



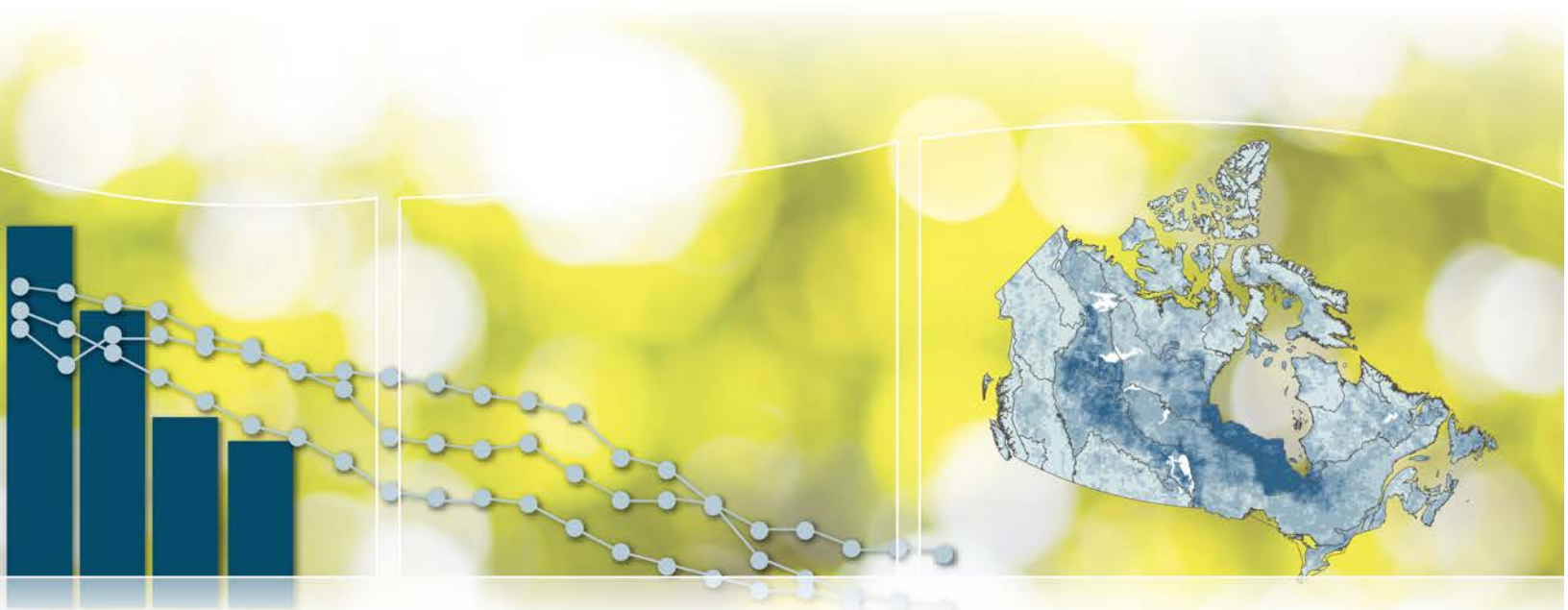
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# Canadian Environmental Sustainability Indicators

## Sustainable Fish Harvest



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# Canadian Environmental Sustainability Indicators

## Sustainable Fish Harvest

March 2017

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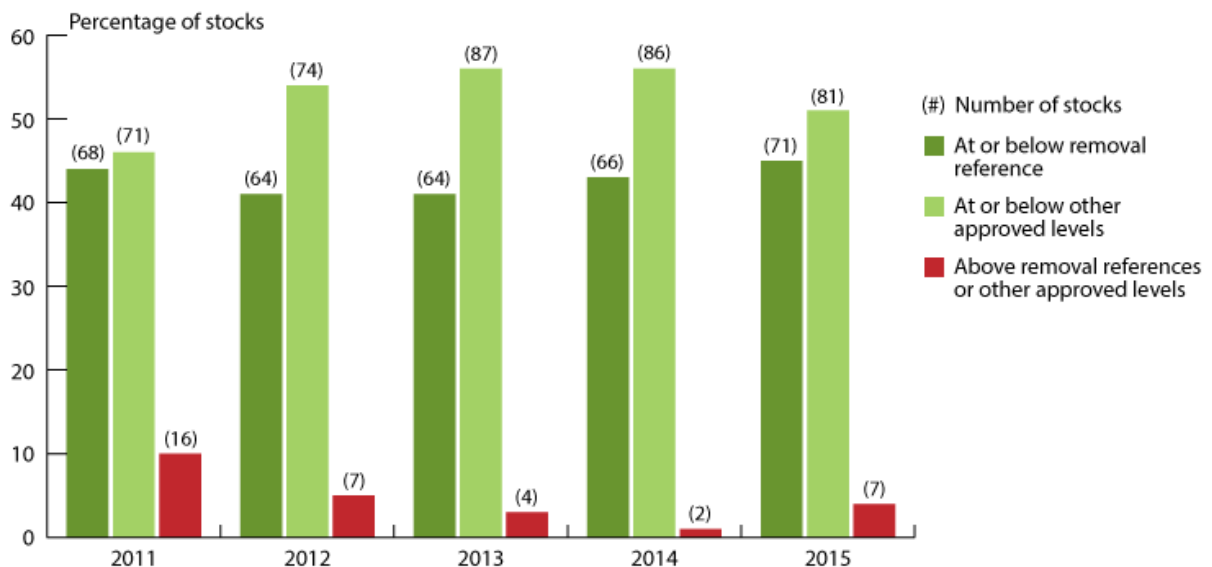
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## Part 1. Sustainable Fish Harvest Indicator

Harvest limits for wild fish and other marine animals protect these stocks for the future. Of the 159 major stocks assessed in 2015, 152 (96%) were harvested at levels considered to be sustainable. Seven stocks (4%) were harvested above approved levels.

There are two methods for setting fish harvest levels. For 78 stocks (49%), there is sufficient information to set the level using the mathematically based Removal reference, while the harvest levels for an additional 81 stocks (51%) were set using other scientific approaches. The proportion of fish stocks harvested within approved levels has improved since 2011, when 10% of stocks were overharvested. From 2012 to 2015, the proportion of overharvested stocks has remained below 5%. Small changes in the number of overharvested stocks among years should be expected and the rate of overharvest is considered stable since 2012. The improvement is in large part due to the implementation of the Sustainable Fisheries Framework Policies.<sup>1</sup>

**Figure 1. Harvest of major stocks relative to approved levels, Canada, 2011 to 2015**



[Data for Figure 1](#)

**Note:** Labels are the number of stocks in each category. The Removal reference is a harvest rate that is estimated to be biologically sustainable, based on an analytical assessment of historical stock productivity data. When Removal references are not available, other approved levels are established. Comparisons between years should be made with caution as some changes to the list of major stocks were made in 2014 and 2015.

**Source:** Fisheries and Oceans (2016) [Sustainability Survey for Fisheries](#).

The key decisions in fisheries management are how much of a stock should be harvested and by whom. Harvest rates include all removals of fish (i.e., targeted fishing and bycatch mortality), by all types of fishing. Overharvesting<sup>2</sup> sometimes occurs when fishers compete

<sup>1</sup> For more information, visit [Sustainable Fisheries Framework](#).

<sup>2</sup> Overharvesting occurs when a stock is harvested above its Removal reference or other approved level. Note that, in other contexts, a stock may be said to be overharvested if its biomass is below its limit reference point.

for a share of the total allowable catch, or when fish are caught as bycatch<sup>3</sup> in another fishery, or if fishers exceed their quota. For the seven stocks over-harvested in 2015, management responses from the federal government include quota reconciliation, meaning that the amount overharvested in 2015 will be deducted from the harvest limit in 2016.

Limits are determined using a [precautionary approach](#).<sup>4</sup> When scientific information is uncertain, unreliable or inadequate, decisions must still be taken and the absence of adequate scientific information should not be used as a reason to postpone or fail to take action to avoid serious harm to the resource. "The precautionary approach to fisheries recognizes that changes in fisheries systems are only slowly reversible, difficult to control, not well understood, and subject to changing environment and human values."<sup>5</sup>

Harvest rates are reported against the Removal reference baseline in cases where a Removal reference is known. The Removal reference is an approach for determining the maximum acceptable removal rate for the stock when there is sufficient historical data on stock productivity to allow the level to be estimated analytically. As Fisheries and Oceans Canada continues to implement the precautionary approach, Removal reference levels are established for more stocks.

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<sup>3</sup> Bycatch is the part of a catch that is not the target of the fishery. It is caught incidentally during the fishing activity.

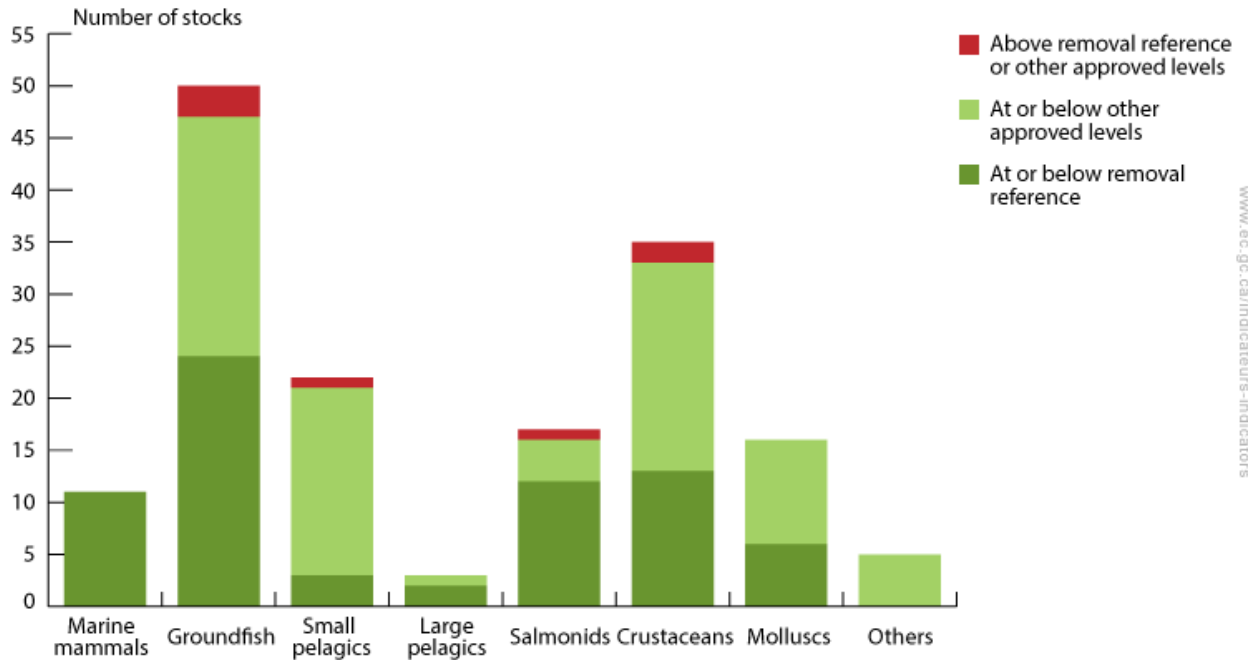
<sup>4</sup> Fisheries and Oceans Canada (2009) [A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#). Retrieved on June 22, 2016.

<sup>5</sup> Food and Agriculture Organization (1996) [FAO Technical Guidelines for Responsible Fisheries – Precautionary Approach to Capture Fisheries and Species Introductions](#). Retrieved on April 7, 2016.

## Sustainable fish harvest, by stock group

Canada's major fish stocks have been grouped into eight categories based on similar biology. Of the eight stock groups, four contain stocks that were all harvested within limits.

**Figure 2. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2015**



[Data for Figure 2](#)

**Note:** The species in each stock group are listed with the figure's data table. Pelagic fish live in midwater or close to the surface, in contrast to groundfish, which are usually caught near the ocean bottom. Crustaceans are shelled animals with joints, such as lobster, crab and shrimp. Molluscs include bivalve shellfish species, such as clams, oysters and mussels, which we commonly think of as shellfish.

**Source:** Fisheries and Oceans Canada (2016) [Sustainability Survey for Fisheries](#).



Healthy coasts and oceans

This indicator supports the measurement of progress towards the long-term goal of the [Federal Sustainable Development Strategy 2016–2019](#): Coasts and oceans support healthy, resilient and productive ecosystems.

# Part 2. Data Sources and Methods for the Sustainable Fish Harvest Indicator

## Introduction

The [Sustainable Fish Harvest](#) indicator is part of the [Canadian Environmental Sustainability Indicators](#) (CESI) program, which provides data and information to track Canada's performance on key environmental sustainability issues. This indicator is also used to report and measure progress towards the goals of the [Federal Sustainable Development Strategy 2016–2019](#).

## Description and rationale of the Sustainable Fish Harvest indicator

### Description

A biological fish stock is a group of fish of a single species that live in the same geographic area and mix enough to breed with each other when mature. A management stock may refer to a biological stock, or a multispecies complex that is managed as a single unit.

The Sustainable Fish Harvest indicator compares harvest rates with established harvest limits. These limits are based on scientific information, providing a direct measure of whether we are managing the use of these resources within ecosystem limits. The Sustainable Fish Harvest indicator measures compliance with harvest limits as a measure of pressures on wild fish stocks.

The Sustainable Fish Harvest indicator classifies stocks based on two elements:

1. Removal reference – This indicates the maximum sustainable harvest level established for a fish stock; and
2. Actual harvest level – This indicates whether the actual harvest was above, at or below the established maximum sustainable harvest level. Harvest includes all bycatch, whether it is retained or returned to the water.

Where Removal references have already been set as a component of the precautionary approach, the indicator measures whether harvest is above, or if it is at or below the established Removal reference. For stocks where the Removal reference has not been set, the indicator measures whether stocks are being harvested within other approved levels<sup>6</sup> established by Fisheries and Oceans Canada. Approved levels are determined by Fisheries and Oceans Canada on the basis of the best available information and knowledge of the biological, economic and social aspects associated with a given stock.

Overharvest leads to a management response to avoid harm to fish stocks. Stocks managed through quotas, for example, are subject to quota reconciliation, which provides that any overharvest of a stock in one year is deducted from the harvest limit established for the following year.

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<sup>6</sup> Fisheries and Oceans Canada (2014) [Fisheries Management Decisions](#). Retrieved on June 22, 2016.



## Rationale

The long-term maintenance of the ecological, social and economic value of fish stocks requires controlling harvest. Overfishing and other pressures can reduce the size and productivity of fish stocks, so harvest rates must be adjusted to reflect changing conditions.

Established harvest limits can be exceeded due to a number of factors, including short-time-frame competitive fisheries and unforeseen bycatch. Fishing is monitored by Fisheries and Oceans Canada and corrective actions are taken to address situations as they arise. Actions include implementing moratoria on fishing when necessary, adjusting harvest limits and enforcement to ensure conservation is not compromised. The overall goal is always conservation, responsible and sustainable harvesting practices, and equitable distribution of the resource among user groups.

## Recent changes to the indicator

The data source for this indicator, the [Sustainability Survey for Fisheries](#), formerly called the Fishery Checklist, has been revised over time to improve its usefulness as a management tool. In 2011, the Checklist and a set of 155 major stocks were finalized for the period 2011–2014, allowing comparability between years. The Porbeagle Shark was classified in the Critical zone in 2013 and the fishery was subsequently closed, resulting in the stock being removed from the list in 2014. Numbers reported for 2014 total 154 stocks.

Changes were made to the survey in 2015 and the list of major stocks was revised to a total of 159:

- Three Snow Crab stocks were merged (-2), the merged Snow Crab fishery was over-harvested in 2015;
- One Northern Shrimp fishery was closed and the stock removed from the list (-1);
- Six stocks (three Shrimp, one Elver, one Redfish and one Witch Flounder) were added (+6); and
- Pacific Ocean Perch was split into three stocks (+2) and one of these was over-harvested.

Survey results were reviewed in 2014 and 2015, and the criteria regarding classification of harvest relative to Removal references were tightened in 2015.

## Data

### Data source

Data were drawn from the [Sustainability Survey for Fisheries](#), formerly known as the Fishery Checklist. The Sustainability Survey for Fisheries is a tool that provides a systematic review of progress on conservation and sustainable-use policies and objectives. Different data are drawn from the same survey to generate the [Status of Major Fish Stocks](#) indicator.

Each year, Fisheries and Oceans Canada surveys how it manages major fish stocks. The survey includes commercial, recreational and Indigenous fisheries. These data provide a qualitative snapshot of a stock for a certain period, capturing how a fishery is addressing a range of factors considered necessary for sustainable management. The data also give an indication of progress being made to implement the department's sustainable fisheries policies.<sup>7</sup>

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<sup>7</sup> Fisheries and Oceans Canada (2009) [Sustainable Fisheries Framework](#). Retrieved on June 22, 2016.

### Spatial coverage

National, for all major fish stocks.

### Temporal coverage

Annual from 2011 to 2015, inclusive.

### Data completeness

Major stocks are identified by regional managers within Fisheries and Oceans Canada and include all stocks that meet one or more of the following criteria:

- have an annual landed value greater than \$1 million;
- have an annual landed weight greater than 2000 tonnes;
- have an [Integrated Fisheries Management Plan](#);
- are highly migratory or are a transboundary stock that is internationally managed;
- have been assessed by [Committee on the Status of Endangered Wildlife in Canada](#) as being of special concern and are subject to a directed fishery; and/or
- are deemed to be of regional significance.

These stocks include finfish, shellfish, marine mammals and other marine invertebrates.

### Data timeliness

Data for the Sustainability Survey for Fisheries are reported in the spring for the previous year. A year is defined variably, depending on how fishing seasons and closures are defined for individual stocks, and may not align exactly with the calendar year. The indicator is current to the end of 2015.

## Methods

The indicator is a simple tabulation of stocks based on whether harvest levels are within Removal reference levels, within other harvest limits, or over harvest limits.

The Removal reference is an approach for determining the maximum acceptable removal rate. In the past, annual harvest levels were set on the basis of scientific and economic information and in consultation with stakeholders. For an increasing number of stocks, a formal precautionary approach<sup>8</sup> is now being applied. This is a more rigorous, risk-based approach, common across stocks, and includes the use of a Removal reference for assessing whether harvests are sustainable. In this approach, the harvest strategy for a fishery must contain a set of standard components (reference points, harvest decision rules, etc.)

The removal rate is the ratio of all human-induced removals and the total exploitable stock size. The Removal reference is determined when there is sufficient historical data on stock productivity to allow those levels to be estimated analytically. It is adjusted based on the stock's abundance and its location in the three stock status zones defined in federal policy (i.e., Healthy, Cautious and Critical zones; see the [Status of Major Fish Stocks](#) indicator for more information on stock status). With this approach, managers report whether the harvest rate is above or below the reference level.

In 2015, 60 stocks (38%) have fully defined Removal references, and a further 18 stocks (11%) have Removal references defined for one or two of the three stock status zones (i.e., Critical, Cautious and Healthy). Marine mammal stocks use Potential Biological Removal indicators as a Removal reference for the purposes of the indicator but, as these are not

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<sup>8</sup> Fisheries and Oceans Canada (2009) [A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#). Retrieved on June 22, 2016.

based strictly on the Precautionary Approach Policy, they are not included in the total number of Removal references reported here. While most of the major stocks have had some components of the precautionary approach implemented (72%), only 21% have had all components fully implemented.

All components of the precautionary approach have not been implemented fully for all stocks and there are many different fisheries management measures in place. These measures depend on the species, area, fishing gear used, seasons, stock assessments, and other factors.

Whether a Removal reference is used or not, allowable harvest rates are determined by Fisheries and Oceans Canada based on scientific assessments, the condition of the stock, and economic and social considerations.

Stock groups used for reporting on this indicator are marine mammals, salmonids, groundfish, large pelagics, small pelagics, crustaceans (crab, lobster and shrimp), molluscs, and others. Each group comprises species with similar life history characteristics. For example, groundfish spend their adult life at or near the bottom of the ocean. The same groupings are used in the [Status of Major Fish Stocks](#) indicator.

## Caveats and limitations

The Sustainability Survey for Fisheries, formerly known as the Fishery Checklist, was initiated in 2007. A number of changes have been made as the program has developed. In particular, the stocks included in the survey have changed and questions have been revised. A standard list of stocks and questions were established in 2011 and no changes were made to the set of stocks until the removal of Porbeagle Shark in 2014. In 2015, the survey was streamlined to track the implementation of policies under the [Sustainability Survey for Fisheries](#).

The Sustainability Survey for Fisheries is completed with the best available information. Since the oceans are wide and deep, and fish migrate, their populations are difficult to monitor.

The Sustainability Survey summarizes information across a wide variety of species, management regimes, types of fisheries, geographic regions, and socio-economic contexts. Results should be interpreted with this in mind.

For most stocks, including all groundfish, quota reconciliation is implemented where there are seasonal overharvests. In-season transfers allow exchanges to be made between licence holders, such as an overharvest by one fisher being applied to the unused quota of another. When in-season transfers do not sufficiently cover overharvests, the overharvest is deducted from the harvest limit established for the following year.

The indicator does not account for fished stocks that do not meet the criteria to be considered major.

## Part 3. Annexes

### Annex A. Data tables for the figures presented in this document

**Table A.1. Data for Figure 1. Harvest of major stocks relative to approved levels, Canada, 2011 to 2015**

Year	At or below Removal reference (number of stocks)	At or below other approved levels (number of stocks)	Above Removal references or other approved levels <sup>[A]</sup> (number of stocks)	Total
2011	68	71	16	155
2012	64	84	7	155
2013	64	87	4	155
2014	66	86	2	154
2015	71	81	7	159

<sup>[A]</sup> Most stocks that are harvested above approved levels are subject to quota reconciliation. Quota reconciliation provides that overharvest of a stock in one year is deducted from the harvest limit established for the following year.

**Note:** The Removal reference is a harvest rate that is estimated to be biologically sustainable, based on an analytical assessment of historical stock productivity data. When Removal references are not available, other approved levels are established. Comparisons between years should be made with caution as some changes to the list of major stocks were made in 2014 and 2015.

**Source:** Fisheries and Oceans (2016) [Sustainability Survey for Fisheries](#).

**Table A.2. Data for Figure 2. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2015**

Stock group	Species included	At or below Removal reference (number of stocks)	At or below other approved levels (number of stocks)	Above Removal references or other approved levels (number of stocks)
Marine mammals	Whale, walrus	11	0	0

Stock group	Species included	At or below Removal reference (number of stocks)	At or below other approved levels (number of stocks)	Above Removal references or other approved levels (number of stocks)
Groundfish	Halibut, rockfish, cod, flounder, hake, redfish, dogfish, haddock, lingcod, perch, plaice, pollock, sablefish, skate, thornyhead	24	23	3
Small pelagics	Herring, mackerel, whitefish, capelin, sardine, striped bass, gaspereau, eulachon	3	18	1
Large pelagics	Tuna, swordfish	2	1	0
Salmonids	Salmon, char, trout	12	4	1
Crustaceans	Crab, lobster, shrimp, prawn, krill	13	20	2
Molluscs	Clam, scallop, whelk, geoduck	6	10	0
Others	Sea cucumber, sea urchin, eel and elver	0	5	0
<b>Total</b>	<b>–</b>	<b>71</b>	<b>81</b>	<b>7</b>

**Note:** Pelagic fish live in midwater or close to the surface, in contrast to groundfish, which are usually caught near the ocean bottom. Crustaceans are shelled animals with joints, such as lobster, crab and shrimp. Molluscs include bivalve shellfish species, such as clams, oysters and mussels, which we commonly think of as shellfish.

**Source:** Fisheries and Oceans Canada (2016) [Sustainability Survey for Fisheries](#).

## Annex B. References and additional information

### References and further reading

Fisheries and Oceans Canada (2009) [A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#). Retrieved on June 22, 2016.

Fisheries and Oceans Canada (2009) [Management Measures](#). Retrieved on June 22, 2016.

Fisheries and Oceans Canada (2009) [Sustainable Fisheries Framework](#). Retrieved on June 22, 2016.

Fisheries and Oceans Canada (2016) [Fisheries Management Decisions](#). Retrieved on June 22, 2016.

### Related information

[Fisheries and Oceans Canada – Aquatic Species](#)

[Fisheries and Oceans Canada – Fisheries Programs and Initiatives](#)

[Fisheries and Oceans Canada – Integrated Fisheries Management Plans](#)

[Fisheries and Oceans Canada – Policy for Managing Bycatch](#)

[Fisheries and Oceans Canada – Sustainable Fish and Seafood](#)

[Status of Major Fish Stocks](#)

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