window.
- Spatial and temporal measures: closed areas, closed times, and fishing prevented in deepwater environments (DFO 2008a).
- Biodegradable panels and escape vents, which allow certain nontarget species to escape.
- Minimum number of traps per line, and removal of endlines.
- Biodegradable traps and protected areas have been efforts implemented and being developed to mitigate the risk of ghost fishing (DFO 2017t).
- Inshore lobster harvesters are allowed to retain green crab (*Carcinus maenas*)—for example, in LFAs 27 to 38 (Criquet, G. and Brêthes, J. 2017a)—which helps maintain ecosystem balance because it is an invasive species that competes with and preys upon lobster (DFO 2010b).

Other regions have attracted studies regarding environmental impacts, including PEI lobster size composition, benthic communities, diversity, food web, and habitat impacts. The study also found that there was no concern that the fishery caused serious or irreversible harm to the ecosystem function or structure {Criquet, G. and Brêthes, J.C. 2014}.

A conservation plan has been designated to prevent trophic cascades. Rock crab is caught in many of the lobster fisheries; this is a key species in the Gaspésie ecosystem because it is an important prey species for lobster and other predators. A recent assessment concluded that the fishery does not pose a significant risk to the rock crab in Gaspésie. The diameter of the circular escape vents in lobster traps was increased to 65 mm for the 2016 fishing season, which is a standardized size within the fisheries, thereby allowing increased escapement of rock crab. Interactions between the Gaspésie lobster trap fishery and ETP species are low, and there is a low level of risk of the fishery causing serious or irreversible harm to ETP species. During the 2015 Merinov study, the Atlantic wolffish was observed in catches in only one area, Newport, and represented 2% of by-catch by weight. Individuals are released alive (Criquet, G. and Brêthes,J.C. 2016b). The lobster fisheries in this region are considered highly unlikely to cause serious or irreversible harm to the ecosystem structure and function.

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

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Appendix A: Report Review and Update

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

Overall recommendations for lobster caught in all Canadian fisheries were downgraded to Avoid.

The scope of the ratings was refined to more accurately reflect the stock structure of American lobster in Canadian waters.

The lobster fishery in LFA 41 (Offshore) was previously certified by the Marine Stewardship Council (MSC). Following the withdrawal of the fishery from the MSC certification program, it was added to the Seafood Watch assessment of Canadian lobster fisheries.

The most recent lobster stock assessments were reviewed and included in the assessment where necessary. This resulted in an improvement in the score for Factor 1.1 for LFAs 27–32 (referred to in the previous Seafood Watch assessment as East of Cape Breton) from moderate concern to low concern. Scores for fishing mortality improved for LFAs 27–32, 33, and 34 from moderate concern to low concern.

The most recent stock status information was used to update answers for Factors 2.1 and 2.2 for North Atlantic right whale. This did not result in a change in the score for either factor.

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

Red criterion scores for Criteria 2 and 3 result in an overall rating of Avoid for all Canadian lobster trap fisheries using vertical lines.