

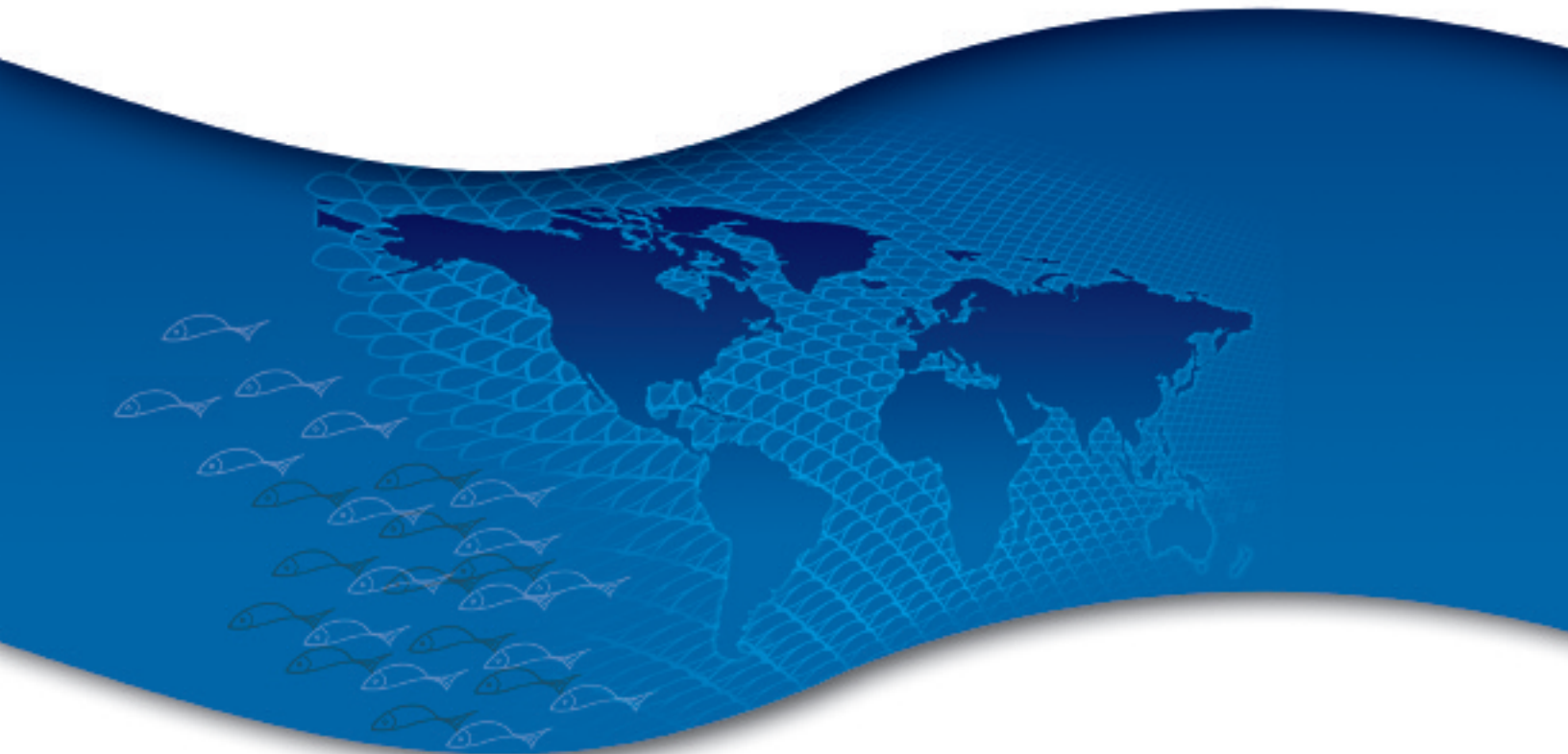


Government  
of Canada

Gouvernement  
du Canada

# National Plan *of Action* for the Conservation *and* Management *of* Sharks

March 2007



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# 1. INTRODUCTION

## 1.1 Purpose

The purpose of this document is to present Canada's national plan for the conservation and management of sharks and their long-term sustainable use. Globally, the impact of Canada's fishing activities on shark populations tends to be low. Nevertheless, measures have been and continue to be implemented to improve the management of these species.

Canada's *National Plan of Action for the Conservation and Management of Sharks* (NPOA-Sharks) was developed in accordance with the principles and provisions of the *International Plan of Action for the Conservation and Management of Sharks* (IPOA-Sharks), as developed by United Nations Food and Agriculture Organization (FAO).

This document provides an overview of shark stocks in Canadian fisheries waters, identifies priorities for the NPOA, highlights Canada's current legislative framework and international commitments, and outlines current measures to monitor, assess and manage these populations and their related fisheries. Recommendations for possible enhancements to existing conservation and management practices are also presented.

## 1.2 Overview of Sharks

Within the IPOA-Sharks, the term "sharks" is applied broadly to include all species of sharks, as well as related species of skates and chimaeras (class *Chondrichthyes*). The IPOA principles and provisions apply equally to all of these species. Consequently, for the purposes of this NPOA, the term "shark" is used to include all of these species, unless otherwise noted.

Shark species can be found in the fisheries waters off Canada's Atlantic, Pacific and Arctic coasts. This NPOA-Sharks focuses on the most commonly found species, which include 27 species of sharks, 29 skates, and four chimaeras. (As outlined in Annex 1, there are additional species that have been recorded in Canadian fisheries waters but are considered to be exceptionally rare.) Only a few species are the subject of directed commercial fisheries, while the majority of species might be caught as bycatch in other fisheries, or are known to be in Canadian fisheries waters but are not caught.

Prior to 1995, there were no specific restrictions on the fishing of sharks. Historically, these species were considered commercially undesirable and were readily discarded. With the decline of the groundfish fisheries, commercial interest in sharks began to grow resulting in increased landings in the 1990s. This was soon followed by the adoption of the first shark management plans and total allowable catches (TACs) for these species within Canada.

Sharks are typically slow growing and although their survival rate from birth is high, they produce few young per year. Given their life history characteristics, sharks are highly susceptible to overexploitation and are slow to recover from stock depletion. The precautionary approach to management and conservation is therefore warranted for sharks, especially as information about some of these species remains limited.

## 1.3 Origin and Purpose of IPOA-Sharks

The IPOA-Sharks was developed by the FAO in accordance with its Code of Conduct for Responsible Fisheries. The objective of the IPOA-Sharks is to improve the conservation and management of sharks and their long-term sustainable use within the directed and non-directed fisheries.

The IPOA emerged out of growing international concerns about the sustainability of shark populations given increased commercial exploitation, population vulnerability to overfishing, slow population recovery rates, and limited knowledge about these species and related fishery practices.

The IPOA-Sharks applies to States in whose waters sharks are caught by vessels (their own or foreign) or whose vessels catch sharks on the high seas. Under this voluntary framework, participating States are encouraged to assess their current shark populations, identify threats to these populations, and provide special attention to vulnerable or threatened species. They are also encouraged to improve catch reporting, increase catch utilization, and enhance frameworks for broad stakeholder consultation.

## 1.4 Canadian Legislative and Regulatory Framework

There are a number of legislative measures, enacted by the Government of Canada, that are relevant to managing and maintaining the long-term sustainability of shark populations and fisheries. Canada's approach to managing its fisheries and oceans resources is based on a commitment to ecological sustainability, integrated fisheries management, and the precautionary approach. These legislative instruments include:

- *Department of Fisheries and Oceans Act*;
- *Oceans Act*;
- *Fisheries Act*;
- *Coastal Fisheries Protection Act*; and
- *Species at Risk Act*.

These legislative instruments, along with the policies and programs that support them, are consistent with the principles of the IPOA-Sharks and FAO Code of Conduct for Responsible Fisheries. They are informed by the precautionary approach in which it is realized that uncertainties exist within fisheries and the current state of knowledge, and that risk management measures must be followed to reduce the risks to the sustainability of the fish stocks, related fisheries, and their ecosystems.

### 1.4.1 *Department of Fisheries and Oceans Act*

The *Department of Fisheries and Oceans Act* establishes the powers, duties, and functions of the Minister of Fisheries and Oceans Canada (DFO), which extend to and include all matters over which Parliament has jurisdiction relating to:

- seacoast and inland fisheries;
- fishing and marine sciences; and
- the coordination of policies and programs of the Government of Canada respecting oceans.

### 1.4.2 *Oceans Act*

The *Oceans Act* gives the Minister of DFO the legal authority to bring together all of Canada's oceans stakeholders to develop an oceans management strategy based on sustainable development and integrated management of activities and resources in estuarine, coastal, and marine waters. Marine protected areas can also be designated through regulations under this legislation.

This *Act* also defines Canada's maritime zones, including its territorial sea and contiguous zone, its exclusive economic zone (EEZ) and its continental shelf. The *Act* affirms the sovereign rights and jurisdiction of Canada over its EEZ and the sovereign rights of Canada over its continental shelf consistent with the 1982 United Nations Convention on the Law of the Sea. Finally, the *Act* holds that conservation based on an ecosystem approach is of fundamental importance to maintaining biological diversity and productivity in the marine environment.

### 1.4.3 Fisheries Act

The *Fisheries Act* is the cornerstone of Canada's fisheries management policy, providing broad powers to the Minister for the management, conservation, and protection of fish resources. These powers include discretion to:

- issue licenses or leases for fisheries or fishing;
- allocate harvests among user groups; and
- protect fish habitat and prevent pollution.

While the regulation of commercial fishing is the most visible of DFO regulatory programs, the *Act* also applies to tidal and recreational fishing, freshwater fisheries, and Aboriginal fisheries.

Three sections of the *Fisheries Act* form the basis for fisheries management in Canada:

- Section 7 provides the Minister with the absolute discretion to issue licenses and leases, wherever the exclusive right of fishing does not already exist by law;
- Section 9 provides the power to cancel or suspend licenses and leases for cause; and
- Section 43 provides regulation-making power by the Governor General in Council for the conservation and protection of fish and the proper management and control of fisheries.

The *Foreign Vessel Fishing Regulations*, that were promulgated under the *Fisheries Act*, also contains the detailed management provisions governing foreign fishing, including close times, size limits, incidental catch limits, mesh size, closed areas and seasons.

### 1.4.4 Coastal Fisheries Protection Act

The Minister's responsibility for regulating foreign fishing in Canadian fisheries waters is set out in the *Coastal Fisheries Protection Act*. This *Act* and its associated regulations provide the Minister with the authority to allow foreign fishing vessels access to Canadian fisheries waters or Canadian ports.

### 1.4.5 Species at Risk Act

The *Species at Risk Act* was created to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened. This *Act* protects species at risk, their residence and their critical habitats. The Committee on the Status of Endangered Wildlife in Canada was established as an advisory body under the auspices of the *Species at Risk Act*.

## 1.5 International Commitments

The Government of Canada recognizes that sustainability of fisheries is an international as well as a national challenge.

To help ensure the conservation and sustainable use of fisheries resources in international waters, Canada participates in several international and regional organizations and bodies concerned with fisheries management. DFO monitors the fishing activities of foreign-flagged vessels in areas of the high seas managed by regional fisheries management organizations (RFMOs). In addition, DFO negotiates and



administers fisheries-related agreements and treaties and provides expertise in the negotiation of trade agreements that include fisheries issues.

Canada has ratified and implemented the following international agreements that are, *inter alia*, key elements for conserving and managing shark species:

- 1982 United Nations Convention on the Law of the Sea;
- 1995 United Nations Fish Stocks Agreement; and
- FAO Code of Conduct for Responsible Fisheries.

### **1.5.1 United Nations Convention on the Law of the Sea**

The United Nations Convention on the Law of the Sea is the comprehensive regime of law and order covering the world's oceans and seas. Within UNCLOS are rules governing all uses of the oceans and their resources. It enshrines the notion that all challenges related to ocean space are closely interrelated and need to be addressed as a whole. Canada ratified UNCLOS in November 2003.

The Convention establishes the requirements for signatories to conserve and manage targeted and associated species within EEZ waters and to cooperate with other States in the conservation and management of living resources in the areas of the high seas. Canada encourages broader participation in this Convention.

### **1.5.2 United Nations Fish Stocks Agreement**

The United Nations Fish Stocks Agreement is an implementing agreement for provisions of UNCLOS regarding the conservation and management of straddling fish stocks and highly migratory fish stocks. Canada ratified UNFSA in August 1999 and is a strong supporter of the Agreement. Canada encourages its broader ratification and implementation.

UNFSA carries an obligation to apply the precautionary approach and ecosystem-based management when managing fisheries on the high seas and in waters under the jurisdiction of coastal States. It also obliges States to minimize pollution, waste, and discards of fish, and to exercise effective control over their fishing vessels on the high seas.

One of the most innovative aspects of UNFSA is the right of States to board and inspect vessels of other State parties in order to verify compliance with internationally agreed fishing rules of RFMOs. Finally, UNFSA provides a compulsory and binding dispute settlement mechanism to resolve conflicts in a peaceful manner.

### **1.5.3 Regional Fisheries Management Organizations**

Canada is a member of several RFMOs, including the Northwest Atlantic Fisheries Organization (NAFO) and the International Commission for the Conservation of Atlantic Tunas (ICCAT). Both NAFO and ICCAT have taken positions on shark management that support the principles and practices of the IPOA-Sharks. They encourage the complete reporting of all shark catches, the full utilization of shark carcasses (including restrictions on finning), and the reduction and release of shark bycatch. The 2006 United Nations General Assembly Sustainable Fisheries Resolution urges States to adopt these same principles.

In 2004, NAFO became the first RFMO to set fishery management limits for a shark (elasmobranch) species when it established a TAC of 13,500 tonnes for the thorny skate (*Amblyraja radiata*) within Canadian and international fisheries waters around the Grand Banks of Newfoundland.



In addition to the measures outlined above, ICCAT has adopted a number of resolutions that support the study of stock status and bycatch levels for all sharks within ICCAT-managed fisheries and the collection and assessment of data on specific species including porbeagle, blue and shortfin mako sharks. It has also adopted voluntary agreements not to increase efforts to target these same species.

#### ***1.5.4 FAO Code of Conduct for Responsible Fisheries***

The FAO Code of Conduct for Responsible Fisheries is based on the principle that all States and users of fishery resources have an obligation to act responsibly so as to ensure the effective conservation and management of aquatic resources and ecosystems. The IPOA-Sharks expands upon the Code in its specific application to sharks.

## 2. CURRENT STATE OF MANAGEMENT OF SHARKS IN CANADA

### 2.1 Overview

For some time, many fishing countries and multilateral organizations have recognized that existing practices in fisheries management and science were not without their limitations, and that uncertainty needed to be recognized and considered in how fisheries were managed. As a result, work began at the international level on the application of the precautionary approach in fisheries management. Such a risk management approach was incorporated into a series of new international agreements and plans, including the United Nations Fish Stocks Agreement and the IPOA-Sharks.

Canada strongly supports these international instruments and the principles that underline them. Canada's *Oceans Act* encourages "the wide application of the precautionary approach to the conservation, management and exploitation of marine resources in order to protect these resources and preserve the marine environment." In 2001, the Government of Canada released a policy paper to provide a common structure for the application of the precautionary approach across all federal government departments.

The precautionary approach is based on sound risk management, which requires one to exercise caution and recognize uncertainty in decision making. This is of particular importance where action or inaction could cause serious and potentially irreversible damage. Risk avoidance is essential where there is great risk and great uncertainty. Such risk and uncertainty exist to varying degrees within fisheries.

As outlined in the IPOA-Sharks, adopting a management regime that incorporates the precautionary approach is warranted for sharks because of their specific life history, which makes them particularly vulnerable to the long-term effects of overfishing. They mature at a late age, grow at relatively slow rates, and produce few offspring compared to bony fish. Depletion in shark stocks can occur rapidly and recovery times can be long. Limitations in scientific and stock status information also warrant the precautionary approach.

For several years, DFO has been proactively engaged in the elaboration and discussion of the precautionary approach and its application to fisheries in Canada. The precautionary approach and elements of it have already been applied in some fisheries. DFO is now implementing a fishery decision framework that incorporates the precautionary approach in more marine fisheries in Canada.

Successful delivery of a fishery harvest strategy that incorporates the precautionary approach will require a number of activities including information gathering, catch reporting, data analysis, consultation and involvement of resources users, and the evaluation and amendment of regulations. Canada undertakes these activities and manages its fisheries through:

- Integrated Fisheries Management Plans;
- Research and Consultation; and
- Fisheries Monitoring Programs

All of these measures are applied throughout Canada on a relatively consistent basis. However, the detailed development, application and enforcement of these measures occur at the regional level within Canada (i.e., Atlantic, Pacific and Arctic areas). Consequently, for the purpose of this NPOA, a general national overview is presented, with specific details and exceptions given in sections dealing with Atlantic, Pacific and Arctic fisheries.

## 2.1.1 Integrated Fisheries Management Plans

The Integrated Fisheries Management Plans (IFMPs) are developed by DFO to identify goals and measures relating to conservation, management and science for a particular fishery. IFMPs also control licensing and TACs for users and areas.

When establishing an IFMP, DFO consults the fishing industry (representatives and associations), provincial and territorial governments, advisory bodies, as well as other stakeholders and interests.

IFMPs are specific to each fishery. Thus, different species of sharks fall under different IFMPs, according to gear and associated fish species. Annually, the IFMPs and TACs are reviewed and approved for the next year through consultations between DFO and regional research and advisory committees. IFMPs applicable to sharks include:

- Canadian Atlantic Pelagic Shark Integrated Fisheries Management Plan
- Integrated Fisheries Management Plan Atlantic Mackerel
- Integrated Fisheries Management Plan Atlantic Bluefin Tuna
- Canadian Atlantic Swordfish and Other Tunas Integrated Fisheries Management Plan
- Dogfish Management Plan For Maritimes Region
- Groundfish Management Plan Scotia-Fundy Fisheries Maritimes Region
- Integrated Groundfish Management Plan for the Gulf of St-Lawrence
- Pacific Region Integrated Fisheries Management Plan Groundfish

Shark finning, the practice of removing the fins and discarding the remainder of the carcass while at sea, was banned in Canada in June 1994. The ban applies to Canadian fisheries waters and Canadian licensed vessels fishing outside of the EEZ. Moreover, the trade and sale of fins must be in appropriate proportion to the quantity of carcasses landed (five per cent of dressed carcass weight).

## 2.1.2 Research and Consultation

In managing and conserving aquatic resources and habitat, DFO is required to consider a broad scope of knowledge and advice (scientific and traditional), including through the following mechanisms.

### **Regional Advisory Process**

The Regional Advisory Process provides peer-reviewed reports on the status of the fisheries and marine mammal resources on the Atlantic coast (starting in 1993), as well as the Pacific and Arctic coasts (starting in 1997).

The process engages industry, stakeholders and outside scientific expertise, along with DFO experts in science, fisheries management and policy, in an extensive review of a full range of resource management issues. Such technical reviews are fully documented through the production of stock status reports, fisheries status reports, and habitat status reports. Such reports have been completed for the populations of porbeagle, shortfin mako, blue shark, spiny dogfish, thorny skate, and winter skate in Atlantic Canada.

### **Committee on the Status of Endangered Wildlife in Canada**

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was established as an advisory body in 1977 to meet the need for a single, official and national classification of wildlife species at risk and operates under the auspices of the *Species at Risk Act*.

COSEWIC uses the best available scientific, Aboriginal and community knowledge to assess species that might be at risk in Canada and reports its assessment, including the rationale and any uncertainties, to the Canadian Endangered Species Conservation Council and to the Canadian public.

Based on the assessment, COSEWIC assigns one of several designations to a species. The Minister of Environment, in close consultation with the Minister of Fisheries and Oceans, then considers the assessment and may or may not recommend that the species be added to the List of Wildlife Species

at Risk. The Minister of Environment may also refer the matter back to COSEWIC for further consideration, especially if an assessment is deemed to be incomplete or erroneous.

COSEWIC assessments have been or are in the process of being completed for the following species:

Basking shark (Atlantic and Pacific)	Smooth skate (Atlantic)
Big skate (Pacific)	Soupin shark (Pacific)
Blue shark (Atlantic)	Spiny dogfish (Atlantic and Pacific)
Brown cat shark (Pacific)	Spinytailed skate (Atlantic)
Longnose skate (Pacific)	Thorny skate (Atlantic)
Porbeagle shark	White shark (Atlantic)
Sandpaper skate (Pacific)	Winter skate (Southern Gulf, Eastern Scotian Shelf, Georges Bank-Western Scotian Shelf-Bay of Fundy)
Shortfin mako (Atlantic)	
Six-gill shark (Pacific)	

### **International Initiatives**

Canada continues to participate and take the lead in a number of international fora where key players in shark research, conservation and management are brought together to exchange information and practical expertise. For instance, in 2005, Canadian and American researchers partnered to organize the First International Symposium on the Management and Biology of Dogfish Sharks, held in Seattle, Washington. Such activities are of particular importance for species, like the spiny dogfish, that straddle national boundaries and require an integrated conservation and management approach.

### ***2.1.3 Fisheries Monitoring Programs***

The shark fisheries are subject to dockside monitoring, at-sea observer coverage, quota monitoring systems, electronic vessel monitoring system and hail requirements for both the at-sea observer program and dockside monitoring program.

#### **Dockside Monitoring Program**

Established by DFO in the early 1990s, the objective of the dockside monitoring program (DMP) is to provide accurate, timely, and independent third party verification of fish landings. When first established, the DMP was set up to monitor catch quotas for groundfish in the Gulf of St. Lawrence. Since then, the program has expanded throughout Atlantic Canada and Quebec. Similar programs are also in place in British Columbia for Canada's Pacific waters.

Dockside monitoring companies are contracted by the fishing industry and designated by DFO to provide timely, accurate, and impartial verification of fish landings. The information collected allows DFO fishery managers and enforcement officers to monitor each vessel for compliance with quotas for individual vessels. The programs are managed and funded by the private sector at arms-length from the fishing industry. However, DFO fishery officers are solely responsible for enforcement and they conduct regular checks at landing sites to ensure compliance with DMP requirements. Another goal of this program is to guarantee the accuracy of landing data for timely closures so as to monitor and support the sustainability of the fishery.

All shark landings (directed and bycatch) in the groundfish fisheries are monitored dockside by an approved dockside observer at industry's cost. However, in the case of many skate species and some shark species, the DMP does not include discarded catches at sea or rarer species that are difficult to identify once landed.

## **At-Sea Observer Programs**

At-sea observers provide independent data on the fishing activities of fishing vessels. By being on board, these observers can collect information on fishing efforts, catches and discards at sea. This information presents a more accurate picture of the impact of fishing efforts on stocks and habitat than that which can be attained through fishing logbooks. The data collected by these observers can be used on a daily basis to evaluate the ongoing status of specific fisheries and areas and to make decisions regarding the opening and closing of fisheries. These data are also used by scientists to assess stock status and by managers to establish the TAC for a specific species or area. The cost of the At-Sea Observer Program is shared between DFO (1/3) and industry (2/3).

Having observers on board also serves to raise awareness about conservation issues and protection measures, including identification and protection of vulnerable bycatch, and may also serve as a general deterrent. These observers are not DFO fishery officers, however, and cannot enforce regulations or laws, although they may be called on to testify in court.

Coverage for at-sea observers varies depending on the fishery and fishing area. In Atlantic Canada, coverage for domestic vessels ranges from three to 10 per cent. In the past, when foreign vessels fished in Canadian fisheries waters, observers provided 100 per cent coverage of non-Canadian vessels engaged in trawl and hook-and-line fisheries.

Since 1996, the Pacific trawl fishery has had 100 per cent at-sea observer coverage. In 2006, a new electronic monitoring system was implemented in all the other groundfish fisheries (hook-and-line and trap) in Canadian Pacific fisheries waters. This program utilizes logbooks that are later audited using at-sea camera footage. In the pilot program, both at-sea observers and electronic monitoring were used. When compared, catch estimates were within two per cent.

## **Fisher Reporting**

Where at-sea observers or DMP is not present (e.g., rod-and-reel fishery), fishers are often educated on common bycatch species through the provision of identification guides with photos and descriptions. On the Pacific coast, fishers also receive disposable cameras, are taught how to measure the length of different species (e.g., wing length), and are required to submit reports.

## **2.2 Atlantic Coast**

### ***2.2.1 Pelagic Sharks***

On the Atlantic coast, the porbeagle shark is the only species of shark that is targeted by a directed longline fishery, but harvest limits for this species are low (approximately 200 tonnes). Bycatches of blue shark and shortfin mako occur as part of other commercial fisheries. It is believed that bycatch for these species is larger than recorded due to unreported discarding and live releases. A small number of blue sharks are also landed as part of annual shark derbies, where all catches are examined for research purposes.

Porbeagle, blue and shortfin mako sharks interact with other pelagic species and are caught in longline fisheries directed at tuna and swordfish. Such species interactions have been incorporated into management plans, research and consultation for the pelagic longline fisheries.

The first Atlantic management plan for all shark species was implemented in 1995. This was followed by a series of improved plans, the most recent of these being the 2002-2007 integrated fisheries management plan for pelagic sharks. In 2005, 28 exploratory shark fishing licences were authorized to land porbeagle and/or blue shark; all other sharks, including shortfin mako, are restricted to bycatch. This represents a reduction from 55 licences in 2001 by attrition of inactive licences, which is a management measure in response to the current stock status. In addition, there were more than 1,000 recreational shark licences restricted to catch-and-release only, not including a small number of approved derbies that allow for retention of catch for scientific research purposes.

### **Porbeagle Shark (*Lamna nasus*)**

The porbeagle shark only became part of the Canadian directed fishery in 1991, although they were harvested by Norwegian and Faroese vessels in Canadian fisheries waters beginning in the 1960s. Most commonly found around the continental shelf, the porbeagle is caught primarily by the pelagic longline fishery. Its meat is sought after in Europe and its fins in Asia.

Over the last two decades, knowledge about the porbeagle shark, its biology and population dynamics has grown substantially. The Canadian longline shark and swordfish fishing industry has provided financial and in-kind support for research, which has included on-board collection of detailed measurements and tissues by scientific staff as well as measurements by fishing industry members (for 100 per cent of current landings). Between 1998 and 2005, five stock assessment reports were published by DFO, and a recovery assessment report followed in 2005.

Best evidence indicates that the porbeagle population began to decline in the 1960s. Canadian vessels joined the fishery in the 1990s with the result that reported landings reached 1,778 tonnes in 1992. According to the 2001 stock status report, the porbeagle population was under pressure from fishing and was low in abundance. Consequently, in 2002 the TAC for porbeagle was set at 250 tonnes, with 200 tonnes being directed catch and 50 tonnes as bycatch.

As a result of this management plan, the porbeagle population has stabilized. However, population projections indicated that population recovery would require that harvest rates be kept below four per cent. In response, the TAC was lowered for the fishery in 2006 to 185 tonnes (135 tonnes directed and 50 tonnes bycatch). Given the low productivity of the porbeagle, it is expected to take several decades for this species to recover from its low abundance.

### **Blue Shark (*Prionace glauca*)**

According to recent research, the catch mortality for blue sharks within Canadian Atlantic fisheries waters has been greatly underestimated in the past. As blue sharks are of low commercial value, they are regularly discarded as bycatch within the commercial pelagic fishery. Historically, such discards of bycatch have not been regularly recorded. New estimates, however, place landed catch and bycatch mortality at an annual average of up to 1,000 tonnes, with the majority resulting from discarded mortality. This would make the blue shark the most commonly caught large shark in Canadian fisheries waters. While bycatch rates for blue sharks may be higher than those for other shark species, research suggests that they have a higher survival rate on returning to the water as long as appropriate handling techniques are used.

Over the past decade, the blue shark population in Canadian fisheries waters has been in decline while mortality has been increasing. Catch rates for commercial longline fisheries and recreational tournaments have fallen and the median size of blue sharks caught has decreased. This warrants ongoing monitoring of the species.

It is estimated that catch mortality within the total North Atlantic ranges between 26,000 and 32,000 tonnes for blue shark. These are considered to be low estimates, of which the Canadian portion is very small. Tagging studies show that blue sharks are extremely migratory and do not establish long-term residency in Canadian fisheries waters.

Further research on the blue shark population and fishery within Canadian fisheries waters is warranted and in particular the impact of reported and unreported catches requires further assessment.

Since 1995, fishery management plans have placed non-restrictive catch guidelines of 250 tonnes on blue sharks within the directed fishery (i.e., for longline, handline, and rod-and-reel gear). The recreational fishery is limited to catch-and-release, except for a few authorized derbies. No restrictions are currently placed on bycatch in large pelagic fisheries. Annually, blue sharks are caught as part of recreational shark fishing derbies. Between four and six shark derbies are held every year in communities throughout the province of Nova Scotia. These derbies are exempt from normal DFO catch-and-release requirements provided that all catches are subject to examination and measurement by attending scientists. Although



99 per cent of all sharks caught at these tournaments are blue sharks, this represents only three per cent of the total Canadian fishing mortality for this species. By monitoring trends in data from year to year, onsite scientists are able to monitor stock abundance, size, and sexual maturity, and thereby identify possible concerns with the population.

### **Shortfin Mako Shark (*Isurus oxyrinchus*)**

Shortfin makos are retained as a high-value bycatch of the pelagic longline fishery. Annually, catches amount to 60-80 tonnes, which represents only a small portion of the estimated total population of shortfin makos. This species, like the blue shark, is highly migratory with the majority of the population residing in waters south of Atlantic Canada.

While a standardized catch rate index from the commercial large pelagic fishery has suggested stable abundance since 1988, the median size of mako sharks, within the commercial catch, has declined during these years. This would suggest a loss of larger mako sharks. However, given limitations in available research, the overall abundance and exploitation of this species is difficult to determine. The first report on the stock status of shortfin mako sharks in Atlantic Canadian fisheries waters was completed in 2004.

Since makos are not part of the directed fishery and bycatch rates represent only a small portion of the global population, it is expected that current exploitation rates within Canada are not having a significant negative impact on the sustainability of this species. However, given apparent declines in abundance, monitoring should continue.

### **Other Pelagic Shark Species**

Other species of pelagic sharks are infrequently found in Canadian Atlantic fisheries waters. Annex 1 includes a full listing of these 15 species. Most landings of these species are recorded by observer and dockside monitoring programs, either as part of the commercial fisheries or during annual derbies. Average annual landings for each of these species equal less than one tonne.

### **Advisory Committees**

Formal consultations for sharks and other pelagic fish are held annually in two advisory fora known as the Atlantic Large Pelagics Advisory Committee (ALPAC) and the Scotia-Fundy Large Pelagics Advisory Committee (SFLPAC). Fishery reviews, plans and annual TACs are tabled at both ALPAC and SFLPAC for discussion.

Each Committee provides advice to DFO on the management and development of the fisheries for sharks, tunas, swordfish and other large pelagic species of Atlantic Canada. While ALPAC advises on the entire Atlantic area, SFLPAC focuses on the Scotia-Fundy areas, where the majority of sharks are fished and the majority of shark fishing vessels on this coast originate.

These Committees are composed of representatives from industry sectors that are most involved in the harvesting and processing/marketing of the resource, provincial governments, Aboriginal groups, environmental groups, Canadian Commissioners of ICCAT, and DFO. In formulating their advice, these Committees take into consideration biological, marketing and other relevant information.

### **Seasonal and Area Restrictions**

The 1985 Atlantic Fisheries Regulations were initially structured to allow for the opening and closure of the entire shark and swordfish fisheries for a specified period of time. They did not allow, however, for the opening and closure of a particular fishery based on individual species, gear type or vessel type. This system proved to be too rigid, as all shark and swordfish fisheries would have to be closed simultaneously once one sector reached quota. Seasonal and area restrictions could only be managed through a combination of licence conditions, conservation harvesting plans and the voluntary cooperation of industry. Such volunteer commitments and licensing measures proved to be difficult to monitor and hard to enforce.

In 2005, the Regulations were thus amended to allow for the targeted closure of the fishery based upon species, gear type and vessel type. A specific fishery could be quickly and effectively closed without causing financial loss within the sector.



## 2.2.2 Spiny Dogfish (*Squalus acanthias*)

Within fisheries regulations, the spiny dogfish is defined as a groundfish species and is governed by the groundfish integrated fish management plan. Harvesting of dogfish was capped at 2,500 tonnes in 2002. This was the first quota applied to species and was in response to the need to conduct further research on this species and its populations in order to establish sustainable harvest levels.

The spiny dogfish is potentially the most abundant shark species in the world and it is present in Canada's Atlantic and Pacific fisheries waters. On the Atlantic coast, about 2,400 tonnes of this species were landed in 2005. First harvested over 100 years ago, the spiny dogfish was initially utilized for the production of lamp oil, machine lubricant and Vitamin A. Today, it is valued as a food within a number of countries. Spiny dogfish have also been targeted as "nuisance" fish within the commercial fishery. They are usually harvested by longline or handlines and are a common bycatch in the groundfish fishery.

Atlantic spiny dogfish are thought to be divided between residential and migratory populations. The latter of these are distributed between Nova Scotia and the waters off North Carolina. Some surveys suggest that the residential populations are on the whole not in decline, although local abundance may vary. However, documented localized declines in dogfish raise possible concerns about the relative status of the migratory population.

DFO is currently completing a five-year study on the spiny dogfish, the results of which are expected to be published in 2007. This study will include stock assessments targeting both migratory and residential populations.

## 2.2.3 Skates

There are 17 species of skates (family *Rajidae*) in Canadian Atlantic fisheries waters. Of these, only the thorny skate (*Amblyraja radiata*) is part of the directed commercial fishery and represents about 90 per cent of all skates caught. Other species are commonly taken as bycatch within commercial groundfish fisheries, although bycatch totals have dropped since the early 1990s with the general decline of this fishery. The most common species that end up as bycatch are thorny skate, winter skate (*Leucoraja ocellata*), smooth skate (*Malacoraja senta*), little skate (*Leucoraja erinacea*), barndoor skate (*Dipturus laevis*), spinytailed skate (*Bathyraja spinicauda*), and round skate (*Rajella fyllae*). Recreational landings are insignificant.

Prior to the mid-1990s, skates were considered to be commercially undesirable by Canadian fleets. More recently, skates are harvested for their wings, which are prepared as food. Skates are covered under the integrated fish management plans for the groundfish fishery. The principal commercial fishing method used to catch skates is otter trawling.

Identification of less common skate species is difficult because of similar morphology. More common species, like thorny skates, are classified and recorded by fishery observers programs, but the more uncommon bycatch often go unidentified and are recorded under the general classification "skate." Training and identification cards for less common species are provided to observers in some areas.

### **Thorny Skate (*Amblyraja radiata*)**

The thorny skate is the most common and widespread skate in the Canadian Atlantic fisheries waters. They are found throughout most of the North Atlantic in temperate to Arctic waters. They are readily distinguishable from other skate species by the thorns that mark their tails, shoulders and mid-back section.

Starting in 2005, the Northwest Atlantic Fisheries Organization implemented a TAC for the thorny skate of 13,500 tonnes, of which 2,250 tonnes is allocated to Canada. NAFO scientific advice indicated that a TAC was required to halt the decline in species abundance, which had accelerated between 1985 and 1994. This marked the first time that an RFMO had introduced measures to manage an elasmobranch species.

DFO Stock Status Reports on the thorny skate were completed in 1988 and 2003. While the biomass for this species has declined considerably since the 1970s, it has stabilized since 1994.

### **Winter skate (*Leucoraja ocellata*)**

Winter skates have only been reported in the Northwest Atlantic. Their range extends from the waters of southern Newfoundland to the Gulf of St. Lawrence and south to Cape Hatteras (North Carolina). Within Canadian fisheries waters, their population is mostly centered on the eastern Scotian Shelf.

When the skate fishery first occurred in 1994, winter skate constituted the majority of skates caught (over 2,000 tonnes). However, by 2001, the annual catch was about 300 tonnes and a TAC of 200 tonnes was instituted in 2002. This fishery was closed in April 2006.

DFO completed an assessment of the winter skate's recovery potential on the eastern Scotian Shelf in 2005. It was found that the abundance of winter skate within this area had fallen sharply since the 1970s and was not showing any sign of recovery. It was recommended that human-induced mortality be reduced to minor or zero levels. However, even with the closure of the fishery, population recovery remains uncertain as there has been an increase in natural mortality.

## **2.2.4 Chimaeras**

Chimaeras are only occasionally seen as bycatch in the commercial trawl industry. Annex 1 provides a list of chimaeras caught or known to be in Canadian fisheries waters. Rates of discard and discard mortality for these species remain unknown.

## **2.3 Pacific Coast**

### **2.3.1 Pelagic Sharks**

On the Pacific coast of Canada, there are 13 species of sharks, of which 10 are considered pelagic sharks. Other than dogfish which are targeted, four species are commonly and incidentally caught and discarded as part of the commercial fishery: brown cat shark, Pacific sleeper shark, blue shark and bluntnose sixgill shark. However, 100 per cent at-sea observer coverage of trawl, hook-and-line, and trap fisheries means that almost all bycatch and discard totals are recorded and classified for all 14 shark species.

### **2.3.2 Spiny Dogfish (*Squalus acanthias*)**

Since 2006, the dogfish fishery has been managed under the Pacific Region Integrated Fisheries Management Plan Groundfish. Between 2003 and 2006, dogfish were covered by two different IFMPs for groundfish: one for hook-and-line and the other for trawl.

Spiny dogfish have been part of the commercial fishery in British Columbia since 1870 and continues to be the shark species of greatest commercial importance on the Pacific coast. Since the mid-1970s, this fishery has supplied food to markets in Europe and Asia.

The dogfish population off of British Columbia is considered to be distinct from the Canadian Atlantic populations (see 2.3.2) for geographical reasons. Tagging studies in the Northeast Pacific indicate that there are local stocks centred on the Strait of Georgia and Puget Sound. Additionally, there is a highly migratory population outside the continental shelf that ranges from Alaska to southern California and moves into coastal waters on a seasonal basis.

Over the last five years, annual landings of dogfish in Canadian Pacific fisheries waters have ranged between 4,000 tonnes to 5,000 tonnes for the trawl and hook-and-line fleets. This is well below the annual TAC of 11,500 tonnes, of which only 3,400 tonnes can be taken from the Strait of Georgia. Estimates of biomass indicate that annual catches of 15,000 tonnes would be sustainable. Given current annual catches, it is unlikely that the present population is being dramatically altered by present fishing efforts.

Landings and discards within the trawl fleet has been 100 per cent observed since 1996, while the hook-and-line fishery was partially covered by logbook and at-sea observers. Since 2006, full electronic monitoring of this fleet has occurred. Key research includes The Hecate Strait Trawl Survey (1984-2003), International Pacific Halibut Commission Standardized Stock Assessment Survey (1993-2004), and West Coast Triennial Survey (1980-2001).

### **Advisory Committees**

There are three committees for the relevant groundfish fisheries: Groundfish Trawl Advisory Committee, Groundfish Hook and Line Advisory Committee, and Sablefish Advisory Committee. These bodies advise DFO in the development of long-term management plans and provide expert consultation on the relevant species, their biology, and fisheries, including spiny dogfish and skates.

### **2.3.3 Skates**

Within the Pacific waters of Canada, there are 16 species of skate. Of these, only two species, the big skate (*Raja binoculata*) and longnose skate (*Raja rhina*), have directed fisheries. The remainder are caught only as uncommon bycatch.

Skate catches first began to be recorded in 1954, but it was not until the 1990s that they were further classified and recorded according to species. Today, records are kept for all skate species and identification of species is assisted through the dissemination of identification guides.

As skates are caught mainly through groundfish trawl and hook-and-line gear, the fishery is managed through the Pacific Region Integrated Fisheries Management Plan Groundfish. Under this plan, TACs are set annually, in consultation with advisory committees, for the big skate, longnose skate and combined skate catches within designated areas.

Catch monitoring for all skate species, including landings and discard, is considered to be accurate, because trawl vessels have 100 per cent observer coverage and, as of 2006, full coverage was added to hook-and-line vessels in the form of at-sea and video monitoring.

#### **Big skate (*Raja binoculata*)**

Big skates are caught primarily by commercial trawlers. Some are also caught in hook-and-line fisheries, especially the halibut fishery. The market value for big skate increased in recent years, which resulted in landings peaking at around 1,500 tonnes in 2003. In 2005, annual catch was 1,000 tonnes.

Current information about the population structure for this species is limited. DFO began an extensive tagging program in March 2003 and continues to undertake this work. This program should quantify migration patterns and development histories for this species. In the meantime, it is assumed that the population is largely residential and constitutes a single unit. This population is distributed along the Pacific coast from the Gulf of Alaska along British Columbia to Point Conception (California).

In 2002, a TAC of 567 tonnes was established for the trawl fishery within a designated area (5C/D Hecate Strait), but no restrictions are placed on other areas. Within the hook-and-line fishery, each vessel is limited to 5.7 tonnes with no area restrictions, as of April 2004.

The Hecate Strait Trawl Survey (1984-2003) seems to indicate that the abundance of this species is generally stable. Catch per unit effort data within the region does not indicate a decline in abundance.

#### **Longnose skate (*Raja rhina*)**

Like all skates in the region, the longnose is caught primarily in the trawl and hook-and-line fisheries and mainly as bycatch within the directed fisheries for groundfish. Annual catches within the trawl fleet average between 300-400 tonnes, with about 54 per cent being retained. Bycatch and discard mortality is not well known for the hook-and-line fleet, although it is estimated that the halibut directed fishery may catch upwards of 300 tonnes per year. This remains an issue of concern for this species.

Longnose skates are distributed across the entire Canadian Pacific coast and extend southward to the Gulf of California and northward to the Bering Sea. Little is known about the population structure of the longnose skate or whether it constitutes a distinguishable unit. The longnose is readily identifiable by its long, pointed snout, although this species was not differentiated from other skates in landing records prior to 1996.

The TAC for trawl in the Hecate Strait (area 5C/D) was set to 47 tonnes in 2002. Restrictions are not placed on other areas.

The Hecate Trawl Survey and West Coast Triennial Survey indicate that the abundance of longnose skates within the survey area is stable and perhaps increasing.

### **2.3.4 Chimaeras**

The spotted ratfish (*Hydrolagus colliei*) is the sole chimaera in Canadian Pacific fisheries waters. Ratfish are a common bycatch (about 700 tonnes per year) within the commercial trawl fishery for skates. Since ratfish are of no commercial value, they are discarded at sea. Rates of discard mortality remain unknown.

## **2.4 Arctic Coast**

There is no directed fishery for sharks within Canada's Arctic fisheries waters. However, certain species are taken as bycatch and usually discarded at sea. These mainly include Greenland shark (*Somniosus microcephalus*), Arctic skate (*Amblyraja hyperborea*), and some thorny skate (*Amblyraja radiata*). Although the overall fishery in the Arctic (including commercial, recreational and food) is much smaller than that in the Pacific or Atlantic, it is an important source of income and sustenance for Aboriginal and northern communities and is tied with traditional culture. DFO manages the Arctic fishery through integrated fisheries management plans and allocation decisions are mostly made through co-management boards, which are established under legislated land claims agreements.

## 3. ACTIONS

The purpose of this section of the NPOA-Sharks is to identify existing gaps and propose remedial steps that can be implemented for the conservation and management of sharks. This includes implementation of an ecosystem approach and the precautionary approach.

### 3.1 Data Collection and Research

#### 3.1.1 Objective

To continue and enhance current research efforts on sharks, and build upon collaborative knowledge sharing and consultation with fishers, Aboriginal groups, conservation organizations, academics, and other interests.

#### 3.1.2 Means

Research of particular importance will include:

- Recovery potential assessment for porbeagle shark with implications for the future of the directed shark fishery and identification of pupping grounds for possible management measures;
- Population dynamics of blue sharks, including assessment of mortality due to commercial discarding and shark derbies;
- Recovery potential assessments for shortfin mako and basking sharks, with implications for new management measures;
- Completion of a five-year study on the shared population of spiny dogfish in the Atlantic waters of Canada and the United States, production of the first joint, Canada-US stock assessment for this shared and highly migratory population, and proposal of possible management measures for this population;
- Assessment of a potential pupping ground for black dogfish in the Laurentian Channel;
- Initiation of a joint Canada-US stock assessment (to be completed in 2008) for Pacific coast dogfish;
- Ongoing research on the skate complex (14 species) off Newfoundland and Labrador (including detailed information on age and growth, reproduction, morphometrics and meristics, food and feeding, for the first time for many of the species);
- Growth and reproductive potential of winter, little and thorny skates on the Scotian Shelf; and
- Completion of tagging research on big skate (Pacific), which will quantify seasonal migration patterns and provide information on species growth and age composition.

### 3.2 Adoption of an Ecosystem Approach and the Precautionary Approach as Key Elements of Fisheries Management Renewal

#### 3.2.1 Objective

To incorporate management tools that reflect the modern conservation objectives of DFO, in particular, through the delivery of Fisheries Management Renewal and the adoption of an ecosystem approach and the precautionary approach to the management of Canada's fisheries.

### 3.2.2 Means

Over the last several years, DFO has engaged resource users, Aboriginal groups, provinces, territories, and others with an interest in fisheries resources to modernize the way fisheries are managed. The results of these reviews have been consolidated into Fisheries Management Renewal (FMR) – a package of program renewal undertakings that promote predictability, stability and transparency, and a strong and healthy fisheries resource. The FMR's overarching goal is to develop a new fisheries management governance model that will enable DFO and resource users to meet conservation objectives, and that will enable resource users to respond to the economic forces that affect their industries.

Adopting an ecosystem approach and the precautionary approach to the management of fisheries is fundamental to achieving the conservation objectives envisioned by FMR.

Adopting an ecosystem approach to fisheries management involves better understanding and managing the cumulative impacts of fishing. A comprehensive ecosystem-based approach would involve taking account of, among other things:

- all the interactions the target fish stock has with predators, competitors, and prey species;
- the effects of weather and climate (including climate change);
- the interactions between fish and habitat; and
- the effects of fishing on species and habitat.

DFO is developing the necessary building blocks to take an ecosystem approach in fisheries management. The emerging approach includes data collection and ecosystem assessment, setting clear ecosystem and management objectives and the development of decision models. It will be supported by policies on forage species, bycatch, sensitive benthic areas, and emerging fisheries and delivered through IFMPs.

Adopting the precautionary approach to fisheries management involves setting biologically based reference points and establishing pre-agreed, risk-based actions to be taken at those reference points well in advance of a fishery in order to avoid the stock being reduced to a state of serious harm. For each stock in question, these systems are established in consultation with stakeholders and other interests.

As an example of the progress being made in applying the precautionary approach to fisheries, reference points have been identified for at least 17 fisheries, and these are used to guide management actions. Reference points are used in the management of Barkley Sound sockeye salmon on the west coast and Gulf herring and harp seals on the east coast.

IFMPs are the fundamental tool for identifying goals relating to conservation, management, science, as well as resource management protection and conservation measures for a particular fishery. IFMPs will continue to evolve along with Canada's approach to managing fisheries.

## 3.3 Standardized Reporting and the Management Plan Process

### 3.3.1 Objective

To develop a nationally consistent approach to the management of shark and shark-like species.

### 3.3.2 Means

Consultations with shark industry representatives in advisory fora provide for a review of and planning for the policy and procedural basis for management of these fisheries. These fora are normally open to the interested public.



Following the framework for the various IFMPs ensures national consistency in the objectives and approaches to fisheries management in each of these fisheries. Minor amendments to IFMPs are generally considered on an annual basis. Any major technical analyses required that relate to the assessment of the stock are vetted through DFO's scientific peer review process.

The Advisory and IFMP processes will continue to be refined to ensure that the commitments for an ecosystem approach and the precautionary approach are addressed in this process.

## **3.4 Bycatch Reduction and Reporting of Discard Mortality**

### **3.4.1 Objective**

To reduce levels of bycatch and increase reporting of discard mortality within other fishing industries.

### **3.4.2 Means**

Canada will move ahead with measures to:

- Improve the reporting of discarded bycatch and the associated mortality rates in domestic fisheries through better data collection and species identification by at-sea fisheries observers, as well as through mandatory reporting of all bycatch for the commercial and recreational fishing industry;
- Continue awareness-raising efforts among commercial and recreational fishers and other resource users about the risks facing certain shark and shark-like species (e.g., dogfish caught in the Pacific sports salmon fishery) and promote conservation-based release practices to reduce discard mortality;
- Encourage the strengthening of regulations of relevant RFMOs with regard to both the handling and release of shark bycatch species and to improve the identification and reporting of bycatch and associated mortality; and
- Review the current practices in all commercial and recreational fisheries and implement, where feasible, new rules or technologies with the potential to reduce both the bycatch of sharks and associated mortality.

## **3.5 Extend Conservation and Management Measures to the Arctic Coast**

### **3.5.1 Objective**

To enhance information about northern species of sharks by evaluating the potential impacts of changing conditions on shark species in the Arctic (e.g., climate change, increased shipping, fishing rights, and shifts in migration).

### **3.5.2 Means**

Canada will move ahead with measures to:

- Increase knowledge about the life history and abundance of shark species in the Arctic (e.g., Greenland shark and Arctic skate); and
- Evaluate how changing conditions in the Arctic may be affecting shark species.



## 3.6 Enhance Outreach and Education Efforts in Canada

### 3.6.1 Objective

To enhance public knowledge about the presence and types of shark species within Canadian fisheries waters, the importance of shark species to sustainable ecosystems, the reasons why Canada has developed a national plan of action for the conservation and management of sharks, and the efforts that are being taken to assess, understand and manage these species.

### 3.6.2 Means

Canada will move ahead with measures to:

- Increase public awareness in Canada about shark species, risks to their survival, their importance within the ecosystem, and the fact that they are often a global resource requiring international research and conservation efforts;
- Encourage commercial and recreational fishers, and other industries to be more aware of the shark species present in Canadian fisheries waters, their biology, risks these species face, and catch-and-release practices through the advisory committee processes;
- Enhance efforts to classify and record rarer species of sharks and skates by promoting better identification in existing observer programs and through enhanced reporting by fishers; and
- Continue annual shark derbies as opportunities to raise public awareness about shark species, their biology, and identification criteria.

## 3.7 National Plan of Action Review

### 3.7.1 Objective

To report progress on Canada's NPOA-Sharks as required under the IPOA-Sharks, and to ensure that the NPOA remains a living document that can be updated as new measures are developed and endorsed.

### 3.7.2 Means

Under the IPOA-Sharks, Canada will monitor progress in implementing its NPOA-Sharks and report to the FAO, every four years, on progress made, lessons learned, and effective strategies implemented. Additionally, Canada will provide available updates on the current status of stocks, new initiatives in management and research, and any substantial changes to existing management measures and practices.

Canada will review the NPOA-Sharks and report on the effectiveness of this plan of action and provide an updated assessment of the conservation and management efforts for sharks. Measures for improving the NPOA and current management measures will be identified and considered.

## 4. REGIONAL AND INTERNATIONAL CONSIDERATIONS

The objective of this section of the NPOA-Sharks is to identify gaps in the plan and propose remedial steps at the regional and international level.

### 4.1 Cooperate within RFMOs to Improve the Conservation and Management of Sharks

#### 4.1.1 Objective

To improve the conservation and enforcement measures for sharks in regional fisheries management organizations of which Canada is a member.

#### 4.1.2 Means

While some shark species are harvested through directed fisheries under the mandate of some RFMOs, the majority of the shark harvests are a result of incidental bycatch in other directed fisheries that are managed by these organizations. It is generally recognized that information related to the overall catch levels of these species is inadequate. Given the international consensus for RFMOs to demonstrate increased implementation of an ecosystem approach and the precautionary approach in fisheries management, Canada will encourage RFMOs to consider means to collect better data and implement bycatch policies, as well as management measures to ensure that the bycatch of sharks are within acceptable limits.

In this regard, Canada will work with other Contracting Parties within the relevant RFMOs to:

- Encourage Contracting Parties that have not done so to implement the FAO IPOA-Sharks through national plans of action;
- Promote the adoption of an ecosystem approach and the precautionary approach to fisheries management within RFMOs;
- Encourage improved data collection and information sharing within and among RFMOs regarding commercial catches and incidental bycatch of sharks; and
- Promote the review and implementation of measures to reduce shark bycatch in directed fisheries managed by the RFMOs.

### 4.2 Enhance Outreach and Education Efforts Internationally

#### 4.2.1 Objective

To enhance international and regional awareness about the purpose and principles of IPOA-Sharks.

#### 4.2.2 Means

To support and encourage other States in developing plans of actions for sharks, Canada will work with other countries and RFMOs to raise awareness of the importance of the IPOA/NPOA-Sharks, and to promote practical skills and knowledge transfer between countries.

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*(Note: All document links were accessed as of February 2007.)*

# ANNEX 1: SHARKS SPECIES IN CANADA

## ATLANTIC COAST LANDINGS (metric tonnes)

SPECIES	FISHERY	2001	2002	2003	2004	2005
<b>Sharks:</b>						
Porbeagle Shark ( <i>Lamna nasus</i> )	Directed Fishery	499 (\$818)*	239 (\$385)	143 (\$202)	232 (\$231)	203 (\$264)
Blue Shark ( <i>Prionace glauca</i> )	Directed Fishery	1/(1,000)** (\$1)	5/(1,000) (\$6)	6/(1,000) (\$9)	0/(1,000) (\$0)	12/(1,000) (\$13)
Spiny Dogfish ( <i>Squalus acanthias</i> )	Directed Fishery	3,807	3,596 (\$4,779)	1,324 (\$3,043)	2,371 (\$2,215)	2,270 (\$2,615)
Shortfin Mako Shark ( <i>Isurus oxyrinchus</i> )	Bycatch	70 (\$107)	79 (\$133)	73 (\$105)	80 (\$85)	95 (\$110)
<b>Skates:</b>						
Skate – All*** ( <i>Rajidae</i> )	Directed and Bycatch	2,628 (\$787)	2,984 (\$866)	2,601 (\$749)	1,931 (\$430)	1,789 (\$484)

\* Represents landed value (\$'000) in Canadian dollars.

\*\* Blue Shark is grossly underreported. See Campana et al., 2004. Figures represent estimated discard in metric tonnes.

\*\*\* Skate includes all. Thorny skate comprises 90-95 percent of total figures. Winter skate fishery closed as of 2006, and a cap limit of 200 tonnes for bycatch purposes was established in 2002.

## Bycatch 2001-2005 (less than one metric tonne)

### Sharks

Greenland Shark (*Somniosus microcephalus*); Basking Shark (*Cetorhinus maximus*); Oceanic Whitetip Shark (*Carcharhinus longimanus*); Dusky Shark (*Carcharhinus obscurus*); Smooth Dogfish (*Mustelus canis*); Thresher Shark (*Alopias vulpinus*); Atlantic Sharpnose Shark (*Rhizoprionodon terraenovae*); Smooth Hammerhead Shark (*Sphyrna zygaena*); Tiger Shark (*Galeocerdo cuvier*); Black Dogfish (*Centroscyllium fabricii*); Portuguese Shark (*Centroscyllium coelelepis*); Rough Sagre (*Etmopterus princeps*); Sand Tiger Shark (*Odontaspis taurus*); White Shark (*Carcharodon carcharias*); and Deepsea Cat Shark (*Apristurus profundorum*).

### Skates

Little Skate (*Leucoraja erinacea*); Smooth Skate (*Malacoraja senta*); Barndoor Skate (*Dipturus laevis*); White Skate (*Dipturus linteus*); Atlantic Torpedo (*Torpedo nobiliana*); Round Skate (*Rajella fyllae*); Spinytail Skate (*Bathyraja spinicauda*); Shorttail/Jensen Skate (*Amblyraja jenseni*); Arctic Skate (*Amblyraja hyperborea*); Soft Skate (*Malacoraja spinacidermis*); Abyssal Skate (*Rajella bathyphila*); Bigelow's Skate (*Rajella bigelowi*); Nova Scotia Skate (*Breviraja marklei*); Richardsons Skate (*Bathyraja richardsoni*); and Pelagic Stingray (*Dasyatis violacea*).



## Chimeras

Knifenose Chimaera (*Rhinochimaera atlantica*); Longnose Chimaera (*Harriotta raleighana*); and Deepwater Chimaera (*Hydrolagus affinis*).

Other species of sharks (14), skates (3) and chimaeras (1) have been sighted within Atlantic Canadian fisheries waters, but are considered to be extremely rare.

## PACIFIC COAST LANDINGS (metric tonnes)

SPECIES	FISHERY	2001	2002	2003	2004	2005
<b>Sharks</b>						
Spiny Dogfish ( <i>Squalis acanthias</i> )	Directed Fishery	4117.5 (1,219.6)* (\$2,820)**	4610.8 (1,420.8) (\$1,317)	5059.6 (1,419.4) (\$1,766)	5079.9 (1,491.3) (\$1,573)	4054.7 (1,784.2) (\$1,639)
Brown Cat Shark ( <i>Apistururs brunneus</i> )	Bycatch	0 (1.7)	0 (2.4)	0 (2.2)	0.03 (1.6)	0.03 (1.2)
Pacific Sleeper Shark ( <i>Somniosus pacificus</i> )	Bycatch	0 (10.3)	0 (13.3)	0 (5.9)	0 (7.6)	0 (7.7)
<b>Skates</b>						
Skate- All ( <i>Rajidae</i> )	Directed and Bycatch	1,581 (\$779)	1,540 (\$1,205)	2,537 (\$2,108)	2,012 (\$690)	1,801 (\$579)
Bigskate ( <i>Raja binoculata</i> )	Directed Fishery	1,153.6 (162.1)	924.7 (288.9)	1,500.6 (273.1)	1,005.9 (212.3)	1,024.4 (150.5)
Longnose ( <i>Raja rhina</i> )	Directed Fishery	176.4 (140.7)	159.2 (146.8)	268.7 (125.3)	242.7 (130.4)	247.9 (90.9)
Deepsea Skate ( <i>Bathyrāja abyssicola</i> )	Bycatch	0 (1.5)	0 (3.6)	0 (5.9)	0 (3.7)	0 (.32)
Sandpaper Skate ( <i>Bathyrāja interrupta</i> )	Bycatch	0.8 (18.5)	0.8 (19.07)	2.4 (20.9)	1.5 (24.9)	2.3 (25.92)
Roughtail Skate ( <i>Bathyrāja trachura</i> )	Bycatch	0 (14.8)	0 (12)	0 (13.9)	0.01 (5.5)	0 (3.9)
Alaska Skate ( <i>Bathyrāja parmifera</i> )	Bycatch	0.4 (0.81)	0 (0.16)	0 (2.2)	0 (0.4)	0 (1.9)
Unidentified Skate	Bycatch	1.2 (12.7)	0 (14.2)	0 (1.7)	0.6 (0.7)	0.2 (1.3)
<b>Chimaeras</b>						
Spotted Ratfish ( <i>Hydrolagus colliei</i> )	Bycatch	5.7 (755.1)	2.9 (811.2)	3.2 (714.7)	8.2 (790.2)	32.8 (619.6)

\* Represents discard in metric tonnes.

\*\* Represents landed value (\$'000) in Canadian dollars.



## Uncommon Bycatch 2001-2005 (less than one metric tonne)

### Sharks

Broadnose Sevengill shark (*Notorynchus cepedianus*); Bluntnose sixgill shark (*Hexanchus griseus*); Thresher Shark (*Alopias vulpinus*); Great White Shark (*Carcharodon carcharias*); Basking Shark (*Cetorhinus maximus*); Salmon Shark (*Lamna ditropis*); Bigeye Thresher Shark (*Alopias superciliosus*); Soupfin Sharks (*Galeorhinus zyopterus*); and Blue Shark (*Prionace glauca*).

### Skates

Broad Skate (*Amblyraja badia*); Whitebrow Skate (*Bathyraja minispinosa*); Starry Skate (*Raja stellulata*); Pacific Electric Eel (*Torpedo californica*); Pelagic Stingray (*Dasyatis violacea*); and Diamond Stingray (*Dasyatis brevis*).

Other species of sharks (2) and skates (2) have been sighted within Canadian Pacific fisheries waters, but are considered to be extremely rare.

# ANNEX 2: MANAGEMENT MEASURES BY SPECIES (2006)

## ATLANTIC

MEASURES	SPECIES				
	<b>Porbeagle Shark</b> ( <i>Lamna nasus</i> )	<b>Blue Shark</b> ( <i>Prionace glauca</i> )	<b>Spiny Dogfish</b> ( <i>Squalus acanthias</i> )	<b>Shortfin Mako</b> ( <i>Isurus oxyrinchus</i> )	<b>Thorny Skate</b> ( <i>Rajidae</i> )
At-Sea Observer Program	100%/5%*	100%/5%	100%/5%	100%/5%	100%/5%
Dockside Monitoring Program	yes	yes	yes	yes	yes
Stock Status Reports	yes	yes	yes	yes	assessed annually at NAFO
Fisheries Management Plans	Atlantic IFMP Pelagics	Atlantic IFMP Pelagics	Groundfish/Dogfish Plan	Atlantic IFMP Pelagics	Groundfish/NAFO
Total Allowable Catch	185 tonnes (135 t dir. + 50 t bycatch)	250 tonnes (non-restrictive)	2,500 tonnes	250 tonnes (non-restrictive)	2,250 tonnes (Canada) 13,500 tonnes in total

\* Coverage for foreign vessels and domestic vessels in Canadian fisheries waters.

## PACIFIC

MEASURES	SPECIES			
	<b>Spiny Dogfish</b> ( <i>Squalus acanthias</i> )	<b>Big Skate</b> ( <i>Raja binoculata</i> )	<b>Longnose Skate</b> ( <i>Raja rhina</i> )	<b>Spotted Ratfish</b> ( <i>Hydrolagus colliei</i> )
At-Sea Observer Program*	100%	100%	100%	100%
Dockside Monitoring Program	yes	yes	yes	yes
Stock Status Reports	yes	yes	yes	no
Fisheries Management Plans	Pacific IFMP Groundfish	Pacific IFMP Groundfish	Pacific IFMP Groundfish	Pacific IFMP Groundfish
Total Allowable Catch	11,500 tonnes	567 tonnes (5C/D trawl), else unrestricted 5.7t per hook-and-line vessel	47 tonnes (5C/D trawl), else unrestricted	(unrestricted)

\* Includes at-sea observer program (trawl) and electronic monitoring (hook-and-line and trap).