Fisheries and Oceans Canada | Pêches et Océans Canada

REBUILDING PLAN

Atlantic Herring
Clupea harangus

Spring spawner component

NAFO Division 4T

Gulf Region

Date stock was determined to be at or below LRP: 2002
Date stock was prescribed to the Fish Stocks provisions: April 4, 2022
Date Rebuilding Plan Approved: [Insert Date]

Canada

Summary

The Herring population in the Southern Gulf of St. Lawrence (sGSL) consists of two spawning components; spring spawners and fall spawners components. These two Atlantic Herring components are defined as different stocks and managed over two fishing season (spring and fall) and across seven Herring Fishing Areas (HFA) within the Northwest Atlantic Fisheries Organization (NAFO) Division 4T. A distinct Total Allowable Catch (TACs) for the two spawning components has been established since 1985 but, to simplify fishery management, quota and allocations are determined on a seasonal, rather than spawning component basis.

The Atlantic Herring spring spawner component of the sGSL, has remained in the critical zone of the Precautionary Approach (PA) framework since 2002.

Spring spawning Herring recruitment level has been demonstrated to be driven by environmental effects, while recruitment variations are not driven strongly by spawning biomass. The Gulf of St. Lawrence is seeing a trend towards warmer waters, shorter duration of ice season, lower ice volume, and changes in primary and secondary production phenology (herring food sources). The sea surface temperature of the sGSL and the spring spawning Herring recruitment abruptly shifted from a cold water/high recruitment regime (1978-1991) to a warmer water/low recruitment regime (1992-2017) in the early 1990s. The spring spawning Herring stock is less likely to rebuild in the current regime of warmer water/low recruitment.

As outlined in the Precautionary Approach (PA) framework, the primary objective of this rebuilding plan is to promote the sGSL Atlantic Herring spring spawner component growth out of the critical zone, by ensuring that 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. Based on the PA framework, the overarching objective of the rebuilding plan is therefore to grow the stock out of the critical zone. The rebuilding target for the plan will be to grow the stock so that it is above the Limit Reference Point (LRP) of 46,340 t, with a high likelihood (≥75%). If the rebuilding target can be reached, the long-term management objective under the Integrated Fisheries Management Plan (IFMP) will be to continue the stock's growth toward the healthy zone and then maintain the spawning stock biomass (SSB) in that zone.

Unfortunately, even with no fishing, both the short term and long term prospects (SSB projections until 2027 and 2069 respectively) to rebuild the Atlantic Herring spring spawner component appear unlikely given current environmental conditions of poor recruitment and high natural mortality.The current warmer water/low recruitment regime, reduced weight-at-age and high natural mortality conditions (mainly predation) are limiting the likelihood of stock growth. Some spring spawner long term population projections models, using different scenarios of recruitment and environment relationship, were tested from year 2020 to 2069. The most promising models showed little changes in SSB over time and the stock staying in the critical zone of the PA.

These prevailing conditions of the ecosystem are such that a timeline to the rebuilding target cannot be calculated at this moment. During each review of the plan (every 4 years), the factors limiting the stock growth potential will be re-assessed to determine if they are still limiting stock growth and, if a timeline can be calculated. In the meantime and consistent with the PA framework, this rebuilding plan still aims at minimizing, to the extent possible, further declines of the stock. This is to preserve the stock such

that, should the prevailing conditions limiting the stock's recovery change, the stock retains the potential to rebuild.

Guided by the PA framework, management actions set out in this Rebuilding Plan maintain low fishing mortality to support rebuilding while continuing to monitor and assess the stocks. This will be done through:

- Keeping removals from all sources to the lowest possible level by continuing to implement and/or develop new management measures on all fisheries that direct for or intercept spring spawner Herring. This will be achieved by maintaining; the closure of the commercial and bait spring fisheries for the fixed gear fleet, the spring spawner bycatch limits for the mobile fleet which targets the fall spawning component and, a catch limit on sampling activities undertaken by Science.
- Monitoring sources of fishing mortality and enforcing compliance of management measures.
- Advancing current scientific knowledge in the fields of monitoring stock status, recruitment, environmental conditions, and those ecosystem factors that are likely to impact the stock's recruitment, growth, habitat and health.

Acronyms

AFS	Aboriginal Fisheries Strategy.
$B_{recover}$	The lowest historical SSB from which the stock was able to recover.
COSEWIC	Committee on the Status of Endangered Wildlife in Canada.
CSAS	Canadian Scientific Advisory Secretariat.
DFO	Fisheries and Oceans Canada.
DU	Designated Unit as defined by the COSEWIC.
F	Fishing mortality.
$F_{0.1}$	Removal reference in the healthy zone of the PA corresponding to the fishing mortality rate at which the marginal yield-per-recruit (i.e. the increase in yield-per-recruit in weight for an increase in one unit of fishing mortality) is only 10% of the marginal yield-per-recruit on the unexploited stock.
FSC	Food, Social and Ceremonial fisheries by First Nations and indigenous organizations.
FSP	Fish Stocks Provisions in the amended *Fisheries Act* (2019).
GSL	Gulf of St. Lawrence.
GSPAC	Gulf Small Pelagics Advisory Committee.
IFMP	Integrated Fisheries Management Plan.
LRP	Limit Reference Point at the critical-cautious zone boundary of the precautionary approach framework.
M	Natural mortality.
NAFO	Northwest Atlantic Fisheries Organization.
PA	Precautionary approach.
RR	Removal reference is the maximum acceptable removal rate for the stock.
RV survey	Research Vessel survey (scientific) conducted annually in September.
SARA	*Species at Risk Act*.
sGSL	Southern Gulf of St. Lawrence.
SSB	Spawning Stock Biomass.
t	metric ton.
TAC	Total Allowable Catch.
TRP	Target reference point determined by productivity objectives for the stock, broader biological considerations and social and economic objectives for the fishery.
USR	Upper Stock Reference Point at the cautious-healthy zone boundary.

Important definitions used in this document

Fixed gear fleet	Harvesters licensed to use gillnets (also call gillnetters).
Fall fishing season	Fishing season running from early July to end of December targeting fall spawners but may also include some spring spawners.
Fall spawners	Component of the Atlantic Herring population that spawn in the fall.
Mobile gear fleet	Harvesters licensed to use purse seines (also call seiners)
Spring fishing season	Fishing season running from January to the end of June (but practically from mid-April to end of June) targeting spring spawners but may also include some fall spawners.
Spring spawners	Component of the Atlantic Herring population that spawn in the spring.

Foreword

In 2009, Fisheries and Oceans Canada (DFO) developed A Fisheries Decision-Making Framework Incorporating the Precautionary Approach (PA Policy)[1] 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 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 establishes a timeline for each rebuilding plan's development.

The purpose of this plan is to identify the main rebuilding objectives for the Atlantic Herring spring spawner component in NAFO Division 4T, 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(s) has reached its rebuilding target. Once the stock is determined to be at the target, the stock(s) 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.

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The Honourable Joyce Murray, P.C., M.P. *Date of approval of rebuilding plan*

Minister of Fisheries, Oceans and the Canadian Coast Guard

[1] A fishery decision-making framework incorporating the precautionary approach: https://www.dfo-mpo.gc.ca/reports-rapports/regs/sff-cpd/precaution-eng.htm

Contents

1.0 Introduction and Context

1.1 Population and distribution

Herring species belong mostly to the family Clupeidae and are the most abundant group of forage fish in the world, with species occurring mainly in shallow and temperate waters of the North Pacific and the North Atlantic oceans, including the Baltic Sea, as well as off the west coast of South America.

The Atlantic Herring is considered as the most abundant Herring species. Distributed on both sides of the North Atlantic, it provides over half of all Herring catches in the world. In the western North Atlantic, the species ranges from western Greenland to Labrador and southward along the North American coast to Cape Hatteras (Stevenson and Scott 2005, Scott and Scott 1988). The species is found in the sGSL from the north shore of the Gaspe Peninsula (Québec) to the northern tip of Cape Breton Island (Nova Scotia) and includes the Magdalen Islands (Simon and Stobo 1983; Claytor 2001; LeBlanc 2016).

1.2 Biology

The Herring population in the sGSL consists of two spawning components: spring spawners and fall spawners. Herring adult for both components over-winter at the entrance of the Gulf of St. Lawrence (Figure 1). When the ice breaks up in the spring both Herring spawning components begin to return to the sGSL. Spring spawners migrate first to spawning areas and peak spawning occurs during April and May, but may extend to June 30 in various areas of the sGSL at depths less than 10 meters. Fall spawning typically occurs from mid-August to mid-October at depths of 5 to 20 m, but can occur as early as July 1 (LeBlanc 2016, McDermid *et al.* 2018).

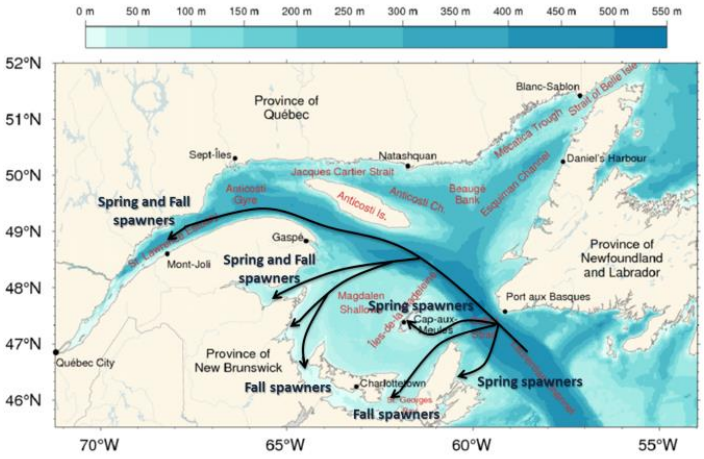

Figure 1. Migration of Spring and Fall Atlantic Herring spawning components in the Southern Gulf of St. Lawrence. Adapted from White and Johns 1997 and Galbraith *et al.* 2021.

The spring and fall spawner components of NAFO Division 4T are considered distinct stocks and are assessed separately. Recent genetic studies have confirmed genetic differentiation among these stocks (Lamichhaney *et al.* 2017). Herring also show high spawning site fidelity (Wheeler and Winters 1984; McQuinn 1997; Brophy *et al.* 2006) where they can aggregate in large concentrations. These localized spawning grounds are especially targeted by the gillnet fishery, therefore capturing fish during their spawning activities.

Each population spawns only once a year over a relatively short time period. Females lay their eggs on the seabed where they are fertilized by the males. The eggs stick on stones, gravel, sand and seaweed, forming extensive egg beds that are often many layers deep. In general, spring spawners produce fewer eggs (up to 50% less) than fall spawners for females of comparable size. Fecundity can range from 23,000 to 261,000 eggs per female, but large females can produce up to 360,000 eggs (Messieh 1988). The eggs are 1.0-1.4 mm in diameter. They remain attached to the bottom throughout the incubation period, which could be 14 to 19 days depending on water temperature which range from 3.3°C to 9.7°C for spring-spawned eggs (Messieh 1987).

Atlantic Herring from populations on the Canadian eastern shores can grow up to 45 centimeters in length and weigh up to 1.1 kilograms. Growth rates vary greatly from stock to stock. The life expectancy once mature is 12 to 16 years. Some Herring will mature by age 3, but most will mature by age 5 (Scott and Scott 1988). In the sGSL, female fork length at 50% maturity (*L50*) is estimated at 23.5 cm (DFO 2007) and the age at first spawning is typically 4 years of age (Messieh 1988).

Generation time has not been estimated for the sGSL spring spawner stock. It was estimated at 3.3 years in FishBase[2], from 85 growth studies over the entire worldwide distribution of the species. A higher value of 6 years was estimated by Feng *et al.* (2017), based on historical sampling of several North Atlantic Herring stocks before the onset of large-scale commercial fishing or just after World War II. The authors are however indicating a decreasing generation time with the increasing fishing pressure on the herring stocks. Assuming that Herring in the sGSL are reaching 50% sexual maturity at approximately 4-5 years of age (Messieh 1988, Scott and Scott 1988), the generation time should normally be around that age or a little higher. More research is required to estimate the generation time for this stock.

1.3 Habitat requirements

The Atlantic Herring is a pelagic species that forms schools, particularly during feeding, spawning and annual migrations. In recent years, the largest spring spawning areas are in relatively shallow waters of the Northumberland Strait and Chaleur Bay, and the largest fall spawning areas are in coastal waters off Miscou and Escuminac N.B., North Cape and Cape Bear P.E.I., and Pictou, N.S (Wheeler and Winters 1984; McQuinn 1997; Brophy *et al.* 2006; DFO 2018).

Herring may show specific habitat requirements for spawning, as they demonstrate high spawning site fidelity. Well-mixed (unstratified) waters and transition zones (fronts) between well-mixed and stratified waters are preferred habitats for adults; also more abundant in or on edges of plankton aggregations. The egg beds are normally found in coastal waters with strong bottom currents and coarse substrate. Larvae remain on or near bottom for first few days after hatching, until yolk-sac is absorbed, then rise to surface and are dispersed by currents (Stevenson and Scott 2005). Therefore, abundance of the food source and the nature of the seabed substrate may be considered as key determinants for the spatial aggregation (Maravelias 2001).

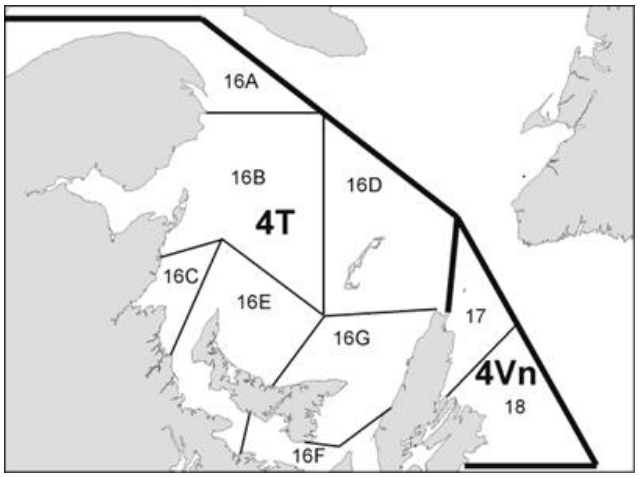

Figure 2. Southern Gulf of St. Lawrence Herring fishing areas within NAFO Divisions 4T and 4Vn.

Adult herring behavior is affected by temperature changes (Stevenson and Scott 2005). Herring probably have characteristic temperature ranges and tolerances during particular times of its life cycle (Blaxter and Holliday 1963) and can perceive temperature changes which are smaller than 0.1°C (Laevastu 1993). At the distributional extremes of the species, stocks are restricted to a single spawning strategy, with autumn spawning in the south and spring spawning in the north. Changes in environmental conditions in the sGSL, characterized by a general water warming trend, favors autumn spawners (Melvin et al 2009). Broad-scale environmental

[2] FishBase: https://fishbase.mnhn.fr/summary/24

changes can introduce large interannual variability and limit the reproductive and recovery potential of a stock (Melvin et al 2009).

1.4 Ecosystem interactions

The Atlantic Herring is a forage species and one of the most important pelagic species throughout the North Atlantic. Herring, which filter tiny zooplankton such as copepods and euphausids, are consumed by top marine predators. Many species of fish, bird, and marine mammal rely on Herring as a source of food. Their eggs are also subject to predation by a variety of bottom dwellers, including winter flounder, cod, hake, sculpins, skates and smelt (Scott and Scott 1988, Benoît and Rail 2016). Herring is therefore considered to form a critical link between the base of the food web (plankton) and other marine organisms.

1.5 The fishery

The two Atlantic Herring stocks (spring and fall spawner components) in the sGSL are managed over two fishing season (spring and fall) and across seven Herring Fishing Areas (HFAs 16A to 16G) within the Northwest Atlantic Fisheries Organization (NAFO) Division 4T (Figure 2). The spring season extends from January 1 to June 30 and the fall season from July 1 to December 31.

Prior to 1967, the herring fishery of the sGSL was mainly exploited by the inshore fleet using gillnets (referred to as fixed gear) and average landings from 1935 to 1966 were 34,000 t. In the mid-1960s, a purse seine fishery (referred to as mobile gear) was introduced and average landings increased to 166,000 t during 1967 to 1972 period. A quota or Total Allowable Catch (TAC) of 166,000 t was introduced in 1972 and reduced to 40,000 t in 1973. The purse seine fleet accounted for most of the catch from the time of the TAC introduction until 1981. Beginning in 1981, a change in the management plan altered the relative allocation of the TAC between the inshore (fixed gear) and purse seine (mobile gear) fleets. The purse seine fleet was allocated 20% of the TAC within the sGSL and also, approximately 4,000 t from the over-wintering area off Cape Breton (NAFO Division 4Vn). In 1992, the Cape Breton portion of the allocation was formally recognized as part of the sGSL TAC. The allocation split since 1992 has been 23% to the purse seine fleet and 77% to the inshore fleet (Claytor 2000).

At the time, in 1972, the TAC was set for the spring and fall fishing seasons combined without a distinction for the spring and fall spawner components. In 1985, a separate TAC for the spring spawner and fall spawner components was established. To simplify fishery management, quotas were established on a seasonal (spring and fall fishery), rather than the spawner components basis. For stock assessment purposes, landings are later attributed to spring spawners or fall spawners based on biological samples taken during the fishery and processed in laboratory. The quota by season is an operational consideration since determining spawning group in laboratory cannot keep up with the fast fishing pace. Generally, the purse seine fleet harvests both spawning groups throughout the year, while the inshore fixed gear fleet harvests primarily spring spawners in the spring and fall spawners in the fall.

The fixed gear fishery is focused in HFAs 16A to 16G within NAFO Division 4T, whereas the mobile gear fishery occurs in 4T and historically, occasionally in 4Vn (Figure 2). During the spring and fall fishing seasons, the mobile fleet are prohibited from fishing in inshore areas, which are set aside exclusively for the fixed gear fleet (Claytor *et al.* 1998). Starting in 2013, the mobile gear fleets was authorized to fish fall spawners in the spring fishing season by limiting their fishing effort in the northern half of the HFA 16D, along the boundary of NAFO Division 4T, which is referred to as the “Edge”. Since a portion of the fall spawners are schooling in this specific region of the sGSL, seiners are allowed to fish a portion of

their fall herring quota during the spring fishing season (May-June) along the ''Edge''. Catches are then accounted under the fall fishery season in the landing statistics. In the fall fishing season (July-December), mobile gear fleets are also authorized to fish 50% of their quota in the Bay des Chaleurs.

In the sGSL, commercial and bait Herring fishing licences give access to the spring and fall fisheries. The fixed gear fleet represents the vast majority of the Herring fishing effort (Table 1). In 2021, 3,031 fixed gear and 20 mobile gear licences (11 large and 9 small seiners) were renewed. Small seiner licences allow the use of purse seine or gillnet as gear type. The percentage of active harvesters of the fixed gear fleet was 13%, the large and small seiner fleets, 11% and 9% respectively and, for the bait fishery 7%. The number of active harvesters in each fishing season may vary from year to year, as each licence holder can decide to fish in one or both fishing seasons. Some inactive harvesters may also decide to become active, or may transfer their licences to new owners through the Commercial Fisheries Licensing Policy.

Table 1. Number of renewed commercial (fixed and mobile gear) and bait licences and estimate of the number of active harvesters in the southern Gulf of St. Lawrence Herring fishery in 2021.

Type of fishng licences	Renewed licences	Estimate of the number of active harvesters
Fixed gear (inshore)	3,031	381
Mobile gear (large seiners >19.8 m)	11	1
Mobile gear (small seiners <19.8 m)	9	1 [1]
Bait fishery (personal use only)	3,061 [2]	207 [3]

Source: Gulf and Quebec Regions Licensing and Statistics divisions (December 2022).

1 – *Active harvesters using gillnet instead of a small seine.*

2 – 2,179 bait fishing licence holders also have a commercial Herring fishing licence.

3 – Estimate based on hail-ins.

Annual landings in the spring and fall fishing seasons have shown a steady decline over the 1999 to 2021 period (Figure 3). The most acute decline was observed during the spring fishing season, when spring spawners are caught. As the biomass of spring spawners was entering the critical zone of the PA, TACs were gradually reduced from 21,000 t in the early 1990's to 500 t for the 2020 and 2021 spring fishing

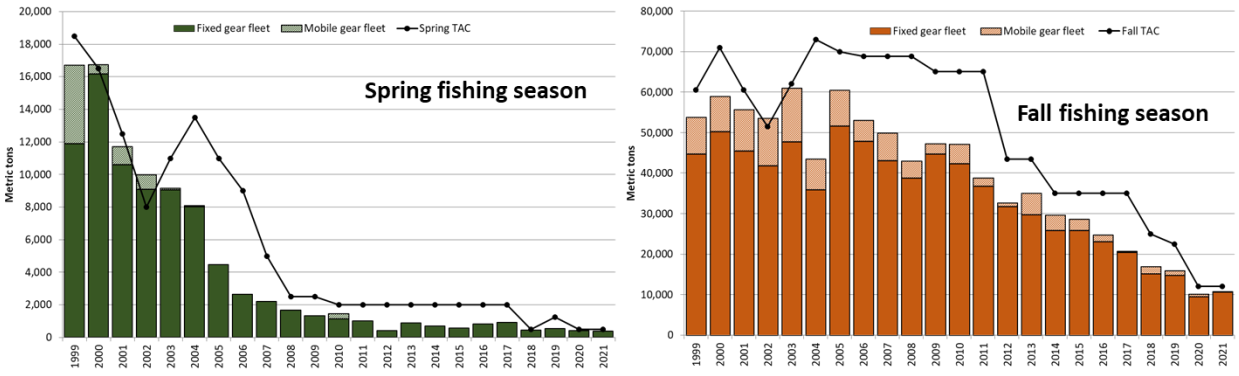

Figure 3. Landings (metric tons) by fishing gear and fleet and total allowable catches (TAC) for the spring and fall Atlantic Herring fishing seasons in NAFO Division 4T, from 1999 to 2021. Starting in 2013, with the authorization for the "Edge Fishery" targeting fall spawners, catches by the mobile gear fleet in the spring season were reported as fall season catches. Data extracted from the 2022 stock assessment research document (Rolland *et al.* 2022).

season. Due to the lack of stock recovery and the continuing critical state of the spring spawner component, the herring commercial and bait fishery during the spring season was closed in 2022.

Although spring spawners are mainly caught during the spring fishing season, some are also caught during the fall season. The same is observed with some fall spawners being caught during the spring season. As the fixed gear fleet generally operates on different fishing locations than the mobile fleet, the proportion of spring and fall spawners in the catch varies between fleets (Figure 4).

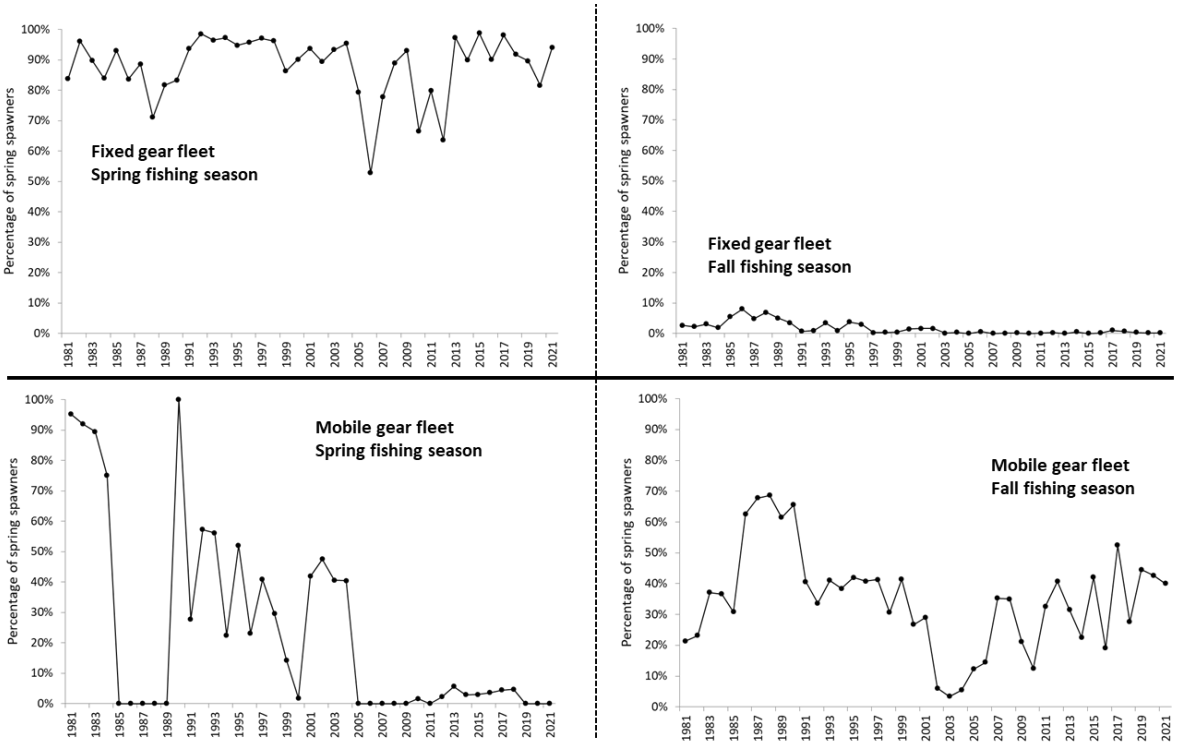

Figure 4. Percentage of spring spawners in landings by fishing season (left and right panels) and fishing gear (top and bottom panels), from 1981 to 2021. Data extracted from the 2022 stock assessment research document (Rolland *et al.* 2022).

The percentage of spring spawners caught by the fixed gear fleet during the spring and fall fishing seasons have stayed relatively stable over time (Figure 4). With some few exceptions, spring spawners represent more than 85% of the fixed gear fleet catches during the spring fishing season and less than 1% during the fall fishing season (Figure 4).

Spring spawners catches by the mobile gear fleet during the spring fishing season have shown important fluctuation over the last 40 years. During the spring fishing season from 1990 to 2004, approximately 40% of the mobile gear fleet catches were spring spawners (Figure 4). That percentage dropped to 4% for the 2012-2018 period, in part due to; new management measures, the implementation of the "Edge fishery" targeting higher fall spawner concentrations and, a major reduction in fishing activities since 2005.

The percentage of spring spawners caught by the mobile gear fleet in the fall fishing season have also fluctuated over time, with some years being above 60% (1986 to 1990). Since 2003, the year of the lowest value, percentages have shown a steady increase from 3% to 40% in 2021.

1.6 Overview of the fishery socio-economic and cultural importance

The Atlantic Herring fishery is the largest of the fisheries for small pelagic species in eastern Canada. Products from the fishery include fresh, frozen, smoked, canned (including sardines), pickled, roe and bait (fresh, frozen, and salted) and by-products including fishmeal and fish-oil. For 2021, the total spring and fall fishery landed value in NAFO Division 4T is estimated at less than $8.3 million. The landed value for the spring fishing season is much lower than the fall fishing season and represents approximately 4% of the value.

Herring landed during the spring fishing season from NAFO Division 4T are presented in Table 2. In 2021, 123 active commercial herring licence holders reported landings of 323t in NAFO Division 4T with an associated value of $283,127.

Table 2. Atlantic Herring spring fishing season landings (metric tons), value and fishing effort in NAFO Division 4T, 2010-2021

Year	TAC (t)	Quantity landed (t)	Value ($)[2]	Price ($/kg)	Active Harvesters [3]
2012	2,000	616	367,338	0.60	147
2013	2,000	1,049	894,557	0.86	157
2014	2,000	672	491,013	0.73	122
2015	2,000	569	447,885	0.79	101
2016	2,000	784	535,601	0.68	124
2017	2,000	938	765,290	0.82	130
2018	500	460	405,054	0.88	135
2019	1,250	561	750,685	1.34	124
2020 [1]	500	309	389,337	1.26	83
2021 [1]	500	323	283,127	0.88	123
2022	Commercial and bait spring fishery season was closed.				

Source: DFO, Gulf and Quebec Regions.

[1] Preliminary data.

[2] Landed values for the bait fishery not included since catches are not for sale, but for personal use.

[3] Include commercial harvesters from the fixed gear and mobile gear fleets. Active bait licence holders are not included.

Between 2012 and 2021, the landed value of the 4T herring spring season harvest has been distributed between the provinces of New Brunswick (37%), Quebec (36%), Prince Edward Island (27%) and Nova Scotia (1%).

Prior to the 2022 closure of the 4T herring spring fishery for the fixed gear fleet, the dependency on this fishery for harvesters of this fleet was considered low, since 93% of enterprises were dependent on 4T spring herring for less than 25% of their fishing income in 2020 (Table 3).

Table 3. Dependency (% of total fishing income) on spring fishing season Herring for 2020

	Less than 5%	**5% - 25%**	**26% - 50%**	**51% -100%**
Number of active inshore harvesters	108	6	2	7

Source: DFO, Gulf and Quebec Regions

The herring commercial spring fishery was normally considered a complementary fishery to the much more lucrative commercial lobster and snow crab fisheries (Table 4).

Table 4. Value of other species caught by active herring spring season harvesters in 2020 ($ millions).

Lobster	Snow crab	Shrimp	Fall season Herring	Other species	Total
47.5	30.4	2.0	0.8	3.2	83.9

The total value of the herring spring season in 2020 was 0.39 million $. Source: DFO, Gulf and Quebec Regions

Bait licences are issued to harvesters to catch both Herring and Mackerel for personal use only. In the Gulf and Quebec Regions, approximately 2,500 Herring/Mackerel bait licences are issued annually for fisheries using traps or hooks/longlines, such as Lobster, Crab, Groundfish and Tuna fisheries. However, in 2021, only 169 participants were active in the spring herring/mackerel bait fishery.

Up until and including the year 2019, only a bait monitoring document was requested (Gulf Region) or an electronic logbook (e-log, Québec Region) from participants in the Herring/Mackerel bait fishery and compliance was low, which resulted in limited information on landings for this fishery. Starting in 2020, a hail-in of the catch estimate is a mandatory requirement before entering the port for fish harvesters from the Gulf and Québec Regions. The hail-ins, the returned bait monitoring documents (Gulf Region) and e-logs (Québec Region) are used to estimate the bait fishery landings. Mandatory logbooks (paper format) were also introduced in 2022 for the fall season of the herring commercial and bait fisheries of the Gulf Region.

As a consequence of the above reporting requirements, the total bait landings for 2021 spring season are estimated at 95t for Gulf and Québec Regions. Since catches in the bait fishery cannot be sold (personal use only), there is no purchase transactions or formal mechanism to estimate the catch value. Although, a precise price has not yet been determined, an estimate of $2.20/kg based on discussion with industry members would correspond to a value of over $200,000, if harvesters were to buy their Herring from a bait supplier.

There is currently no authorized recreational fishery with access to Herring in NAFO Division 4T.

Herring is also fished as part of the Food, Social and Ceremonial (FSC) fishery. A total of 12 First Nations and Indigenous organizations can fish in the spring and fall seasons for FSC purposes in the Gulf and Québec Regions. FSC fisheries are managed under the Aboriginal Community Fishing Licence Regulations and Aboriginal Fisheries Strategy (AFS) agreements. The species caught under FSC are not allowed to be sold. There are no reported catches or estimates available for removals of Herring in this FSC fishery, however the quantity is likely minimal (from qualitative observations obtained from Conservation and Protection fishery officers).

1.7 Involvement of stakeholder and Indigenous groups in the development of the plan

Consultations were conducted with different harvester's associations, processors, First Nations and Indigenous groups in the provinces of New Brunswick, Prince Edward Island, Nova Scotia and Québec between February 13 and March 16, 2020. A working book was developed to facilitate discussions but above all, to facilitate the gathering of written comments. Participants were also invited to propose adjustments or alternatives to the management measures presented.

2.0 Stock Status and Stock Trends

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 Fisheries Decision-Making Framework Incorporating the Precautionary Approach was developed (DFO 2009), and applies where decisions on harvest strategies or harvest rates for a stock must be taken to determine TAC or other measures to control harvests. The 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 subsistence 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 general decision framework:

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

Reference points (Table 5) as defined by the Precautionary Approach Framework (DFO 2009) were first estimated for the Herring spring spawner component in 2005 (Chouinard *et al.* 2005; DFO 2005) and later updated or modified in 2016 (DFO 2016; Swain 2016), 2020 (DFO 2020) and 2022 (DFO 2022; Rolland *et al.* 2022).

Table 5. Summary of the Precautionary Approach Framework reference points for NAFO Division 4T Atlantic Herring, spring spawner component.

PA reference point [1]	Stock-specific value of the reference point	Source
Limit Reference Point (LRP)	46,340 t	Rolland *et al.* 2022
Upper Stock Reference (USR)	129,994 t	Rolland *et al.* 2022
Target Reference Point (TRP)	N/A	
Removal Reference (RR)	$F_{0.1}$ = 0.35	Rolland *et al.* 2022

[1] - The limit reference point (LRP) in 4T Herring is $B_{recover}$, which is the lowest biomass from which the stock has been observed to readily recover. It is calculated as the average of the 4 lowest SSB estimates in the early 1980s (i.e., 1979-1982). Consequently, this value is dependent to the model used to assess the stock. If the model changes, stock biomass may be re-scaled upwards or downwards. Since the assessment model was modified in 2022, the reference points were re-scaled (Rolland *et al.* 2022).

The last full assessment of Atlantic Herring stock and the stock spawning biomass (SSB) of the spring spawner component of the sGSL, NAFO Division 4T, was completed in 2022 (Rolland *et al.* 2022).

SSB estimates based on the 2022 modified assessment model are presented in Figure 5 from 1978 to 2021 (Rolland *et al.* 2022). Estimated SSB increased from low levels in the early 1980s to highest levels in the mid-1980s to mid-1990s. The SSB declined in the mid-1990s to reach the critical zone in 2002. SSB increased slightly until 2010, but then declined again and fluctuated around a mean value of 39,550 t until 2021. Estimated SSB in 2020 and 2021 were 38,402 t and 35,626 t, respectively. The estimate for 2021 is 77% of the LRP (46,340 t).

Estimated recruitment (number of age 2 fish) was highest in the early 1980s, 1990 and 1993 (Figure 6). Recruitment has been relatively stable at lower values since 1993, with slightly higher values between 2006 and 2008. Recruitment declined to lowest values of the time-series after 2008 up to 2020, except a small peak in 2015.

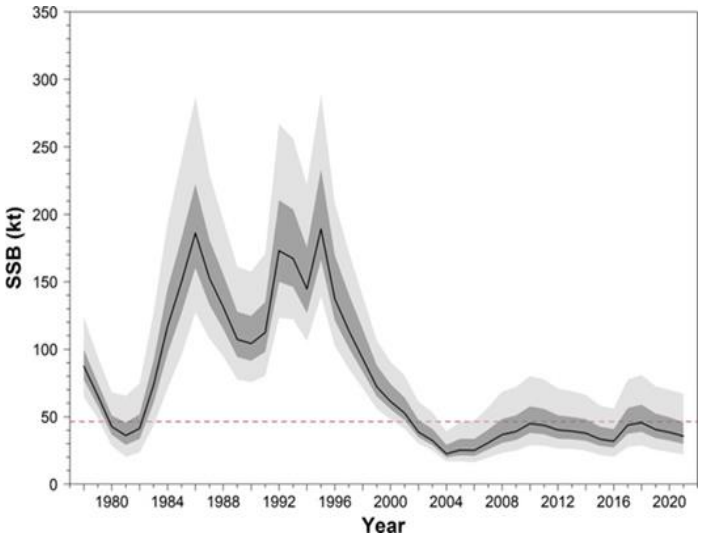

Figure 5. Estimated beginning of the fishing season (April 1) spawning stock biomass (SSB) of the spring spawner component of Herring in the southern Gulf of St. Lawrence, 1978 to 2021. The solid line is the median estimate and light shading its 95 % confidence interval and dark shading is 50 % confidence interval. The red horizontal dashed line is the Limit Reference Point (46,340 t of SSB) (DFO 2022).

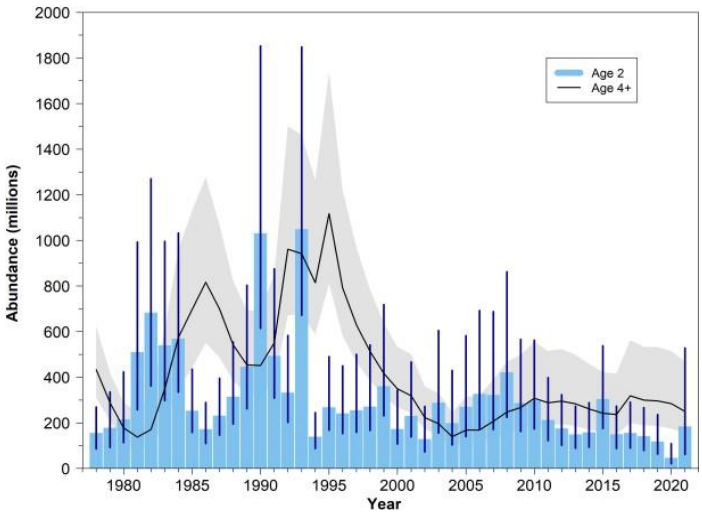

Figure 6. Estimated beginning-of-year (January 1) abundance of age 2 (blue bars), and 4 years and older (black line) of the spring spawner component in the southern Gulf of St. Lawrence. Black line shows the median estimate and shading shows 95% confidence interval (Rolland *et al.* 2022).

Estimated abundances of recruits to the fishery (age-4 fish entering the fishery) were highest in the mid-1980s, 1992 and 1995 (Figure 7). The number of fishery recruits declined from 1995 to the lowest level observed in 2004 and has remained at a very low level since then (average 102.8 million Herring).

The decrease in SSB started in 1994 and reached a minimum value in 2004. At the same time, fishing mortality increased from 0.20 in 1997 to 0.59 in 2004. Fishing effort was reduced after 2004 and fishing mortality sharply declined until 2012 and has since continued to decline at the lower rate. Recruitment increased slightly between 2002 and 2008, resulting in a slow increase in SSB. However, natural mortality increased rapidly since 2010 (Figure 8), and recruitment decreased again after 2008, driving another decrease in SSB. Recruitment was slightly variable at low levels since 2017, and natural mortality was the highest, keeping SSB low. Moreover, the decline in weight-at-age over the time-series also contributed to the decline in SSB (Rolland *et al.* 2022).

2.1 Committee on the Status of Wildlife in Canada (COSEWIC)

This stock has not been assessed by COSEWIC and is therefore not currently under consideration for listing under the *Species at Risk Act* (SARA).

2.2 Indigenous knowledge

DFO aims to incorporate Indigenous traditional knowledge and traditional ecological knowledge considerations in science processes as participants to peer review meetings, and into fisheries management planning as members of the Gulf Small Pelagics Advisory Committee (GSPAC). As required, Indigenous knowledge is also gathered through consultations with First Nations and other Indigenous organizations.

3.0 Probable Causes for the Stock's Decline

The decline in spring spawning Herring SSB in the 1990s and the following lack of recovery is attributed to a combination of factors, including overfishing, poor recruitment, changes in the environment and increased natural mortality.

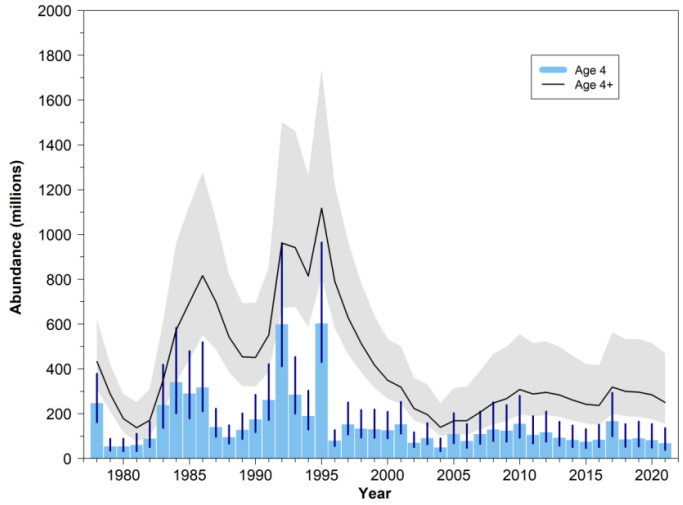

Figure 7. Estimated beginning-of-year (January 1) abundance of 4 year old Herring (blue bars), and Herring 4 years and older (black line) of the spring spawner component in the southern Gulf of St. Lawrence. Black line show the median estimate and vertical lines and shading show 95 % confidence interval (Rolland *et al.* 2022).

Despite the continuous reduction in fishing mortality since 2004, the stock has not recovered.

Pelagic fish such as Herring often exhibit sporadic recruitment peaks, making long term projections highly uncertain. However, recruitment is currently low in both spring and fall spawners. Spring spawning Herring recruitment level has been demonstrated to be driven by environmental effects, while recruitment variations are not driven strongly by spawning biomass (Brosset *et al.* 2018; Turcotte 2022). Similar findings were reported for other Herring stocks (Szuwalski *et al.* 2019).

Since 1992, the Gulf of St. Lawrence has experienced a trend towards warmer waters, shorter duration of ice season, lower ice volume (Galbraith *et al.* 2021). Both the sea surface temperature of the sGSL and the spring spawning Herring recruitment abruptly shifted from a cold water/high recruitment regime (1978-1991) to a warmer water/low recruitment (1992-2017) regime in the early 1990s (Turcotte 2022). These environmental changes, often linked to climate changes, may have triggered seasonal fluctuations in production of

Overfishing of the herring stocks in the sGSL has occurred in the past and contributed to the decline of the spring spawner stock (Fisheries Resource Conservation Council 2009). The decrease in SSB started in 1994 and reached a minimum value in 2004. At the same time, fishing mortality increased from 0.20 in 1997 to 0.59 in 2004 (Rolland *et al.* 2022). Fishing effort was reduced after 2004 and fishing mortality sharply declined until 2012 and has since continued to decline.

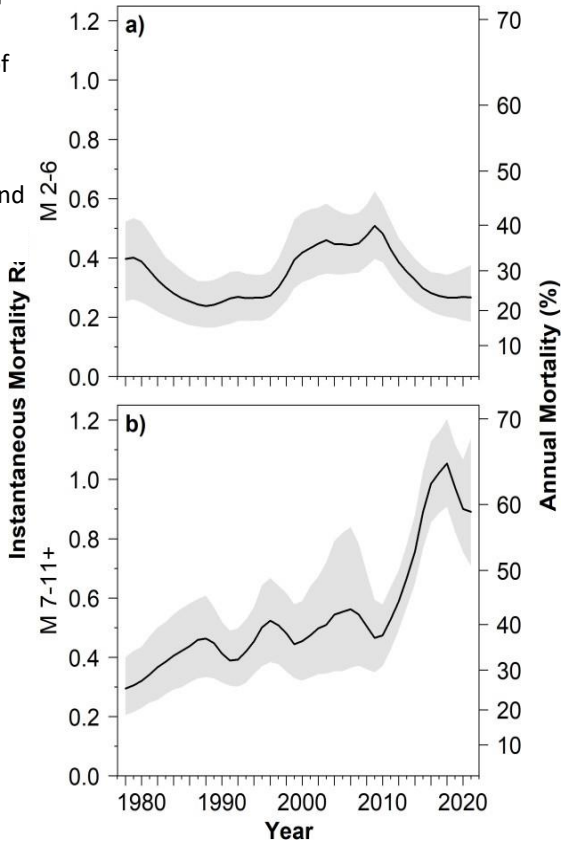

Figure 8. Estimated instantaneous natural mortality rate (left axis) and annual mortality (%, right axis) of spring spawning Herring from the population model, for ages 2 to 6 (upper panel) and 7 to 11+ (lower panel). Lines show the median estimates and shading their 95 % confidence interval (Rolland *et al.* 2022).

phytoplankton and zooplankton, primarily a change in the main Herring food source with a decrease in abundance of cold-water copepod species and an increase of warm water copepod species abundance (Blais *et al.* 2021). The spring spawning Herring stock is less likely to rebuild in the current regime of warmer water than it was in the former regime. This is consistent with a model suggesting that cold environmental conditions favor spring spawners, whereas warm conditions favor fall spawners in Western Atlantic Herring stocks (Melvin *et al.* 2009).

For both spring and fall Herring spawner stocks, the increase in natural mortality for the age group 7-11+ correlated with the increases in the abundance indices of Grey Seal, Atlantic Bluefin Tuna and Northern Gannets, the most important Herring consumers in the sGSL (Benoit and Rail 2016; Turcotte *et al.* 2021). Although predation is considered the main constituent of the natural mortality, further analysis of predator abundance, spatial distribution, size distribution, diet and functional response of predators to prey will be necessary to quantify the effects of the different predators on spring and fall spawning Herring natural mortality.

The weight-at-age of Herring has also declined by 39.6% between 1978 and 2021, and remains at near record low levels. Normally in fish populations, a shift in age structure toward younger less productive spawners can negatively affect productivity. The causes of these declines in weight-at-age and the consequences to recruitment rate are unknown (Rolland *et al.* 2022).

The cumulative impacts of multiple factors are responsible for keeping the stock in the critical zone since 2002. It is suggested that low recruitment is the main process keeping this stock in the critical zone (Turcotte 2022). Under the current warmer water/low recruitment regime, reduced weight-at-age and high natural mortality conditions, this stock is not expected to recover in the short term. Six years projections in SSB show no significant changes from 2022 to 2027, even without fishing (catch level = 0 t) (DFO 2022).

Some spring spawner long term population projections models, using different scenarios of recruitment and environment relationship, were tested from year 2020 to 2069 (Turcotte 2022). The best performing models showed little changes in SSB over time, as the stock stayed in the critical zone of the PA. Although these models are characterized by wide uncertainties, the long term prognosis suggests that, under current environmental conditions, the Herring spring spawner stock is unlikely to rebuild.

Given the current understanding and best available scientific evidence, loss or degradation of the sGSL spring spawner Herring stock's fish habitat is unlikely to have contributed to the stock's decline. The main drivers of the stock's decline were and continue to be high fishing mortality, low recruitment, decreasing weight-at-age and increasing natural mortality.

4.0 Measurable Objectives Aimed at Rebuilding the Stock

4.1 Rebuilding Target and Timeline

As outlined in the PA framework, the primary objective of this rebuilding plan is to promote stock growth out of the critical zone (grow the stock beyond 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. Based on the PA framework, the overarching objective for the Atlantic Herring spring spawner component is to grow out of the critical zone. The rebuilding target for the plan will be to grow the stock above the LRP (46,340 t) with a high likelihood (≥75%). If the rebuilding target can be reached, the long-term

management objective under an IFMP will be to continue the stock's growth toward the healthy zone and then maintain the stock's SSB in that zone. This long-term objective would be to the benefit of all Canadians, including harvesters, those sectors closely involved with the fishing industry and coastal communities that derive economic benefits from this resource.

Even with no fishing, the short term and long term prospects (SSB projections until 2027 and 2069 respectively) for rebuilding the Atlantic Herring spring spawner component appears unlikely given current environmental conditions of poor recruitment and high natural mortality (Rolland *et al.* 2022, Turcotte 2022). Current warmer water temperature/low recruitment regime, reduced weight-at-age and high natural mortality are limiting the likelihood of stock growth. Long term population projections models (2020 to 2069) under different scenarios of recruitment and environment relationship suggest that the spring spawner stock is unlikely to rebuild under prevailing conditions. As a result, a rebuilding timeline to the rebuilding target cannot be calculated at this time. During each review of the rebuilding plan (see Section 8.0: Periodic Review of the Rebuilding Plan), the factors limiting the stock's potential for growth will be re-assessed to determine if they are still influencing the stock and if a rebuilding timeline can be calculated. In the meantime and consistent with the PA framework, this rebuilding plan still aims at minimizing, to the extent possible, further declines of the stock. This is to preserve the stock such that, should the prevailing conditions limiting the stock's recovery change, the stock retains the potential to rebuild.

4.2 Additional Measurable Objectives and Timelines

Under the PA framework, while the stock is in the critical zone, management actions must promote stock growth, removals from all fishing sources must be kept to the lowest possible and there should be no tolerance for preventable decline.

Table 6 provides an overview of the secondary rebuilding objectives for the Atlantic Herring spring spawner component. These objectives aim at enabling DFO to monitor; all sources of mortality, the impacts of implemented management measures and whether there is improvement in the stock status and the overall state of the ecosystem.

Table 6. Additional measurable objectives and timelines aimed at rebuilding the NAFO Division 4T Atlantic Herring, spring spawner component.

Secondary Objectives	Timeline
1 – Keep removals from all sources to the lowest possible level by continuing to implement and/or develop new management measures on all fisheries that direct for or intercept spring spawner Herring.	Ongoing and reviewed every 4 years with the review of the rebuilding plan.
2 – Monitor sources of fishing mortality and enforce compliance of management measures.	Starting in 2023 and reviewed every 4 years with the review of the rebuilding plan.
3 – Advance current scientific knowledge in the fields of monitoring stock status, recruitment, environmental conditions, and those ecosystem factors that are likely to impact the stock's recruitment, growth, habitat and health.	Continue and review the status of the stock every 2 years, concurrently with the periodic 4 years review of the rebuilding plan.

5.0 Management Measures Aimed at Achieving the Objectives

Multiple management measures are required to achieve the objectives identified in Table 7. These measures and expected outcomes are presented in Table 7. They are informed by the numerous DFO Sustainable Fisheries Framework (SFF) policies such as the Precautionary Approach (DFO 2009), bycatch (DFO 2013) and catch monitoring (DFO 2019) policies. Since the Atlantic Herring, spring spawner component is unlikely to rebuild under prevailing conditions (see section 3.0: Probable Causes for the Stock's Decline), the objectives are aimed at preserving the stock such that should the prevailing conditions limiting the stock's recovery change, the stock retains the potential to rebuild.

Table 7. Summary of management measures aimed at achieving the rebuilding plan objectives for the Atlantic Herring, spring spawner component (NAFO Division 4T). The details for each management measure are presented in Annex 1.

Objective	Management Measure(s)	Expected Outcome	Biology or Environmental Conditions Taken into Account
1 – Keep removals from all sources to the lowest possible level by continuing to implement and/or develop new management measures on all fisheries that direct for or intercept spring spawner Herring.	Maintain full closure of the commercial and bait spring fisheries for the fixed gear fleet catching spring spawner Herring. *Note: This fishery closure was implemented in 2022.* *Note: The mobile gear fleet operate on an annual season and can still target fall spawners during the spring.* Maintain spring spawner bycatch limits for the mobile fleet by closing the fishery for the season when either one of the two triggers occurs: 1) a total amount of 25t of spring spawners bycatch has been caught, or 2) exceeding 10% of spring spawner	These measures are expected to keep removals at the lowest possible levels. Bycatches of spring spawners in the fall Herring fishing season will be the only sources of captured spring spawners component.	The bycatch measures take into account the inability to distinguish between spring and fall spawners onboard fixed gear vessels during the fall fishing activities.

Table 7. Summary of management measures aimed at achieving the rebuilding plan objectives for the Atlantic Herring, spring spawner component (NAFO Division 4T). The details for each management measure are presented in Annex 1.

Objective	Management Measure(s)	Expected Outcome	Biology or Environmental Conditions Taken into Account
	bycatch for 2 consecutive trips. Allow a maximum of 25t of spring spawners for science stock assessment sampling activities. *Note: Due to the low bycatch of spring spawners and inability to monitor in real-time the ratio of spring and fall spawners, no catch limit is set for spring spawners caught in the fixed gear fall fishery.*		
	The FSC fishery represents non-significant catches (from Conservation and Protection agents' field observations), no additional measures are being developed at this time.		
2 – Monitor sources of fishing mortality and enforce compliance of management measures.	Maintain catch sampling and monitoring of fishing activities to estimate the volume of spring spawners caught during the Herring fall fishing season (fixed and mobile fleets), and the spatial distribution and level of fishing effort. Sampling and monitoring tools will vary by fleet and include	Dependable and timely data to quantify catches during the Herring fall fishery.	Low abundance stocks caught in other fisheries managed under different conservation and compliance objectives (i.e.: fall fishery) should have methods and levels of monitoring that allow estimates of higher quality.

Table 7. Summary of management measures aimed at achieving the rebuilding plan objectives for the Atlantic Herring, spring spawner component (NAFO Division 4T). The details for each management measure are presented in Annex 1.

Objective	Management Measure(s)	Expected Outcome	Biology or Environmental Conditions Taken into Account
	hail in/out, dockside monitoring/sampling of landings, at-sea observer coverage, logbooks, and vessel monitoring systems.		
	For the mobile fleet, maintain the use of the small fish protocol according to the IFMP. *Note: The small fish protocol does not apply to the fixed gear fleet since they use gillnets with mesh sizes designed to allow escapement of small size Herring.*		
3 – Advance current scientific knowledge in the fields of monitoring stock status, recruitment, environmental conditions, and those ecosystem factors that are likely to impact the stock's recruitment, growth, habitat and health.	Maintain the sampling protocol for determining the proportions of spring and fall spawners in catches. Conduct annual stock abundance surveys for the spring and fall spawner components. Continue and develop research programs on herring recruitment and research on predation effects on natural mortality. Estimate generation time.	Stock assessments and research findings are peer-reviewed and published. Generation time expected to be published before the next review of the plan (2026).	

6.0 Socio-Economic Analysis

While a summary analysis of the overall financial Herring spring directed fishery contribution and harvesters involved was presented in section 1.6 of this document, this section provides the analysis to assess the impacts of the fishery closure and other measures on the different markets and usages of spring Herring. Since the spring fishing season closure occurred in 2022, prior to this Rebuilding Plan, there will be no incremental impacts on commercial or bait harvesters.

The general overview of the economic contribution of the spring Herring fishery and number of harvesters involved in the sGSL, acknowledge that the implementation of any new measures beyond those outlined here to further curtail and monitor the capture of Herring spring spawners will impact multiple sectors of the fishing industry differently.

The Herring bait fishery is more challenging to analyze due to the lack of dependable catch and effort data. The closure of the 2022 bait spring season fishery may however create an increase in effort on fall spawners in the bait fall fishing season, which will be closely monitored. As discussed in section 1.6, herring bait is known to be in high demand for the Lobster, Snow Crab, Rock Crab and Tuna fisheries.

7.0 Method to Track Progress Towards Achieving the Objectives

Performance metrics provide DFO with a means to assess the progress of the rebuilding plan towards the Rebuilding Plan's objectives. For each objective, Table 8 outlines how and when progress will be measured.

Table 8. Summary of the performance metrics and frequency of measurement associated with each objective in this rebuilding plan.

Objective	Metric to Measure Progress	Frequency of Measurement
1 – Keep removals from all sources to the lowest possible level by continuing to implement and/or develop new management measures on all fisheries that direct for or intercept spring spawner Herring.	Total bycatch of spring spawners by the mobile gear fleet does not exceed 25t. Total catch for science sampling and stock assessment activities does not exceed 25t.	Annually
2 – Monitor sources of fishing mortality and enforce compliance of management measures.	Qualitative assessment of the efficiency and efficacy of catch monitoring programs with the different fleets (fixed and mobile gear) and harvesters (commercial, bait and FSC) during the fall fishing season.	Annually as part of a review of all management activities and fisheries conducted in the sGSL (NAFO Divisions 4T) (Gulf Region – Annual post season review)
3 – Advance current scientific knowledge in the fields of monitoring stock status, recruitment, environmental	Conduct annual scientific surveys. New findings from science work published in Canadian Scientific	Stock assessments conducted and published on a 2-years cycle.

Table 8. Summary of the performance metrics and frequency of measurement associated with each objective in this rebuilding plan.

Objective	Metric to Measure Progress	Frequency of Measurement
conditions, and those ecosystem factors that are likely to impact the stock's recruitment, growth, habitat and health.	Advisory Secretariat (CSAS) research documents. Some results may also be published in specialized scientific journals.	New research findings published as they become available.

8.0 Periodic Review of the Rebuilding Plan

The department will engage stakeholders on any matter related to the implementation and review of the rebuilding plan through the established GSPAC process. Outcomes from the application of this rebuilding plan will be monitored periodically, and a comprehensive review will be undertaken every four years. Since the Herring stock assessments are conducted every two years, the rebuilding plan review will be conducted concurrently with every two cycles of stock assessments.

The review of the plan will be based on the data gathered using the metrics identified in the Method to Track Progress Towards Achieving the Objectives section of this plan. It will assess the progress of the implementation of management measures and evidence of their effectiveness, as well as the status of the stock and recent trends. In addition, the review will include opportunities for consultation with Indigenous organizations and stakeholders on their views of the stock's progress towards rebuilding.

The review process will generate a report that evaluates progress towards each management objective against their timelines with accompanying evidence and may propose adjustments to the rebuilding plan if necessary to achieve the objectives.

Stock rebuilding is not always a slow and steady, or even predictable process. Stocks may fluctuate and persist at low levels for years until conditions promote surplus production, resulting in rapid growth of the population. Thus lack of progress towards rebuilding may not be an indication that the rebuilding plan's objectives or management measures are insufficient or ineffective.

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Annex 1. Management measures until the next review of the rebuilding plan in 2026.

The closure of the Herring commercial and bait spring season fishery in 2022 was implemented prior to the present rebuilding plan. Although the rebuilding plan aimed at addressing the situation of the Herring spring spawner component, some measures were implemented in the fall Herring fishing season, mainly to reduce by-catch and to monitor spring spawners. Some of these management measures could be modified from year to year.

Objective	2023	2024	2025	2026
1 – Keep removals from all sources to the lowest possible level by continuing to implement and/or develop new management measures on all fisheries that direct for or intercept spring spawner Herring.	Fixed gear fleet: Maintain full closure of the commercial and bait spring fisheries for the fixed gear fleet catching spring spawner Herring.			
	[1] Mobile gear fleet: Maintain spring spawner bycatch limits for the mobile fleet by closing the fishery for the season when either one of the two triggers occurs: • a total amount of 25 t of spring spawners bycatch has been caught, o • exceeding 10% of spring spawner bycatch for 2 consecutive trips.			
	[1] Science activities: Allow an annual maximum of 25 t of spring spawners for science stock assessment sampling activities.			
	FSC fishery: The FSC fishery represents non-significant catches (no quantitative data, only qualitative), so no additional measures are being implemented at this time.			
2 – Monitor sources of fishing mortality and level of compliance with management measures; by fleet and fishing area (see Figure 2).	Fixed gear fleet: • 16A – Île Verte: 100% CMP, 25% DMP, and mandatory E-log. • 16B – Chaleurs Bay: New-Brunswick, 100% DMP and mandatory logbook (paper format). Quebec, 100% CMP, 25% DMP, mandatory E-log. • 16C and E – Escuminac, western Prince-Edward-Island and northern Nova Scotia: 100% DMP and mandatory logbook (paper format). • 16D – Magdalen Islands: 100% CMP, 25% DMP, mandatory E-log. • 16F and G – Pictou: 100% DMP and mandatory logbook (paper format).			
	Mobile gear fleet: • Mobile gear fleet will continue to be subject to a small fish protocol. • All large seiners (vessel greater than 19.81 meters) must be equipped with an operational Vessel Monitoring System (VMS) during fishing activities. • All large seiners (vessel greater than 19.81 meters) are subject to 100% at-sea observer coverage during fishing activities.			

Objective	2023	2024	2025	2026
	• Catches of fall spawners during the spring fishing season (May-June) along the ''Edge'' are accounted towards the large purse seiner fall quota.			
	Catch composition: Commercial fishery catches are sampled by DFO scientific personnel at dockside for the fixed gear and mobile gear fisheries. Sampling protocol is designed to obtain samples that are spatially and temporally representative of landings. The samples are used to identify the herring spawning component (spring or fall spawners).			

CMP (catch monitoring program): Catch estimate reported through hail-in.
DMP (dockside monitoring program): Landings verified by a certified company.
[1] Additional management measure in 2022.