Environment and Climate Change Canada
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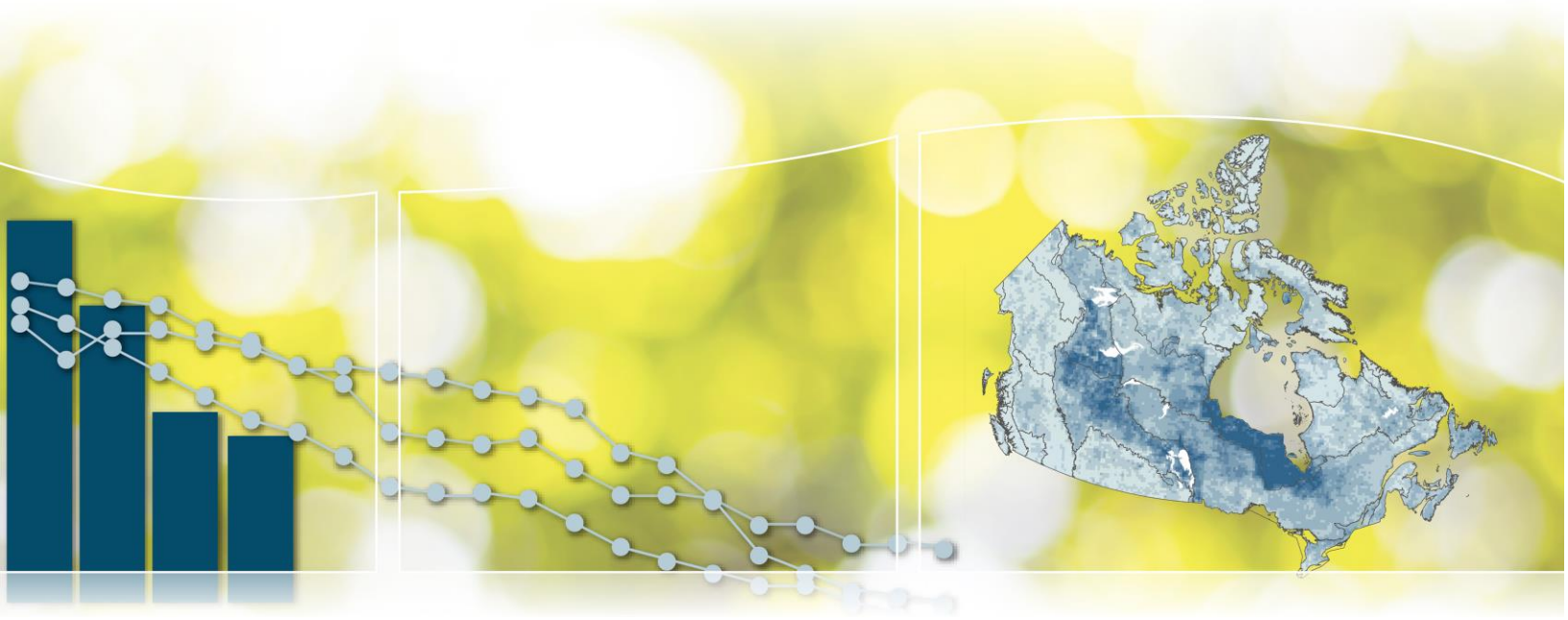
Canadian Environmental Sustainability Indicators

Sustainable fish harvest



Canada

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Sustainable fish harvest

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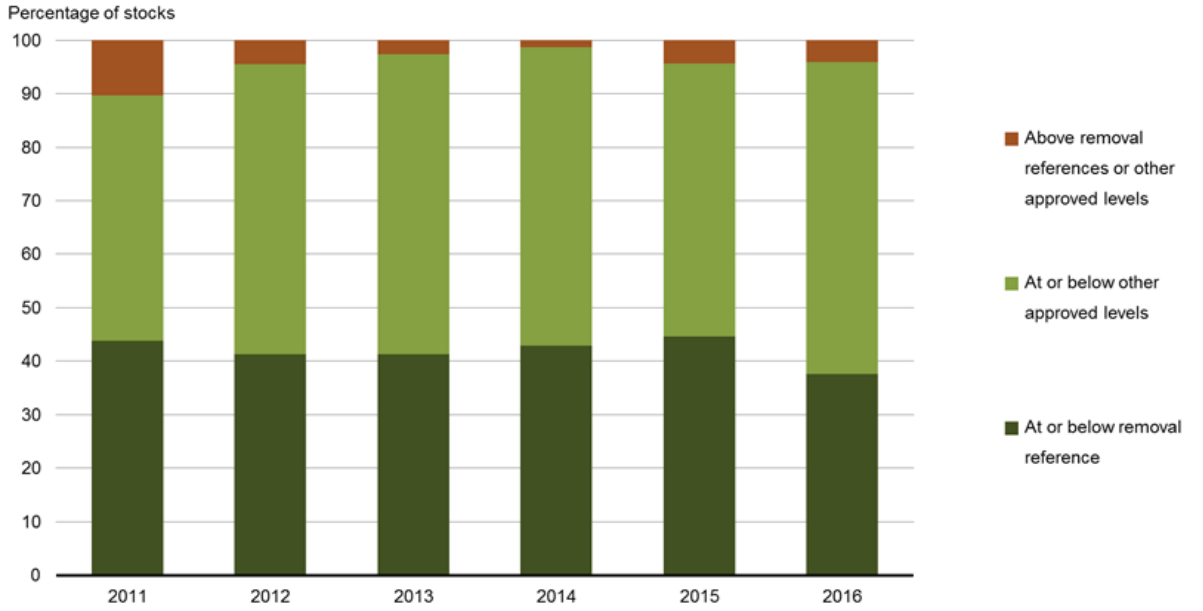
Sustainable fish harvest

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. When overharvesting occurs, action is taken to protect the stocks.

Key results

- Of the 170 major stocks assessed in 2016:
  - 163 stocks (96%) were harvested at sustainable levels
  - 7 stocks (4%) were harvested above approved levels
- From 2012 to 2016, the percentage of overharvested stocks has been consistently low

Figure 1. Harvest of major stocks relative to approved levels, Canada, 2011 to 2016



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 (2017) Sustainability Survey for Fisheries.

Overharvest means a stock has been harvested above its removal reference or other approved level. It is avoided through Sustainable Fisheries Framework 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.

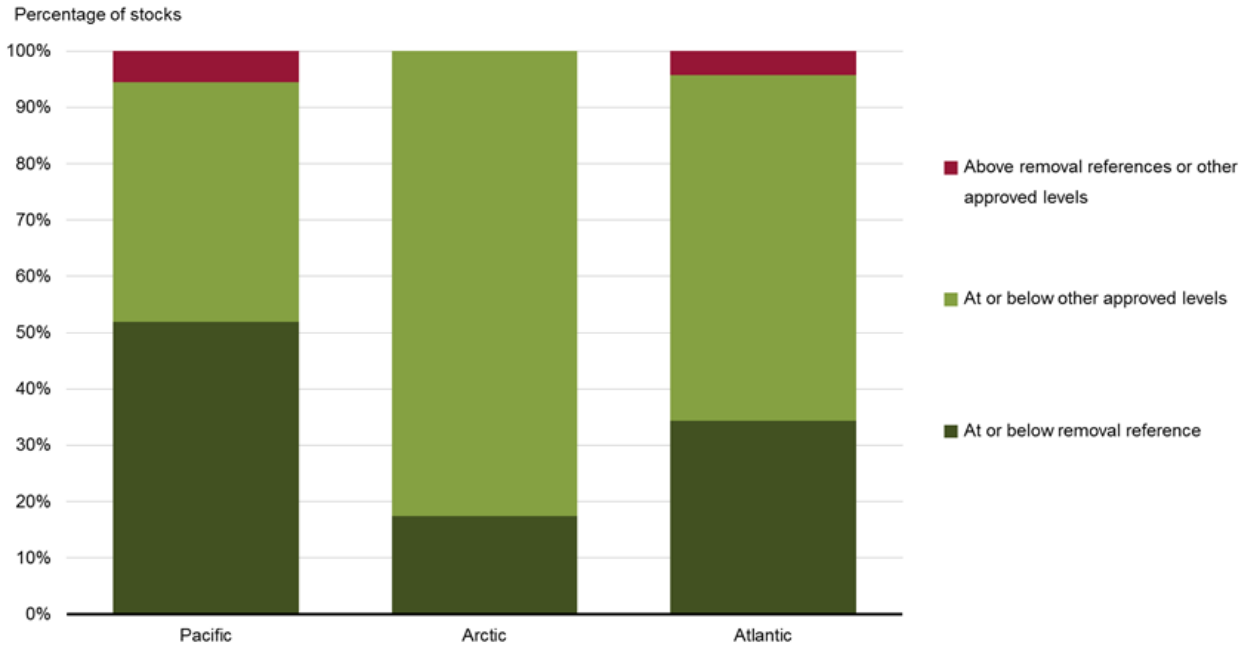
For 2 of the 7 stocks overharvested in 2016, quota reconciliation was applied. This means that the amount overharvested in 2016 was deducted from the harvest limit in 2017. For the others, specific

management actions were taken, such as restricting the allowable catch, season length, fishing areas and permitted gear.

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. In 2017, 68 stocks were assessed against a removal reference. Levels for the other stocks were set using other scientific approaches.

Stocks can be divided into regions based on the managing office. The Pacific and Atlantic management regions have similar proportions of overharvested stocks. No stocks were overharvested in the Arctic region.

Figure 2. Harvest of major stocks relative to approved levels, by regional management office, Canada, 2016



Data for Figure 2

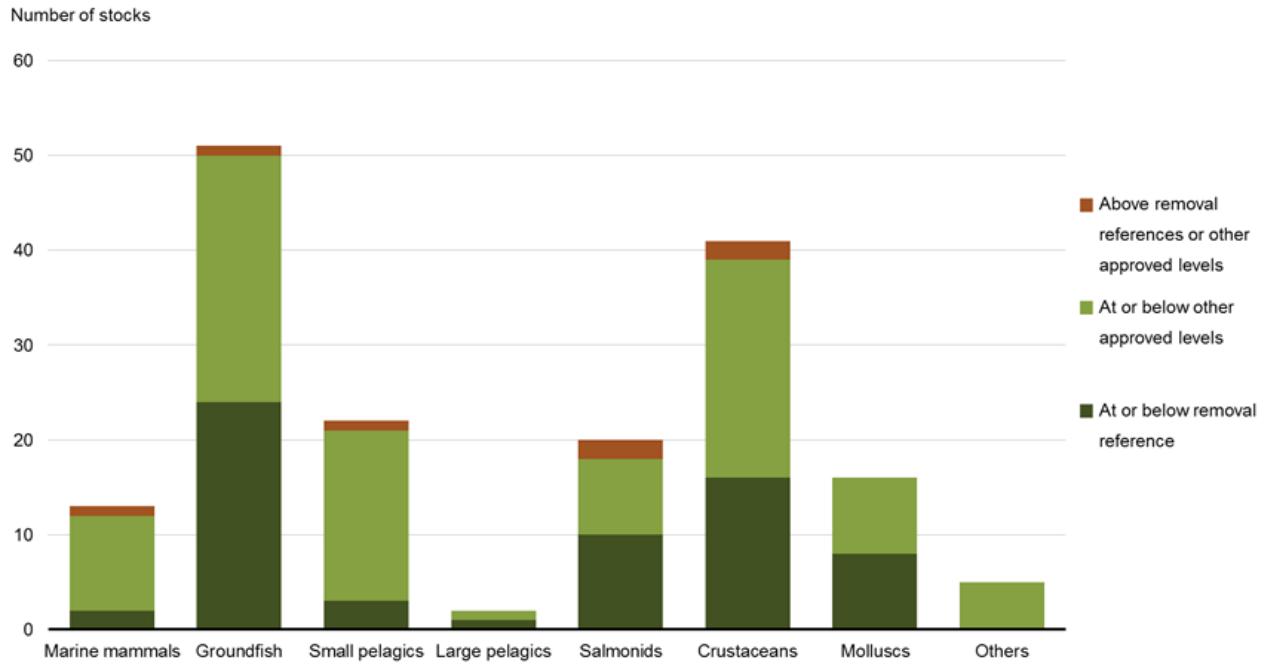
Note: Stocks managed from the central National office were allocated to Atlantic and Arctic regions as appropriate. The removal reference is a harvest rate that is estimated to be biologically sustainable, based on an analytical assessment of historical stock productivity data. When removal references are not available, other approved levels are established. Comparisons between years should be made with caution as the list of major stocks has changed.
Source: Fisheries and Oceans Canada (2017) Sustainability Survey for Fisheries.

Sustainable fishing, by stock group

Key results

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

Figure 3. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2016



Data for Figure 3

Note: The species 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 (2017) Sustainability Survey for Fisheries.

Canada's major fish stocks have been grouped into 8 categories based on their biology. Pelagic fish live in mid-water 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 measures

The indicators compare 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.

Related indicators

The Status of major fish stocks indicator provides information on whether major stocks are healthy, need to be managed with caution, or if they are at a critical level.

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.

Data sources and methods

Data sources

Data for 2015 and 2016 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 toward 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 one 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 two 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 established maximum sustainable harvest level. 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).

In 2016, 57 of the 170 major fish stocks (34%) had fully defined removal references, and a further 22 stocks (13%) had removal references defined for 1 or 2 stock status zones. Marine mammal stocks use potential biological removal indicators as removal references for the purposes of the indicator but, as these are not 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 (71%), only 34% of the major stocks have had all components fully implemented. 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 to prevent 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 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 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. Each group is comprised of 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.

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. 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, changes were made and the checklist became the annual Sustainability Survey for Fisheries. 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, additional changes were made to the survey. 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)

Survey results were reviewed each year from 2014 to 2016, and the criteria for classifying harvest relative to removal references were tightened in 2015.

A view of the information by region is now provided.

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.

The regional breakdown is based on the managing office, not the location of the stock, except in the case of the National office where stocks were allocated to Atlantic and Arctic regions as appropriate.

Resources

References

Fisheries and Oceans Canada (2009) A Fishery Decision-Making Framework Incorporating the Precautionary Approach. Retrieved on October 24, 2017.

Fisheries and Oceans Canada (2016) Fisheries management decisions. Retrieved on October 24, 2017.

Fisheries and Oceans Canada (2016) Sustainable Fisheries Framework. Retrieved on October 24, 2017.

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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 2016

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
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

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 (2017) Sustainability Survey for Fisheries.

Table A.2. Data for Figure 2. Harvest of major stocks relative to approved levels, by regional management office, Canada, 2016Figure 1. Harvest of major stocks relative to approved levels, Canada, 2011 to 2016

Harvest level	Pacific (number of stocks)	Arctic (number of stocks)	Atlantic (number of stocks)
At or below removal reference	28	4	32
At or below other approved levels	23	19	57
Above removal references or other approved levels	3	0	4

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. Comparisons between years should be made with caution as the list of major stocks has changed.
Source: Fisheries and Oceans Canada (2017) Sustainability Survey for Fisheries.

Table A.3. Data for Figure 3. Number of major stocks harvested relative to approved levels, by stock group, Canada, 2016

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	Whales, walrus	2	10	1
Groundfish	Halibut, rockfish, cod, flounder, hake, redfish, dogfish, haddock, lingcod, perch, plaice, pollock, sablefish, skate, thornyhead	24	26	1
Small pelagics	Herring, mackerel, whitefish, capelin, sardine, striped bass, gaspereau, eulachon	3	18	1
Large pelagics	Tuna, swordfish	1	1	0
Salmonids	Salmon, char, trout	10	8	2
Crustaceans	Crab, lobster, shrimp, prawn, krill	16	23	2
Molluscs	Clam, scallop, whelk, geoduck	8	8	0
Others	Sea cucumber, sea urchin, eel and elver	0	5	0
Total		**64**	**99**	**7**

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 (2017) Sustainability Survey for Fisheries.

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