



Rebuilding Plan for Atlantic Cod (*Gadus morhua*) NAFO Sub-division 3Ps Newfoundland and Labrador Region



- [Date stock was determined to be at or below LRP: 2000](#)



- [Date stock was prescribed to the Fish Stock Provisions: April 4, 2022](#)
- [Date Rebuilding Plan Approved: March 26, 2024](#)

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Foreward

In 2009, Fisheries and Oceans Canada (DFO) developed 'A Fisheries Decision-Making Framework Incorporating the Precautionary Approach' (PA Policy) under the auspices of the 'Sustainable Fisheries Framework'. It outlines the departmental methodology for applying the precautionary approach (PA) to Canadian fisheries. A key component of the PA Policy requires that when a stock has declined to or below its limit reference point (LRP), a rebuilding plan must be put in place with the aim of having a high probability of the stock growing above the LRP within a reasonable timeframe.

In addition, under section 6.2 of the Fish Stocks Provisions (FSP) in the amended *Fisheries Act* (2019), rebuilding plans must be developed and implemented for prescribed major fish stocks that have declined to or below their LRP. This legislated requirement is supported by section 70 of the *Fishery (General) Regulations* (FGR), which set out the required contents of

those rebuilding plans and establish a timeline for each rebuilding plan's development.

The purpose of this plan is to identify the main rebuilding objectives for Atlantic cod in Northwest Atlantic Fisheries Organization (NAFO) sub-division 3Ps, as well as the management measures that will be used to achieve these objectives. This plan provides a common understanding of the basic "rules" for rebuilding the stock. This stock is prescribed in the *Fishery (General) Regulations* (section 69) and thus is subject to section 6.2 of the *Fisheries Act* and regulatory requirements.

The objectives and measures outlined in this plan are applicable until the stock has reached its rebuilding target. Once the stock is determined to be at the target, the stock will be managed through the standard Integrated Fisheries Management Plan (IFMP) or other fishery management process in order to fulfill the requirements of the FSP. Management measures outlined in this rebuilding plan are mandatory, and may be modified or further measures added if they fail to result in stock rebuilding.

This rebuilding plan is not a legally binding instrument which can form the basis of a legal challenge. The plan 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 rebuilding plan in accordance with the powers granted pursuant to the *Fisheries Act*.

Decisions flowing from the application of this rebuilding plan must respect the rights of Indigenous peoples of Canada recognized and affirmed by section 35 of the *Constitution Act* (1982), including those through modern treaties. Where DFO is responsible for implementing a rebuilding plan in an area subject to a modern treaty, the rebuilding plan will be implemented in a manner consistent with that agreement. The plan should also be guided by the 1990 Sparrow decision of the Supreme Court of Canada, which found that where an Aboriginal group has a right to fish for food, social and ceremonial purposes, it takes priority, after conservation, over other uses of the resource.

1.0 Introduction and context

1.1 Biology of stock

The Northwest Atlantic Fisheries Organization (NAFO) Sub-Division 3Ps stock of Atlantic cod (*Gadus morhua*) off southern Newfoundland (NL) extends from Cape St. Mary's to just west of Burgeo Bank, and over St. Pierre Bank and most of Green Bank. Stock structure and migration patterns of 3Ps cod are complex; cod mix with adjacent stocks at the margins of the stock boundary, some offshore components migrate seasonally to inshore areas, and there are inshore components of this stock (e.g. Bratley and Healey 2007; Campana et al. 1998).

Spawning is spatially widespread in 3Ps, occurring close to shore as well as on Burgeo Bank, St. Pierre Bank, and in the Halibut Channel. Timing of spawning is variable and extremely protracted (Morgan and Rideout 2009, and references therein). A rapid shift to earlier age at maturity occurred in the early 1990s, with the proportion of female cod maturing at ages 4-6 increasing for all cohorts subsequent to 1985. Current age at 50 per cent mature for females in this stock is 5 years. Cod growth rates have varied over time, but has generally decreased since the mid-2000s.

1.2 Environmental conditions and ecosystem factors affecting the stock

Oceanographic conditions in 3Ps are influenced by the Labrador Current from the east, the warmer and saltier Gulf Stream waters from the south, as well as the complex bottom topography in the region and local atmospheric climate conditions. In 3Ps, near-bottom temperatures have experienced a general warming trend since 1990 (Cyr et al. 2022) and ocean warming is expected to continue (Bush and Lemmen 2019). Ocean climate modelling for the Newfoundland shelf projects widespread increases in bottom temperature in 3Ps, along with increases in sea surface temperature and changes in salinity (Han et al. 2017). Across the North Atlantic, the productivity of Atlantic cod stocks is likely to be limited by continuing increases in ocean temperatures (Sguotti et al. 2019). Important changes have also been noted in nutrient levels, phytoplankton and zooplankton across the Northwest Atlantic, including in 3Ps (Bélanger et al. 2021). Widespread changes in the size structure of the zooplankton community toward a higher dominance of smaller copepod species occurred around 2010 (Maillet et al. 2022). These changes can impact energy transfer and contribute to bottom-up limitations within the ecosystem.

Atlantic cod was the historically dominant species among predatory fishes in

this ecosystem unit, but its dominance within this functional group has been markedly reduced since 2010 due to increases in warm water species such as Silver hake (*Merluccius bilinearis*) (Koen-Alonso and Cuff 2018; NAFO 2021). Ongoing warming trends, together with more recent increased dominance of warm water fishes, indicate that the 3Ps ecosystem continues to experience structural changes. Cod diet composition in 3Ps is less consistent than adjacent stocks in the NL bioregion, suggesting that food availability in this ecosystem unit may be highly variable. This, in conjunction with overall declines in weight-at-age and generally poor cod condition – a measure of fish health, and one of the major factors impacting increased natural mortality levels in 3Ps cod – in the 2010s could indicate food limitation effects on cod. In this context, bottom-up effects are contributing to poor fish condition and increased natural mortality of cod in this stock (DFO 2022/022).

Grey seals (*Halichoerus grypus*) and Harbour seals (*Phoca vitulina*) are found in 3Ps year-round, with Grey seals appearing to use this area primarily in the summer months. Both species are known to predate on Atlantic cod, however available data indicates that cod do not make up a significant portion of their diet in 3Ps (e.g. Vincent et al. 2022), and available scientific evidence indicates that predation by seals is not currently a major driver of 3Ps cod stock trends. Seal abundance, distribution, and diet are discussed further in section 3.0.

Physical and biological oceanographic changes influence cod ecology across all life stages. The distribution, abundance, and seasonality of predators, of prey, and of competitors can all impact cod growth, survival, and condition. Predicting the impact of climate changes on cod dynamics is incredibly complex as stocks are impacted by both direct and indirect processes (Drinkwater et al. 2010). While the understanding of climate impacts on Atlantic cod continues to develop, effects on stock rebuilding for Atlantic cod in 3Ps are not currently known.

1.3 Extent of stock and fishing area

The Atlantic cod stock off southern Newfoundland extends from Cape St. Mary's in the east, to just west of Burgeo Bank, and over St. Pierre Bank and most of Green Bank. Fishing occurs throughout this area (Figure 1).



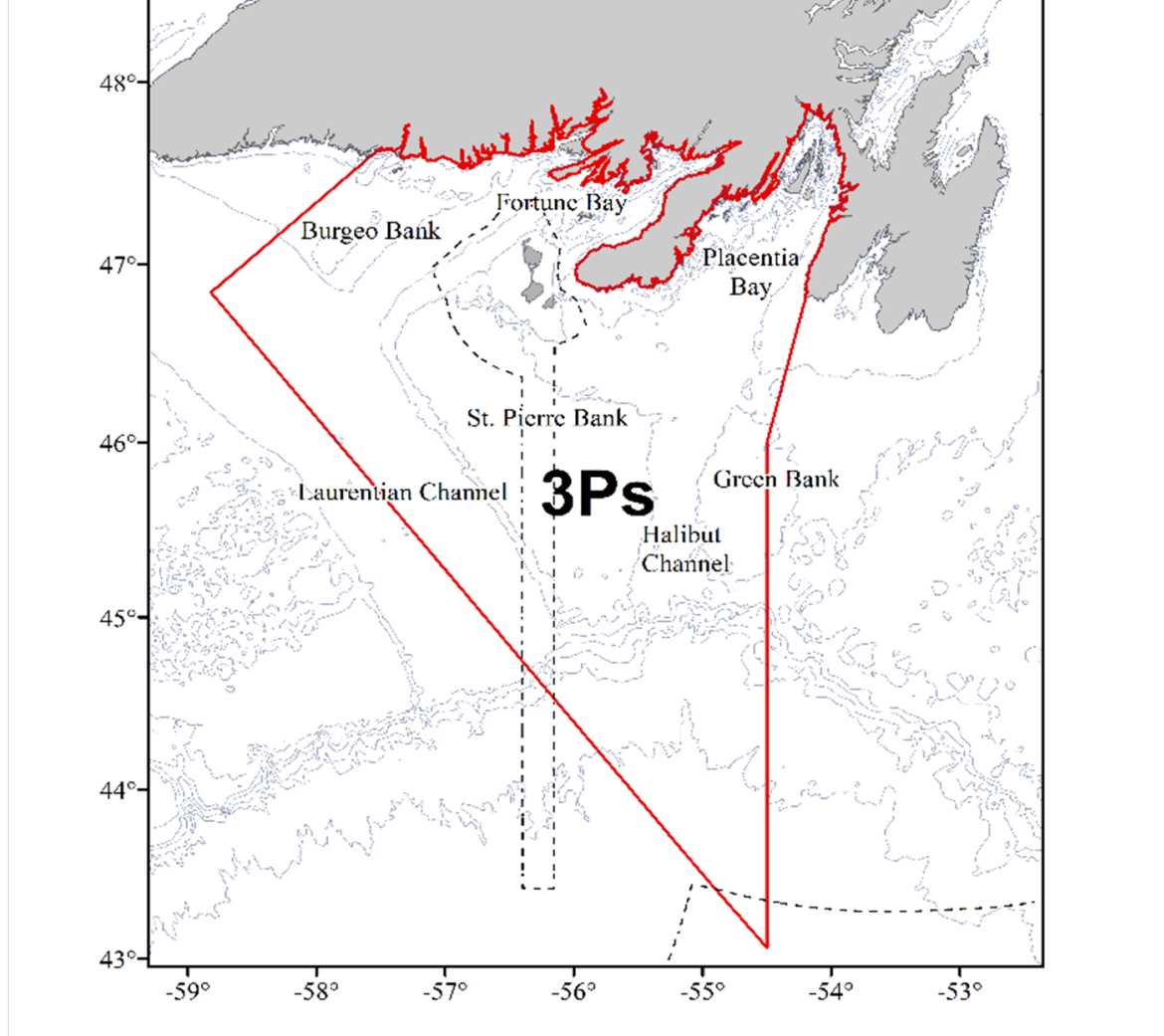


Figure 1. NAFO Sub-Division 3Ps management area and economic zone around the French islands of St. Pierre et Miquelon (SPM, dashed line) (DFO 2022/022).

► Description

1.4 Overview of commercial fishery

The directed commercial fishery for 3Ps cod is prosecuted primarily by inshore fixed gear enterprises¹ less than 65 feet in length, with gillnets as the predominant gear type used (accounting for approximately 78 per cent of fixed-gear landings since 2019). The remainder of landings from the commercial fishery is taken primarily by other inshore and offshore vessels.

Cod is also caught as bycatch in other commercial groundfish fisheries in 3Ps, including in fisheries for Redfish, Witch flounder, Atlantic halibut, and White hake.

Socioeconomic analysis of the 3Ps cod fishery is provided for historical context, as well as specific to this rebuilding plan's management procedure. The analyses of harvesting sector impacts are largely focused on 3Ps-based

² less than 65 feet fishing enterprises with cod landings. The reason for this approach is that these enterprises account for the vast majority of Canadian 3Ps cod landings; an annual average of more than 75 per cent since 2010. There are also active fishing enterprises less than 65 feet with 3Ps cod landings that are not based ² in 3Ps. However, they are not included in the analysis because some of these enterprises have access to different species and areas, particularly snow crab, separate from those enterprises based in 3Ps. It is recognized that 3Ps cod has been an important component of the operations of these enterprises.

There are other fleets that harvest 3Ps cod either directly or as bycatch in other fisheries. They land in either the Newfoundland and Labrador (NL) or Maritimes Regions, albeit 3Ps cod landings in the Maritimes Region have been low in recent years (annual average of about 50t per year since 2018). These fleets tend to be in the greater than 65 feet category. In the period from 2011 to 2021, there were, on average, ten active vessels per year in this fleet with 3Ps cod landings in the NL and Maritimes Regions. On average, over that period, these vessels landed about 907 tonnes of cod per year with a landed value of approximately \$2.1 million. Many of these vessels are owned and/or operated by large, vertically integrated companies with different licensing profiles than the less than 65 feet fleet, and some are also engaged in onshore processing. Furthermore, these companies have access to other species and areas than that of 3Ps-based less than 65 feet enterprises. The business arrangements and financial structure of these companies are not known to the Department and, as a result, it is difficult to determine the relative impact of the rebuilding plan on them and thus they are not directly included in the analysis below. It is recognized that 3Ps cod has been an historically important component of the operations of these vessels. It is also understood that cod can be an important species to a vessel's annual fishing plan.

1.4.1 Historical context ³

The cultural and economic significance of Atlantic cod to the origins and way of life for many coastal communities and families in Newfoundland and Labrador has been well documented. From the inshore fishery on the island, north to Labrador, and to the offshore banks, this one species sustained fishing operations dating back to the 1500s.

By the 1980s ⁴, the commercial fishery in NL was highly dependent on cod,

which supported significant employment in the harvesting and processing sectors. The commercial cod fishery throughout the province accounted for more than 55 per cent of average annual total landed volume, and 52 per cent of average annual total landed value, of all species harvested, during the 1980s.

On the south coast of NL, the importance of Atlantic cod as a local economic driver mirrored that of the province generally. During the 1980s, average annual Canadian landings of cod in 3Ps totaled approximately 30,000 tonnes (t), with a landed value of approximately \$12 million. Of these total landings, vessels less than 35 feet accounted for more than half (56 per cent), vessels between 35 and 65 feet accounted for 33 per cent, and vessels greater than 65 feet landed approximately 10 per cent. On average, cod accounted for about 58 per cent of average annual total landed value, from all species harvested, for all vessels based in 3Ps during the 1980s.

As well, 3Ps cod was heavily exploited by non-Canadian fleets in the 1960s to early 1970s, with catches at their highest levels in 1961 at 87,000t. A Total Allowable Catch (TAC) was introduced in 1973 at 70,500t and in 1977, the Canadian Exclusive Economic Zone was extended to 200 nautical miles.

Following the extension of jurisdiction, catch by vessels from France (Saint Pierre et Miquelon), averaged 14,700t annually for the period 1977 to 1993.

By 1986, there were about 200 registered processing plants active in the province, providing employment to approximately 186 communities (Department of Finance, 1987). Approximately 20 of these plants were located in communities on the south coast of Newfoundland and were primarily processing groundfish, largely cod.

Landings of 3Ps cod decreased sharply in the early 1990s and a commercial moratorium was imposed on this stock in August 1993. The closure of several groundfish stocks, including 3Ps cod, resulted in the loss of tens of thousands of harvesting and processing jobs, as well as wide-spread indirect impacts on local businesses. This was a pivotal time for the harvesting and processing sectors, and it re-shaped the identity of many communities. The federal government response to these groundfish closures unfolded over several years and included income support, licence buybacks, early retirements, and retraining.

1.4.2 Post moratorium

In May 1997, the 3Ps cod fishery re-opened under an overall TAC for the stock of 10,000t, which subsequently increased to 20,000t in 1998 and to 30,000t in 1999. At that time, there were about 1,100 active less than 65 feet enterprises with cod landings in 3Ps. In 1998 and 1999, these less than 65 feet enterprises had cod landings of approximately 12,000t and 19,000t, with landed values of about \$19 million and \$26 million, respectively. Cod accounted for approximately 42 per cent of total fishing revenue for the average active fishing enterprise in these years. French catch for the period 1997 to 1999 averaged approximately 2,600t annually.

Over the following decade (2000 to 2009), there were reductions in the TAC for 3Ps cod, from 20,000t in 2000-01 to 11,500t in 2009-10. Over this period, 3Ps cod landings and landed value declined from a high in 2000 of about 14,600t and \$21 million, to 5,800t and \$6.2 million by 2009. The number of active fishing enterprises also declined over this period from about 1,000 enterprises in 2000 to about 760 by 2009. Dependence on cod (that is, cod as a percentage of total fishing revenue) declined from the previous decade to about 25 per cent of total fishing revenue for the average active fishing enterprise between 2000 and 2009. Other species, such as Lobster and Snow crab, increased in significance and became larger contributors to the average total fishing revenue for these enterprises during this time. French catch for the period 2000 to 2009 averaged approximately 2,700t annually.

The TAC was maintained at 11,500t for 3Ps cod from 2009-10 to 2013-14. A rebuilding plan was established for 3Ps cod in 2014. In accordance with the rebuilding plan's harvest control rule (HCR), the TAC was increased to 13,225t for 2014-15 and 13,490t for 2015-16, and was reduced to 13,043t for 2016-17. The rebuilding plan and its HCR was suspended in the setting of the TAC for 2017-18, as the HCR's output was deemed higher than considered prudent given the stock's downward trajectory and its close proximity to the Limit Reference Point (LRP). The TAC for 2017-18 was reduced by 50 per cent to 6,500t, and was further reduced to 5,980t for 2018-19 and 2019-20. During the last decade (2010 to 2019), cod landings and the number of active enterprises continued to decline, albeit with some annual variability. In 2010, 3Ps-based less than 65 feet enterprises landed about 5,100t of cod with a landed value of approximately \$5 million (Figures 2 to 4). By 2019, cod landings by the less than 65 feet fleet were down to about 2,800t, with a landed value of approximately \$4.4 million. The number of active enterprises declined from 665 in 2010 to about 370 by 2019 (Figure 5). For the average

active enterprise, cod dependence was approximately 14 per cent.

Dependence on Lobster and Snow crab increased (Figure 6) as the landed value of Lobster and Snow crab continued to increase (Figure 6 and 7). Over this period, the highest cod dependence for this fleet was 20 per cent in 2017. French catch for the period 2010 to 2014 averaged approximately 1,200t, which declined to an annual average of 600t for the period 2015 to 2021. Catches in the most recent years of this latter period are well below this average.

From 2019 to 2021, the TAC was further reduced, from 5,980t in 2019-20 to 2,691t in 2020-21 and to 1,346t in 2021-22, which was maintained in 2022-23. Cod landings and landed value declined by about 77 per cent from 2,790t and \$4.4 million in 2019, to approximately 675t and \$955,000 by 2021. In recent years, cod dependence for the average active 3Ps-based less than 65 feet enterprise has been less than 2 per cent. Lobster, Snow crab and, to a lesser extent, Sea cucumber and other species have become the largest contributors to total fishing revenue for the average active fishing enterprise.

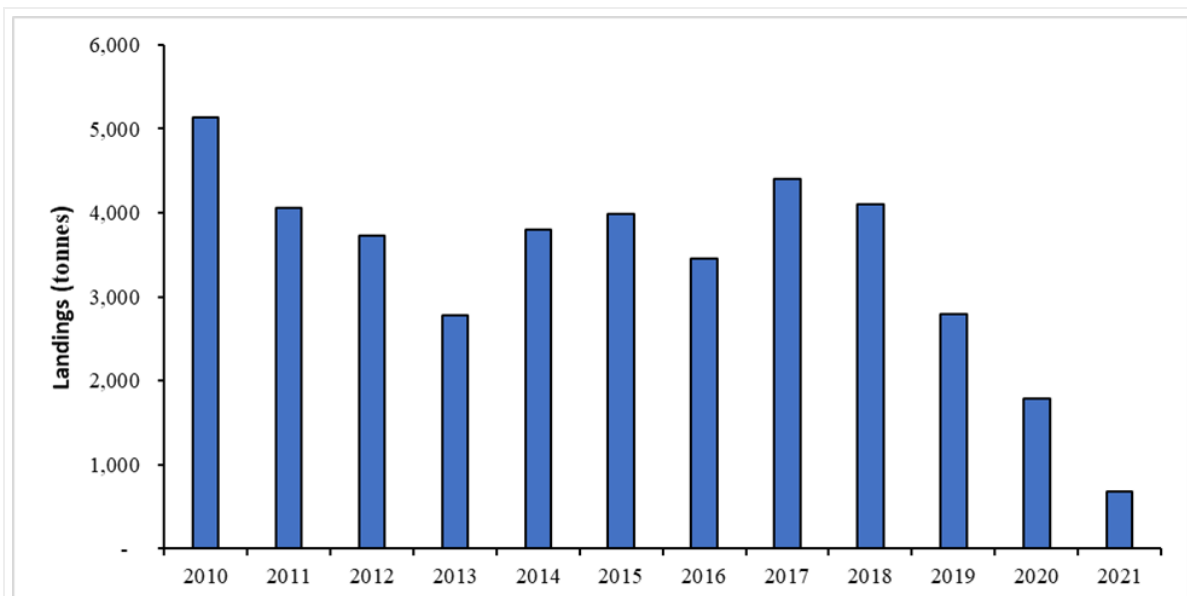
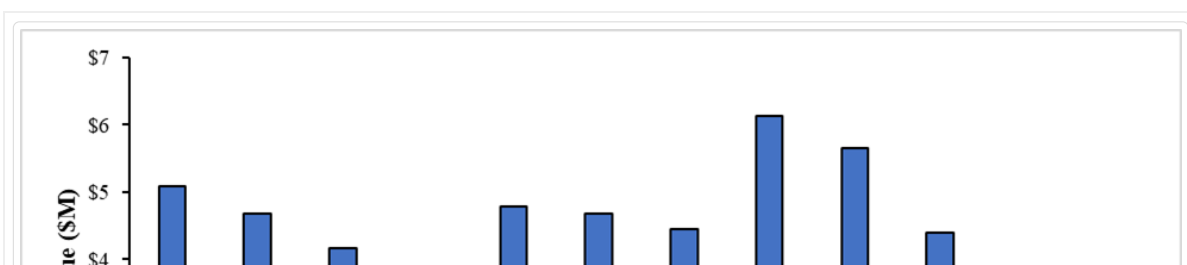


Figure 2. Total cod landings, round weight, for 3Ps-based less than 65 feet enterprises, in tonnes, for the period of 2010 to 2021 in NL region.

► Description



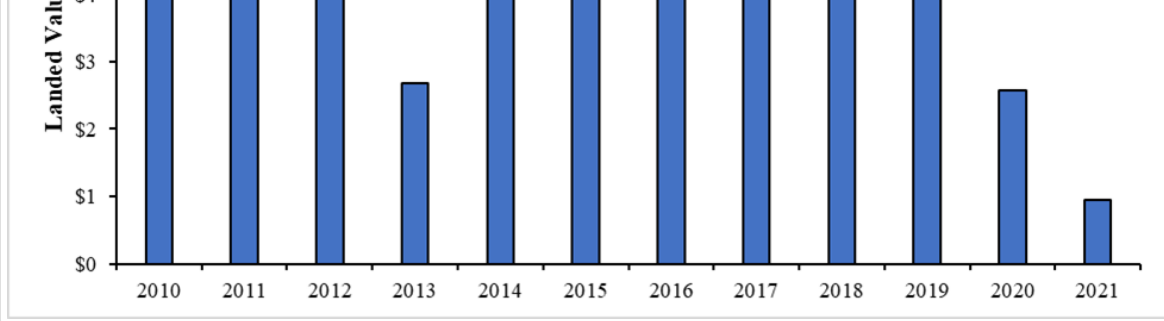


Figure 3. Total cod landed value for 3Ps-based less than 65 feet enterprises, in millions of dollars, for the period of 2010 to 2021 in NL region.

► Description

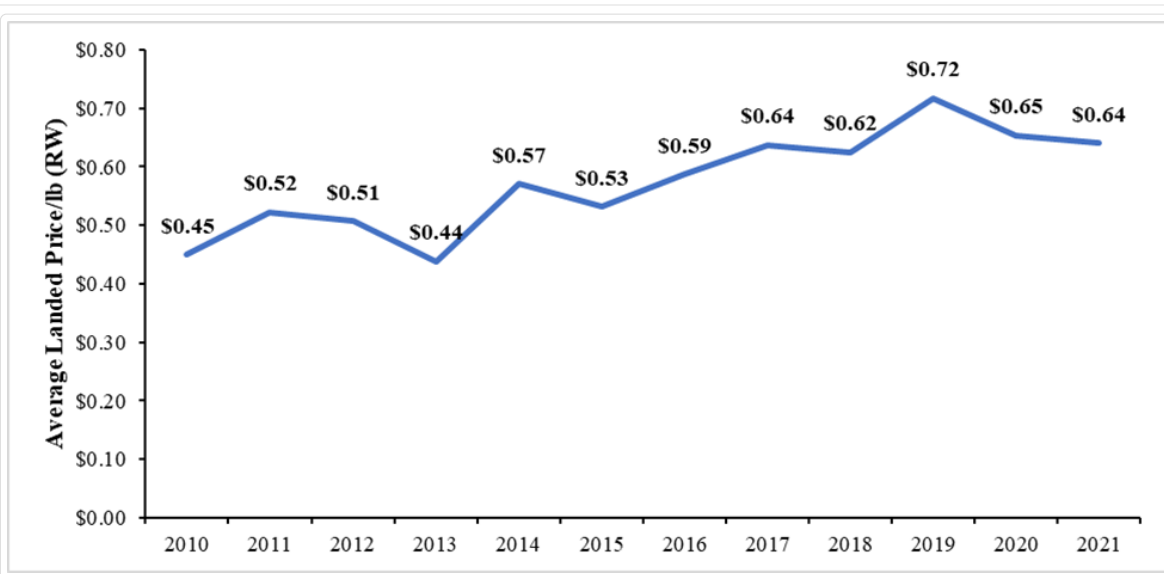


Figure 4. Average landed price per pound (lb.), round weight, of cod in the NL Region for the less than 65 feet fleet, for the period of 2010 to 2021.

► Description

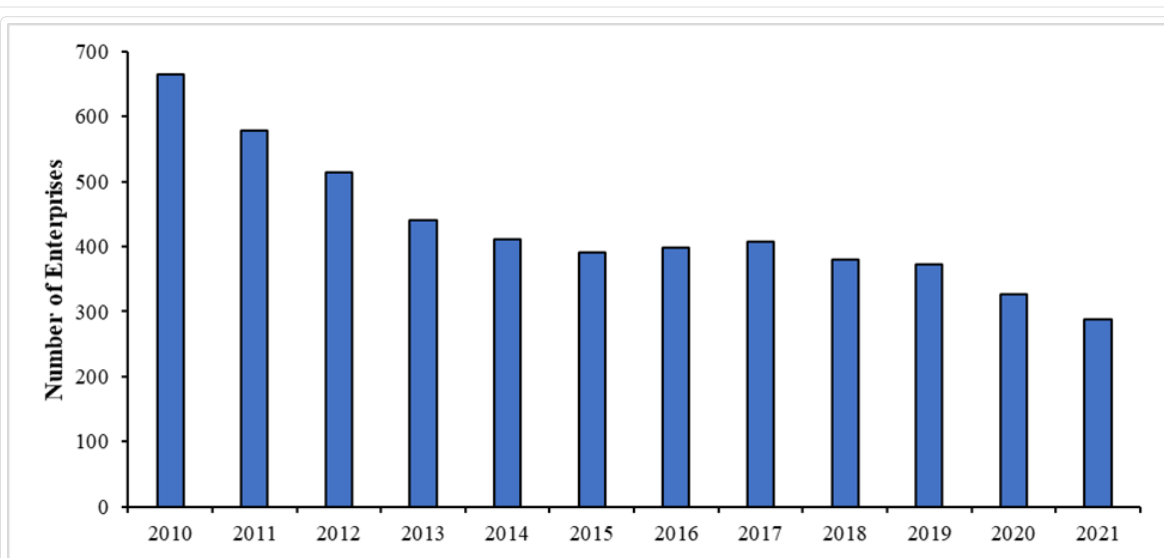


Figure 5. Number of active 3Ps-based less than 65 feet enterprises for the period of 2010 to 2021 in NL region.

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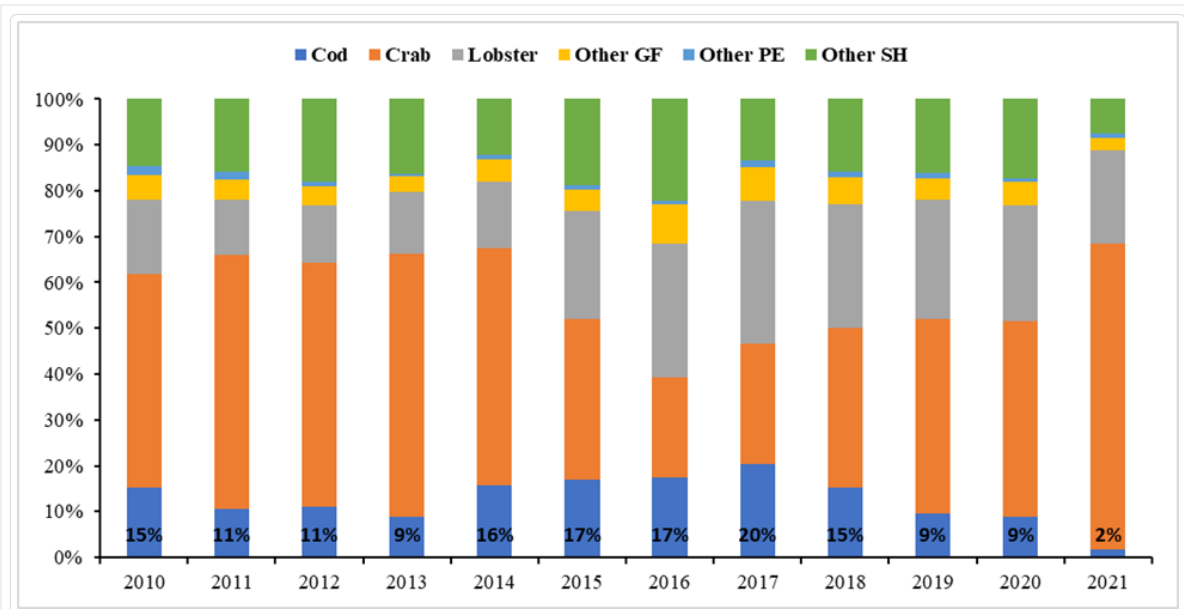


Figure 6. Species dependence for 3Ps-based less than 65 feet enterprises with cod landings, by proportion of total fishing revenue, 2010 to 2021. Note: GF = groundfish, PE = pelagic, SH = shellfish.

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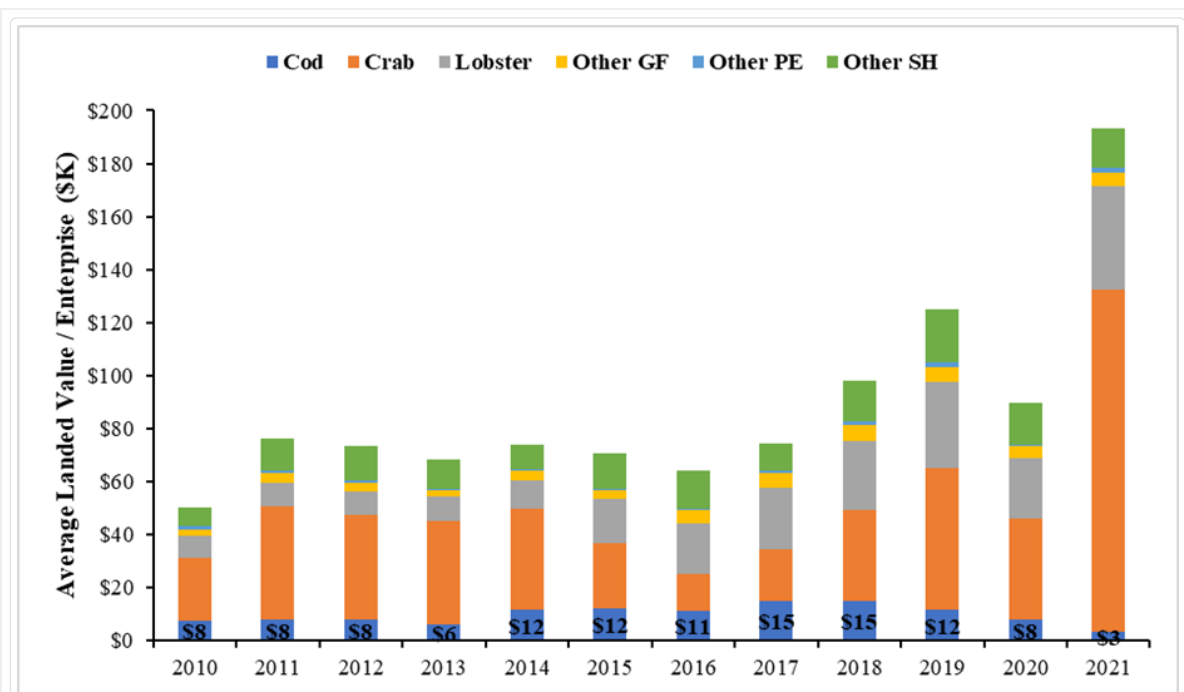


Figure 7. Average landed value per enterprise by selected species for 3Ps-based less than 65 feet enterprises with cod landings, in thousands of dollars, for period of 2010 to 2021 in NL region. Note: GF = groundfish, PE =

pelagic, SH = shellfish.

► Description

1.4.3 Processing Sector

The number of plants that process groundfish in NL decreased substantially in the period from 1980 to present. While several processing plants are licensed to process groundfish, Icewater Seafoods Inc ⁵. in Arnold's Cove, NL is currently the only plant that is focused entirely on Atlantic cod. Icewater Seafoods Inc. is a state-of-the-art facility that supplies cod to premium markets, primarily in Europe. The company secures these markets through a focus on quality, innovation and a year-round supply. In recent years, the company has invested in upgrades that enable the plant to operate year-round. Icewater Seafoods Inc. employs about 225 local people from Arnold's Cove and neighboring communities, in an area that traditionally has one of the highest unemployment rates in the country.

Icewater Seafoods Inc. processes cod that is sourced both from NL waters and imported. In terms of local cod supply, 3Ps cod accounted for 40 to 60 per cent of total raw material in the 2010s. In 2021, 3Ps cod accounted for about 7 per cent of locally sourced cod, with cod in NAFO Divisions 2J3KL (Northern cod) accounting for about 80 per cent.

Landings of 3Ps cod serve as an important component of the seasonal cod supply for this operation. It is landed outside of the typical period for 2J3KL cod, providing raw material for processing when cod landings from other NL fisheries are unavailable.

1.4.4 Other Fishery Removals

In addition to the directed commercial fishery for 3Ps cod, and bycatches of cod in other commercial fisheries in 3Ps, a recreational groundfish fishery has occurred in all NAFO areas/subareas around NL, including 3Ps, since 2006. There is no licence requirement for the recreational groundfish fishery. However, the recreational groundfish fishery is regulated with season and daily possession limits and authorized gear types (angling gear and handlines). This fishery is closely monitored through routine patrols, dockside inspections, at-sea inspections, and aerial surveillance to promote compliance with the regulations and management measures governing this fishery ([refer to 2022 management decision](#)). The 2015 Survey of

Recreational Fishing in Canada collected information about recreational fishing activities to assess the economic and social importance of recreational fisheries to Canada's provinces and territories. According to the Survey, cod was the primary recreational species caught in NL. In 2015, over 110,000 resident anglers were active in the recreational fishery in the province.

There is also an Indigenous fishery for 3Ps cod, with a Food, Social, and Ceremonial licence (FSC) annually issued to an Indigenous group based in 3Ps.

An annual sentinel fishery for cod and other groundfish occurs annually in areas around NL, including in 3Ps. The sentinel program began in 1995 and is conducted by DFO in collaboration with fish harvesters and collects scientific information on cod and other groundfish in inshore areas around NL.

1.5 Allocations and Governance

Atlantic cod in 3Ps is a transboundary stock straddling the maritime zone around the French islands of St. Pierre et Miquelon (SPM). 3Ps cod is co-managed with France under the 1994 Procès-Verbal Applying the 1972 Agreement between Canada and France on their Mutual Fishing Relations (PV). The PV governs how Canada and France co-operate to share 3Ps cod and 5 other co-managed stocks in Sub-Division 3Ps. The PV established the Canada France Advisory Committee (CFAC) as a joint body to annually negotiate fishery measures, including Total Allowable Catches (TACs), to recommend to each party's Minister. The management period for this stock is from April 1 to March 31. Canada's allocation is 84.4 per cent of the TAC, with the remainder allocated to France.

Canada and France have agreed to a Management Procedure (MP) that specifies the recommended maximum total catch for 3Ps cod (from all fishery-related sources), which will inform decision-making on the annual TAC for this stock. The 2023 to 2024 management period is considered as year 1 for implementation of this MP (see section 5.1 for further details). As agreed to by Canada and France, the TAC for 3Ps cod for 2023 to 2024 is 1,304t, in accordance with the MP's recommended maximum total catch. Canada's share of this 2023 to 2024 TAC is 1,101t. Separate from this TAC, Canada has unilaterally set aside an amount of 100t for unaccounted removals of 3Ps cod, including from the recreational fishery. This amount

may be adjusted from year to year should quantitative estimates become available that warrant a revision.

The sentinel allocation is calculated as 1.334 per cent of the overall TAC and deducted from Canada's allocation. Through the Aboriginal Fishing Strategy, DFO and an Indigenous group annually negotiates a mutually acceptable catch limit for 3Ps cod in an FSC licence. For the past number of years, the annual catch limit for 3Ps cod in this FSC licence has been 5t. For the 2023 to 2024 management period (first year of implementation of this rebuilding plan), 5t is set aside from the Canadian quota for the FSC fishery. As the FSC amount is subject to annual negotiation, the annual amount set aside for FSC may be adjusted from year to year. The remaining quota for the Canadian commercial fishery is allocated in accordance with the established percentage fleet shares. The resulting commercial fleet allocations account for both cod caught in the directed commercial fishery and as bycatch in commercial fisheries for other species.

- Inshore fixed gear fleet (vessels less than 65 feet): 78.3%
- Inshore mobile gear fleet (vessels less than 65 feet): 4.9%
- Atlantic-wide mid-shore fixed Gear fleet (vessels 65-100 feet): 2.0%
- Atlantic-wide offshore fleet (vessels greater than 100 feet): 14.8%

DFO established a 3Ps Groundfish Advisory Committee (the Committee) as a forum to discuss issues with stakeholders and Indigenous groups related to the management of groundfish in 3Ps, including cod. The Committee meets annually to discuss, and to seek the perspectives of various stakeholders, on management measures for 3Ps groundfish. The most recent available science and input from the Committee informs DFO's mandate for the annual CFAC meeting in late winter. The outcomes of the CFAC meeting inform the Minister of DFO's decision on management measures for 3Ps cod.

Canada manages its domestic commercial fishery for 3Ps cod through management measures in accordance with the Integrated Fisheries Management Plan (IFMP) for Groundfish in NAFO Sub-Division 3Ps, which was established in 2016. This IFMP is in the process of being updated, and the reader should defer to this rebuilding plan for any differences in measures between the current IFMP and those outlined in this document with respect to 3Ps cod. Guided by the IFMP and rebuilding plan, fleet specific management measures for the 3Ps cod commercial fishery are identified in Conservation Harvesting Plans (CHPs) and licence conditions,

including fishing and gear restrictions, season dates, monitoring and reporting requirements, bycatch limits, and small fish and bycatch protocols.

1.6 COSEWIC assessment status

Atlantic cod was initially included on Schedule 3 of the *Species at Risk Act* (SARA) as Special Concern under 1 designatable unit (DU) in 1998. In May 2003, the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) split Atlantic cod into 4 discrete populations: Maritimes; Newfoundland and Labrador; Arctic; and Laurentian North. At this time, the Laurentian North DU, which includes the cod management units 3Ps, 3Pn, and 4RS, was assessed as threatened. The Governor in Council did not list Atlantic cod under SARA at that time. In April 2010, the Laurentian North DU of Atlantic cod was reassessed by COSEWIC as endangered due to sharp declines in populations (available on the [SAR Public Registry](#)). Following this reassessment, DFO Science completed a [Recovery Potential Assessment](#). To date, there has been no SARA listing decision for Atlantic cod and the stock continues to be managed under the *Fisheries Act*.

1.7 Indigenous knowledge

Indigenous traditional knowledge and traditional ecological knowledge from Indigenous groups are considered in science processes and management decisions with respect to 3Ps cod. Indigenous groups have participated formally in science advisory processes for 3Ps cod that are coordinated by the Canadian Science Advisory Secretariat for DFO. Indigenous groups have also participated in DFO's 3Ps Groundfish Advisory Committee process, as well as in DFO's 3Ps Cod Rebuilding Plan Working Group process that was established to develop proposed rebuilding plan elements for 3Ps cod.

2.0 Stock status and stock trends

2.1 Precautionary approach

In 2003, the Privy Council Office, on behalf of the Government of Canada, published a framework applicable to all federal government departments that set out guiding principles for the application of precaution to decision making about risks of serious or irreversible harm where there is a lack of full scientific certainty.

[A fishery decision-making framework incorporating the precautionary](#)

approach (PA) was developed and applies where decisions on harvest strategies or harvest rates for a stock must be taken to determine Total Allowable Catch (TAC) or other measures to control harvests. The PA framework applies to key harvested stocks managed by DFO: those stocks that are the specific and intended targets of a fishery, whether in a commercial, recreational, or Food, Social, and Ceremonial (FSC) fishery. In applying the framework, all removals of these stocks from all types of fishing must be taken into account.

The following are the primary components of the generalized framework:

- reference points and stock status zones (Healthy, Cautious, and Critical)
- harvest strategy and harvest decision rules
- the need to take into account uncertainty and risk when developing reference points and developing and implementing decision rules

A new LRP was established for 3Ps cod during a stock assessment process by DFO Science in November 2019 (DFO 2020/018). The LRP is based on the relationship between Spawning Stock Biomass (SSB) and recruitment (abundance at age 2) estimated from the model, and is 66,000 t of SSB. 3Ps cod has been determined to be at or below the LRP since 2000. An Upper Stock Reference (USR), Target Reference Point (TRP) or Removal Reference have not been established for 3Ps cod as this time.

Summary of the precautionary approach framework reference points for 3Ps Atlantic cod

- Limit Reference Point (LRP): 66,000 tonne SSB
- Upper Stock Reference (USR): N/A
- Target Reference Point (TRP): N/A
- Removal Reference: N/A

Source: Stock assessment of NAFO subdivision 3Ps Cod DFO 2020/018

The most recent assessment of 3Ps cod (DFO 2024/016) was conducted in November 2023, which indicated the stock remains well within the Critical zone of Canada's PA (DFO 2009), with SSB in 2024 projected to be at 54 per cent of the LRP (Figure 8).



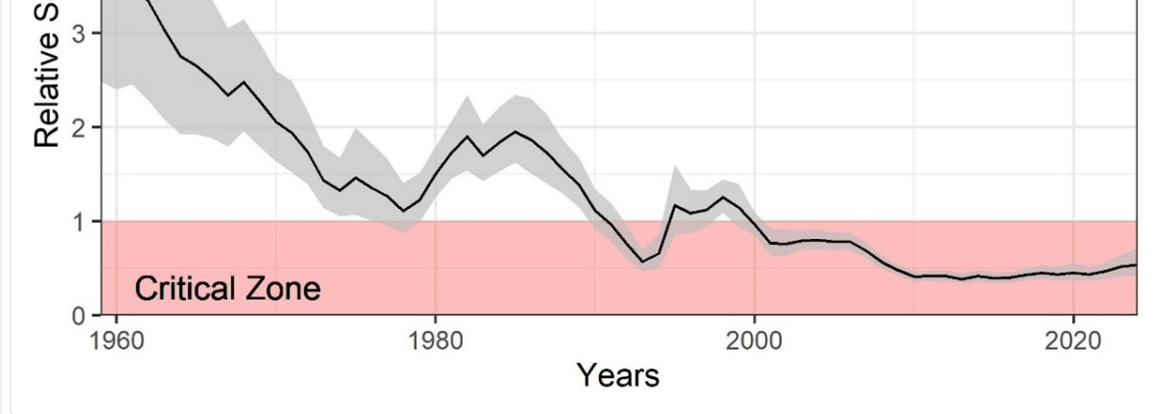


Figure 8. Estimates of Relative Spawning Stock Biomass (SSB/LRP; black line = median estimate with grey area = 95 per cent confidence interval) for the period 1959–2024, relative to the Limit Reference Point (LRP = 66 kt SSB). This reference point (shown here at Relative SSB=1) represents the boundary between the Critical (red shaded area) and Cautious zones of DFO’s Precautionary Approach framework.

► Description

2.2 Stock assessment

The 3Ps cod stock is assessed using a custom state-space analytical assessment model that was developed through a framework process (Varkey et al. 2022) completed in 2019. This new model expanded the data sources used to estimate stock trends and extended the time series. It incorporates landings and catch at age (1959 to 2020), time-varying natural mortality informed by trends in cod condition, and includes abundance indices from research surveys using bottom trawls conducted by Canada (1983 to 2021), France (1978 to 1991), industry (1998 to 2005), and standardized catch rate indices from inshore Sentinel gillnet and line-trawl surveys (1995 to 2020). In comparison, the previous assessment model used only data from the Canadian research trawl survey data and produced stock trends starting from 1983, coinciding with the start of that survey.

An LRP was determined for the stock based on the relationship between SSB and recruitment estimated from the new model (DFO 2020/018). The new model and the revision of the basis for defining the LRP led to a change in the perception of status of this stock. Previously considered to be in the Cautious zone (DFO 2019/009), the stock is now estimated to have been below the LRP since the early 2000s, with SSB remaining at or near time series lows since 2009.

Low recruitment (Figure 9) and increased natural mortality (Figure 10) are

limiting the growth of this stock. Recruitment reached historically low levels in the mid-2010s, and has been well below average since the early 1990s. There are very few fish entering the population in any year. The cause of this extended period of low recruitment is unknown. Poor fish condition is one of the major factors impacting increased natural mortality levels (estimated at 0.35 in 2022 for fish aged 5 to 8). Fishing mortality has been declining since 2000 and in 2022 was estimated to be 0.02 (average on fish aged 5 to 8, Figure 11), the lowest level since the moratorium (1994 to 1996). While fishing mortality is currently low, given the low status and productivity of the stock, continued fishery removals also delay recovery prospects of this stock.

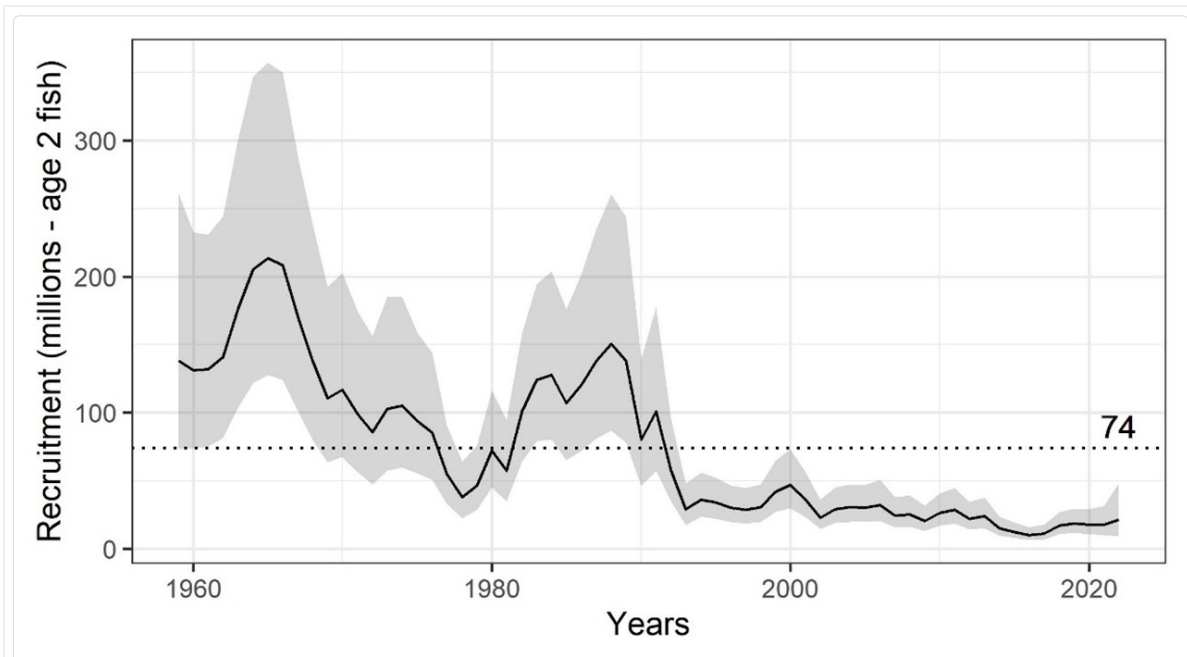


Figure 9. Estimated recruitment (median estimate of age-2 abundance, with 95 per cent confidence interval) from 1959 to 2022. The dashed horizontal line is the time-series median.

► Description

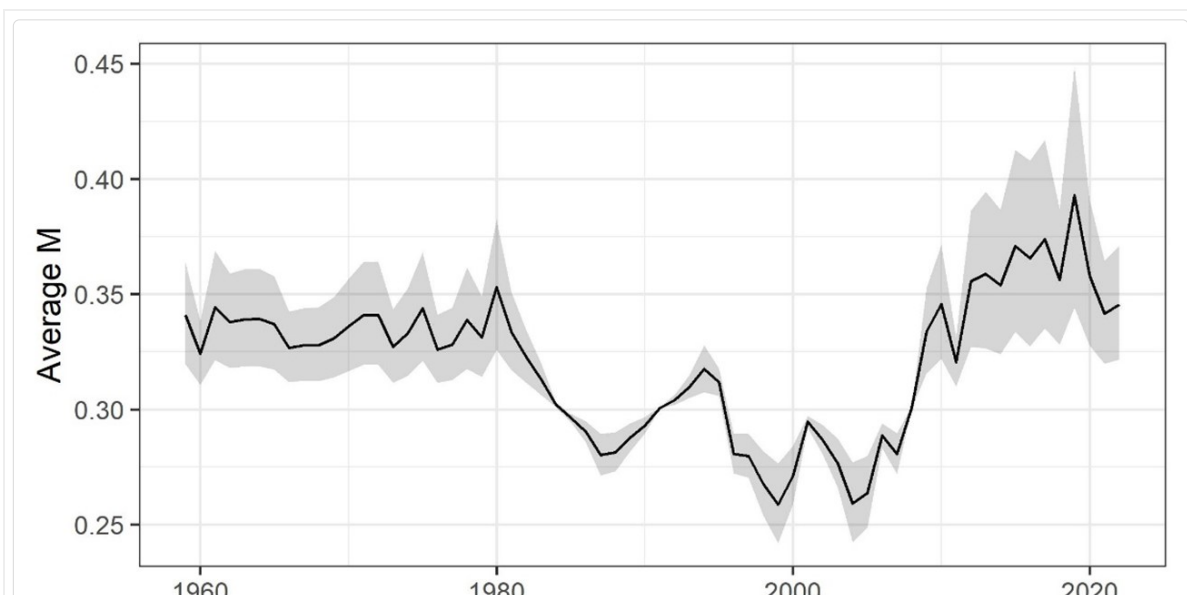


Figure 10. Average Natural (M) mortality (ages 5 to 8) estimates from 1959 to 2022 with 95 per cent confidence interval.

► Description

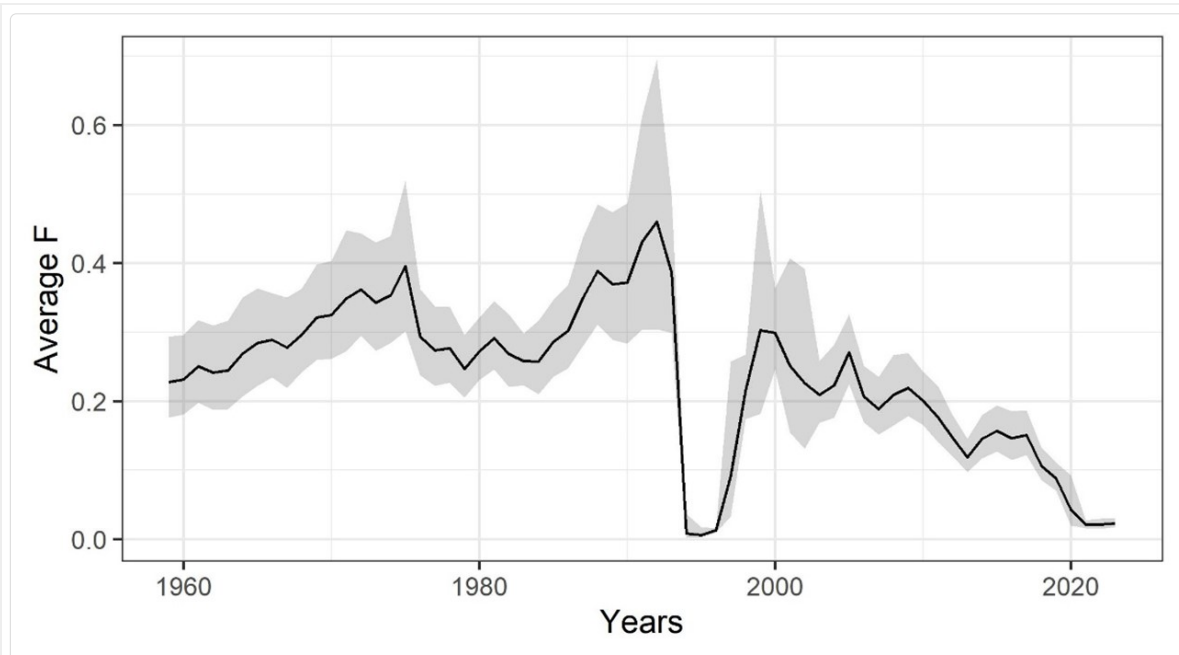


Figure 11. Average Fishing (F) mortality (ages 5 to 8) estimates from 1959 to 2022 with 95 per cent confidence interval.

► Description

3.0 Probable causes for the stock's decline

Assessments of the stock in the mid- to late 1990s noted difficulties in interpreting stock status resulting from uncertainty associated with defining stock structure, impact of seasonal migrations, variability in trawl survey estimates, and poor quality historical data on catch and effort (DFO 1996/081, 1998/A2-02). Analyses at the time indicated that a catch of about 20,000t was unlikely to exceed an average fishing mortality (F) of 0.1 (DFO 1998/A2-02). However, our current understanding indicates that average fishing mortality was significantly higher in this period immediately following the moratorium, reaching 0.3 in 1999 and 2000 (average ages 5-8) (DFO 2022/022). During this period of stock decline, natural mortality (M) was among the lowest levels in the stock's time series from 1996 to 2005 (average 0.27). Recruitment at this time was well below the time series

average. It is likely that high fishing mortality along with low recruitment led to the decline of this stock in the early 2000s. Loss or degradation of the stock's fish habitat is unlikely to have contributed to the stock's decline given the current understanding of the best available evidence.

Increased natural mortality and low recruitment are limiting the growth of this stock, while fishing mortality is currently low and in 2023 is estimated to be 0.02, the lowest level since the moratorium. Recruitment has remained among the lowest in the time series, with very few fish entering the population in any 1 year since. Poor fish condition is 1 of the major factors impacting increased natural mortality levels (Varkey et al. 2022), with measurements of fish condition from survey and sentinel sampling informing trends in natural mortality estimates for this stock. Poor condition is not only associated with death due to starvation, but also increased susceptibility to predation and parasitism, poor swimming performance, and lessened competitive ability (Regular et al. 2022 and references therein).

As a result of anthropogenic climate change, the world's oceans have been undergoing unabated warming since the 1970s, together with decline in dissolved oxygen concentration and pH (increase in acidity) which may affect fish abundance and fisheries potential (IPCC 2019). The 3Ps ecosystem is no exception to these changes. Ongoing warming trends and biogeochemical changes, together with more recent increased dominance of warm water fishes, indicate that the ecosystem in 3Ps continues to experience structural changes. In this context, bottom-up effects are contributing to poor fish condition and high natural mortality of cod (DFO 2022/022).

Prey availability for 3Ps cod is one of these bottom-up forces, with food limitations being a driver of poor fish condition. Examinations of fish diet in 3Ps support the importance of food availability and suggest that the observed diet variability in this stock could be associated with reduced prey availability in this ecosystem unit (NAFO 2021). These examinations also highlight the diversity of prey for cod in this area, which includes pelagic fishes such as Capelin (*Mallotus villosus*) and Sandlance (*Ammodytes sp.*) but also shellfish and other benthic invertebrates, flatfishes, along with other cod and fishes.

Fishery stakeholders have raised concerns about the current status of forage fish in 3Ps, including the potential impact that harvesting forage resources has on other stocks. Commercially harvested forage fish in 3Ps

include Capelin, Herring (*Clupea harengus*), and Mackerel (*Scomber scombrus*). Sandlance are not commercially harvested and are poorly sampled by scientific survey methods currently used in this area, therefore their abundance and dynamics in 3Ps are unknown. Although 3Ps Capelin is surveyed annually in the spring bottom-trawl survey, little is known about stock status as this data is not used to estimate abundance or evaluate distribution. as the gear used (bottom trawl) is not considered representative for this pelagic species. Population connectivity between the 4RST Capelin stock and 3Ps is unknown. With respect to Herring, the status of the Fortune Bay stock complex has been negative for the past decade whereas Placentia Bay has been largely uncertain (DFO 2022/035). Recruitment of the most recent mature year class (2017) was above average for all areas in 3Ps during the most recent stock assessment. Mackerel in 3Ps are a component of the Northern Contingent of Atlantic mackerel, which have been in the Critical zone since 2011 (DFO 2021/029).

Available scientific evidence indicates that predation by seals is not a major driver of 3Ps cod stock dynamics. Satellite telemetry data from tags deployed between 1993 and 2010 (Benoît et al. 2010, Hammill et al. 2017, and references therein) indicate that only a very small proportion of the Grey Seal (*Halichoerus grypus*) population in Atlantic Canada utilizes 3Ps, primarily during the summer months (also see Vincent et al. 2022). Counts from 12 complete censuses conducted at all haul-out sites between 2016 and 2022, ranged between 650 and 1,650 Harbour seals in St. Pierre and Miquelon (Vincent et al. 2022). Analysis of scat samples collected during the summer in 3Ps (Burin Peninsula and St. Pierre et Miquelon) indicate that Atlantic cod are detected in a relatively small number of Harbour seal and Grey seal scats during this time of the year (less than 3 per cent of all samples; Vincent et al. 2022, Stenson et al. unpublished data). Continued data collection is required to quantify year-round diet composition.

Fish harvesters, however, continue to express concern over the impact of seals on 3Ps cod and work continues to further understand this impact. A coastal aerial survey of Harbour and Grey seal haul-out sites was conducted out by DFO around NL in July and August of 2021 (Lang, Hamilton, Goulet et al. unpublished data). Over 5,500 km of coastline were surveyed (including St. Pierre et Miquelon) during which all observed seals were photographed. This was the third year of a 3 year study to provide the first Atlantic Canada-wide estimate of Harbour seal abundance. The survey will also provide data

on the summer abundance and distribution of Grey seals in NL waters. Data analysis is ongoing, and reports describing the survey and summarizing the counts is forthcoming. New information on seal distribution, abundance, and use of 3Ps will be considered in the context of stock assessment and rebuilding to determine if updated information changes the understanding of the relative impact of seals on this cod stock.

4.0 Measurable objectives aimed at rebuilding the stock

As outlined in the PA Framework, the primary objective of this rebuilding plan is to promote stock growth out of the Critical zone (i.e. grow the stock above the LRP), by ensuring removals from all fishing sources are kept to the lowest possible level until the stock has cleared this zone. Within the Critical zone, this objective remains the same whether the stock is declining, stable, or increasing.

The rebuilding target, milestone, and short-term objective for the rebuilding plan, as well as associated timelines, are outlined in this rebuilding plan. The milestone is considered to represent the nearest step to be achieved as the stock grows through the Critical zone, followed by a short term objective to increase the stock to the rebuilding target. When the rebuilding target is reached, the long term objectives for 3Ps cod will include further rebuilding the stock above the LRP and into the healthy zone, and maintaining the stock in this zone. These long term objectives will be included in the IFMP once the stock has reached the rebuilding target.

4.1 Rebuilding target and timeline

The rebuilding target is a level of SSB that is above the LRP with a 75 per cent probability. The desired timeline to reach this rebuilding target is period of 25 years, in which 2023 is considered year 1 of this timeline.

For the purposes of informing rebuilding plan timelines and the development of management measures to achieve the rebuilding target, long term population projections were conducted to determine the time the stock would take to rebuild to the rebuilding target in the absence of all fishing and under prevailing productivity conditions (DFO 2023/007, Varkey et al. *in press*). Prevailing productivity conditions have been defined for this purpose as a stock recruit relationship fit to the entire available time series

of SSB and recruitment (since 1959), and a level of natural mortality that is consistent with the level observed in 2021 (estimate in the terminal year of the most recent assessment; DFO 2022/022). The prevailing productivity conditions defined for natural mortality and recruitment are considered appropriate for calculating the minimum time to rebuild to the rebuilding target in the absence of fishing. The long-term projections suggest that under prevailing productivity conditions and in the absence of fishing, the 3Ps cod stock will reach the rebuilding target in 2036 (DFO 2023/007). A longer timeframe to reach the rebuilding target (by 2048) has been selected considering the likelihood of rebuilding success, as well as socio-economic and cultural impacts, and is within the required timelines specified in the [Policy for writing rebuilding plans per the Fish Stocks Provisions and A Fishery Decision-making Framework Incorporating the Precautionary Approach](#) (DFO 2023/007 and Varkey et al. *in press*).

The projected timeline to reach the rebuilding target in the absence of fishing is sensitive to the assumptions made about future recruitment and mortality (DFO 2023/007). The review parameters established for the rebuilding plan will include a review of whether the scientific assumptions used to assess rebuilding plan timelines, and to inform the development of measurable objectives and associated timelines, remain appropriate.

4.2 Additional measurable objectives and timelines

- Milestone: Achieve a positive stock growth trajectory with a 75 per cent probability over the 5 year timeframe
- Short-term Objectives: Increase SSB to 75 per cent of the LRP within 15 years, with a 75 per cent probability

5.0 Management measures aimed at achieving the objectives

5.1 Management procedure

A Management Procedure (MP) is implemented as part of this rebuilding plan to support the rebuilding of 3Ps cod towards the rebuilding target. It is a fishing mortality-based MP and will recommend the maximum annual TAC for 3Ps cod.

Under this MP, the maximum level of fishing mortality remains at a fixed level while the 3Ps cod stock is in the Critical zone. In the calculation of the

MP, fishing mortality at the fully selected ages (9+) is set at 0.065, and decreases with age according to the average selectivity from 2019 to 2021 estimated for this stock, as tested within the rebuilding simulation framework (DFO 2022).

Separate from the maximum TAC recommended by the MP, an amount of 100t has been set aside for unaccounted removals of 3Ps cod, including from the recreational fishery. The maximum TAC recommended by the MP will be derived from the most recent estimate or projection of SSB from the most up to date stock assessment. The projected fishery removals under this MP (plus 100t for unaccounted removals), allows for stock growth towards the rebuilding target within the specified timeline, and also provides reasonable fishing opportunities considering the socio-economic and cultural importance of this stock for fish harvesters and adjacent communities.

The performance of this MP is considered for the purposes of this plan under prevailing productivity conditions (as identified by the 3Ps Cod Rebuilding Plan Working Group (DFO 2023/007)). Under these conditions, it is anticipated that with this MP, the rebuilding target will be reached by 2048. The recommended maximum total catch under the MP for 2023 was 1,304t, which combined with the additional amount of 100t set aside for unaccounted removals, results in a high likelihood (greater than or equal to 75 per cent probability) of stock growth to the rebuilding target within the specified timeline and a 7 per cent likelihood of preventable decline ⁶.

MP performance with respect to achieving the rebuilding target and additional measurable objectives, and estimated total catches, was examined within a rebuilding simulation framework (see Appendix A; DFO 2023/007; Varkey et al. *in press*). Stock rebuilding potential under the MP was examined under various scenarios of natural mortality, recruitment, and fishing mortality. However, there is considerable uncertainty associated with long term stock projections, much of which is driven by uncertainty in future ecosystem conditions and stock productivity.

Notably, the recruitment and natural mortality scenarios examined within the rebuilding simulations fall within the conditions previously experienced by the stock. In a changing ocean climate these conditions may not accurately capture future conditions. Biological evidence suggests that natural mortality in this stock is more likely to increase than decrease, in which case the scenarios examined within the rebuilding simulations would underestimate mortality, overestimate stock growth and future stock size,

and underestimate the relative impact of fishing mortality. However, at this time future levels of natural mortality cannot be predicted, and the relative likelihood of any magnitude of increase cannot reliably be determined.

In addition, the impact of ongoing ecosystem and oceanographic changes on cod recruitment in 3Ps are not known. Work continues to better understand the drivers of natural mortality and recruitment in this stock.

The November 2023 assessment found the age structure of the fishery had shifted over the last 3 years to a higher proportion of younger fish. As a result, the age structure of the fishery is no longer consistent with that assumed in the testing and subsequent adoption of the MP. DFO Science assessed the impact of this change on the anticipated performance of the MP and noted minimal change in short-term projections of stock size or trajectory, given the overall low level of fishing mortality.

Given the current stock status, low productivity, and sources of uncertainty, the TAC level established for 3Ps cod during the rebuilding plan implementation period may be lower for conservation purposes than the recommended maximum TAC determined by the MP. Ongoing monitoring of the MP will occur during the implementation period of the rebuilding plan and adjustments will be considered as necessary.

5.2 Additional management measures

The following management measures outline existing measures that are contributing to the sustainable management of 3Ps cod, and therefore supporting the rebuilding plan's measurable objectives for promoting stock growth.

5.2.1 Gear restrictions

The directed commercial 3Ps cod fishery has a suite of gear restrictions in place, with the specific restrictions depending on the fleet. Fleet-specific measures are outlined in CHPs and licence conditions. For the inshore fixed-gear fleet, the fishery is restricted to gillnets, longlines, handlines, cod traps, and cod pots, with additional restrictions on the number of nets, hooks, traps, and pots permitted. For the inshore mobile-gear fleet, the fishery is restricted to otter trawl with mesh size restrictions. The mid-shore fixed-gear fleet is restricted to gillnets and longlines, and the offshore fleet is restricted to otter trawl and longline, with additional restrictions on the mesh size and gape size. The recreational groundfish fishery is restricted to

the use of hand lines and angling gear, and the FSC fishery for 3Ps cod is restricted to the use of gillnets, longlines and handlines, and angling gear.

5.2.2 Management of bycatch

The bycatch of 3Ps cod in other fisheries is managed using the [Policy on Managing Bycatch](#). The objectives of this policy are: one, to ensure that Canadian fisheries are managed in a manner that supports the sustainable harvesting of aquatic species and that minimizes the risk of fisheries causing serious or irreversible harm to bycatch species; and 2, to account for total catch.

A number of management tools have been established to limit bycatch of cod in other fisheries in 3Ps. For each fishery, CHPs set out measures to reduce incidental catch or bycatch of non-target species, including incidental catch or bycatch limits, either per day or per fishing trip, which if exceeded may result in a closure of a fishery for a period of time. The current bycatch limits of cod is specific to the fleet, gear, and fishery. For example, for the inshore fixed-gear fleet, daily bycatch of cod may not exceed 10 per cent or 200 pounds round weight, whichever is greater. For the inshore mobile-gear fleet, bycatch of cod may not exceed 5 per cent per week or day (depending on the fishery), and for mid-shore and offshore fleets, unless otherwise specified, bycatch of cod may not exceed 2,500 kg or 10 per cent per trip, whichever is greater. Further, for the offshore fleet, when directing for Witch flounder in 3Ps, overall bycatch caps of cod and daily thresholds for cod bycatch are in place from March to May. Landings of groundfish are mandatory in Newfoundland and Labrador (except where authorized), and any bycatch of 3Ps cod in other fisheries is retained and recorded through the dockside monitoring program (DMP).

5.2.3 Small fish protocol

A small fish protocol applies to the 3Ps cod fishery, in which catches of 3Ps cod are considered undersized if smaller than 45 cm. This measure is informed by scientific information which indicates that the 45 cm metric is generally consistent with the average length at 50 per cent maturity (L50). Designated areas may close to individual licence holders or a fleet sector when the number of undersized fish reaches or exceeds 15 per cent of the catch. Small fish closures are to be established for a minimum period of 10 days, and a successful, observed, industry-funded test fishery would be

required to consider a re-opening of the fishery to an individual licence holder or fleet sector.

5.2.4 Closed areas

Several long-standing seasonal conservation closures have been established to protect cod in 3Ps. A spawning closure occurs from March 1 to mid-May annually, in which all of 3Ps is closed to all fleets to directed fishing activity for 3Ps cod. An additional spawning closure occurs in an area inside Sound Island, Woody Island and Bar Haven Island in Placentia Bay, which is closed to all groundfish fishing from January 1 to mid-May.

An annual mixing closure is established in 3Ps sub-units (a), (d) and (e) (Figure 12) to protect the 4RS3Pn cod stock, in which the directed cod fishery in these areas is closed to all fleets from November 15 to mid-May (with the exception of 3Ps (a) which remains open to February 28 to inshore fixed-gear harvesters who are residents in 3Ps (a) and (b)).

An annual closure is also established in Paradise Sound, in which this area is closed to all groundfish fishing from January 1 to February 28, following a request from industry to protect overwintering fish in this area.

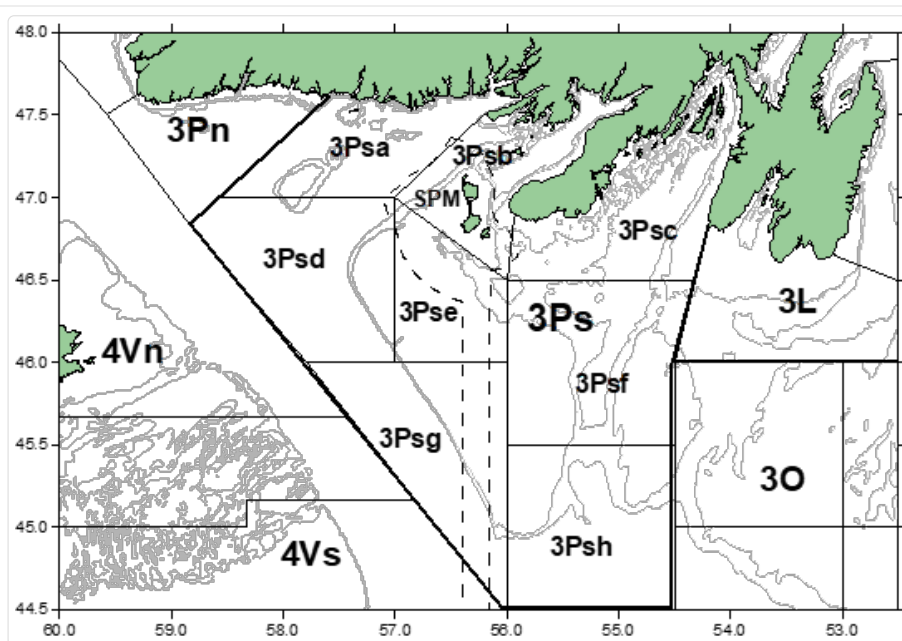


Figure 12. Map of NAFO Sub-Division 3Ps that is subdivided into unit areas. Dashed lines indicate the economic zone around the French islands of St. Pierre et Miquelon (SPM).

► Description

5.2.5 Marine conservation areas

The Laurentian Channel Marine Protected Area (MPA), designated under the Oceans Act in 2019, is located in NAFO Sub Division 3P and spans 11,570 km² (Figure 13). The overarching goal of the MPA is to conserve biodiversity through protection of key species and habitats, ecosystem structure and function. Supporting this goal, and recognizing the important ecological features of the Laurentian Channel, the conservation species of focus for the MPA are corals (specifically sea pens), Black dogfish, Smooth skate, Porbeagle shark, Northern wolffish and the Leatherback sea turtle. While there is no conservation objective or management measure for Atlantic cod specifically, the MPA Regulations prohibit all commercial and recreational fishing throughout the MPA, with the exception of fishing that is authorized under the Aboriginal Communal Fishing Regulations for Food, Social, and Ceremonial licences. The prohibitions in place for the Laurentian Channel MPA minimize the risk of human harm on species and habitats within the area.

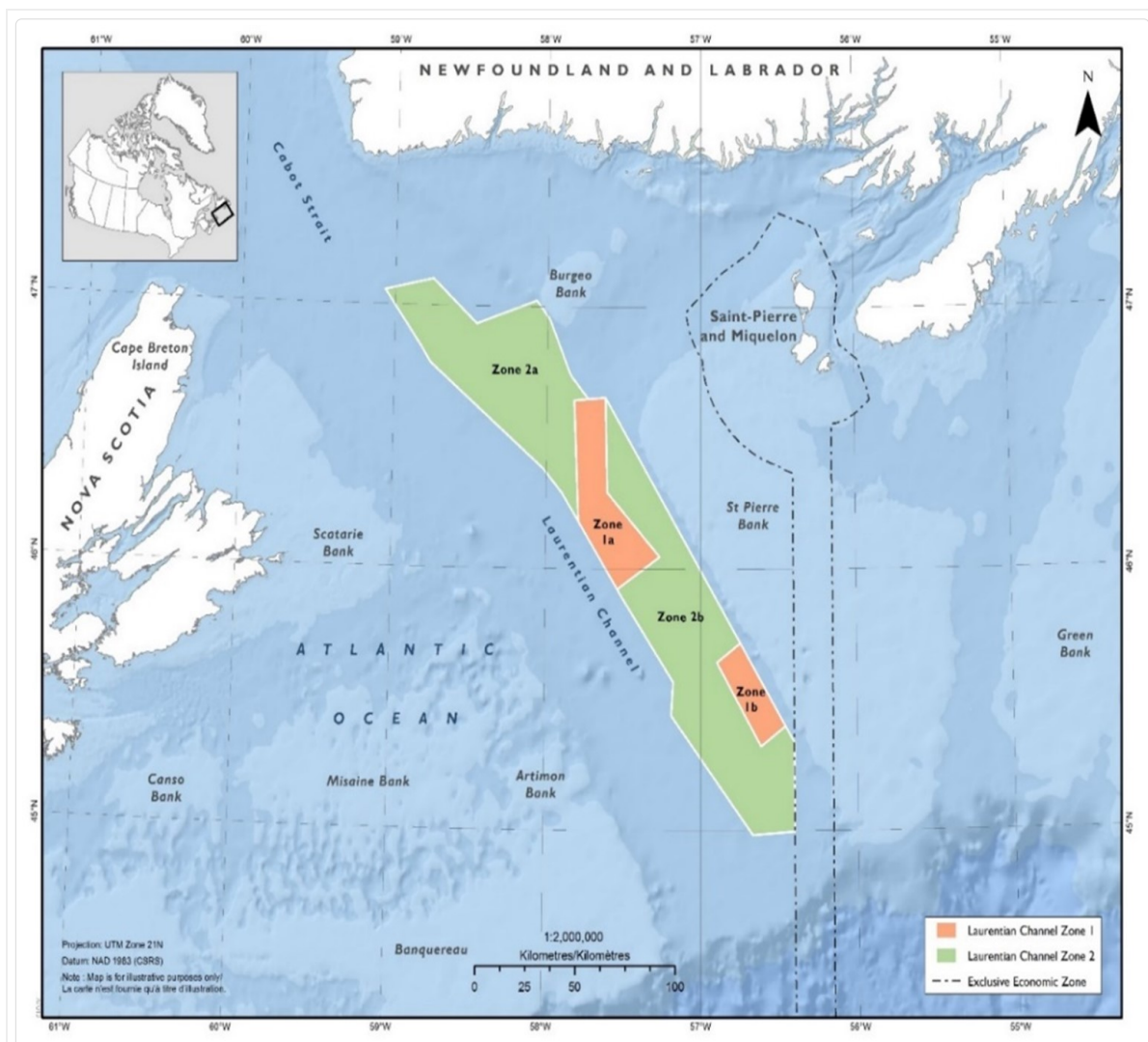


Figure 13. Map of Laurentian Channel Marine Protected Area in NAFO Division 3P.

5.2.6 Monitoring

3Ps cod is a priority stock for the implementation of the Fishery Monitoring Policy. The objectives of this policy are to have dependable, timely and accessible fishery information necessary to:

1. help ensure that Canadian fisheries are managed to support the sustainable harvest of aquatic species
2. to carry out enforcement activities to ensure compliance with the *Fisheries Act, the Oceans Act, the Species at Risk Act* and their associated regulations
3. to apply a common set of procedural steps to establish fishery monitoring requirements across fisheries, to ensure consistent application of the policy. The Department intends to fully implement this policy for 3Ps cod by 2027-28.

The Conservation and Protection (C&P) program promotes and maintains compliance with legislation, regulations and management measures implemented to achieve the conservation and sustainable use of Canada's aquatic resources, and the protection of species at risk, fish habitat and oceans. The program is delivered through a balanced regulatory management and enforcement approach. Specifically:

1. promotion of compliance through education and shared stewardship
2. monitoring, control and surveillance activities
3. management of major cases and special investigations in relation to complex compliance issues
4. use of intelligence data supplied through the National Fisheries Intelligence Service

Currently, tools used to monitor catches of 3Ps cod include the Dockside Monitoring Program (DMP), patrols by DFO fishery officers (air, sea and land), at-sea observer coverage, vessel monitoring systems (VMS), daily hails, and completion of logbooks by harvesters. C&P monitors for incidental catch (for example: undersize, SARA listed species) and other groundfish fisheries for cod by-catch to ensure compliance with harvest limits. Target levels of observer coverage

Target levels of observer coverage are outlined in fleet-specific CHPs and currently range from 5 per cent to 20 per cent. However, for the inshore

(less than 65 feet) fleet, coverage levels for 3Ps cod are currently lower than target levels due to ongoing challenges with shortages of at-sea observers, an issue that is national in scope. As part of rebuilding efforts, DFO C&P will work with at-sea observer companies to coordinate deployments in an effort to increase coverage levels within the 3Ps cod fishery, where required.

6.0 Socio-economic analysis

This section provides an analysis of the impacts associated with the Management Procedure (MP) established as part of this rebuilding plan. The analysis depends on information on future stock projections based upon the management measures outlined in the [previous section](#). It should be noted that this analysis considers the MP impacts for 2023 only. Longer-term impacts of projected cod catches under the MP would require assumptions about future landings, landed prices and participation levels for multiple species which would likely not be robust. A ten-year (2010 to 2019) average of landings and landed value for 3Ps-based less than 65 feet enterprises with cod landings is used as the base case ⁷. The reason for this approach is that these enterprises account for the vast majority of Canadian 3Ps cod landings; an annual average of more than 75 per cent since 2010.

The analysis assumes that the recommended maximum total catch under the MP would include incidental catch of cod in other 3Ps fisheries, such as Atlantic halibut, witch flounder and redfish.

6.1 Management Procedure (MP)

The Total Allowable Catch (TAC) for 3Ps cod was set at 1,304t for 2023-24, in accordance with the Management Procedure (MP) adopted for this stock, which is a slight reduction of 42t from the 2022-23 TAC level of 1,346t. The projected catch under this MP increases to an estimated 8,654t by 2047 ⁸ under prevailing productivity conditions (as estimated in the rebuilding plan simulation framework described in [Appendix A](#)).

The 2023 projected cod catch for 3Ps-based cod commercial fishing enterprises less than 65 feet is estimated to be about 771t ⁹. At current average landed round weight prices, this volume of cod would have a landed value of about \$1.4 million. Compared to the cod fishing revenue for the average active enterprise in the 2010 to 2019 period (\$10,600), this catch level would result in a loss of about \$5,900 in cod fishing revenue per active enterprise. Cod dependence for the average active enterprise could decline

to about 4 per cent of total fishing revenue from 14 per cent in the 2010 to 2019 period. Average cod fishing revenue in 2023 would be about \$4,800, a significant 55 per cent decline vis-à-vis the 2010 to 2019 average of \$10,600.

About 35 per cent of enterprises had a high dependence (greater than 25 per cent) on cod over the 2010 to 2019 period (Table 1). Moreover, about 53 enterprises per year had a greater than 50 per cent dependence on cod. Not all enterprises have access to other higher valued species. In 2019, about 24 enterprises did not have landings of lobster or crab.

Table 1. Average cod dependence for 3Ps-based less than 65 feet enterprises for period of 2010 to 2019 in NL.

Degree of dependence	Number of enterprises	Percentage of enterprises	Average total fishing revenue	Average cod fishing revenue
0 to 9.9%	188	42%	\$103,000	\$4,000
10 to 24.9%	110	24%	\$79,000	\$13,000
25 to 49.9%	105	22%	\$54,000	\$18,000
50 to 74.9%	24	6%	\$38,000	\$22,000
75 to 99.9%	15	3%	\$17,000	\$15,000
100%	14	3%	\$4,000	\$4,000

From a processing perspective, a projected decline in the 2023 cod catch could further reduce the amount of local cod available. Reductions in local supply could result in increased operational costs (i.e. increased reliance on high-priced frozen-at-sea cod imports) for processors, and potentially lead to a reduction in employment of local employees.

6.2 Benefits of Rebuilding the 3Ps Cod Stock

The rebuilding of 3Ps cod is anticipated to have benefits in terms of its continued functional role in the ecosystem. Canadians, including Indigenous peoples, may also place a value on the conservation and protection of the species in and of itself, and its value to future generations. The value of these benefits is currently unknown. A recovered stock would also have significantly more commercial value but this possibility must be viewed in the context of the time required to rebuild and uncertainty associated with long-term forecasting.

7.0 Method to track progress to achieve the measurable objectives

Performance metrics provide DFO with a means to assess the progress of the rebuilding plan towards the plan's measurable objectives and outlines how and when progress will be measured.

Metrics for tracking progress to achieving the rebuilding plan objectives.

Objective 1

Achieve a positive stock growth trajectory with a 75 per cent probability over the 5 year timeframe, starting in 2023.

Metric to measure progress: SSB in the terminal year of the current stock assessment relative to SSB in 2023.*

*If unavailable, biomass indices from the research vessel survey and cod condition indices from the sentinel survey in 2022 to the current year.

Frequency of measurement:

- Every stock assessment where SSB is updated.
- Annually. However, a single year is insufficient to indicate a change in stock trajectory given survey indices can show significant fluctuations year over year.

Objective 2

Increase the SSB to 75 per cent of the LRP within 15 years with a 75 per cent probability, starting in 2023.

Metric to measure progress: SSB in the terminal year of the current stock assessment.

Frequency of measurement: During the periodic review of the rebuilding plan (or earlier if an assessment indicates a significant change in the stock relative to this objective)

Objective 3

Increase the SSB above the LRP within 25 years (2.5 generation time) with a 75 per cent probability, starting in 2023.

Metric to measure progress: SSB in the terminal year of the current stock assessment.

Frequency of measurement: During the periodic review of the rebuilding plan (or earlier if an assessment indicates a significant change in the stock relative to this objective)

The most recent and best available estimate of SSB will be compared to projections from the rebuilding simulation framework to monitor overall stock trajectory relative to the rebuilding simulations. The median SSB estimates from the updated model in the most recent year, along with any available short term projections, will be overlaid on the probability envelopes for these years with projections from the simulation framework under prevailing conditions. If the median SSB falls below the 75 per cent probability envelope for any of the years, then it will be noted as an indicator that expected progress has not been achieved.

If an updated SSB estimate is unavailable (e.g. due to lack of new, comparable survey indices), survey biomass and cod condition indices will be monitored, with the latter considered as a proxy for natural mortality. In the short term, rebuilding simulations are most sensitive to mortality rates, with poor fish condition being one of the major factors impacting increased natural mortality levels in this stock. If significant changes occur in estimates of cod condition, this will be considered as an indicator that prevailing mortality conditions from the simulation framework are no longer representative.

8.0 Periodic review of the rebuilding plan

The rebuilding plan will be reviewed every 5 years to determine whether progress towards the plan's objectives, including the rebuilding target, is being made and whether revisions to the rebuilding plan are necessary in order to achieve those objectives. An interval of 5 years was determined appropriate to allow time to assess the performance of the stock and rebuilding plan in meeting the measurable objectives. Reports of each review will be published on DFO's website.

The first comprehensive review of the rebuilding plan is scheduled for 2028 and will occur through the 3Ps Groundfish Advisory Committee. In addition to the comprehensive review, a review of the stock-recruit relationship for 3Ps cod will be undertaken in 2028 by DFO Science to inform whether scientific assumptions used to assess rebuilding plan timelines and to inform the development of the harvest strategy and decision rule remain

appropriate.

The Rebuilding Plan will be reviewed earlier than the scheduled 5 year interval if scientific information indicates a major change in the understanding of the stock and/or a sustained decline in the stock of 3 or more years (i.e. decline continuing without interruption). This information will be reviewed through the 3Ps Groundfish Advisory Committee to determine if changes to the rebuilding plan are warranted.

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Footnotes

- 1 A fishing enterprise is defined as the fishing unit comprising all licences, vessels, gear, facilities and crew. Fishing enterprises in the NL Region are multi-species firms and species dependence varies inter-annually, with changes in resource availability and landed prices.
 - 2 Based refers to being homeported in 3Ps.
 - 3 Monetary values in this section are nominal; inflation and other factors are not taken into account.
 - 4 Given the limitations with the historical data in the NL Region, and to assist the reader with an understanding of the importance of this fishery in the pre and post moratorium periods, the data presented is limited to 3Ps-based less than 65 feet enterprises.
 - 5 Information on Icewater Seafoods provided by and used with the express permission of Mr. Alberto Wareham, President and CEO of Icewater Seafoods.
 - 6 The probability of preventable decline is defined here as the difference between the probability of stock decline over a 5 year period in the absence of fishing and the probability of decline across the same period with the MP implemented.
 - 7 A ten year period ending in 2019 was chosen since 2020 was strongly impacted by the Covid-19 pandemic, and 2021 and 2022 were particularly strong snow crab and lobster seasons, with historically high average landed prices.
 - 8 Catch projections in rebuilding plan simulation framework extended to 2047; however as noted in section 4.1 the end year of the rebuilding plan timeline is 2048.
 - 9 See footnote 5.
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Appendix A – MSE testing of management procedure

A simplified Management Strategy Evaluation (MSE-lite) framework was developed to enable closed-loop simulations of various rebuilding scenarios

for Atlantic cod stock in NAFO Sub-Division 3Ps (see DFO 2023/007 and Varkey et al. *in press* for details). Management procedure (MP) scenarios (i.e., alternate fishery removal levels) are applied in the long term projections based on a variety of operating models that consider different future scenarios. The base operating model for MSE-lite is based on the current integrated state-space model for this stock known as Hybrid (Varkey et al. 2022). The growth of the stock is currently constrained by recent increases in natural mortality rates and low recruitment. Therefore, long-term projections of the rebuilding scenarios presented incorporate a series of hypotheses regarding future natural mortality rates and recruitment trends for the stock, with three scenarios simulated for each (Table A1). Notably, all scenarios tested fall within conditions previously observed by the stock, and in a changing ocean climate these may not adequately capture future conditions. The performance of MPs within the MSE-lite was evaluated based on their effectiveness in stock size achieving the various rebuilding plan objectives.

Productivity scenarios considered within the MSE-lite simulation framework for 3Ps Cod

Natural mortality

- Low: Average estimate of natural mortality from 1996-2005 = 0.27.
- Prevailing: Estimate of natural mortality in the terminal year (2021) of the most recent stock assessment (DFO 2022/022) = 0.34.
- High: Average estimate of natural mortality from 2015-2021 = 0.37.

Recruitment

- Average 2019-21: Constant recruitment (with uncertainty) into the future at the average level of the most recent three years (2019 to 2021). These years are within the recent low level of recruitment observed in this stock.
- Beverton-holt (BH): A Beverton-Holt stock recruit relationship fit to the data from 1993 onwards
- Sigmoid Beverton-holt (SigBH): Sigmoidal Beverton-Holt stock-recruit relationship (as in Perälä et al. 2022) fit to the entire available time series of SSB and Recruitment (since 1959)

The performance of the projected fishery removals under the adopted MP (F0.065) (plus 100t for unaccounted removals), was evaluated relative to the

Rebuilding Plan’s measurable objectives. The performance results are shown here across the suite of recruitment and natural mortality scenarios tested within the MSE-lite (Figure A1). Notably, the milestone of stock growth over 5 years is achieved with a high probability (defined as ≥ 0.75) across all scenarios examined. This MP achieves all of the rebuilding objectives with a probability of 0.75 or greater at reduced mortality and under the prevailing conditions defined by the 3Ps Cod Rebuilding Plan Working Group. With increased mortality or lower recruitment, the short term and rebuilding objectives are not projected to be achieved with a high probability.

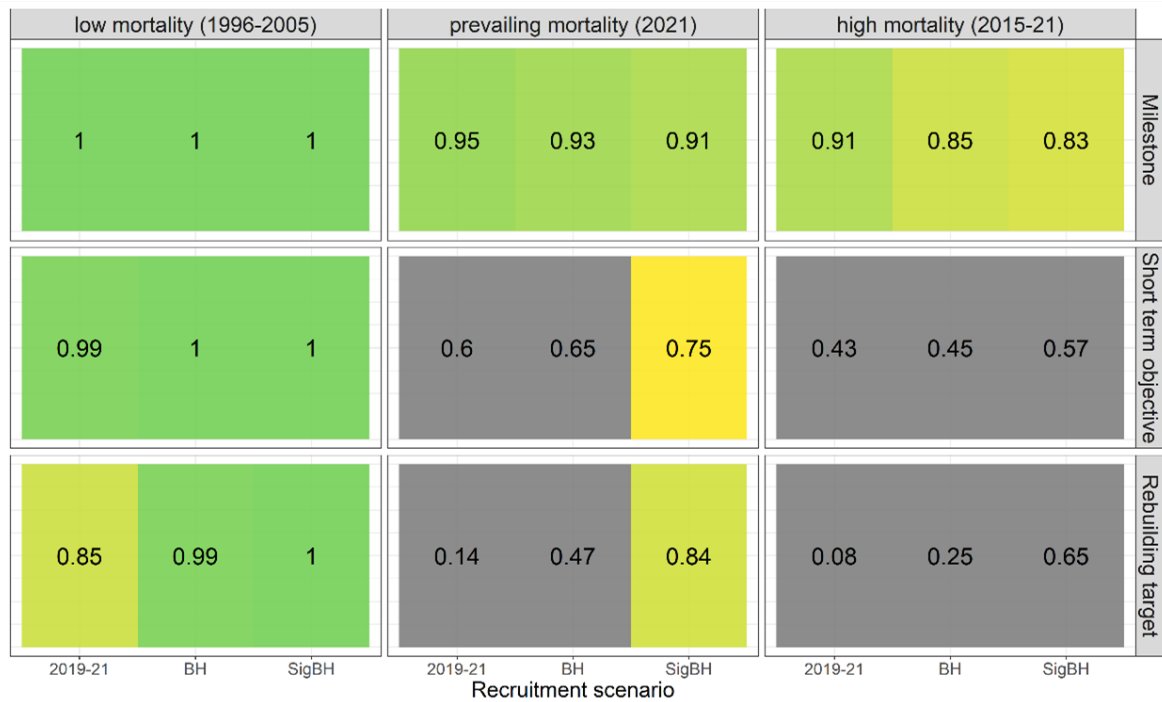


Figure A1. Performance metric summary scorecard for the adopted MP (F=0.065) + 100t. Values in each cell indicate the probability of achieving the objective listed at the right, under each scenario of mortality (panels) and recruitment (R; bottom axis). Grey cells indicate the metric is not achieved with a high probability under these conditions.

► Description

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