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Canadian Environmental Sustainability Indicators

Sustainable Fish Harvest



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Canadian Environmental Sustainability Indicators

Sustainable Fish Harvest

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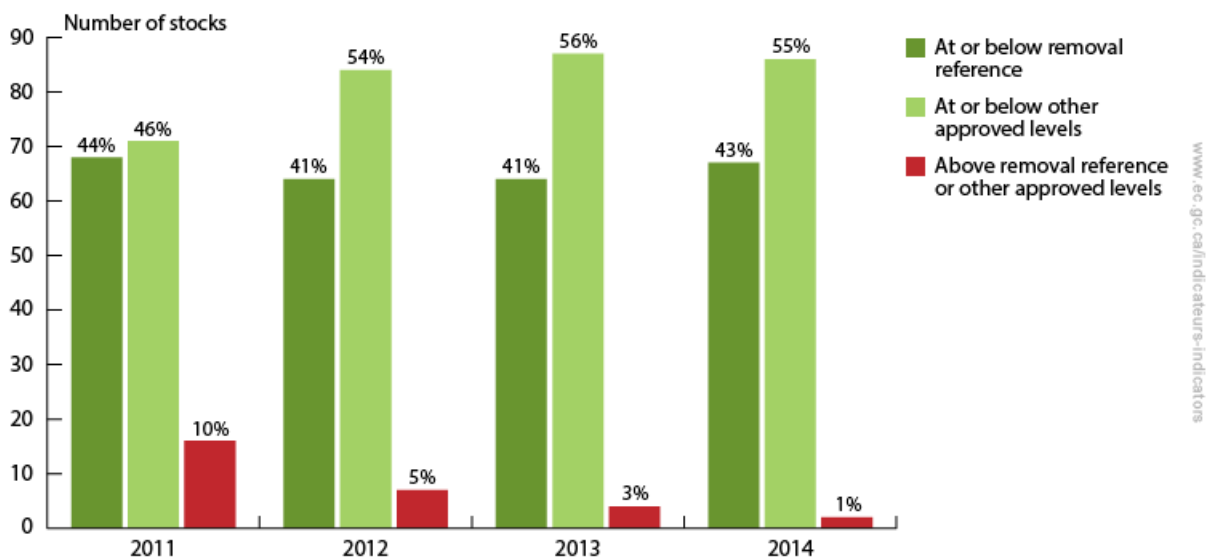
Part 1. Sustainable Fish Harvest Indicator

Harvest limits for wild fish and other marine animals protect these stocks for the future. Of the 155 major stocks assessed in 2014, 153 (99%) were harvested at levels considered to be sustainable. Two stocks (1%) were harvested above approved levels.

There are two methods for setting fish harvest levels. For 67 stocks (43%), there is sufficient historical information to set the level using the mathematically based removal reference, while the harvest levels for an additional 86 stocks (55%) were set using other scientific approaches.

The number of fish stocks harvested within approved levels has improved since 2011, when 16 stocks (10%) were overharvested. The improvement is in large part due to the implementation of Sustainable Fisheries Framework Policies.¹

Figure 1. Number of major stocks harvested relative to approved levels, Canada, 2011 to 2014



[Data for Figure 1](#)

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. Major stocks were harvested above the removal reference and/or approved levels primarily in competitive fisheries or because of landings in other directed fisheries. Percentages may not add to 100 due to rounding.

Source: Fisheries and Oceans Canada (2015) Fishery Checklist version 4.

Overharvest sometimes occurs when fishers compete for a share of the total allowable catch, or when fish are caught as bycatch² in another fishery. For the two stocks over-harvested in 2014, mackerel and walrus, management responses from the federal government include reducing the total allowable catch in the mackerel fishery and developing a full integrated fisheries management plan for walrus.

¹ For more information, visit [Sustainable Fisheries Framework](#).

² *Bycatch* is the part of a catch that is not the target of the fishery. It is caught incidentally during the fishing activity.

Major stocks (freshwater and marine) are classified using a consistent set of criteria, and include all stocks with a landed value of more than \$1 million or a landed weight of more than 2000 tonnes, as well as other important stocks (see the [Data Sources and Methods](#) section for details).

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. Limits are determined using a [precautionary approach](#).³ 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."⁴

Harvest rates are reported against the *removal reference* as a 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. Fifty-three stocks (34%) have fully defined removal references, and a further 27 stocks (17%) have removal references defined for one or two of the three stock status zones (i.e., critical, cautious and healthy). While most of the major stocks have had some components of the precautionary approach implemented (76%), only 22% have had all components fully implemented.⁵

³ Fisheries and Oceans Canada (2009) [A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#). Retrieved on 15 September, 2015.

⁴ Food and Agriculture Organization (1996) [FAO Technical Guidelines for Responsible Fisheries – Precautionary Approach to Capture Fisheries and Species Introductions](#). Retrieved on 15 September, 2015.

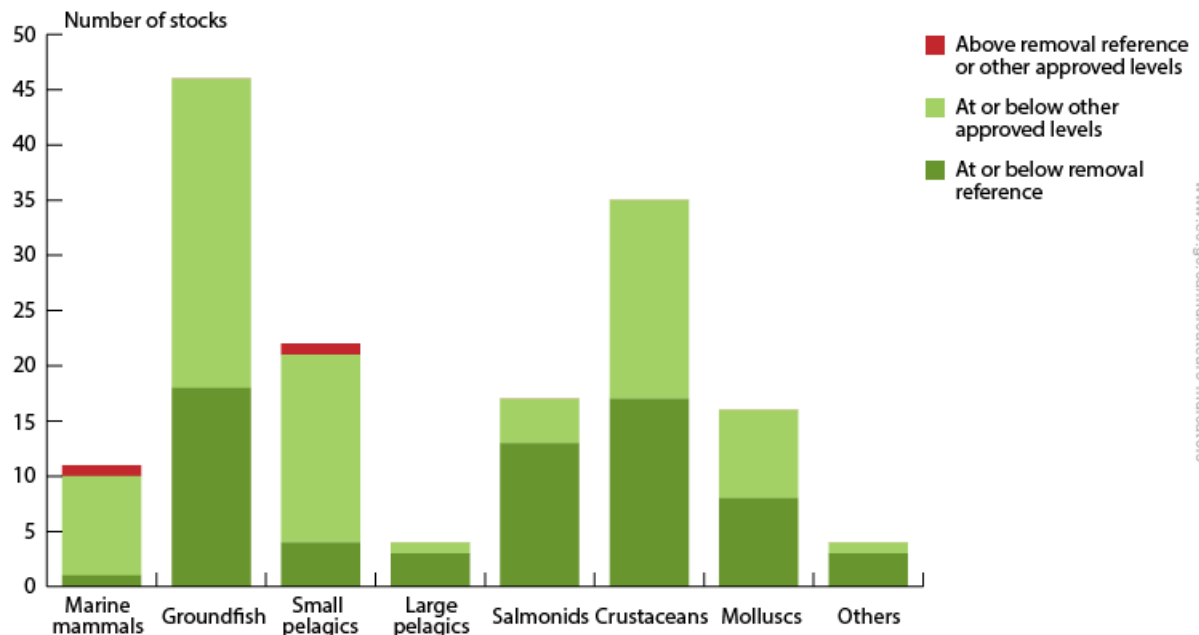
⁵ The components of the Precautionary Approach are: upper stock reference points, limit reference points, removal reference points for each of the three zones (critical, cautious and healthy); developed, implemented and reviewed harvest decision rules.

Sustainable fish harvest, by stock group

Stocks can be grouped based on similar biology. For this indicator, Canada's major stocks have been grouped into eight categories. Of the eight stock groups, six are currently harvested within limits.

The two stocks overharvested in 2014 are being addressed, including through reassessment of the allowable catch. In 2013, 4 of 46 groundfish stocks were overfished. These four stocks were subject to quota reconciliation, meaning that the 2013 overharvest was deducted from the harvest limit for 2014.

Figure 2. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2014



[Data for Figure 2](#)

Note: The species in each stock group are listed with the chart data. 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 (2015) Fishery Checklist version 4.

Some species and stock groups are more difficult to monitor than others. Fisheries and Oceans Canada is working to improve stock status reference points and control harvest levels through the adoption of the precautionary approach.



This indicator is used to measure progress toward [Target 5.1: Sustainable Fisheries – Improve the management and conservation of major stocks](#) of the [Federal Sustainable Development Strategy 2013–2016](#).

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 measure progress towards the goals and targets of the [Federal Sustainable Development Strategy](#).

The long-term maintenance of the ecological, social and economic value of fish stocks requires controlling harvest to avoid overexploitation. In partnership with industry, Fisheries and Oceans Canada implements plans, policies and programs to protect stocks, assist in long-term sustainability, and provide for the fair allocation and distribution of harvestable surpluses among those dependent on the resource, in accordance with the precautionary approach. The Sustainable Fish Harvest indicator measures compliance with harvest limits as a measure of pressures on wild fish stocks.

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 and adjusting harvest limits, to ensure conservation is not compromised.

Description and rationale of the Sustainable Fish Harvest indicator

Description

Stocks are subpopulations of a particular species of fish or other marine animal, for which factors such as growth, recruitment, and natural and fishing mortality are the only significant factors in determining population dynamics. Other factors such as immigration and emigration are considered to be insignificant. A fish stock can be managed as a 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 has two elements:

Removal reference – This indicates the maximum sustainable harvest level established for a fish stock; and

Actual harvest level – This indicates whether the actual harvest was above, at or below the established maximum sustainable harvest level. Harvest includes bycatch, both bycatch that is retained and that is 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.

In the case of stocks for which removal references have yet to be set, or the approved level is set above the removal reference based on other factors, the indicator measures whether

stocks are being harvested within levels⁶ 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 biology, economics and social aspects associated with a given stock.

Overharvest leads to a management response to avoid damage 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.

Rationale

Fish must be consistently harvested at or below established limits to avoid overfishing. Two types of harvest limits exist. In the past, annual harvest levels were set on the basis of scientific and economic information and in consultation with stakeholders with approval from the Minister of Fisheries and Oceans Canada.

For an increasing number of stocks, now a formal precautionary approach⁷ is 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 and harvest decision rules, etc).

Recent changes to the indicator

The data source for this indicator, the Fishery Checklist, has been revised over time to improve its usefulness as a management tool. In 2011, the Checklist and the set of major stocks considered were finalized for the period 2011–2014, allowing comparability between years.

The standard set of 155 stocks established in 2011 is now assessed through the Fishery Checklist and is planned for use until at least 2016 to ensure consistent reporting. All stocks meeting the criteria for *major stocks* in 2011 are included, and no additional stocks have been added. However, beginning in 2012, dogfish were moved from the large pelagic group to the groundfish group to be consistent with Integrated Fisheries Management Plans.

Checklist results were reviewed in 2014, and the criteria regarding classification of harvest relative to removal references were tightened. The number of stocks reported to have removal references cannot be compared among indicator reports in different years.

Data

Data source

Data were drawn from the Fishery Checklist version 4. The Fishery Checklist is an internal, self-diagnostic tool that provides a systematic review of progress on conservation and sustainable-use objectives. Different data are drawn from the same Checklist to generate the [Status of Major Fish Stocks](#) indicator.

⁶ Fisheries and Oceans Canada (2014) [Fisheries Management Decisions](#). Retrieved on 15 September, 2015.

⁷ Fisheries and Oceans Canada (2009) [A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#). Retrieved on 15 September, 2015.

Each year, Fisheries and Oceans Canada surveys how it manages major fish stocks. The results provide fisheries managers and others with comprehensive assessments of fish harvest rates, bycatch, ecological impacts, and stakeholder engagement, and include the impacts of commercial, recreational and Aboriginal 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.⁸

Spatial coverage

National, for all major fish stocks.

Temporal coverage

From 2011 to 2014, inclusive.

Data completeness

All 155 major stocks are included in the Fishery Checklist for the four years reported.

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](#),
- be highly migratory or be a transboundary stock that is internationally managed,
- have been assessed by [Committee on the Status of Endangered Wildlife in Canada](#) (COSEWIC) 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 Fishery Checklist is reported by April 1 for the previous year. The indicator is current to the end of 2014. 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.

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. 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.

⁸ Fisheries and Oceans Canada (2009) [Sustainable Fisheries Framework](#). Retrieved on 15 September, 2015.

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, gear used, seasons, stock assessments, and other factors.

Allowable harvest rates, whether or not a removal reference has been established, are determined by Fisheries and Oceans Canada based on science assessments, the condition of the stock, and economic and social considerations. The overall goal is always conservation, responsible and sustainable harvesting practices, and equitable distribution of the resource among user groups.

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 Fishery Checklist program was initiated in 2007. A number of changes have been made as the program has developed. In particular, the stocks included in the Checklist program have changed and questions have been revised. A standard list of stocks and checklist questions were established in 2011. Year-to-year comparisons are only possible for years between 2011 and 2014.

The Fishery Checklist is completed with the best available information. Given the challenges and expense of monitoring mobile fish in a large volume, comprehensive information is not always readily available.

The Fishery Checklist 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 for stocks 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.

Part 3. Annexes

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

Table A.1. Data for Figure 1. Number of major stocks harvested relative to approved levels, Canada, 2011 to 2014

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 ^[A] (number of stocks)
2011	68	71	16
2012	64	84	7
2013	64	87	4
2014	67	86	2

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. Major stocks were harvested above the removal reference and/or approved levels primarily in competitive fisheries or because of landings in other directed fisheries.

^[A] 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.

Source: Fisheries and Oceans Canada (2015) Fishery Checklist version 4.

Table A.2. Data for Figure 2. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2014

Stock group	Species included	At or below removal reference (number of stocks)	At or below other approved levels (number of stocks)	Above removal references of other approved levels (number of stocks)
Marine mammals	Whales, walrus	1	9	1
Groundfish	Halibut, rockfish, cod, flounder, hake, redfish, dogfish, haddock, lingcod, perch, plaice, pollock, sablefish, skate, thornyhead	18	28	0
Small pelagics	Herring, mackerel, whitefish, capelin, sardine, striped bass, gaspereau, eulachon	4	17	1

Stock group	Species included	At or below removal reference (number of stocks)	At or below other approved levels (number of stocks)	Above removal references of other approved levels (number of stocks)
Large pelagics	Tuna, shark, swordfish	3	1	0
Salmonids	Salmon, char, trout	13	4	0
Crustaceans	Crab, lobster, shrimp, prawn, krill	17	18	0
Molluscs	Clam, scallop, whelk, geoduck	8	8	0
Others	Sea cucumber, sea urchin, eels	3	1	0
Total		67	86	2

Note: The species in each stock group are listed with the chart data. 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 (2015) Fishery Checklist version 4.

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 15 September, 2015.

Fisheries and Oceans Canada (2009) [Management Methods](#). Retrieved on 15 September, 2015.

Fisheries and Oceans Canada (2009) [Sustainable Fisheries Framework](#). Retrieved on 15 September, 2015.

Fisheries and Oceans Canada (2015) [Fisheries Management Decisions](#). Retrieved on 15 September, 2015.

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 – Underwater World](#)

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