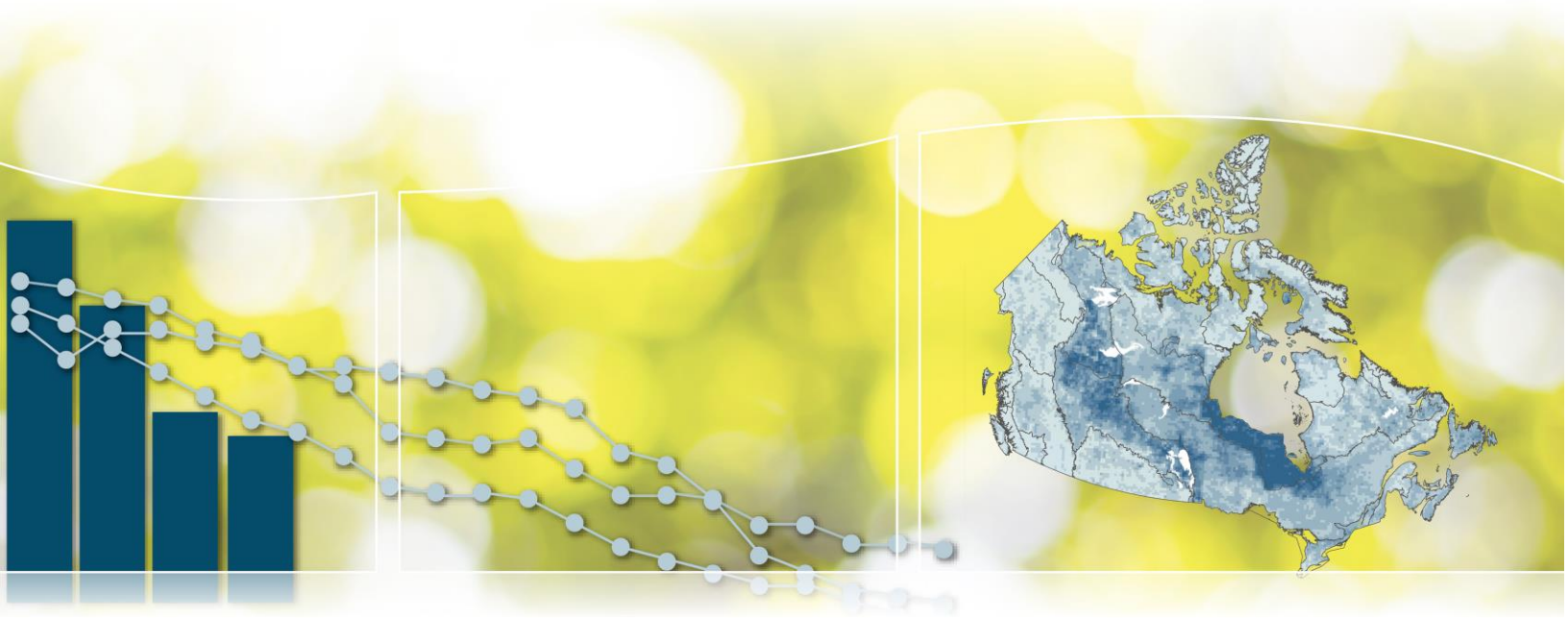
Environment and Climate Change Canada
Environnement et Changement climatique Canada

Canadian Environmental Sustainability Indicators

Sustainable fish harvest



Canada

Suggested citation for this document: Environment and Climate Change Canada (2019) Canadian Environmental Sustainability Indicators: Sustainable fish harvest. Consulted on *Month day, year*. Available at: www.canada.ca/en/environment-climate-change/services/environmental-indicators/sustainable-fish-harvest.html.

Cat. No.: En4-144/34-2019E-PDF
ISBN: 978-0-660-29982-2

Environment and Climate Change Canada
Public Inquiries Centre
12th floor, Fontaine Building
200 Sacré-Coeur boul.
Gatineau, QC K1A 0H3
Telephone: 1-800-668-6767 (in Canada only) or 819-938-3860
Fax: 819-938-3318
Email: ec.enviroinfo.ec@canada.ca

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Canadian Environmental Sustainability Indicators

Sustainable fish harvest

April 2019

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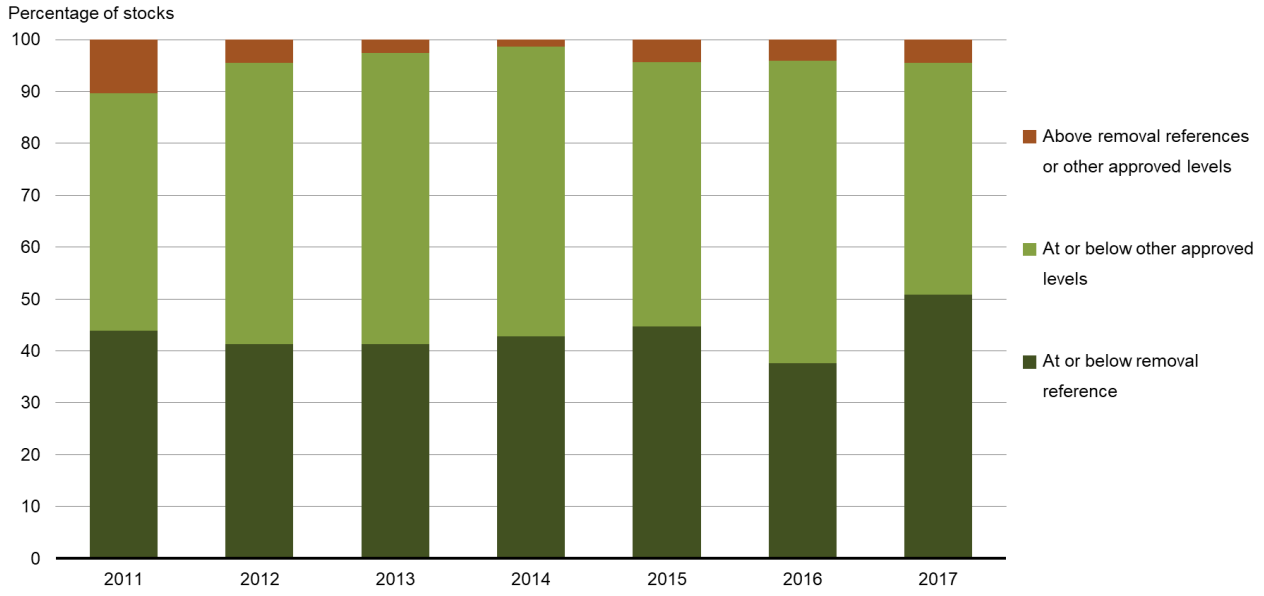
Sustainable fish harvest

Harvest limits for wild fish and other marine animals are set to protect these stocks for the future. This indicator reports the proportion of major stocks that are overharvested.

Key results

- Of the 179 major stocks assessed in 2017:
  - 171 stocks (96%) were harvested at sustainable levels
  - 8 stocks (4%) were harvested above approved levels
- From 2012 to 2017, the percentage of overharvested stocks has been consistently low

Figure 1. Harvest of major stocks relative to approved levels, Canada, 2011 to 2017



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. When removal references are not available, other approved levels are established. Comparisons between years should be made with caution as the list of major stocks has changed.
Source: Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries.

Overharvest means a stock has been harvested above its removal reference or other approved level. It is avoided through conservation and sustainable use policies. The key decisions in fisheries management are:

- how much of a stock should be harvested
- who should harvest

Harvest rates include all removals of fish by all types of fishing. Overharvesting can occur when fish are accidentally caught as bycatch (that is, caught unintentionally while fishing for another stock or size class) or if fishers exceed their quota.

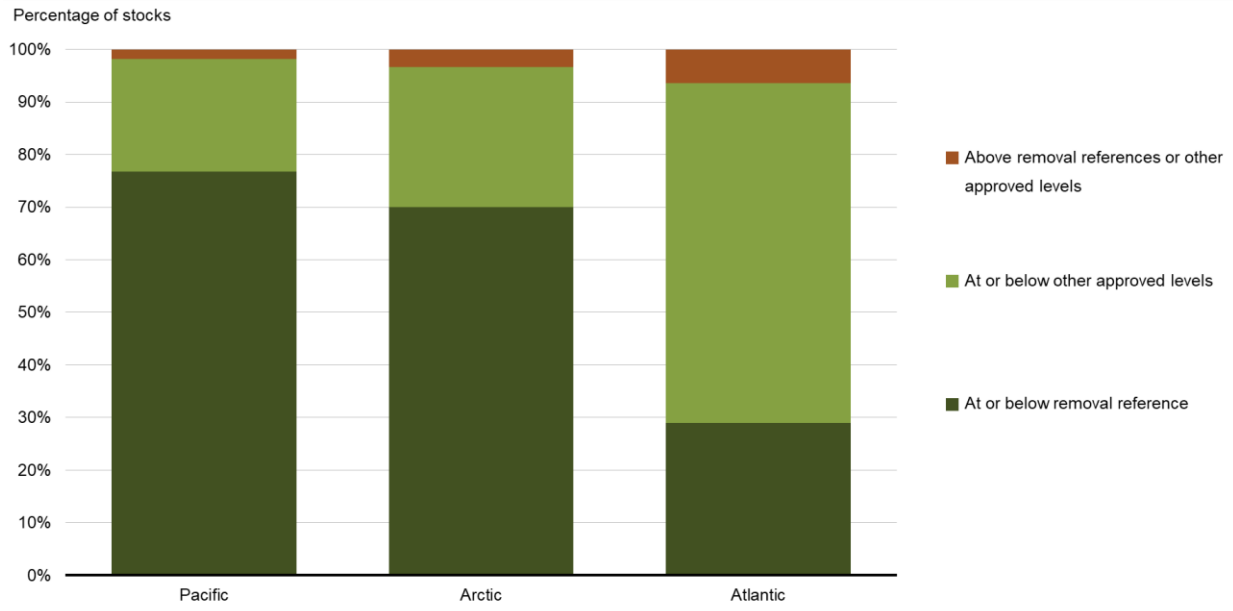
For the 8 stocks listed as overharvested in 2017:

- 1 stock was subject to quota reconciliation
- 1 stock was subject to a total allowable catch reduction for 2018
- 1 stock was listed as overharvested but within the expected variation in catch estimates
- 3 were listed as overharvested but within the total allowable catch, which was set above other approved harvest rates due to socio-economic considerations
- 2 stocks were listed as overharvested in the absence of approved harvest rates for those stocks

Harvest rates are reported against the removal reference baseline when it is known. A removal reference can be determined where there is sufficient historical data on stock productivity. Levels for stocks that do not have removal references are set using other scientific approaches.

Stocks can be divided into regions based on the Fisheries and Oceans Canada managing office. The Pacific and Arctic management regions have similar proportions of overharvested stocks (2% and 3%, respectively). The Atlantic management region had the highest proportion of overharvested stocks at 6%.

Figure 2. Harvest of major stocks relative to approved levels, by region, Canada, 2017



Data for Figure 2

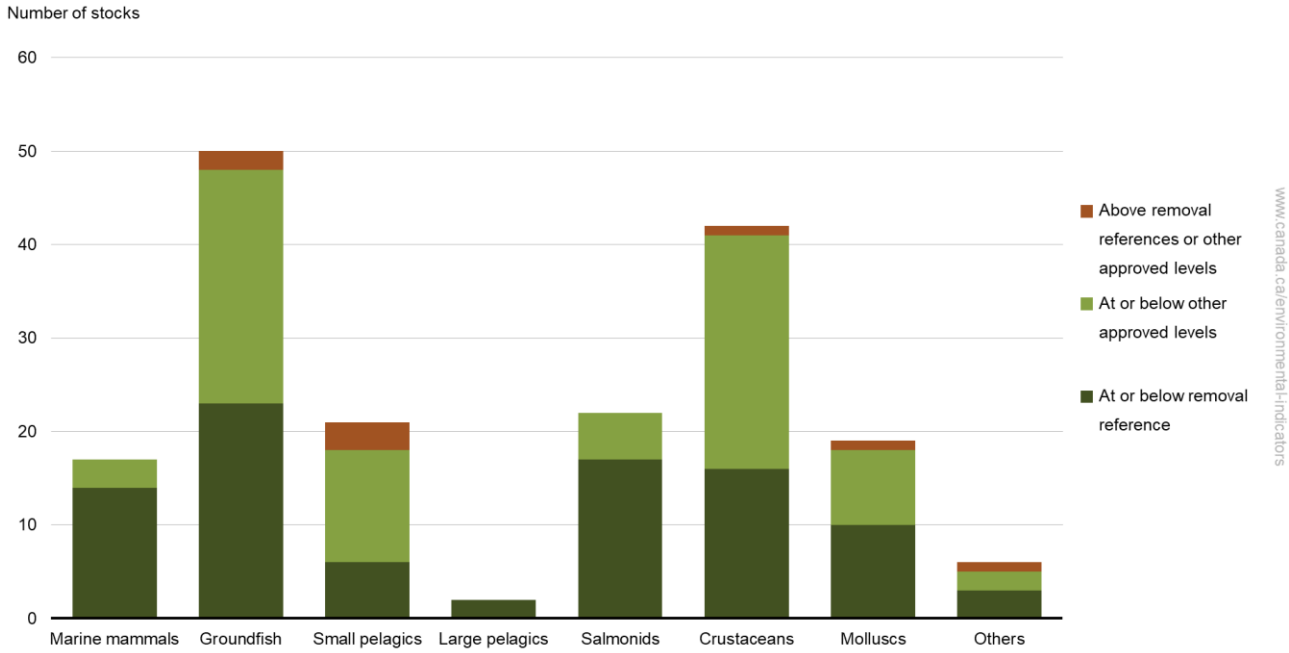
Note: Stocks managed from the central National office were allocated to Atlantic and Arctic regions as appropriate. The removal reference is a harvest rate that is estimated to be biologically sustainable, based on an analytical assessment of historical stock productivity data. When removal references are not available, other approved levels are established.
Source: Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries.

Sustainable fishing, by stock group

Key results

- Of the 8 stock groups, 3 had all stocks harvested within limits in 2017

Figure 3. Number of major stocks harvested relative to approved levels by stock group, Canada, 2017



Data for Figure 3

Note: The species or stock in each stock group are listed in the figure's data table. Pelagic fish live in midwater or close to the surface, in contrast to groundfish, which live in deeper waters. Crustaceans are shelled animals with joints, such as lobster, crab and shrimp. Molluscs are the species we commonly think of as shellfish, including bivalve species like clams, oysters and mussels.
Source: Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries.

Canada's major fish stocks have been grouped into 8 categories. 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 are species we commonly think of as shellfish, including bivalve species such as clams, oysters and mussels.

About the indicator

What the indicator measure

The 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. It is one measure of fishing pressure on wild fish stocks.

Why this indicator is important

The preservation of the ecological, social and economic value of fish stocks requires limiting harvest. Overfishing and other pressures can reduce the size and productivity of fish stocks and in the past have even led to their collapse. The harvest rate is the proportion of the stock that is taken from the water, either intentionally or as bycatch. Harvest rates must be adjusted to reflect changing conditions and to protect stocks for the future.

Healthy coasts and oceans

This indicator supports the measurement of progress towards the following 2016–2019 Federal Sustainable Development Strategy long term goal: Coasts and oceans support healthy, resilient and productive ecosystems. It supports the measurement of progress towards the target: By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches starting at 96% in 2015.

In addition, the indicator contributes to the Sustainable Development Goals of the 2030 Agenda for Sustainable Development. It is linked to the 2030 Agenda's Goal 14: Life Below Water and Target 14.4: "By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics."

It also contributes towards reporting on Target 9 of the 2020 Biodiversity Goals and Targets for Canada: "By 2020, all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem-based approaches."

Related indicators

The Status of major fish stocks indicator provides information on whether major stocks are in the healthy, cautious or critical zone.

Data sources and methods

Data sources

Data for 2015, 2016 and 2017 are from the annual Sustainability Survey for Fisheries (the survey). The survey replaces the Fishery Checklist, which was used from 2011 to 2014. The survey provides a systematic review of national progress towards conservation and sustainable-use objectives.

More information

The survey is conducted each spring and captures data for the previous year. The same survey supports the Status of major fish stocks indicator.

The data provide a qualitative snapshot of how a fishery is addressing a range of factors for sustainable management. The data also give an indication of progress in implementing sustainable fisheries policies. Fisheries managers and scientists include results from the most recent stock assessments in their response to the survey.

The survey includes major stocks used by commercial, recreational and Indigenous fisheries. A fish stock is a population of individuals of 1 species found in a particular area. It is used as a unit for fisheries management.

- Major stocks are identified by regional managers within Fisheries and Oceans Canada and include all stocks that meet at least 1 of the following criteria:
  - have an annual landed value greater than $1 million
  - have an annual landed weight greater than 2 000 tonnes
  - have an Integrated Fisheries Management Plan
  - are highly migratory or are a transboundary stock that is internationally managed
  - have been assessed by the Committee on the Status of Endangered Wildlife in Canada as being of special concern and are subject to a directed fishery
  - are deemed to be of regional significance
- Fish stocks include marine mammals, finfish, shellfish and other marine invertebrates.
- A year is defined based on fishing seasons and closures for individual stocks. It may not align exactly with the calendar year and may vary between stocks.

Methods

The indicator compares harvest rates with harvest limits. These limits are based on scientific information and provide a direct measure of whether we are managing the use of these resources within ecosystem limits.

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.

More information

The Sustainable fish harvest indicator classifies stocks based on 2 elements:

1. Approved harvest limit: this indicates the maximum sustainable harvest level established for a fish stock, and may be a removal reference or another approved level.
2. Actual harvest level: this indicates whether the actual harvest was above, at or below the approved harvest limit. Harvest includes all bycatch, whether it is retained or returned to the water.

Removal references and other harvest limits

A removal reference is the maximum acceptable removal rate for the stock. Harvest rates should not exceed the removal reference. All allowable harvest rates are based on scientific assessments, the condition of the stock, and economic and social considerations.

A removal reference is determined when there is sufficient historical data on stock productivity to allow the maximum acceptable removal rate to be estimated analytically. It is one element of a formal precautionary approach that uses a rigorous, risk-based analysis, common across stocks. In this approach, the harvest strategy for a fishery must contain a set of standard components including reference points, harvest decision rules, and other elements. Removal references vary with the stock's abundance and its location in the 3 stock status zones defined in federal policy (that is, Healthy, Cautious and Critical zones; see the Status of major fish stocks indicator for more information on stock status).

While most of the major stocks have had some components of the precautionary approach implemented (79%), only 29% of the major stocks have had all components fully implemented and 21% have not implemented any components. The number of removal references varies from year to year as they are reviewed.

For stocks where the removal reference has not been set, other approved levels are established by Fisheries and Oceans Canada. Approved levels are determined on the basis of the best available information and knowledge of the biological, economic and social aspects associated with a given stock.

All limits are determined using a precautionary approach. When scientific information is insufficient, decisions must still be made. The absence of adequate scientific information should not be used as a reason to postpone or fail to take action that prevents serious harm to the resource. According to the Food and Agriculture Organization, 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."

Harvest rates

The harvest rate, also called the removal rate, is the ratio of all human-induced removals to the total exploitable stock size. Each year, managers report whether the harvest rate is above or below the acceptable level.

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 current biomass is below its limit reference point.

Regional information

Regions are defined based on information from the managing office. Stocks managed from the Pacific regional office of Fisheries and Oceans Canada are assigned the Pacific region. Stocks managed from the Central and Arctic office are assigned to the Arctic region: this region contains some freshwater stocks. Stocks managed from the central National office were allocated to Atlantic and Arctic regions as appropriate. All remaining regional offices are assigned to the Atlantic region: Gulf, Maritimes, Newfoundland and Labrador, and Quebec.

Stock groups

Stock groups for reporting on this indicator are marine mammals, salmonids, groundfish, large pelagics, small pelagics, crustaceans (crab, lobster and shrimp), molluscs, and others. Pelagic fish live in midwater or close to the surface, in contrast to groundfish, which live in deeper waters. Crustaceans are shelled animals with joints, such as lobster, crab and shrimp. Molluscs are species we commonly think of as shellfish, including bivalve species such as clams, oysters and mussels. The same groupings are used in the Status of major fish stocks indicator.

Recent changes

The Sustainability Survey for Fisheries (the survey), previously called the Fishery Checklist, has been revised over time to improve its usefulness as a management tool. The Fishery Checklist was used from 2011 to 2014 and became the annual Sustainability Survey for Fisheries in 2015.

In 2011, the checklist and a set of 155 major stocks were finalized for the period 2011 to 2014, allowing comparability between years. The porbeagle shark was classified in the Critical zone in 2013 and the fishery was subsequently closed. The stock was therefore removed from the list in 2014, leaving a total of 154 stocks.

In 2015, the list of major stocks was revised to a total of 159:

- 3 snow crab stocks were merged (-2)
- 1 northern shrimp fishery was closed and the stock removed from the list (-1)
- 6 stocks (3 shrimp, 1 elver, 1 redfish and 1 witch flounder) were added (+6)
- Pacific ocean perch was split into 3 stocks (+2)

In 2016, the list of major stocks was revised to a total of 170:

- 2 lobster stocks were merged (-1)
- 3 stocks with no commercial fishery in 2016 (pink salmon, coho salmon, whelk) were removed from the list (-3)
- 3 salmon stocks (1 chum, 2 sockeye) were split into revised management units (+5)
- 10 commercially fished stocks (6 snow crab, 2 seal, 1 shrimp and 1 scallop) were added to the list (+10)

In 2017, the list of major stocks was revised to a total of 179:

- 4 Atlantic walrus stocks (West Jones Sound, Penny Strait-Lancaster Sound, Hudson Bay-Davis Strait and South and East Hudson Bay) were added (+4)
- 2 Greenland halibut stocks were merged (-1)
- 7 stocks (sea cucumber, Atlantic salmon, witch flounder, pink and spiny scallop, Pacific oyster, Fraser pink and common clam) were added (+7)
- 1 herring spawn on kelp stock was removed (-1)

The criteria for classifying harvest relative to removal references were tightened in 2015. Survey results are reviewed each year to track progress, gather information about major fish stocks and assist in setting priorities for improving fisheries management.

Caveats and limitations

Overharvest in a single year does not mean that a stock is harvested unsustainably. Rather, it leads to a management response. Stocks managed through quotas, for example, are subject to quota reconciliation, meaning that any overharvest of a stock in one year is deducted from the harvest limit established for the following year.

The Sustainability Survey for Fisheries (the survey) is completed with the best available information. Since the oceans are wide and deep, and fish move between habitats, their populations are difficult to monitor.

The survey summarizes information across a wide variety of species, management regimes, types of fisheries, geographic regions, and socio-economic contexts. Small changes in the set of surveyed stocks occur due to changes in the way stocks are assessed or managed. 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 for major stocks. Seaweeds and other aquatic plants are also excluded.

Resources

References

Fisheries and Oceans Canada (2009) A fishery decision-making framework incorporating the precautionary approach. Retrieved on December 10, 2018.

Fisheries and Oceans Canada (2018) Fisheries management decisions. Retrieved on December 10, 2018.

Fisheries and Oceans Canada (2018) Sustainable Fisheries Framework. Retrieved on December 10, 2018.

Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries. Retrieved on December 10, 2018f

Fisheries and Oceans Canada (2019) About the Sustainability Survey for Fisheries. Retrieved on January 22, 2019.

Related information

Aquatic species

Fisheries programs and initiatives

Integrated fisheries management plans

Fisheries management

Policy for Managing Bycatch

Sustainable fish and seafood

Annex

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 2017

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 (number of stocks)	Total (number of stocks)
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
2016	64	99	7	170
2017	91	80	8	179

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 the list of major stocks has changed.
Source: Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries.

Table A.2. Data for Figure 2. Harvest of major stocks relative to approved levels, by region, Canada, 2017

Harvest level	Pacific (number of stocks)	Arctic (number of stocks)	Atlantic (number of stocks)
At or below removal reference	43	21	27
At or below other approved levels	12	8	60
Above removal references or other approved levels	1	1	6

Note: Stocks managed from the central National office were allocated to Atlantic and Arctic regions as appropriate. 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. **Source:** Fisheries and Oceans Canada (2018) Sustainability survey for fisheries.

Table A.3. Data for Figure 3. Number of major stocks harvested relative to approved levels by stock group, Canada, 2017

Stock group	Species / stocks 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	Atlantic walrus, beluga, bowhead, grey seal, harp seal, narwhal	14	3	0
Groundfish	Cod, dogfish, flounder, haddock, hake, halibut, lingcod, ocean perch, plaice, pollock, redfish, rockfish, sablefish, skate, thornyhead, whitefish	23	25	2
Small pelagics	Albacore tuna, capelin, eulachon, herring, gaspereau, mackerel, sardine, striped bass	6	12	3
Large pelagics	Bluefin tuna, swordfish	2	0	0
Salmonids	Char, chum, north slope dolly varden, salmon, trout	17	5	0
Crustaceans	Crab, krill, lobster, prawn, shrimp	16	25	1
Molluscs	Clam, geoduck, scallop, oyster, whelk	10	8	1
Others	Eel and elvers, sea cucumber, sea urchin	3	2	1
Total		**91**	**80**	**8**

Note: Pelagic fish live in midwater or close to the surface, in contrast to groundfish, which live in deeper waters. Crustaceans are shelled animals with joints, such as lobster, crab and shrimp. Molluscs are the species we commonly think of as shellfish, including bivalve species like clams, oysters and mussels.
Source: Fisheries and Oceans Canada (2018) Sustainability Survey for Fisheries.

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