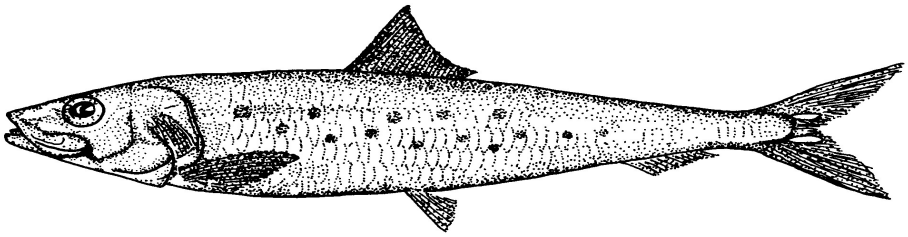
PACIFIC REGION

INTEGRATED FISHERIES MANAGEMENT PLAN

September 30, 2024 – May 31, 2029

PACIFIC SARDINE



Sardinops Sagax

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FOREWORD

The purpose of this Integrated Fisheries Management Plan (IFMP) is to identify the main objectives and requirements for the Pacific Sardine fishery in the Pacific Region, as well as the management measures that will be used to achieve these objectives. This document also serves to communicate the basic information on the fishery and its management to Fisheries and Oceans Canada (DFO, the Department) staff, legislated co-management boards and other stakeholders. This IFMP provides a common understanding of the basic "rules" for the sustainable management of the fisheries resource.

This IFMP is not a legally binding instrument which can form the basis of a legal challenge. The IFMP can be modified at any time and does not fetter the Minister's discretionary powers set out in the *Fisheries Act*. The Minister can, for reasons of conservation or for any other valid reasons, modify any provision of the IFMP in accordance with the powers granted pursuant to the *Fisheries Act*.

Where DFO is responsible for implementing obligations under land claims agreements, the IFMP will be implemented in a manner consistent with these obligations. In the event that an IFMP is inconsistent with obligations under land claims agreements, the provisions of the land claims agreements will prevail to the extent of the inconsistency.

1 OVERVIEW

1.1 Introduction

This Integrated Fisheries Management Plan (IFMP) for Pacific Sardine covers the period from September 1, 2024 to May 31, 2029.

The commercial fishery for Pacific Sardine remains closed. There have been no commercial fishery landings for Pacific Sardine in Canada since 2012, and no allocated quota since 2014 due to low biomass forecasts. Few or no sardines were observed in BC waters since 2013 in fisheries, surveys or from other sources.

1.2 Background

The Pacific Sardine fishery is an opportunistic fishery dependent on the migration of sardines into Canadian waters. Sardine migration and population levels are heavily influenced by oceanic conditions that determine the survival and recruitment of juveniles into the adult stock. A sardine fishery in B.C. is dependent on favourable ocean conditions which support the growth and production of the Pacific Sardine stock.

From 1996 to 2001, there was a limited experimental harvest of Pacific Sardine by a small number of harvesters. Given the results of the experimental fishing, and the de-listing of Pacific Sardine by the Federal-Provincial Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as a species of "special concern" in May 2002, the seine component of the fishery moved to a commercial phase in 2002 consistent with the Department's New Emerging Fisheries policy (NEFP). A one-year interim plan was developed in 2002 using a precautionary approach while providing opportunity for continued assessment of the viability of the fishery and the potential for future expansion. An experimental/exploratory phase was initiated to investigate the feasibility of alternative gear types and areas.

From 2003 to 2006, the Department developed a three year fishing plan that allowed for an incremental approach towards development of the fishery while continuing to follow the principles of the NEFP. From 2007 to 2011, the Department developed an annual Integrated Fisheries Management Plan to support growth of the fishery. Following the decline of the fishery, management plans have been multi-year, reflecting the unnecessity of active management.

1.3 Type of Fishery and Participants

Indigenous People of British Columbia

In the 1990 Sparrow decision, the Supreme Court of Canada found that where an Aboriginal group has an Aboriginal right to fish for food, social and ceremonial (FSC) purposes, it takes priority, after conservation, over other uses of the resource. Fisheries are authorized via a

Communal Licence issued by the Department under the *Aboriginal Communal Fishing Licences Regulations*.

In addition to fishing opportunities for FSC purposes and domestic purposes for treaty rights for the Maa-nulth First Nation and the Tla'amin First Nation, DFO acknowledges that in Ahousaht Indian Band et al. v. Canada and British Columbia, the courts have found that five Nuu-chah-nulth First Nations located on the West Coast of Vancouver Island—Ahousaht, Ehattesaht, Hesquiaht, Mowachaht/Muchalaht, and Tla-o-qui-aht—have aboriginal rights to fish for any species of fish within their Fishing Territories and to sell that fish, with the exception of geoduck.

Recreational

Anglers may harvest sardine in the Pacific Region, although catch and effort levels are limited for the recreational sardine fishery. For more information about recreational fishing for Pacific Sardine, please visit: http://www.pac.dfo-mpo.gc.ca/fm-gp/rec/points/finfish-peche-eng.html.

A British Columbia Tidal Waters Sport Fishing Licence is required for the recreational harvest of all species of fish in tidal waters. Tidal Waters Sport Fishing Licences are available online at: http://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/index-eng.htm.

Commercial

There are a total of 50 licences for the Pacific Sardine fishery (25 commercial and 25 communal commercial licences). The fishery is managed by individual licence quotas. Licence holders are permitted to stack multiple licences and associated quota to the same vessel.

1.4 Location and timing of Fishery

When the commercial fishery was open, harvest was authorized in portions of Pacific Fishery Management Areas (PFMAs) 3 – 13, 20, 23 to 27, 101 to 110, 121, 123 to 127, 130 and 142.

The majority of harvest occurred from August to October.

Indigenous and recreational harvest may be permitted year round with appropriate authorizations. However, sardine is unlikely to be encountered in BC waters outside the late summer and early fall.

1.5 Governance

Management of Pacific Sardine is directed by the *Fisheries Act* and other acts and regulations including:

- The *Pacific Fishery Management Area Regulations*,
- The *Fishery (General) Regulations* and the *Pacific Fishery Regulations*, 1993,

- The *Aboriginal Communal Fishing Licence Regulations*,
- The *Maa-nulth First Nations Final Agreement Act,*
- The *Tla'amin Final Agreement Act*,
- The *British Columbia Sport Fishing Regulations*,
- The *Oceans Act*, and,
- The *Species at Risk Act*.

These documents are available at: http://www.dfo-mpo.gc.ca/acts-loi-eng.htm.

In addition, the national Sustainable Fisheries Framework contains policies for adopting an ecosystem based approach to fisheries management including:

- A Fishery Decision-Making Framework Incorporating the Precautionary Approach;
- Managing Impacts of Fishing on Benthic Habitat, Communities and Species;
- Policy on New Fisheries for Forage Species.
- Guidance for the Development of Rebuilding Plans under the Precautionary Approach Framework: Growing Stocks out of the Critical Zone
- Policy on Managing Bycatch
- Strategic Framework for Fishery Monitoring and Catch Reporting in the Pacific Fisheries
- Ecological Risk Assessment Framework (ERAF) for Coldwater Corals and Sponge Dominated Communities

For more information on the Sustainable Fisheries Framework, please visit: http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/overview-cadre-eng.htm

The national Fishery Monitoring Policy is available at: http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/fishery-monitoring-surveillance-des-peches-eng.htm.

1.6 Consultation

DFO has a broad mandate, with the authority to regulate and enforce activities, develop policy, provide services and manage programs. To help ensure the Department's policies and programs are aligned with its vision and effectively address the interests and preferences of Canadians, DFO supports consultations that are transparent, accessible and accountable. DFO Pacific Region undertakes consultations in order to meet the duty to consult with First Nations, improve departmental decision-making processes, promote understanding of fisheries, oceans and marine transport issues, and strengthen relationships.

Additionally, DFO consults with First Nations through established treaties, such as Maa-nulth, as well as through other existing processes.

1.7 Approval Process

This plan is approved by the Regional Director General for the Pacific Region.

2 STOCK ASSESSMENTS, SCIENCE AND INDIGENOUS KNOWLEDGE

2.1 Biological Synopsis

Sardines are schooling pelagic fish found in relatively warm waters of every ocean with a global distribution restricted from 60°N to 50°S. Scale-deposition studies have revealed hundreds and thousands of years of "boom and bust" cycles of Pacific Sardine populations off California (Baumgartner et al. 1992) and Chile (Valdes et al. 2008). The Pacific Sardine (*Sardinops sagax*) Northern Subpopulation occurring in the Northeast Pacific (and linked to the California Current ecosystem) has undergone long-term fluctuations in abundance for at least 2000 years. In the last century, large abundances occurred throughout the population's range from the early 1900s to the late 1940s. This population was fished extensively from the early 1900s through the late 1940s. Following that period, their abundance declined and their distribution contracted to small pockets off southern California and Ensenada Mexico. The population gradually rebuilt in the 1980s and as the population size increased so did the northern extent of its distribution. A resurgence of sardine distribution into British Columbia (BC) waters was observed in the 1990s and since then the stock has showed considerable variability in abundance. Sardine population levels are heavily influenced by oceanic conditions that determine the survival and recruitment of juveniles into the adult stock and stock migration patterns into Canadian waters.

The main spawning grounds for the California Current Ecosystem sardine population are off California and northwest Baja, Mexico but during warm periods, such as during strong El Niño events, environmental conditions may be conducive to sardine spawning in more northern waters, such as off the Oregon, Washington and BC coasts. Adult sardines can spawn annually between 2 and 10 years of age and year class and recruitment success can vary greatly. A strong year class can have a large impact on the abundance of the coastwide population for several years. Sardines aged two to four generally range from 17 to 22 cm (fork length); whereas sardines aged four to ten years generally range from 20 to 25 cm.

Sardine movements and population structure are quite dynamic and several aspects of stock structure are poorly understood. Seasonal trends in geographic distribution and biological observations (length, age, parasite and historic tagging data) show that regional connectivity in the population is complex. In general, the majority of sardines seasonally observed off BC, Washington and Oregon are relatively large and represent older components of the population compared to sardines observed off California and Baja Mexico. Seasonal migrations are also complex, with timing and extent of movements affected by population size and structure and oceanographic factors (Ware and Thompson 1991; McFarlane et al 2002). The northward migration appears to be constrained by the 12°C isotherm (Ware 2001). Sardines filter feed on phytoplankton and zooplankton and summer migrations into BC waters enable them to benefit from the marine productivity resulting from extended daylight and nutrient rich waters from oceanic upwelling and coastal run-off.

2.2 Ecosystem Interactions

Pacific Sardine occurrence in, and migrations to, waters of the Pacific Northwest of North America are mainly to feed on abundant plankton resources associated with summer months. The extent of the northward migration is in part related to oceanographic conditions, particularly sea surface temperature, such that stocks move further north during warmer years. Sea surface temperature has also been related to juvenile survival for recruitment to the adult spawning population with stronger recruitment occurring during warmer years.

Similar to other forage fish species in BC waters, sardine are eaten by a variety of predators, such as salmonids, sharks, sea lions, seals, Humpback whales, and seabirds. The seasonal distribution of sardine in BC waters corresponds with the foraging and migrating seasons of some of their predators, such as Coho and Chinook salmon and Humpback whales. Ongoing research is helping scientists and fisheries managers to develop a better understanding of ecosystem processes, including environmental effects on sardine recruitment, and the role that sardines play in ecosystem structure and function.

2.3 Precautionary Approach

The Department follows the Sustainable Fisheries Framework (SFF) – a toolbox of policies for DFO and other interests to sustainably manage Canadian fisheries in order to conserve fish stocks and support prosperous fisheries. The SFF includes a decision-making framework incorporating a precautionary approach to commercial, recreational, and food-social-ceremonial fishing (http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-eng.htm).

In general, the precautionary approach in fisheries management is about being cautious when scientific knowledge is uncertain, and not using the absence of adequate scientific information as a reason to postpone action or failure to take action to avoid serious harm to fish stocks or their ecosystem. This approach is widely accepted internationally as an essential part of sustainable fisheries management.

Applying the precautionary approach to fisheries management decisions entails establishing a harvest strategy that:

- identifies three stock status zones – healthy, cautious, and critical – according to upper stock reference points and limit reference points;
- sets the removal rate at which fish may be harvested within each stock status zone; and
- adjusts the removal rate according to fish stock status variations (i.e., spawning stock biomass or another index/metric relevant to population productivity), based on pre-agreed decision rules.

The framework requires that a harvest strategy be incorporated into respective fisheries management plans to keep the removal rate moderate when the stock status is healthy, to

promote rebuilding when stock status is low, and to ensure a low risk of serious or irreversible harm to the stock.

More information related to the precautionary approach is available at: http://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precautionary-precaution-eng.htm

2.4 Stock Assessments

Stock assessments for Pacific Sardine are conducted by the United States (U.S.) National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA). The U.S. NMFS has been annually assessing the status and population trends of the Pacific Sardine Northern Subpopulation of the eastern Pacific Ocean using versions of an age-structured model. Because of its geographic distribution that can range southward from the west coast of Baja California northward to southeast Alaska, it is also known as the California Current Ecosystem sardine stock. Information from fishery independent surveys, monitoring fishery catch and landings, and biological sampling has been used to inform stock assessment models. Stock assessment methods have changed over the years and are expected to further evolve over time as part of multi-year review processes facilitated by the US Pacific Fishery Management Council.

Catch data from the BC sardine fishery were collected for all years of the most recent commercial fishery (2003-2014), including an experimental period prior to 2002. These data include spatial and temporal information linked to fishery landings and biological information from catch samples (e.g, length, weight and sex). In addition to fishery information from other regions of the stock's spatial distribution, BC fishery information on monthly landings and fish size from biological sampling have been used to inform stock assessment efforts led by U.S. NMFS analysts.

Since 2011, one of the main sources of information informing sardine stock assessment efforts of the Northern Subpopulation has been from spring and summer acoustic-trawl surveys. These surveys have occurred since 2006 and are led by the U.S. NMFS (Demer et al 2018, Hill et al 2018). These surveys collect acoustic records through multi-frequency echosounder sampling and information on species and size compositions through trawl catch sampling. In addition to biological sampling associated with the trawl catches, water sampling of eggs and larvae (ichthyoplankton) also occurs to compliment acoustic-trawl observations. The summer acoustic-trawl surveys have extended from waters off the northwest coast of Vancouver Island to the US and Mexican Pacific border to represent a foraging distribution, whereas the spring surveys have ranged from California to Oregon to represent a spawning distribution (Demer et al 2018).

From 1997 to 2014, data from summer DFO pelagic trawl surveys off the west coast of Vancouver Island were used to characterize the regional distribution, relative abundance, and biological information of sardine in BC waters. In 2006, 2008-2014 night trawling was conducted to reduce the variability in catch data of sardine and improve characterization of fish diet

observations. Since 2014, no consistent DFO multi-year survey plan has been employed to specifically monitor sardine occurrence and ecology in BC waters but information is also collected from other DFO multi-species pelagic surveys off the west coast of Vancouver Island (and other areas) which may catch sardine.

2.5 Research and Other Activities

Collaboration between DFO and the U.S. NMFS is ongoing to exchange sardine information related to fisheries, stock assessments, and ecosystem monitoring and interactions. Listed below are examples of sardine research initiatives that have been led by U.S. and Canadian science teams.

The United States:

- Abundance indices, seasonal distribution and biological samples
    - Ichtyoplankton-trawl (and fecundity) spring surveys off California
    - Summer coastwide aerial surveys
    - Spring and summer acoustic-trawl surveys
    - Columbia River Plume pelagic trawl surveys
- Stock assessment modeling or assessment model components
    - Ageing research and developing age and length relationships
    - Recruitment and year class modeling
    - Characterizing fishery selectivities
    - Management strategy evaluation
    - Harvest control rule parameter estimates (e.g F_{MSY} and Distribution)
- Habitat modeling
    - Use of survey, fishery and oceanographic data to predict and test habitat models

Canada:

- Summer pelagic trawl research surveys
    - Trawl densities and regional distribution (relative abundance index)
    - Species associations (sardine diet, sardine predator diet, putative sardine competitors)
    - Plankton and oceanographic (water) sampling
    - Scientific acoustic records - species groups abundance and distribution)
    - Marine mammal daytime observations
- Ageing research and fat testing
- Aerial survey feasibility trials
- Regional ecosystem/trophic modeling

Although not explicitly listed as examples, collaboration and additional research is conducted by Mexican teams.

2.6 Indigenous Knowledge

Indigenous Knowledge has not been generally available on sardine. However, when available, it will be considered in science decisions and the management of the fishery.

3 SOCIAL, CULTURAL, AND ECONOMIC IMPORTANCE

3.1 Indigenous

Sardine fishing for Food, Social, and Ceremonial (FSC) purposes may be authorized upon request. Sardine fishing may also be permitted through the Maa-nulth Harvest Document, or through other treaty-related mechanisms.

3.2 Recreational

Recreational fishing may occur to provide food for personal use, as a leisure activity, or as a combination of the two. The recreational community includes local residents, multi-species charter operators and lodges, and visiting anglers and boaters. These activities provide a range of benefits to the participants as well as contribute directly and indirectly to economic activity.

3.3 Commercial

The majority of the most recently active sardine vessels stacked licences and their associated quota. Based on the most recent (2009) financial profile of the fishery, the average vessel had an estimated boat return of approximately $30,000. Five vessels accounted for just over half of all sardine licences (communal commercial and commercial). While vessels that have been active in the sardine seine fishery were also often active in the salmon and herring fisheries, the majority of their gross revenue (more than 50%) was from the harvest of sardines in 2009.

Between 2010 and 2012, the average landed value and wholesale value of BC Pacific Sardine was $3.66 million and $21.35 million, respectively. Based on this revenue, it is estimated that the 60 or so captain and crew involved in the 2012 season would have earned approximately $1.1 million. Additional income earned by processing sector workers (employed mainly in Ucluelet, Delta, and Port Hardy) would have been in the range of $2.5-$3 million.

A notable future challenge in the sardine fishery, should commercial harvest resume, will be finding appropriate buyers for this product. The BC sardine harvest, like the much larger U.S. sardine harvest, is mostly destined as low value bait in the tuna high seas longline fishery. Past efforts to gain access to the higher value food product market have had mixed results.

4 ACCESS AND ALLOCATION

The Minister can, for reasons of conservation or for any other valid reason, modify access, allocations, and sharing arrangements as outlined in this IFMP in accordance with the powers granted pursuant to the *Fisheries Act*.

4.1 Indigenous

Indigenous harvest of Pacific Sardine for FSC or domestic purposes may occur coast wide where authorized by a communal licence or Harvest Document.

4.2 Recreational

Recreational harvest of Pacific sardine is permitted through a British Columbia Tidal Waters Sport Fishing Licence. The daily limit for Pacific sardine is 100 pieces and the possession limit is 200 pieces.

4.3 Commercial

Commercial harvest of Pacific Sardine is not currently permitted.

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