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Commissioner of the Environment and Sustainable Development

DECEMBER

Chapter 4

A Study of Managing Fisheries for Sustainability

Office of the Auditor General of Canada

The December 2011 Report of the Commissioner of the Environment and Sustainable Development comprises The Commissioner's Perspective, Main Points—Chapters 1 to 5, an appendix, and six chapters. The main table of contents for the Report is found at the end of this publication.

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Chapter

4

A Study of Managing Fisheries for Sustainability

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A Study of Managing Fisheries for Sustainability

Main Points

What we examined

The federal government is responsible for managing seacoast and inland fisheries on behalf of all Canadians and for ensuring that these activities are conducted in a sustainable manner.

Based on principles of sustainable development that are generally accepted internationally, a sustainable fishery would support the current needs of society and of individuals engaged in the fishery and would be managed with a view to protecting the resource for future generations.

We conducted this study to identify the challenges of operating fisheries in a sustainable way; the key properties of sustainable fisheries; and the principles, responsibilities, and management practices involved in managing fisheries sustainably. We focused on marine fisheries, which in Canada include First Nations, commercial, and recreational users.

This document is not an audit report. For this reason, our observations should not be seen as an assessment of the federal government's current fisheries practices or performance. This study is a step toward identifying a framework and criteria for our future audits to determine whether fisheries management practices are supporting sustainable fisheries.

Why it's important

Fisheries account for about 15 percent of the animal protein directly consumed by humans, and the demand for fish is expected to grow. In 2010, however, the Food and Agriculture Organization (FAO) of the United Nations reported that 32 percent of fish stocks worldwide were overexploited, depleted, or recovering.

In Canada, fisheries contribute to the national and coastal economies, but they are also under pressure. Some major fish stocks have declined substantially in recent years, with dramatic economic and social consequences. Because of the complexity of marine ecosystems, it can be challenging to manage human activities against a backdrop of natural variability.

Organizations that manage fisheries have a difficult job. They oversee and regulate the harvesting of fish in the context of significant uncertainty. They need to make decisions so that fish will be available in the future to provide the food and jobs on which many people rely.

What we found

- A sustainable fishery helps sustain fish stocks, markets, fishers, and, in some cases, communities. The long-term sustainability of a fishery depends, in part, on respecting ecological limits identified through the use of reliable scientific information. Respecting these limits requires taking into account the ecosystems on which fish survival depends and uncertainties about how the ecosystem will change.
- One element of a sustainable fishery is a framework of clear roles and responsibilities that is appropriate to the size and importance of the fishery. The FAO and others have concluded that fisheries are at greatest risk when such a clear framework does not exist. An effective framework of clear roles and responsibilities built on accountability and transparency can reduce the risk that fishing activity will endanger the long-term ecological sustainability of fish stocks.
- Every fishery includes many stakeholders. Within the necessary framework, management practices to help achieve a sustainable fishery include establishing and clearly communicating the social, economic, and ecological objectives for the fishery in order to guide the decisions and conduct of all those involved in it. Sound management practices also entail developing, implementing, and evaluating fishery plans aimed at sustainability, but they provide no guarantee of future harvests.

Introduction

4.1 Recent experience, in Canada and elsewhere in the world, has shown that the ability of fisheries to meet future human needs cannot be taken for granted. In 2010, the Food and Agriculture Organization of the United Nations (the FAO) reported that 32 percent of fish stocks worldwide were overexploited, depleted, or recovering, compared to 10 percent in 1974. This situation threatens the incomes and food supply of people around the world. In 2008, the World Bank and the FAO estimated that the world economy could gain roughly $50 billion (US dollars) each year through improved management of fisheries.

4.2 In Canada, some major fish stocks have declined greatly in recent years. During the 1990s, most of Atlantic Canada's commercial groundfish **fishery** collapsed. The stocks fell to historic lows and have yet to recover, even though fishing has been severely limited (Exhibit 4.1). In April 2010, the Committee on the Status of Endangered Wildlife in Canada classified the four Atlantic cod populations as endangered. On the Pacific coast, the 2010 sockeye salmon run in the Fraser River was among the highest ever recorded, yet it followed dramatic declines in preceding years (Exhibit 4.2). It is not yet clear whether the 2011 run will revert to the previous declining trend.

Fishery

A fishery is an activity leading to harvesting of fish. It may involve capture of wild fish or raising of fish through aquaculture.

Source: Food and Agriculture Organization

4.3 These changes in harvest levels result from underlying changes in complex marine ecosystems combined with the impact of human activities. However, it has proved to be difficult to separate the roles of different factors, such as water temperature, availability of prey fish, long-term population cycles, and fishing activity. For example, Fisheries and Oceans Canada has recently focused its attention on the role of grey seals, which eat groundfish, in hampering the recovery of groundfish stocks in eastern Canada.

4.4 Beyond the ecological effects, changes in harvest levels can have profound economic and social consequences, especially in coastal communities and in First Nations that depend on the use of fish in their culture. In Atlantic Canada, the increase in shellfish harvests has in part replaced the groundfish losses, but questions are now being raised about how sustainable these shellfish fisheries are. Governments have had to pay high costs when the drops in fishery harvests were extreme. At the time of the groundfish collapse, Canada spent more than $3 billion over seven years on income support and adjustment programs for Canadians whose livelihoods were hurt by the collapse.

Groundfish

Groundfish are those species that are usually caught near the ocean bottom, including cod, haddock, pollock, redfish, halibut, flounder, and others.

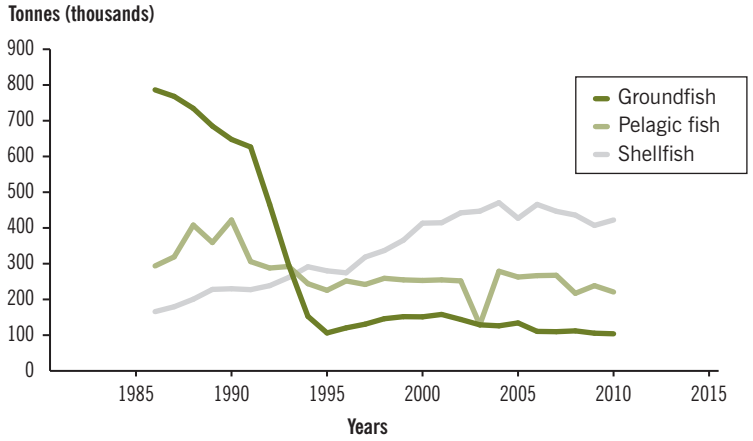
Pelagic fish

Pelagic fish live in midwater or close to the surface, and include salmon, herring, capelin, swordfish, tuna, and others.

Shellfish

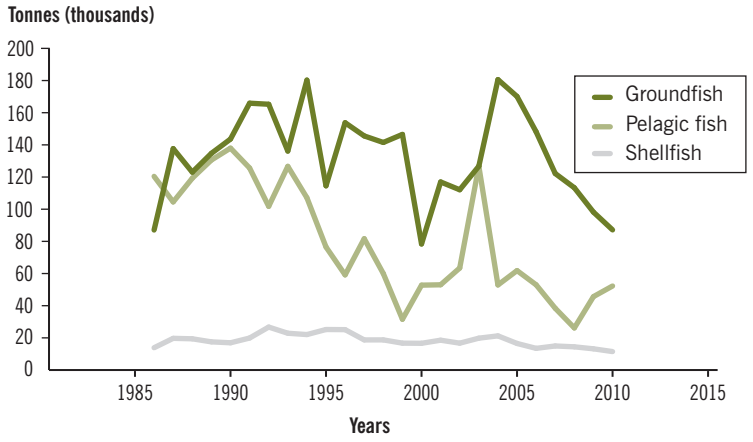
Shellfish include molluscs, such as oysters, and crustaceans, such as crab, shrimp, and lobster.

Exhibit 4.1 Commercial harvests of some major Atlantic Canadian fish stocks have declined since 1986



Note: Data for 2010 is preliminary
Source: Fisheries and Oceans Canada

Exhibit 4.2 Commercial harvests of some major Pacific Canadian fish stocks have declined since 1986



Note: Data for 2010 is preliminary
Source: Fisheries and Oceans Canada

4.5 Overall, in 2009 the fishing sector in Canada landed fish worth about $1.6 billion—a number that has been fairly constant over the last few years. The resulting export income was about $3.6 billion in the same year. Around 52,000 people were employed in harvesting fish in 2008, with another 28,000 people working in the fish processing industry.

4.6 Given that there can be significant fluctuations in some stocks and that there are risks that stocks could decline in the future, governments, fisheries managers, and other stakeholders need to put in place the governance arrangements (who is responsible for what) and management practices (how things are done) that will support the long-term sustainability of fisheries. Such arrangements and practices do not guarantee that fisheries will keep generating economic benefits indefinitely or that catches will be sustained at the desired levels, but do help create the conditions for sustainability over the long term.

Focus of the study

4.7 This study identifies the key properties of sustainable fisheries based on internationally accepted principles and experience, with an emphasis on the principles and lessons that would apply to Canada. We focused on the governance arrangements and management practices that support sustainable fisheries. We did not address inland fisheries or aquaculture but concentrated on marine fisheries, which in Canada include First Nations, commercial, and recreational users. This study is a step toward identifying a framework and criteria for our future audits to determine whether **fisheries management** practices are supporting sustainable fisheries. In this study, we refer to both fisheries managers working directly with fishers and to governments and senior officials providing strategic and policy direction.

Fisheries management

The integrated process of information gathering, analysis, planning, decision making, allocation of resources, and formulation and enforcement of fishery regulations by which the fisheries management authority controls the present and future behaviours of the interested parties in the fishery, in order to ensure the continued productivity of the living resources.

Source: Adapted from Food and Agriculture Organization

4.8 This document is not an audit report. For this reason, our observations should not be seen as an assessment of the current practices used by the federal government to manage fisheries or of its performance. Rather, we have identified some questions that Parliament may wish to consider given its roles of setting the legislative framework for managing fisheries and overseeing the activities of federal departments and agencies.

4.9 More details on the objectives, scope, and approach are in **About the Study** at the end of this chapter.

Observations

What are the sustainability challenges for fisheries?

4.10 The state of the world's fish stocks has highlighted the major environmental, economic, social, and organizational challenges that both governments and fisheries managers face when they seek to create the conditions for a sustainable fishery (Exhibit 4.3). Some of these challenges have been present since governments began to actively manage fisheries; others have emerged much more recently. Some challenges will cause problems that those responsible for managing fisheries must respond to; other challenges will create opportunities.

Exhibit 4.3 A sustainable fishery is defined in relation to current and future needs

The Canadian *Federal Sustainable Development Act* defines sustainable development as development that "meets the needs of the present without compromising the ability of future generations to meet their needs." This point leads to the question of how to define a sustainable fishery. The Food and Agriculture Organization has defined it in terms of "fishing activities that do not cause or lead to undesirable changes in the biological and economic productivity, biological diversity, or ecosystem structure and functioning from one human generation to the next." This and other similar definitions refer to the principles of sustainable development and how fisheries contribute to it. These concepts may also be expressed as follows:

- fisheries that support the current needs of people—those engaged in the fishery and society as a whole; and
- fisheries conducted in a manner that protects the interest of future generations.

In sum, a sustainable fishery helps sustain fish stocks, markets, fishers, and, in some cases, communities. This definition does not necessarily imply that there will be constant and stable levels of any of these elements.

4.11 **Environmental challenges.** Marine ecosystems display long-term trends and short-term fluctuations in a fluid three-dimensional environment. The changes in the physical aspects, such as temperature, and the biological aspects, such as species competing for the same food supply, mean that many influences on the number of fish available in a given year are outside of human control, and cannot be managed. For example, recent work by scientists at Fisheries and Oceans Canada suggests that snow crab populations go through a regular cycle every decade or so. As a result, fisheries managers may need to adjust the factors they can control—mainly fishing activity—as the ecosystem changes.

4.12 The vast expanses of oceans, the natural variation in fish populations, and the physical limits to understanding how marine ecosystems function mean that there will always be gaps in the

knowledge of fish stocks and how they fit into their ecosystems. The result of these limitations on scientific knowledge may be that some stocks are being harvested beyond the ecological limits, while other stocks might withstand higher harvests. The recent Census of Marine Life, led by an international group of scientists, made a major contribution to the understanding of fish stocks and where they migrate, but it also revealed scientists' lack of knowledge about many aspects of ocean ecology.

4.13 Targeted fish may be subject to overfishing; however, other fish and other species caught unintentionally (bycatch) or those indirectly affected by certain fishing methods may also suffer, for example, as a result of pulling fishing nets along the sea floor in sensitive areas. In some settings, these factors may greatly affect fish populations. For example, a recent audit of fisheries management in the Netherlands estimated that the bycatch was 57 percent of the total weight of fish caught. A 2011 report by the International Programme on the State of the Ocean concluded that overfishing and habitat loss were the main causes of biodiversity loss for marine ecosystems.

4.14 Fish stocks vary depending on naturally occurring conditions in marine ecosystems and in the linked rivers and estuaries. Studies now point to climate change as driving physical and biochemical shifts in the ocean environment at the global scale. The ocean is rising and, overall, is becoming warmer and more acidic. While some stocks may benefit from warmer water, these shifts may threaten the ecological viability of other stocks and may make it more difficult to estimate fish populations. The past is becoming a less reliable predictor of the future, which raises questions about estimates based solely on historical data and past trends.

4.15 Fish stocks may also be harmed by other human activities that take place in the ocean, such as offshore oil and gas exploitation. Activities on land have also degraded fish stocks through, for example, runoff of sediment from agricultural land. Those responsible for managing fisheries need to try to understand how fish stocks will be affected by such activities and recognize the cumulative pressures on the stocks that they manage.

4.16 In contrast, measures to protect endangered marine species may have positive impacts on commercial fish stocks. Fisheries and Oceans Canada has recommended that 96 aquatic species be classified as being at risk. They now are listed as such under the *Species at Risk Act*. An arm's-length advisory committee has identified a further 88 aquatic species as being at risk, but they have either not been listed or a listing

decision has not yet been made. In the cases where conservation measures have been put in place to protect such endangered species, species linked to them in the ecosystem may also benefit.

4.17 In Canada and in other countries, the creation of marine protected areas has received much attention lately. Research is under way to understand the effects of such areas on commercially harvested fish stocks. Studies have already shown the benefits of such protected areas for stocks that do not migrate long distances, such as shellfish.

4.18 **Economic challenges.** Those responsible for managing the fisheries must also take account of the economic aspects of the industries they are trying to manage. Some industries operate globally and market their products around the world. As a result, they may be affected by international economic trends and events that include increases in the price of fuel, the impact of foreign exchange rates on export markets, offshore oil spills in other countries, the increase in people's consumption of fish protein, and the increase of aquaculture production as a source of fish that competes with the wild fishery. In particular, the economic context for fisheries is shifting as a result of the global interest in eco-certification (Exhibit 4.4).

Exhibit 4.4 **Eco-certification of fisheries products creates new challenges for fishers and fisheries management**

Concerns about the state of the marine environment have led consumers, retailers, and export markets to demand evidence that fish products are legally caught and are derived from environmentally sustainable fisheries. Market-based initiatives, such as eco-certification, where third parties assess sustainability for fish products, as well as demands from other countries that products be traceable, are having an impact on fishers and fisheries management. More and more often, major seafood buyers and retailers in Europe, the United States, Canada, and elsewhere are asking for proof that products come from sustainable fisheries.

The northern prawn fishery in the Gulf of St. Lawrence is certified by the Marine Stewardship Council.

Major policy choices must be taken to respond to these new market realities. Certification has become a basic requirement for maintaining access in some markets, but the process may be expensive for fisheries managers and for fishers, both for the initial assessment and when maintaining certification. The Marine Stewardship Council, the leading organization offering this service, has certified 18 Canadian fisheries out of a total of 130 worldwide. Several others are being assessed.

Sources: Marine Stewardship Council and Fisheries and Oceans Canada

4.19 Governments and others responsible for managing fisheries have only a limited ability to control some of these economic forces. In Canada and in many other countries, fisheries managers have tried to reduce the capacity of national fishing fleets, seeking to bring fishing effort into line with the ability of the stocks to sustain the harvest. These approaches include economic incentives and schemes for governments to buy excess boats. Results, however, have been mixed. In some countries, financial subsidies have been one of the factors contributing to overcapacity: for example, in the form of fuel subsidies for fishing boats. Today, governments, including Canada, are applying other policy tools to encourage fishers to self-adjust as resources and economies fluctuate.

4.20 Governments may also make choices about the type and extent of financial support for different groups in the fishing sector. Managers may intervene in fisheries to promote or respond to new technologies. For example, better techniques for locating fish may increase the pressure on fish stocks because the existing boats will operate more efficiently. The effect may be similar to adding more fishing boats to the fleet.

4.21 **Social challenges.** Every fishery includes many stakeholders. While fisheries management is sometimes defined only in terms of managing a biological resource, it also has indirect effects on the processing industries that handle the products and on the coastal communities where the fishers and their families live. Because these communities rely socially and economically on fishing incomes, ministers may feel political pressure to increase harvest quotas, even when the stocks may be at risk. Or, communities may seek to have more of a say in how the fishery is managed or how access to the resource is distributed. Officials also need to work with those responsible for social policies, such as employment policies, to make sure that the overall government policy direction is coherent and consistent.

4.22 Because of the political and legal implications, one of the most difficult social challenges is allocating access to fish stocks. In Canada, as a result of the *Constitution Act, 1867*, the federal government has exclusive legislative authority for seacoast and inland fisheries. In tidal waters, in general, Parliament has exclusive jurisdiction over all aspects of fisheries management. Canada's fisheries are a common property resource to be managed for the benefit of all Canadians. As a result, the federal government must place limits on access to prevent overexploitation. The government must also decide how the access will be divided among the various stakeholders who have claims on the

resources. This means understanding the traditional uses of marine resources and where the potential conflicts are among different uses. In making decisions about these issues, the government must take account of principles of equity and constitutionally protected rights, such as the Supreme Court ruling that allowed some Atlantic fisheries to be used by Mi'kmaq and Maliseet First Nations.

4.23 Giving fishers or communities access to resources and allowing those access privileges to be traded can help to reduce overfishing. This approach may also motivate fishers to better manage their investments in boats and equipment, aligning fishing capacity with the health of the fish stocks. Long-term and stable access to the resource may help create a more stable business environment for fishers and may also encourage better stewardship of resources. Fishers with secure access to the fishery may adopt a culture of compliance and self-enforcement, and may be more inclined to pay the costs of managing the fishery. Several countries, including Canada, Australia, New Zealand, and Iceland, have experimented with different approaches to providing access rights to fisheries.

4.24 **Organizational challenges.** Governments and fisheries managers have changed their practices and approaches over the decades in response to these environmental, economic, and social challenges. Fisheries management organizations have also evolved in the way they carry out four core functions.

4.25 The uncertain environment in which management decisions are made leads to the first core function: obtaining and using evidence to manage the fishery. Inadequate information may result in overexploitation of fish stocks, or could lead to missed opportunities for economic benefits. Senior managers need to decide what kinds of and how much scientific research is required; how it complements other sources of information, such as traditional knowledge or monitoring programs; and what research may be needed in the future. For example, shifting from a narrow focus on what is happening to a single fish stock to a broader focus on understanding the main ecological limits will greatly increase the demands on scientists and the need for them to work together.

4.26 The second core function is making decisions related to how the fishery will be operated. After ministers make the political and legal decisions about who is eligible to participate in a given fishery, fisheries managers need processes for deciding which fish will be caught, how many will be taken, by whom, where, when, and using what equipment. These decisions are among the most powerful tools

available to managers to influence the direction and sustainability of the fishery. Fisheries managers need to design organizations based on answers to the following questions: Who should make which decisions? What is the appropriate process? Who participates in the decision making? For example, managers may rely on the analysis and judgment of fisheries scientists and other evidence to estimate how many fish can be caught from a given population.

4.27 The third core function is ensuring that fishers comply with legal and policy requirements. Fishing is largely done far from land, which makes this activity difficult and costly to observe and manage. Researchers in the United Kingdom and Canada estimated that illegal, unreported, and unregulated catches accounted for between 11 and 25 percent of the total global catch in 2003, which shows that effective enforcement is crucial if a fishery is to be sustainable. The estimated proportions for Canadian fisheries were lower, but the researchers highlighted the difficulty of making reliable estimates.

4.28 The last core function is setting priorities and budgets to carry out the other functions effectively. Each of the other functions may involve major financial commitments. In the current Canadian federal context, for example, this situation creates a further challenge of setting budget priorities and managing with constrained resources. It also implies deciding in which situations other parties should bear the costs or users should pay.

What issues were observed in the past?

4.29 Over the last 14 years, the Office of the Auditor General has examined several aspects of fisheries management in Canada (Exhibit 4.5). We have reported several observations and recommendations related to the sustainability of fisheries. The key concerns we have noted in these past chapters include the following:

Environmental:

- a lack of progress on putting marine protected areas in place;
- declining health and quality of the marine environment, including, in some cases, declining harvests;
- the need to take a precautionary approach to harvest levels;

Economic:

- slow and ineffective management of overcapacity in the fishing fleet;

Governance arrangements:

- an unclear division of responsibilities with the provincial governments and with industry partners;
- missed opportunities to involve fishers in management decisions about the fishery resource;

Monitoring and enforcement:

- poor monitoring of fish habitat;
- gaps in monitoring, control, and surveillance;
- inadequate enforcement mechanisms;

Legislation and policy:

- legislation that is not consistent with current demands;
- unclear management objectives, without specific results being described;
- very slow progress on integrated ocean management, including managing the trade-offs between conflicting uses; and
- no clearly stated policy for sustainable fisheries.

Exhibit 4.5 The Office of the Auditor General has released several reports that examine how fisheries are managed

Year	Report title
2009	Protecting Fish Habitat
2005	Fisheries and Oceans Canada—Canada's Oceans Management Strategy
2004	International Environmental Agreements
2004	Fisheries and Oceans Canada—Salmon Stocks, Habitat, and Aquaculture
2000	Fisheries and Oceans—The Effects of Salmon Farming in British Columbia on the Management of Wild Salmon Stocks
1999	Fisheries and Oceans—Pacific Salmon: Sustainability of the Fisheries
1999	Fisheries and Oceans—Managing Atlantic Shellfish in a Sustainable Manner
1997	Fisheries and Oceans Canada—Pacific Salmon: Sustainability of the Resource Base
1997	Fisheries and Oceans Canada—Sustainable Fisheries Framework: Atlantic Groundfish
1997	Fisheries and Oceans Canada—Rationalization and Renewal: Atlantic Groundfish

4.30 Parliamentary committees have endorsed many of our recommendations and have conducted their own investigations of several fisheries. External commissions have also examined fisheries management in Canada. The most recent one is the commission of inquiry into the decline of sockeye salmon in the Fraser River.

4.31 The federal government's approach to managing fisheries has evolved over these 14 years. For example, the government has released new policy statements for Atlantic fisheries and for wild salmon on the Pacific and Atlantic coasts, as well as other conservation policies under an umbrella Sustainable Fisheries Framework. In this study, we have not assessed the progress the federal government has made in response to our past findings and recommendations. Our past findings do, however, reinforce the practical challenges that fisheries managers in Canada have faced.

What are the principles for managing fisheries sustainably?

4.32 Based on our review of the literature, the key principles to help achieve a sustainable fishery fall into two related groups: effective governance arrangements and principles of good management. By a governance arrangement, we mean the legal and authority relationships among the parties, the responsibilities for decisions and action, and the mechanisms for accountability. Also, two specific principles deserve to be looked at in detail: the ecosystem approach and the precautionary approach. In our view, fisheries managers can apply these principles to both the long-standing challenges and the emerging issues.

Effective governance arrangements provide a foundation for sustainability

4.33 As we analyzed international guidance documents and other relevant sources, we found that to achieve a sustainable fishery, a governance framework that is appropriate to the size and importance of the fishery is essential. The Food and Agriculture Organization (the FAO) and others have concluded that fisheries are at greatest risk when governance is weak or absent. If governance arrangements are good, then preferred policy outcomes are more likely to be achieved. An effective governance framework can reduce the risk that fishing activity will endanger the long-term ecological sustainability of fish stocks.

4.34 **Create international governance arrangements.** For fisheries, governance arrangements are set at the international, national, and local levels. A complex system of legally binding and non–legally binding instruments has been put in place to govern and guide the

management and exploitation of marine resources internationally (Exhibit 4.6). Canada has adopted all relevant international agreements.

Exhibit 4.6 Canada has supported several international agreements and undertakings related to fisheries

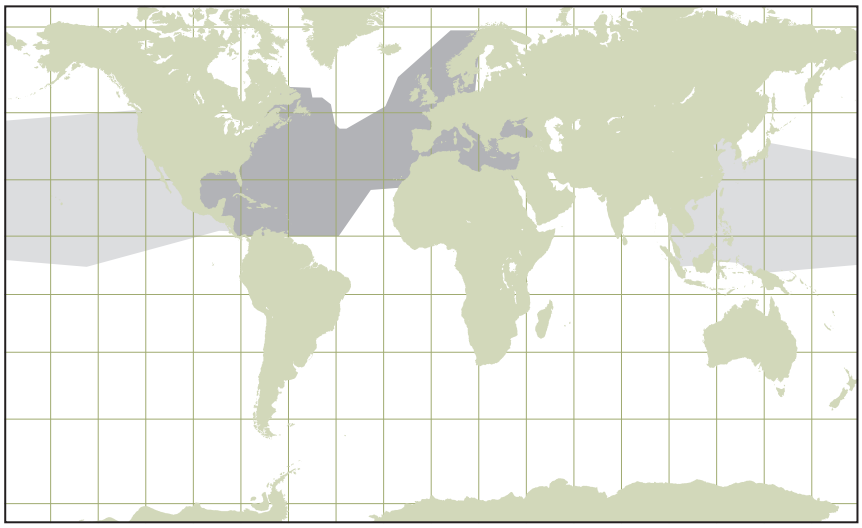
Among other things, the international agreements or undertakings that Canada has signed or committed to provide for

- a framework for international oceans governance, which includes fisheries;
- the rights and responsibilities of nations for using the world's oceans, and guidelines for managing marine natural resources;
- an exclusive economic zone, extending 200 nautical miles from a nation's shores, within which states have exploitation rights for all natural resources;
- a new management approach to sustainable development of the oceans that integrates the views of different sectors and disciplines, and establishes marine protected areas;
- an expectation that nations manage their fish stocks sustainably;
- the obligation to use the ecosystem approach and the precautionary approach, including reference points and harvest decision rules, when managing fisheries;
- the maintenance or restoration of fish stocks to levels that can produce the maximum sustainable yield. For depleted stocks, achieving this goal should be an urgent matter and, where possible, should be achieved no later than 2015;
- the implementation of the 1995 FAO Code of Conduct for Responsible Fisheries, relevant international plans of action, and FAO technical guidelines; and
- the prevention of illegally caught fish from entering international markets.

4.35 Fisheries managers also need agreements to manage fish stocks that cross national boundaries. The United Nations Agreement on Straddling and Highly Migratory Fish Stocks sets out a framework for conserving and managing such stocks in high seas areas: that is, in areas outside of national jurisdiction. In Canada, Grand Banks groundfish stocks are examples of stocks that straddle the boundary of Canada's exclusive economic zone, while bluefin tuna is a stock that migrates through fisheries waters in Atlantic Canada (Exhibit 4.7). These stocks are regulated by regional fisheries management organizations (RFMOs), which bring together representatives of the different countries involved in the fisheries.

4.36 In many ways, the role of RFMOs is similar to the roles of the organizations in charge of national fisheries management, such as Fisheries and Oceans Canada. However, some differences in governance, such as how RFMOs make decisions, mean it is difficult for them to manage the stocks sustainably. In recent years, some academics and non-governmental environmental organizations have criticized the

Exhibit 4.7 Bluefin tuna migrate across the Atlantic Ocean



Note: Shaded ocean areas are the regions through which bluefin tuna migrate.
Source: Food and Agriculture Organization

performance of RFMOs, pointing to governance and accountability issues and to the lack of adequate protection for the stocks that RFMOs manage. Critics have also noted the high percentage of stocks under RFMO management that are being depleted or overexploited.

4.37 Establish national governance arrangements. Within countries, legislation and policy create the direction, the governance relationships, and the principles for managing fisheries. Because the social, economic, and environmental factors affecting fisheries are complex and vary by location, fisheries management organizations in different countries do not apply an identical, uniform approach. However, according to the FAO, nations should include in their fisheries legislation the requirements from international agreements and the legislative framework to achieve the agreed upon objectives for fisheries.

4.38 In Canada, for example, the responsibility for seacoast fisheries rests with the federal government. It is charged with setting up the legal, social, and economic arrangements used to manage fisheries within Canada's exclusive economic zone, such as how rights to use the fishery are allocated and how decisions are to be made and enforced. These arrangements include the roles of fisheries management organizations at the federal, provincial, and territorial levels, and the division of responsibilities in **co-management** relationships.

Co-management

A process of management in which government shares power with resource users, with each given specific rights and responsibilities relating to information and decision-making.

Source: Organisation for Economic Co-operation and Development

4.39 **Establish clear lines of accountability.** Based on earlier work, our Office concluded that five essential elements underlie any type of accountability relationship:

- clear roles and responsibilities,
- clear performance expectations,
- expectations balanced with capacity,
- credible reporting, and
- reasonable adjustment and review.

4.40 In Canada, the Minister of Fisheries and Oceans and the federal government are legally responsible and politically accountable for marine fisheries, answering questions about stewardship of these resources within the Parliament of Canada. Many people are involved in guiding and supporting fisheries management: senior managers, fisheries managers, scientists, and enforcement officials. As stakeholders become more involved, or when resources are co-managed, others outside of government share in governing the fishery. Fishers may also be held individually and collectively accountable through the allocation of rights and through monitoring, control, and surveillance activities.

4.41 Open and well-documented decisions can also help in terms of promoting acceptance and compliance, especially in an environment of uncertainty and when trade-offs need to be made. In our December 2002 Report, we spoke about transparency:

> Transparency is essential to accountability, making it easier for those outside government to monitor and challenge the government's performance for consistency with policy intentions, for fairness, for propriety, and for good stewardship. The prospect of scrutiny also helps keep Ministers and managers of public programs (public servants as well as their partners in program delivery) attuned to the defensibility of their actions.

4.42 In the end, fishery resources are managed on behalf of all Canadians. Therefore, even though arranging accountability for the fishery is complex, Canadians have the right to know how well fisheries are being managed.

Good practices can strengthen fisheries management

4.43 Flowing from the governance framework that spells out who is responsible for what, the management practices describe how things are done. One widely used way of organizing management practices is the "plan-do-check-improve" cycle. We have highlighted a few key practices.

4.44 **Set clear, long-term objectives.** Fisheries managers set policies and objectives based on the social, economic, and environmental issues that fisheries face. Broad objectives or long-term policy goals that cut across several fisheries can be broken down into the operational objectives that can then guide all who are involved in each individual fishery. These objectives need to be defined and communicated clearly. In the United States, managers have set operational objectives for each of the 88 stocks that were overfished or subject to overfishing in 2010.

4.45 The long-term economic and social sustainability of a fishery depends on identifying the key ecological objectives and ensuring they are met. This means, among other things, conducting appropriate scientific studies and acquiring appropriate fisheries data to determine the ecological limits, and then clearly communicating the results to management and stakeholders. Respecting the ecological limits is central to the precautionary approach (see paragraph 4.54). In practice, it may be more difficult to spell out explicit economic and social objectives, especially ones that are consistent with the ecological limits.

4.46 **Establish suitable plans.** National fisheries managers need the mandate and capacity to develop and implement the management functions set out in legislation and policy. Fishery planning processes need to include the following elements:

- adequate financial resources and the right numbers and types of skilled people to carry out the mandate;
- the ability to carry out the science necessary to understand the status, trends, and cause-and-effect relationships affecting fisheries resources and the related uncertainties; and
- a good understanding of the social and economic dynamics of the fishery.

These plans will include specifying the total catch and how that total catch is allocated. As noted above, these decisions may have the biggest influence on the direction and sustainability of a fishery.

4.47 **Include stakeholders in the planning process.** International experience shows that having stakeholders actively involved in fisheries planning contributes to effective governance and means that they will be more likely to understand, accept, and endorse the results. A 2004 Fisheries and Oceans Canada policy document noted: "Fisheries management decision-making processes must be seen to be fair, transparent and subject to clear and consistent rules and procedures." Stakeholders can take part through data collection, knowledge gathering, collaborative research, option analysis, decision making, and other aspects of running the fishery. A 2009 study by a team of international fisheries experts surveyed management practices in all coastal countries and concluded that a participatory and transparent process for converting scientific advice into policy was a key factor in influencing whether a fishery was sustainable.

4.48 **Adequately control fishing activity.** Fisheries managers need to exercise control over the activities of fishers in a way that is adapted to the fishery resource and its socio-economic situation. Managers need to track fishing activity to ensure that participants are following legislation, conditions of access, and approved management measures. This tracking needs to be complemented by enforcement—the inspection, investigation, and legal processes to enforce legislation and fishing plans. In the end, successful control is partly determined by how well participants comply and partly by how much it costs managers to achieve the desired level of compliance. For example, the use of independent observers on fishing boats to monitor the bycatch of sea turtles in the tuna fishery is costly, which limits how much this method of ensuring compliance can be used. Consequently, it might be necessary to use complementary methods to promote compliance.

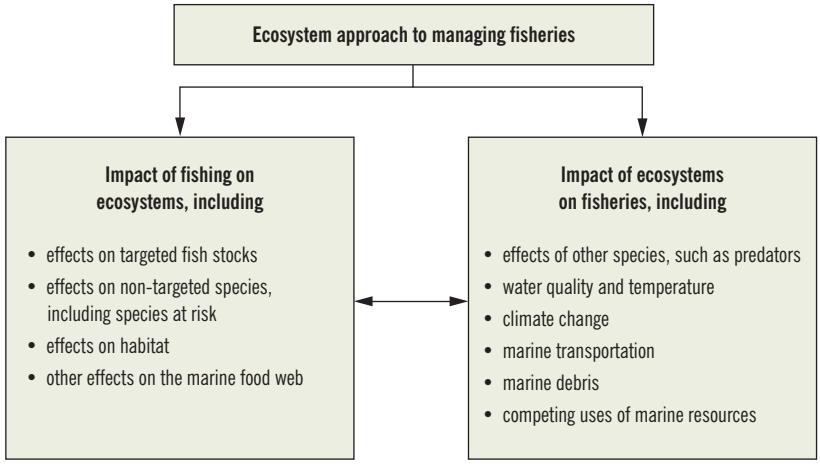
4.49 **Evaluate whether objectives have been achieved.** Managers need to evaluate whether the objectives of the fishing plans have been met. They can evaluate their success by drawing on the information collected from scientific studies, monitoring, and surveillance, and by using the information supplied by fishers themselves. High-quality and timely data can inform scientists when they determine the status of fish stocks. These data can support fisheries managers when they decide on resource use and eventually evaluate how effective fisheries plans are. Managers will typically need to integrate environmental, economic, and social information that may have been collected for different purposes. Fisheries managers can adjust fishing plans according to the results from monitoring systems and evaluations if adjustments are needed to respond to changing circumstances.

4.50 One closely related question is whether a stock is being fished sustainably. The National Oceanic and Atmospheric Administration in the United States has developed a Fish Stock Sustainability Index as an indicator of ecological sustainability; results are reported quarterly. The index reflects the Administration's view of what factors should be considered, including stock status, extent of overfishing, and production at the maximum sustainable yield. In Canada, a broader range of factors is included in a similar checklist. Similarly, the Food and Agriculture Organization of the United Nations prepares reports on the status of fish stocks using categories such as underexploited, fully exploited, overexploited, depleted, or recovering from depletion. These reports also inform readers about the ability of the stock to provide ongoing social and economic benefits.

The ecosystem approach recognizes that fisheries are part of broader natural systems

4.51 Over the last two decades, all important international fisheries agreements, starting with the United Nations Agreement on Straddling and Highly Migratory Fish Stocks, have called for an ecosystem approach to managing fisheries. The ecosystem approach goes beyond the usual focus on targeted fish stocks to consider the sustainability of non-targeted species, habitats, and ecosystems affected by fishing and other activities (Exhibit 4.8). The aim is to ensure that future generations will benefit from all of the goods and services that marine ecosystems can provide. The ecosystem approach to fisheries is a way to move toward sustainable development of fisheries.

Exhibit 4.8 The ecosystem approach to managing fisheries requires considering many factors



Source: Fisheries and Oceans Canada

4.52 This approach has three major implications for managing fisheries:

- Managers will seek to avoid overfishing targeted species and will ensure that depleted stocks are rebuilt.
- Managers will try to minimize the impact of fishing on non-targeted species and habitat, taking into account how species interact. This practice will require a fuller understanding of the ecosystems where fisheries operate, with a greater demand for scientific analysis. Because of the greater complexity of interactions, there may be more uncertainty associated with the resulting scientific advice.
- Compared to conventional fisheries management, a broader range of users of ocean resources, such as tourism, transportation, mineral extraction, and energy production, will participate in decision making, possibly involving new forums for discussion.

4.53 While experts have written about ecosystem considerations for some time, international acceptance of an ecosystem approach to fisheries is fairly recent. Fisheries organizations around the world are beginning to apply the policies and assign the resources needed to put in place such an approach. In Canada, for example, a range of additional tools is being used, including those focused on managing oceans, managing habitat, and protecting species at risk. One key step will be setting out the details of the expected ecological, social, and economic outcomes and integrating them into existing management processes.

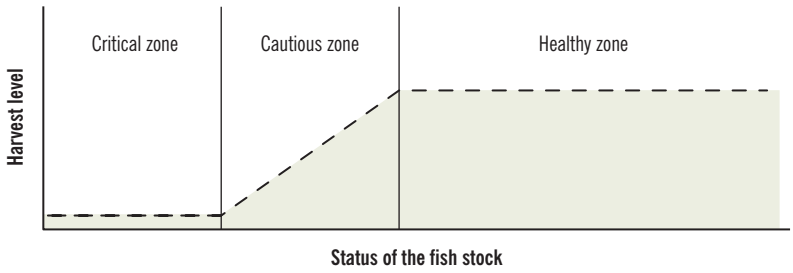
The precautionary approach provides a way to manage uncertainty in fisheries

4.54 Even where much is known about a fish stock, managers make decisions about how to use the resource in the face of uncertainty. Marine ecosystems fluctuate naturally and are affected by fishing and other human activities. As a result, their behaviour is generally not easy to predict. For example, in 2009 and 2010, the returns of sockeye salmon on the Pacific coast fell outside of the ranges that scientists had predicted—one on the low side and one on the high side. To avoid negative and possibly irreversible results, such as overexploiting a fish stock, managers adopt a precautionary approach. This means relying on the best available information, anticipating the possible outcomes, and selecting the harvest rules and conservation measures to avoid the undesirable outcomes. The choice of responses will depend on the degree of uncertainty, the reversibility of any impacts, and the costs linked with possible mistakes.

4.55 By signing the United Nations Agreement on Straddling and Highly Migratory Fish Stocks, the federal government has committed to use the precautionary approach in managing these kinds of stocks. In effect, Canada has also agreed to use the precautionary approach for domestically managed fish stocks.

4.56 In practice, the precautionary approach involves classifying the status of a fish stock based on the scientific analysis of biological indicators, such as the estimated total weight of fish or the number of fish available to spawn. A stock may be classified as in the healthy, cautious, or critical zone (Exhibit 4.9). Decision rules set out in advance what harvests will be allowed in the different zones and what management actions will be taken to respond to the assessed status of the fish stock. As part of this approach, managers need to decide how much precaution is required and under what circumstances.

Exhibit 4.9 The precautionary approach helps managers make decisions despite uncertainty



Note: The boundary between the critical zone and the cautious zone is known as the limit reference point. The boundary between the cautious zone and the healthy zone is known as the upper stock reference point.

Source: Adapted from Fisheries and Oceans Canada

What are the properties of a sustainable fishery?

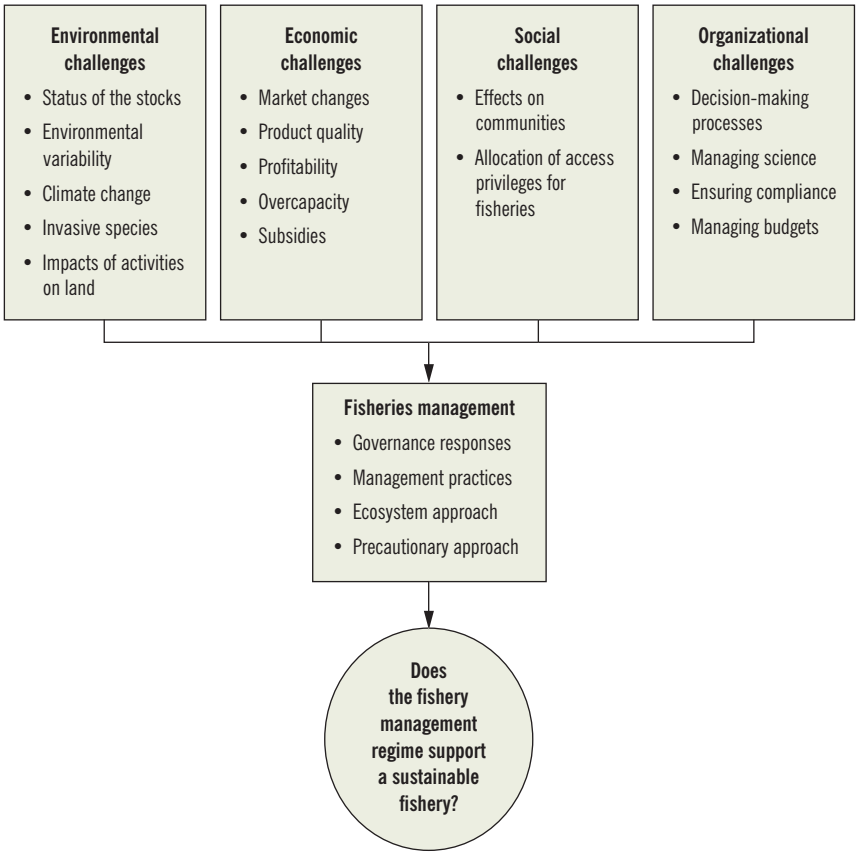
4.57 Many of the key properties of a sustainable fishery can be grouped into three categories, corresponding to the aspects of sustainable development: environmental, economic, and social. In the *Federal Sustainable Development Act*, the federal government acknowledges the need to integrate environmental, economic, and social factors when making all of its decisions. A fourth category, organizational properties, includes ways of integrating and managing the first three. We have summed up the key properties of a sustainable fishery in Exhibit 4.10. The properties are linked; one cannot be achieved apart from the others.

4.58 The four groups of challenges and the management responses based on the principles and approaches described in the previous section are summed up in Exhibit 4.11. These responses lead to the basic question of whether the management regime supports a sustainable fishery.

Exhibit 4.10 The key properties of a sustainable fishery fall into four related categories

Environmental properties	• The harvest of the targeted species is maintained within conservation limits. • Ecological limits have been defined for the fishery and for other parts of the ecosystem, based on available scientific evidence. Where the variability in stock size or the uncertainty in stock estimates is high, a precautionary approach has been taken. • The ecological limits for the targeted and non-targeted species have been respected. • There is no long-term degradation of the ecosystem where the fishery operates. • If external factors affect the health of the stock, the harvest limits are adjusted.
Economic properties	• The fishery is economically competitive and produces a profit for the participants. • The capacity of the fishing fleet is in line with the ability of the resource to sustain fishing pressure. • Subsidies are not provided to the fishery over the long term, recognizing that support may be required for short-term adjustments. • The fishery is able to innovate in response to external changes in the market. For example, the fishery may choose to show that it meets the criteria for eco-certification.
Social properties	• Governance arrangements are clearly defined at the international, national, and local levels. • Aboriginal rights are respected. • Access to the fishery is allocated equitably and predictably among the interested parties, and promotes conservation of the resource. • The fishery contributes to sustaining the communities that depend on it. • The fishery is able to innovate in response to social changes.
Organizational properties	• The organizations that manage the fishery have well-defined mandates and lines of accountability. • The organizations that manage the fishery have the resources they need to carry out their mandates, including conducting scientific research, monitoring the fishery, and ensuring compliance with legal and policy requirements. • Decisions about managing the fishery are based on scientific information and predictable criteria, involve stakeholders, and are openly communicated. • Effective mechanisms are in place for making trade-offs between competing objectives. • The organizations that manage the fishery innovate in response to changing circumstances.

Exhibit 4.11 **How managers respond to sustainability challenges will partly determine if a fishery is sustainable**



What questions could parliamentarians ask?

4.59 Parliament has a crucial role in ensuring that fisheries are sustained in Canada—it sets the basic ground rules through legislation and oversees the federal government's activities. This study is intended to provide information to help members of Parliament to understand the core issues related to sustainable fisheries and to carry out their responsibilities. Earlier in this study we described several major challenges that fisheries managers face, including climate change, new certification expectations, and an evolving legal context.

4.60 In recent years, successive federal governments have introduced amendments to the *Fisheries Act*, Canada's main fisheries legislation. However, these amendments have not become law. In our 1999 audit, we concluded that the Act did not include clear objectives that reflected the social, economic, and ecological nature of sustainable fisheries. In 2005, the Government of Canada's National Plan of Action to Prevent, Deter and Eliminate Illegal, Unreported and

Unregulated Fishing expressed this concern: "…there is consensus that the 138-year-old *Fisheries Act* is itself an inadequate tool for addressing the challenges of the coastal and inland fisheries."

4.61 The 1997 *Oceans Act* sets out Canada's mandate for the governance and management of oceans. Unlike the 1867 *Fisheries Act*, the *Oceans Act* reflects sustainability concepts such as the ecosystem and precautionary approaches, as well as integrated management of oceans. Based on their responsibilities for legislation, members of Parliament may wish to ask the following questions:

- What specific legislative and policy tools are needed to address current and emerging issues, such as international management of fisheries, marine protected areas, and eco-certification? What steps are being taken to put those tools in place?

- What legislative and policy safeguards have been put in place to ensure that fisheries decisions respect the scientifically determined ecological limits? What is the evidence that these safeguards are working as intended?

4.62 In our past audit work, we described obstacles to achieving sustainable fisheries. Through their own studies and reports, committees of both the House and the Senate have also documented concerns related to several fisheries, including lobster, northern cod, Fraser River salmon, Atlantic snow crab, Nunavut fisheries, and Western Arctic fisheries. Based on their responsibilities for oversight, members of Parliament may wish to ask the following questions about a group of fisheries or a single fishery:

- What past audits and studies have been done of these fisheries by Parliament, by the Office of the Auditor General, or by departmental internal audit groups? Have the problems identified in those reports been addressed successfully?

4.63 This study has documented the main principles for managing fisheries sustainably. These principles relate to governance, core management practices, and the use of the ecosystem and precautionary approaches. For these principles to be implemented in the Canadian context, Fisheries and Oceans Canada must play a central role. This point leads to additional possible questions:

- What indicators and information is the federal government using to determine if Canadian fisheries are being managed according to the principles of sustainability? What do those indicators show?

- What mandates and resources does Fisheries and Oceans Canada need to carry out its functions in support of sustainable fisheries, specifically in terms of making risk-based harvest decisions, allocation decisions, conducting science and monitoring to support those decisions, and ensuring compliance with regulations? How do these needed mandates and resources compare to what the Department currently has?

Conclusion

4.64 Will fish continue to be available in the future to provide the food and jobs on which many people have come to rely? The availability of fish cannot be taken for granted. Organizations that manage fisheries have a difficult job. They oversee and regulate the harvesting of fish in the context of significant uncertainty. The challenges they face come from environmental, economic, social, and organizational sources. Some of these challenges have been present since governments began to actively manage fisheries; other issues have emerged much more recently.

4.65 Our review of international guidance and other sources shows that fisheries are more likely to be sustainable when the organizations responsible for managing them take the following actions:

- adopt relevant international agreements and guidance;
- participate in processes for managing straddling and migratory stocks and ensure that the fisheries related to them are sustainable;
- adopt legislation and policies that consider clearly defined social, economic, and conservation objectives, and incorporate the ecosystem and precautionary approaches;
- engage stakeholders and communities through open and transparent processes;
- put in place appropriate accountability arrangements;
- use a decision-making process that is transparent, considers social and economic objectives, and respects the biological limits;
- use the best available scientific research and analysis;
- develop fishing plans that reflect the objectives for the fishery and provide fishers with incentives to pursue fisheries in a sustainable manner;

- develop and put in place appropriate monitoring, control, and surveillance; and
- develop an enforcement capability that promotes and ensures compliance with legislation and supports fisheries planning.

4.66 Even if all the elements of a strong management framework are in place, fish stocks may still fall below a sustainable level. Fish stocks are part of complex marine ecosystems that vary in productivity, independent of fishing activity. An effective management framework can, however, reduce the risk that fishing activity will endanger the long-term ecological sustainability of fish stocks.

4.67 Ensuring that a fishery is sustainable requires leadership and well-defined accountability from all who are responsible for and involved in the fishery. Parliamentarians may wish to ask whether the current legislative and management framework for fisheries addresses adequately the challenges described in this study and incorporates the key properties of sustainability.

About the Study

Objectives

The main objective of this study was to identify the key properties of sustainable fisheries based on generally accepted international principles and experience, with an emphasis on the principles and lessons that would apply in Canada. This study is a first step toward identifying a framework and criteria for our future audits to determine whether fisheries management practices are supporting sustainable fisheries.

Scope and approach

In 2007, the Auditor General asked an independent panel of experts, the Green Ribbon Panel, to examine how the Office of the Auditor General's environmental and sustainable development mandate had been put into practice, and to identify opportunities within the mandate to serve Parliament better. The panel's report underlined that the mandate of the Commissioner of the Environment and Sustainable Development should be focused on sustainable development as well as on how well the federal government is managing the environment.

This study focuses on one aspect of sustainable development: managing the marine capture fishery, which in Canada includes First Nations, commercial, and recreational users. The study does not include inland fisheries or aquaculture. While some aspects of the study would be relevant to either of those two areas, more information would need to be examined to address them fully.

We chose to identify properties of sustainable fisheries rather than exploring specific tools for managing fisheries. We focused on the key governance arrangements and management practices.

We identified the properties of sustainable fisheries by analyzing international guidance documents, including the Food and Agriculture Organization Code of Conduct for Responsible Fisheries and related technical guidance, studies, and academic writings. We identified properties that were found in a number of the sources we examined.

We also met with senior officials from Fisheries and Oceans Canada, industry officials, academics, and environmental groups to get their input on our analysis of the properties and their views on what a sustainable fishery involves.

Study team

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Report of the Commissioner of the Environment and Sustainable Development—December 2011

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