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Data Sources and Methods for the Sustainable Fish Harvest Indicator

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1. Introduction

The Sustainable Fish Harvest indicator (www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=893AB9F4-1) is part of the Canadian Environmental Sustainability Indicators (CESI) program (www.ec.gc.ca/indicateurs-indicators/default.asp?lang=En&n=47F48106-1), 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 (www.ec.gc.ca/dd-sd/default.asp?lang=En&n=CD30F295-1).

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.¹ 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.² 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. Quota reconciliation is also implemented for most stocks, which provides that any overharvest of a stock in one year is deducted from the harvest limit established for the following year.

2. Description and rationale of the Sustainable Fish Harvest indicator

2.1 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

¹ Fisheries and Oceans Canada (2009) A Fishery Decision-Making Framework Incorporating the Precautionary Approach. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm.

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

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 levels³ established by Fisheries and Oceans Canada.⁴

Overharvest leads to a management response to avoid loss to fish stocks. Adjusting harvest limits is referred to as **quota reconciliation**, which provides that any overharvest of a stock in one year is deducted from the harvest limit established for the following year.

2.2 Rationale

Fisheries 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 consultation with stakeholders, and were approved by the Minister of Fisheries and Oceans Canada. For an increasing number of stocks, a formal precautionary approach⁵ 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.).

2.3 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.

A standard set of 155 stocks established in 2011 is now assessed through the Fishery Checklist and will be used until at least 2014 to ensure consistent reporting. All stocks meeting the criteria for "major stocks" in 2011 are included, and no additional stocks were added in 2012 or 2013. However, dogfish have been moved from the large pelagic group to the groundfish group to be consistent with Integrated Fisheries Management Plans.

Results of previous years have been reviewed, and the criteria regarding classification of harvest relative to removal references have been tightened. This has led to lower estimates of the number of stocks harvested within removal references.

3. Data

3.1 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 (www.ec.gc.ca/indicateurs-indicators/default.asp?lang=en&n=1BCD421B-1).

Fisheries and Oceans Canada surveys the management of major fish stocks each year. The results provide fisheries managers and others with comprehensive assessments of

³ Fisheries and Oceans Canada (2014) Fisheries Management Decisions. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/decisions/index-eng.htm.

⁴ 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.

⁵ Fisheries and Oceans Canada (2009) A Fishery Decision-Making Framework Incorporating the Precautionary Approach. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm.

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.⁶

3.2 Spatial coverage

National, for all major fish stocks.

3.3 Temporal coverage

The Fishery Checklist has been completed annually since 2007. Checklist questions have been refined over this time, so that data from before 2011 are not exactly comparable. Beginning in 2011, the Fishery Checklist was finalized and is being maintained for at least four years (2011–2014), allowing comparisons over time to be made.

3.4 Data completeness

All 155 major stocks are included in the Fishery Checklist for 2011 to 2013.

Major stocks are identified by regional managers 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 (www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/ifmp-gmp/index-eng.htm);
- 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) (www.cosewic.gc.ca/eng/sct5/index_e.cfm) as being of special concern and be 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.

3.5 Data timeliness

Data for the Fishery Checklist is reported by April 1 for the previous year. The indicator is current to the end of 2013. 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.

4. 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

⁶ Fisheries and Oceans Canada (2009) Sustainable Fisheries Framework. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/overview-cadre-eng.htm.

Fish Stocks indicator (www.ec.gc.ca/indicateurs-indicateurs/default.asp?lang=en&n=1BCD421B-1) for more information on stock status). With this approach, managers report whether the harvest rate is above or below the reference level.

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 (www.ec.gc.ca/indicateurs-indicateurs/default.asp?lang=en&n=1BCD421B-1).

5. 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 possible between 2011, 2012 and 2013 results, but not to previous years.
- 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.

6. References and further reading

6.1 References

Fisheries and Oceans Canada (2009) A Fishery Decision-Making Framework Incorporating the Precautionary Approach. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/fish-ren-peche/sff-cpd/precaution-eng.htm.

Fisheries and Oceans Canada (2014) Fisheries Management Decisions. Retrieved on 11 July, 2014. Available from: www.dfo-mpo.gc.ca/decisions/index-eng.htm.

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6.2 Further reading

Fisheries and Oceans Canada (2009) Resource Management. Retrieved on 11 July, 2014.
Available from: www.dfo-mpo.gc.ca/fm-gp/peches-fisheries/index-eng.htm.

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