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Gulf Region

Canadian Science Advisory Secretariat
Science Advisory Report 2026/032

SOUTHERN GULF OF ST. LAWRENCE (NAFO DIVISION 4TVN) FALL SPAWNING ATLANTIC HERRING (*CLUPEA HARENGUS*) STOCK ASSESSMENT TO 2025

CONTEXT

The Fisheries and Harbour Management sector of Fisheries and Oceans (DFO) has requested a stock status for the southern Gulf of St. Lawrence (sGSL) (Northwest Atlantic Fisheries Organization (NAFO) 4TVn) Atlantic Herring (*Clupea harengus*) fall spawning component. This stock is expected to be prescribed as part of Batch 2 under section 6 of the *Fisheries Act*. The last scientific assessment for this stock was completed in March 2024 to provide advice for the 2024 and 2025 fisheries (DFO 2024). This stock follows a two-year assessment and management cycle.

This Fisheries Science Advisory Report is from the regional peer review meeting of March 18-19, 2026, on the Southern Gulf of St. Lawrence, NAFO Division 4TVn, Atlantic Herring (*Clupea harengus*) Stock Assessment to 2025. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- Spawning Stock Biomass (SSB) of the sGSL (NAFO division 4TVn) of fall spawning Atlantic Herring remained in the Cautious Zone in 2024, with a 100% probability of being higher than the Limit Reference Point (LRP).
- In 2025, SSB of fall spawning Atlantic Herring increased above the Upper Stock Reference point (USR; probability of 70.3%) and is now in the Healthy Zone.

Trends

- Fall spawning Atlantic Herring has experienced declining SSB from 2014 to 2020, and entered the Cautious Zone in 2016. Since 2020, the SSB has increased and in 2025 entered the Healthy Zone at 108% of the USR.
- Fishing mortality (F) of fall spawning Atlantic Herring has been above the provisional harvest decision rule of the Precautionary Approach (PA) Framework from 2017-2022, but has been below from 2023 to 2025.
- Recruitment of fall spawning Atlantic Herring declined since 2006 to reach the low levels seen in 2015 to 2018, but has since increased with evidence of a notable recruitment event in 2024.
- Starting in 2010, natural mortality estimates for older ages of fall spawning Atlantic Herring sharply increased up to the mid-2010s, then slightly decreased and remained at high levels.

Ecosystem and Climate Change Considerations

- Higher water temperatures, poor food quality and high predator abundance likely have negative implications for Atlantic Herring size-at-age, fecundity and overall abundance.

Stock Advice

- The annual catch option for 2026 and 2027 where the projected fall spawning Herring SSB remains at or above the candidate USR and the projected fishing mortality is at or under the provisional Removal Reference point, is 24 kilotonnes (kt).
- In the absence of fisheries catch, the stock is projected to increase further into the Healthy Zone by 2026 (119% of the USR) and then plateau from 2027 and onward (123% of the USR).
- The probabilities that SSB of fall spawning Atlantic Herring will increase by 2027 range from 49 to 50.7% across all considered catch options (6 to 54 kt).
- At all catch options, there is a <1.1% chance that the SSB will be under the LRP by 2031. The SSB is projected to stay above the USR (>50% probability) by 2031 if yearly catches are less or equal to 24 kt.
- Given the different trends in SSB observed among regions, regional management could be considered.
- Uncertainty around projections is wide and given the boom-and-bust trends observed in herring recruitment, it is important to remain cautious regarding interpretations of projections.
- Current conditions of high natural mortality, low weight-at-age, and reduced fecundity still pose a risk of sudden and unexpected decline in SSB in future years.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2025 (Turcotte In press)

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2024 (DFO 2024; Maynard et al. 2024)
2. Last Interim Year Update: N/A

Stock Assessment Approach

1. Broad category: Single stock assessment model
2. Specific category: State-Space

Ecosystem and Climate Changes Assessment Approach

Use of scientific literature on forage fish predation to provide context in changes in natural mortality of Atlantic Herring in the sGSL over the time-series.

Ecosystem variables are implicitly accounted for in the advice by allowing process errors on natural morality, selectivity, and recruitment.

Stock Structure Assumption

The sGSL fall spawning component of Atlantic Herring (hereafter; fall Herring) is genetically distinct from the spring spawning component (Lamichhaney et al. 2017) and thus is assessed as its own stock. The fall spawning stock is assessed using a regionally-disaggregated state-space modelling approach with time-varying natural mortality implemented in WHAM (Stock and Miller 2021). Separate models are used to estimates biomass and other parameters in the North (Gaspé and Miscou; 4Tmnopq), Middle (Escuminac-Richibucto and west Prince Edward Island; 4Tkl) and South (east Prince Edward Island and Pictou; 4Tfghj) regions of the sGSL, with outputs combined post-hoc to provide sGSL wide estimates (Maynard et al. In prep.[1]). The choice of three regions was determined by geographic proximity of spawning beds and is the finest level of disaggregation that can presently be supported by the available data.

Reference Points

North

- Lower Control Point (LCP): The LCP (69,239 tonnes (t)) is 20% of unfished biomass ($0.2B_0$). $0.2B_0$ is calculated by multiplying the average recruitment over the first 40 years of the time series (1978-2018) with unfished SSB per recruit (Maynard et al. In prep.[1]).
- Upper Control Point (UCP): The candidate UCP (138,478 t) is 40% of unfished biomass ($0.4B_0$).
- Removal Control Point (RCP): Provisional RCP, estimated at 0.19, is the average fishing mortality for ages 5-9 (Average F) over a period of simultaneous stable mean F and high SSB (Maynard et al. In prep.[1]).

Middle

- Lower Control Point (LCP): The LCP (18,027 t) is 20% of unfished biomass ($0.2B_0$).
- Upper Control Point (UCP): The candidate UCP (36,055 t) is 40% of unfished biomass ($0.4B_0$).
- Removal Control Point (RCP): Provisional RCP, estimated at 0.29.

South

- Lower Control Point (LCP): The LCP (61,568 t) is 20% of unfished biomass ($0.2B_0$).
- Upper Control Point (UCP): The UCP (123,137 t) is 40% of unfished biomass ($0.4B_0$).

[1] Maynard, L.D., Turcotte, F., Burbank, J., and DeJong, R. In preparation. Assessment of the NAFO Division 4TVn Southern Gulf of St. Lawrence Fall Spawning Atlantic Herring (*Clupea harengus*) in 2024-2025. DFO Can. Sci. Advis. Sec. Res. Doc.

- Removal Control Point (RCP): Provisional RCP, estimated at 0.22.

Total

- Limit Reference Point (LRP): The LRP (148,834 t) is the sum of the three regional LCPs, which are equivalent to 20% of unfished biomass ($0.2B_0$).
- Upper Stock Reference (USR): The candidate USR (297,669 t) is the sum of the three regional UCPs, which are equivalent to 40% of unfished biomass ($0.4B_0$).
- Removal Reference (RR): Provisional RR, estimated at 0.23, is determined as the mean of the regional RR.

Data

- Commercial landings extracted from dockside monitoring reports, purchase slips and ZIFF (Zonal Interchange File Format) files to inform abundance (1978 – 2025)
- DFO Port Sampling to inform catch-at-age (1978 – 2025)
- Fishery-Independent Acoustic Survey to inform catch-at-age and abundance (1994 – 2025)
- Industry Acoustic Survey of Spawning Grounds to inform abundance (2015 – 2025)
- Experimental Net Program to inform catch-at-age and abundance (2001 – 2025)

Data changes: Former assessments used the Catch Per Unit Effort (CPUE) in the gillnet fishery as an input to the assessment models. However, given the uncertainty in the CPUE index itself due to high sensibility to effort assumptions (Maynard et al. In press) and the poor performance of models estimating process error in CPUE q (Turcotte In press), these model structures were not retained for the current assessment.

Similarly, the data review of the assessment framework review identified concerns with the use of the sGSL wide multispecies bottom-trawl Research Vessel (RV) survey data as index of biomass for each subpopulation (Turcotte et al. In press). Models including the index performed poorly and the index was not retained for the current stock assessment.

Historically, the sGSL fall Herring assessment model used a knife-edge maturity where all herring were assumed to be immature at age 3 and mature at age 4 across all years. This was not data driven, therefore a maturity-at-age model for sGSL fall Herring was developed to provide data driven maturity ogives. The proportion mature at each age for each year predicted by the maturity-at-age models are now utilized in stock assessment models to help better inform SSB.

As described in Turcotte (In press), distinct models were developed under the assumption that NAFO 4TVn fall-spawning herring constitutes a metapopulation, assessable and manageable as three subpopulations (North, Middle, and South) defined by spatially distinct spawning grounds identified in prior assessments. Accordingly, surveys were assigned selectively to the most relevant subpopulation based on available movement data: the fishery independent acoustic survey was applied only where biologically appropriate, i.e., the North stock region (see details in Turcotte et al. In press). In previous assessments, this survey were uniformly applied across all subpopulations, which may have introduced misleading dynamics information in subpopulations where these surveys were less representative.

For the Middle and South, given the fishery independent acoustic survey is no longer applied for these regions, experimental net biomass index was used. The catch at age data was then constructed using age-length keys derived from the experimental nets survey. Annual

proportions in numbers at age by region were then calculated. Regional age-aggregated biomass indices from experimental net data were calculated as the sum of the mean catch at age (in biomass units) per region and year.

ASSESSMENT

NORTH

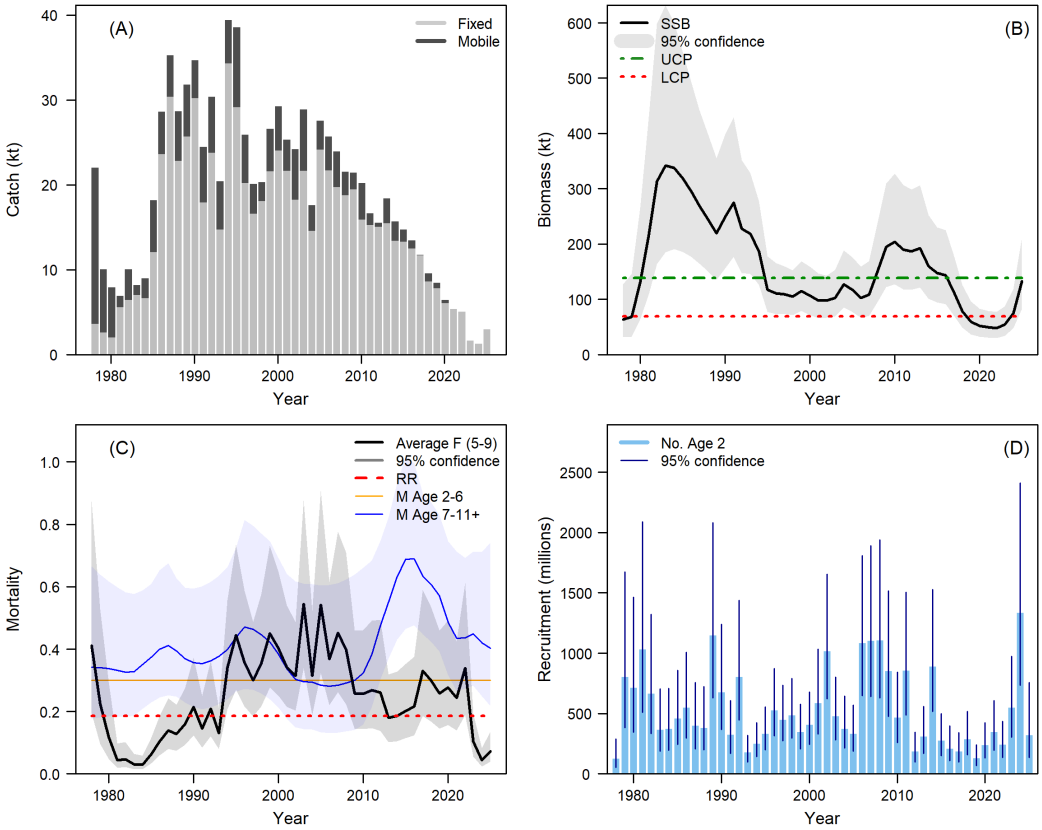

Figure 1. (A) Catch in kilotonnes (kt) for fixed and mobile gear, (B) Spawning Stock Biomass (SSB; kt) in relation to the Lower Control Points (LCP; dotted red) and the Upper Control Points (UCP; dotted green), (C) Average Fishing Mortality (Average F ages 5-9; black), Natural Mortality (M) for ages 2-6 (yellow) and ages 7-11+ (blue), (D) Recruitment (number-at-age 2) of fall spawning Atlantic Herring in the North region of the southern Gulf of Saint Lawrence.

MIDDLE

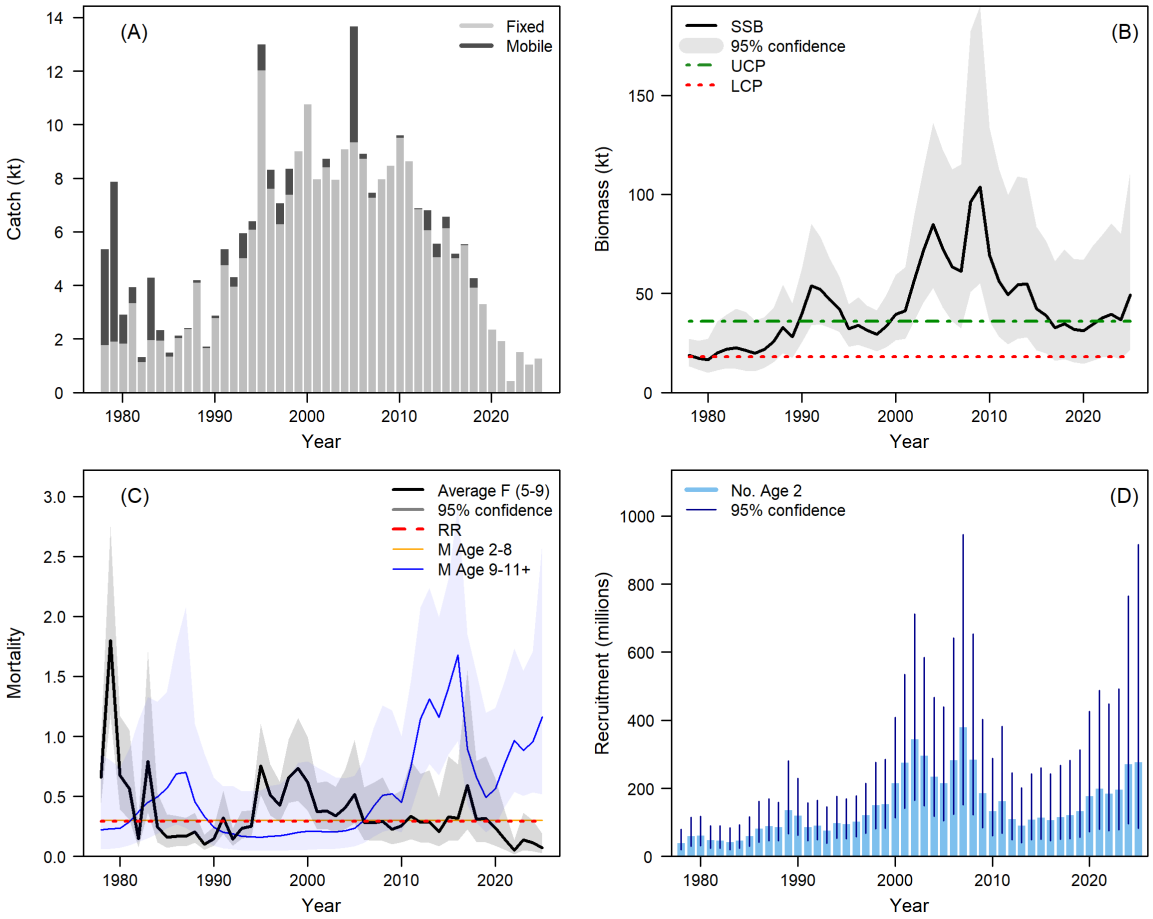

Figure 2. (A) Catch in kilotonnes (kt) for fixed and mobile gear, (B) Spawning Stock Biomass (SSB; kt) in relation to the Lower Control Points (LCP; dotted red) and the Upper Control Points (UCP; dotted green), (C) Average Fishing Mortality (Average F ages 5-9; black) and Natural Mortality (M) for ages 2-8 (yellow) and ages 9-11+ (blue), (D) Recruitment (number-at-age 2) of fall spawning Atlantic Herring in the Middle region of the southern Gulf of Saint Lawrence.

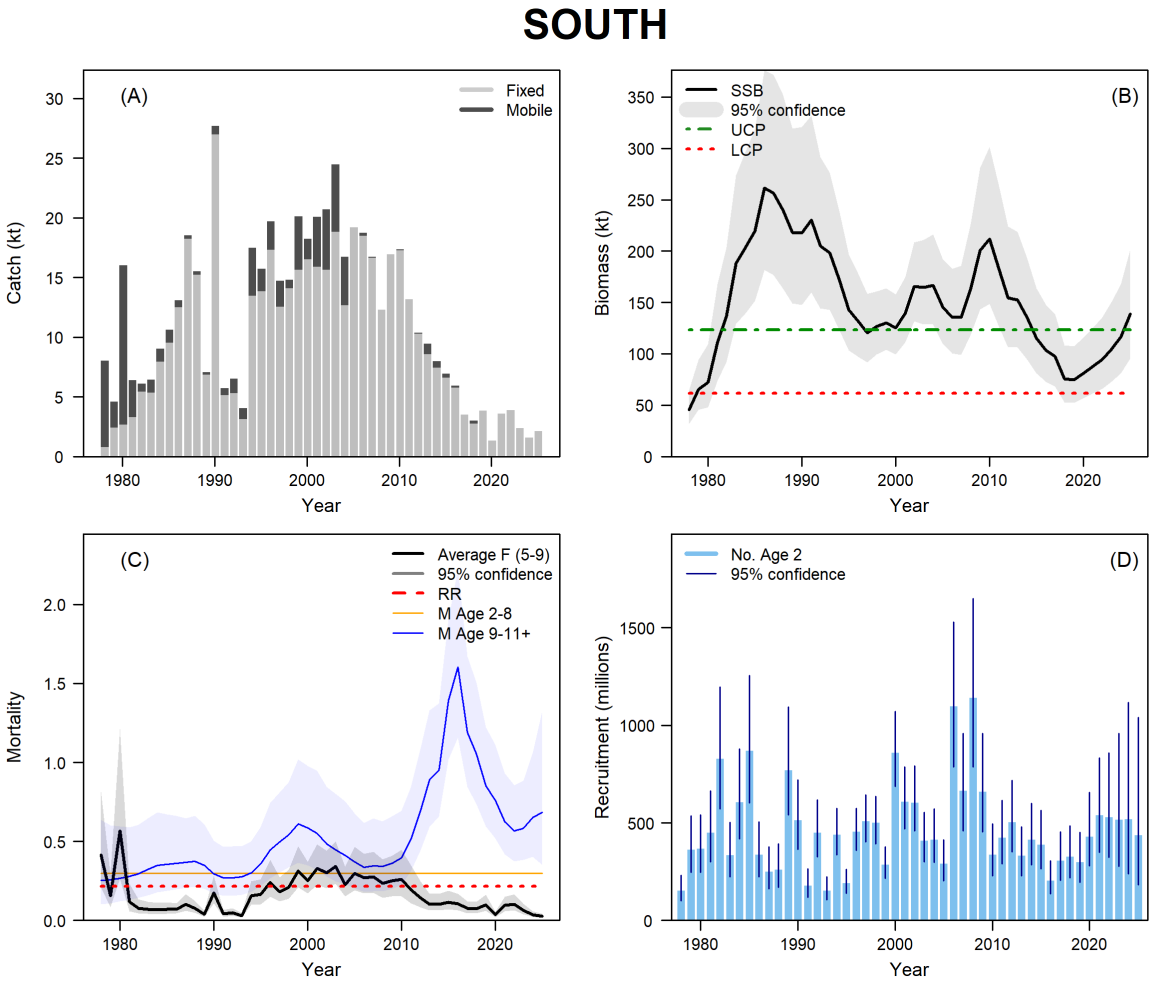

Figure 3. (A) Catch in kilotonnes (kt) for fixed and mobile gear, (B) Spawning Stock Biomass (SSB; kt) in relation to the Lower Control Points (LCP; dotted red) and the Upper Control Points (UCP; dotted green), (C) Average Fishing Mortality (Average F ages 5-9; black) Natural Mortality (M) for ages 2-8 (yellow) and ages 9-11+ (blue), (D) Recruitment (number-at-age 2) of fall spawning Atlantic Herring in the South region of the southern Gulf of Saint Lawrence.

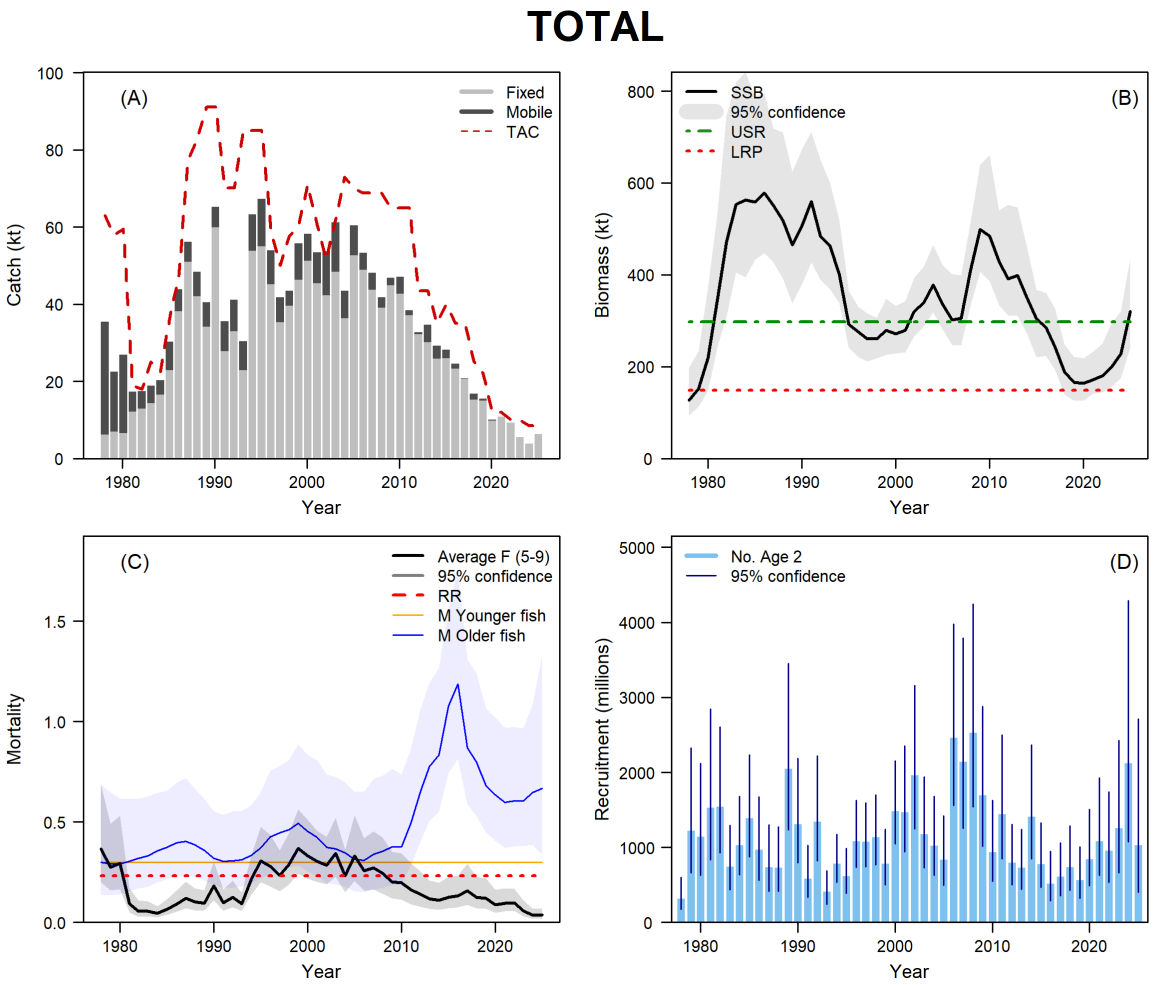

Figure 4. (A) Catch in kilotonnes (kt) for fixed gear and mobile gear vs Total Allowable Catch (TAC; kt), (B) Spawning Stock Biomass (SSB; kt) in relation to the Limit Reference Point (LRP; dotted red) and Upper Stock Reference (USR; dotted green), (C) Average Fishing Mortality (Average F ages 5-9; black) the Removal Reference (RR; dotted red) and Natural Mortality (M) for ages 2-6 (yellow) and ages 7-11 + (blue), (D) Recruitment (number-at-age 2) of fall spawning Atlantic Herring in across the southern Gulf of Saint Lawrence (4T).

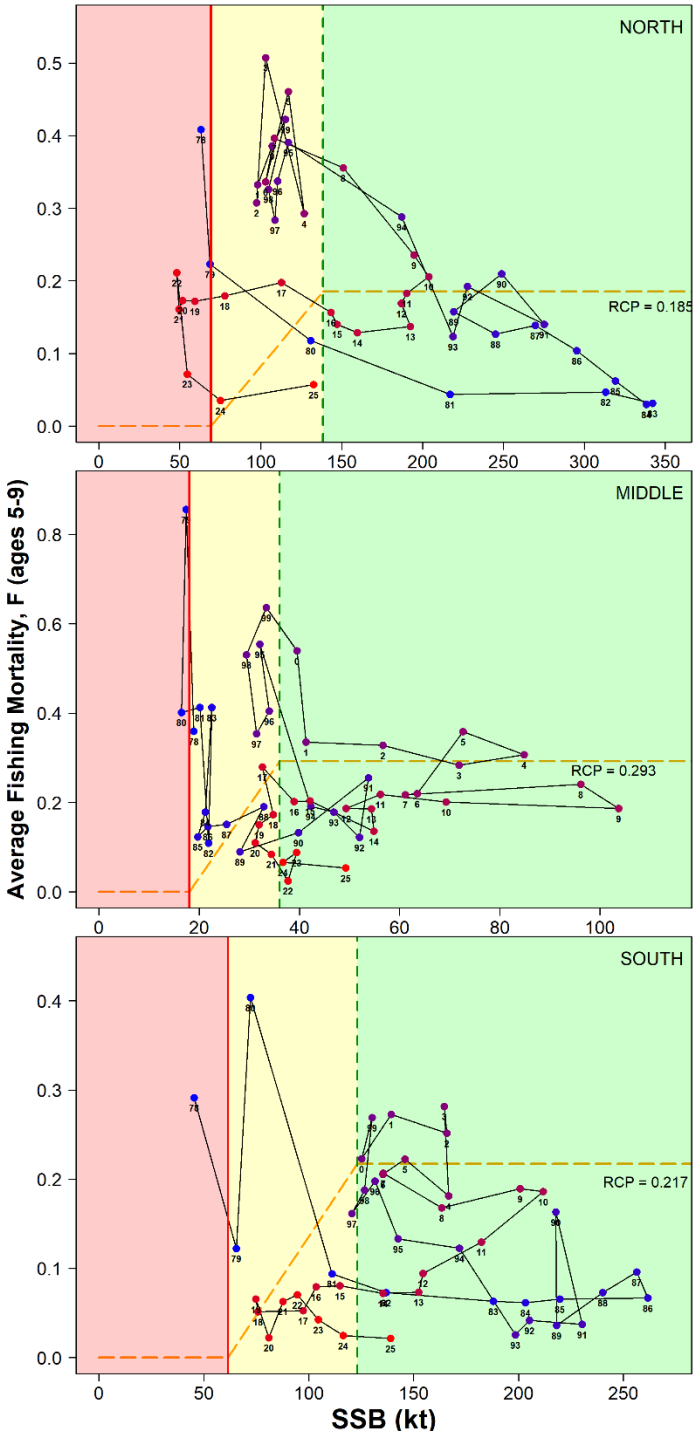

Figure 5. The southern Gulf of St. Lawrence Atlantic Herring fall spawner component trajectory by stock region (North, Middle, South) in relation to spawning stock biomass (kt = kilotonnes) and average fishing mortality rates for ages 5 to 9 years. The red vertical line is the regional Lower Control Point (LCP) and the green dashed vertical line is the candidate Upper Control Point (UCP). The orange lines are the regional provisional removal control points (RCP) in the Healthy Zone and the provisional harvest decision rule of the Precautionary Approach Framework in the Cautious and Critical Zones. Point labels are years (83 = 1983, 0 = 2000, 25 = 2025).

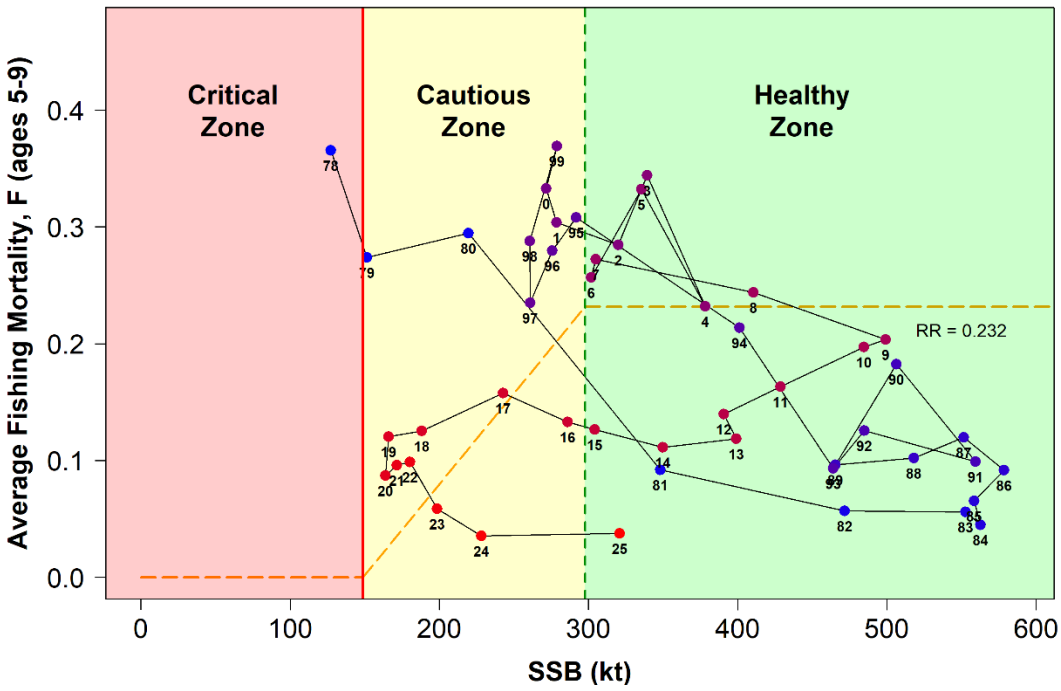

Figure 6. The southern Gulf of St. Lawrence Atlantic Herring fall spawner component trajectory in relation to spawning stock biomass (kt = kilotonnes) and average fishing mortality rates for ages 5 to 9 years. The red vertical line is the Limit Reference Point (LRP) and the green dashed vertical line is the candidate Upper Stock Reference (USR). The orange lines are the provisional removal rate reference value in the Healthy Zone and the provisional harvest decision rule of the Precautionary Approach Framework in the Cautious and Critical Zones. Point labels are years (83 = 1983, 0 = 2000, 25 = 2025).

Stock Status and Trends

Biomass

Trends in estimated SSB vary across regions. In the North region, estimated SSB increased to >300 kt in the early 1980s, then declined to ~ 100 kt from the mid-1990s until the late 2000s (Figure 1B). SSB increased again to 200 kt in 2010 then declined under the Lower Control Point (LCP; 69 kt) in 2018 and reached values as low as 48 kt in 2022. SSB has been gradually increasing above the LCP since 2023, and was estimated at 75 kt in 2024 and 132 kt in 2025; however, SSB has remained under the Upper Control Point (UCP; 138 kt; Figure 1B).

In the Middle region, estimated SSB gradually increased from low values near the LCP (18 kt) in the early 1980s to its highest value in 2009 (103 kt; Figure 2B). SSB decreased again to ~35 kt in the late 2010s and stayed stable until 2025, where a recent increase to 49 kt was observed. The SSB has been above or close to the UCP (36 kt) since 2000 (Figure 2B).

In the South region, estimated SSB increased to >250 kt in the mid-1980s, then declined to values ~125 kt in the 1990s (Figure 3B). It increased back to values closer to 200 kt in the early 2000s, and then increased further a little over 200 kt in 2010. Despite these variations, the estimated SSB remained over the UCP (123 kt). In 2011, SSB started declining sharply and decreased under the UCP in 2014. SSB continued its decline until reaching values as low as 75 kt in 2018 and 2019, almost reaching the LCP (62 kt). SSB gradually increased to 116 kt in 2024 and 138 kt in 2025, barely making it above the UCP (Figure 3B).

Overall, the trend in total SSB was similar among regions (Figure 4B). The sum of regional SSB, hereafter referred to as total SSB, showed two periods of high biomass: a first in the late 1980s and a second around the year 2010 (Figure 4B). The estimates of total SSB in 2024 and 2025 were 228 kt (95% Confidence Interval [CI]: 187 – 306 kt) and 321 kt (95% CI: 259 – 433 kt), respectively. The probabilities that SSB was under the LRP (in the Critical Zone of the Precautionary Approach) were <0.1% in both 2024 and 2025. The probability that the estimated SSB was in the Healthy Zone in 2024 and 2025 is 2.9% and 70.3%, respectively.

Fishing Mortality

In the North, average fishing mortality of fish ages 5 to 9 (Average F) declined from 0.4 to near 0 in the first five years of the time series (Figure 1C). Average F increased slowly to gradually reach higher levels between 0.3 and 0.45 from the mid-1990s to 2010. Average F declined after 2010 and reached an average level of 0.2 by 2022. Average F has decreased to under 0.01 beginning in 2023 (Figure 1C). Average F was 0.04 and 0.06 in 2024 and 2025, respectively.

In the Middle stock region, Average F increased rapidly from 1978 to 1979 (>1.8) but decreased back to 0.57 in 1980 (Figure 2C). Average F varied sharply until the mid-1980s and was low (<0.25) and stable until the mid-1990s. From 1995 to 2000, values varied between 0.43 and 0.75. Values stabilized around 0.2 to 0.4 until 2020 and then declined to lower levels (<0.15) since then (Figure 2C). Average F was 0.07 in 2024 and 0.05 in 2025.

In the South, Average F varied sharply between 1978 and 1982, but then was low until the mid-1990s (Figure 3C). From the mid-1990s to 2010 Average F varied from 0.16 to 0.33 averaging 0.35. Average F decreased gradually to low values from 2010 to 2022 and decreased even more from 2022-2025 (Figure 3C). Average F was 0.02 for 2024 and 2025.

Average F for the stock in 2024 and 2025 was 0.04, which is 17% of the RR (Figure 4C).

Natural Mortality

The mean natural mortality (M) was fixed at 0.30 for younger fish (ages 2-6 for North and 2-8 for Middle and South). In the North stock region, estimates for the older age group (7 to 11+) ranged between 0.28 and 0.69, reaching its highest values in 2014 to 2016 (Figure 1C). M remained low between 1978 and 2010 except for a small increase in the late 1990s. M then increased rapidly to reach a maximum in 2014 and slowly decreased until 2021. M was relatively stable above 0.40 between 2022 and 2025.

In the Middle stock region, M for the older age group (9 to 11+) ranged between 0.16 and 1.68. M increased to >0.70 from 1978 to 1987, then decreased in 1990, ~0.17 until the late 2000s (Figure 2C). M then increased rapidly to reach a maximum in 2016 and slowly decreased in 2019, but rapidly climbed back to values >1.00 in the 2020s.

In the South, M for the older age group (9 to 11+) ranged between 0.25 and 1.60 (Figure 3C). M ranged from 0.22 to 0.61 from 1978 to 2009, with a small peak in the late 1990s. M rapidly increased after 2010 reaching the highest value in 2016, then rapidly declining to values of ~0.70 where it stabilized since then (Figure 3C).

M trends are similar within age groups across the three regions. For the stock, M was estimated at 0.65 and 0.61 in 2024 and 2025, respectively.

Recruitment

In the North stock region, recruitment (number-at-age 2) was highly variable but generally higher between 1978 and 1990 and lower between 1991 and 2004 (Figure 1D). Multiple years of high recruitment occurred between 2005 and 2010. Recruitment then declined to low levels

and increased slightly in recent years with the highest recruitment event of the time series in 2024 (1,333 million individuals, Figure 1D).

In the Middle, recruitment was highly variable but generally higher between 1980 and 1990 and lower between 1991 and 2004. Multiple years of high recruitment occurred between 2005 and 2010. Recruitment then declined to low levels and increased rapidly to high levels in recent years (>270 million individuals; Figure 2D).

In the South, recruitment was highly variable but generally at a moderate level between 1978 and 1990 and lower between 1991 and 1995. Multiple years of high recruitment occurred over the time series but remain relatively constant since 2020 (~ 500 million individuals; Figure 3D).

For the stock, the recruitment estimates increased slightly in the most recent year with a noticeable event in 2024 (>2,000 million individuals, Figure 4D).

Current status

The Middle and the South stocks are above their respective UCP as of 2025 (Figure 5). However, the North stock remains between the UCP and LCP (Figure 5). As a whole, the fall Herring stock of the sGSL is currently in the Healthy Zone (70% probability of being above the USR). Average fishing mortality for ages 5-9 (Average F) was below the RR for 2024 and 2025 (Figure 6).

History of Commercial Landings and TAC

A Total Allowable Catch (TAC) for the combined harvest of both components (spring and fall spawners) in 4T and 4Vn was in place from 1972 to 1990. Since 1991, TAC has been allocated by spawning component. The total landings have generally been less than the TAC for the whole time-series (Figure 4A). The TAC values for fall Herring were 8.50 kt in 2024 and 2025 (Table 1).

In the sGSL, Atlantic Herring are harvested by a gillnet fleet (referred to as “fixed” gear fleet) and a purse seine fleet (“mobile” gear fleet). The fixed gear fishery is focused in NAFO Division 4T whereas the mobile gear fishery occurs in Division 4T and occasionally in Division 4Vn. Over 1981 to 2025, the majority of fall Herring were landed by the fixed-gear fleet (Figure 4A). Local stocks are generally targeted by the fixed gear fishery which takes place on the spawning grounds.

There were approximately 3.84 and 6.33 kt of total landings (Table 1) of fall Herring during 2024 and 2025, respectively, the majority from the fall Herring fishery.

Table 1. Landings and Total Allowable Catch (TAC) in kilotonnes (kt) of southern Gulf of St. Lawrence Atlantic Herring fall spawner component by recent year (2021-2025), fishing season (spring and fall) and gear (fixed and mobile). The percentage (%) of catch in the fixed gear fishery is also provided.

Year	TAC (kt)	Spring fishery landings (kt)			Fall fishery landings (kt)			Total landings (kt)	Fixed gear (%)
		Fixed	*Mobile*	*Total*	*Fixed*	*Mobile*	*Total*		
2021	12	0.03	0	0.03	10.80	0.00	10.80	10.83	100%
2022	10	0.00	0	0.00	9.31	0.02	9.33	9.33	99.8%
2023	10	0.00	0	0.00	5.52	0.00	5.52	5.52	100%
2024	8.5	0.00	0	0.00	3.84	0.00	3.84	3.84	100%
2025	8.5	0.00	0	0.00	6.32	0.00	6.32	6.33	100%

Ecosystem and Climate Change Considerations

Recruitment of fall Herring has been shown to be impacted by zooplankton dynamics and weight-at-age of adults (Burbank et al. 2023a; 2023c). Recruitment had been relatively low from 2011 to 2020, but has been higher from 2021-2024 possibly as a result of more suitable ecosystem conditions. As the sGSL ecosystem is changing, the synchronicity of zooplankton composition, abundance and quality with the timing of the release of Herring larvae and recruitment are difficult to predict.

Atlantic Herring is an important forage fish for numerous predators in the sGSL (Benoît and Rail 2016), transferring energy from lower trophic levels (e.g., zooplankton) to higher trophic levels. As a result, Herring experience substantial natural mortality from predation. Over the past two decades, increases in the predators including seabirds, tuna, and grey seals in the sGSL have coincided with elevated natural mortality of Atlantic Herring, although this trend has stabilized in recent years. High natural mortality at older ages can be problematic as the older individuals can contribute disproportionately to egg production. In addition, declines in size-at-age and a reduced size-fecundity relationship relative to the 1970s further reduce reproductive output (Burbank et al. 2023b; Burbank et al. 2024). Together, these factors suggest periodically monitoring of reproductive output.

Projections

The population model was projected forward for two years to the start of the 2027 fishing season and six years forward to 2031. Projections were conducted at annual catch options between 0 and 18 kt per region and for all regions between 0 and 54 kt.

In the short-term (2 years), for the North and Middle stock regions, all catch options will allow the SSB to reach and/or remain in the Healthy Zone until 2027 (Figure 7). Catch options $\leq$ 8 kt would be under the RCP for the North region (Table 2). For the Middle region, catch options $\leq$ 4 kt would be under the RCP (Table 3). A stronger decrease would be observed in the South region, whereby the SSB would decline under the candidate UCP at catch options $\geq$ 12 kt (Figure 7). Catch options $\leq$ 14 kt would be lower than the RCP for the South region (Table 4).

For all regions, under a 0 kt catch scenario, predicted total SSB in 2026 and 2027 is 354 kt (95% CI: 217– 590 kt) and 366 kt (95% CI: 223 – 618 kt), keeping the stock in the Healthy Zone of the Precautionary Approach (Figure 8, Table 5). SSB for the stock is expected to plateau from 2025 to 2027 at 0 kt catch, but to decrease with increasing catch options (Figure 8). At all catch options except 54 kt, the SSB for the whole stock will remain above the candidate USR in 2026 and 2027. In 2026, catch options $\leq$ 24 kt would be under the provisional RR of the Precautionary approach. In 2027, catch options $\leq$ 30 kt would be under the provisional Removal Rate Reference point of the Precautionary approach.

In the long-term (6 years), at all catch options, the total SSB is expected to decline by 2031 (Figure 8). If an annual catch of $\geq$ 24 kt is maintained for 6 years ($\geq$ 8 kt per region), the total SSB will decline into the Cautious Zone by 2031 (TAC = 24 kt annually) or by 2028 (TAC = 54 kt annually; Table 5). The probability that the total SSB will remain in the Healthy Zone by 2031 varies from 23-79% depending on the catch option (Table 5). In 2031, catch options $\leq$ 30 kt would be under the provisional Removal Rate Reference point of the Precautionary approach.

Regionally, under all catch options $\geq$ 4 kt, the North and South SSB is projected to decrease under their respective candidate UCP by 2031 (Figure 7, Table 2, Table 4). For the Middle stock region, the SSB will remain above the candidate UCP only if catches are maintained $\leq$ 14 kt (Figure 7, Table 3). Catch options $\leq$ 12 kt would be under the RCP for the North region

(Table 2). For the Middle region, catch options ≤ 6 kt would be under the RCP (Table 3). Catch options <12 kt would be lower than the RCP for the South region (Table 4).

Although projections were evaluated across a range of catch options, their outcomes are largely driven by the elevated recruitment observed in recent years, resulting in increased uncertainty. Uncertainties around projections are wide and given the boom-and-bust trends observed in herring SSB it is important to remain cautious regarding interpretations of projections.

Table 2. Risk analysis table of annual catch options for the North Region (between 2 and 18 kilotonnes (kt)) for 2026 to 2031, with predicted resulting SSB in kilotonnes (kt), resulting probabilities (%) of SSB being less than the LCP, resulting probabilities (%) of SSB being above the UCP, resulting probabilities (%) of increases in SSB by 5%, resulting probabilities (%) of decreases in SSB by 5%, and resulting average fishing mortality rate (Average F5-9) for the fall spawner component of Atlantic Herring from the southern Gulf of St. Lawrence.

Year		Catch options (kilotonnes)									
		0	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*
SSB (kt)	2026	159.4	158	156.7	155.3	153.9	152.5	151.1	149.7	148.3	146.9
	2027	162.9	160.2	157.6	154.9	152.2	149.5	146.8	144.1	141.4	138.6
	2031	143.9	139.2	134.5	129.7	125	120.2	115.4	110.5	105.6	100.7
P (SSB < LCP) (%)	2026	0	0	0	0.1	0.1	0.1	0.1	0.1	0.2	0.2
	2027	0	0	0	0.1	0.1	0.2	0.2	0.3	0.5	0.7
	2031	0	0	0	0.1	0.2	0.4	1	2.2	4.2	7.4
P (SSB > UCP) (%)	2026	71.9	70.5	69.1	67.7	66.3	64.8	63.3	61.8	60.3	58.8
	2027	75.3	72.7	70	67.3	64.4	61.6	58.7	55.8	53	50.2
	2031	58.8	51.1	43.7	36.7	30.5	25	20.4	16.5	13.4	11
P (Increase in SSB) (%)	2026	75.3	72.7	70	67.3	64.4	61.6	58.7	55.8	53	50.2
	2027	58.8	51.1	43.7	36.7	30.5	25	20.4	16.5	13.4	11
	2031	65.2	64.2	63.2	62.2	61.1	60.1	59	58	56.9	55.8
Average F5-9	2026	0	0.04	0.08	0.13	0.17	0.22	0.27	0.32	0.37	0.43
	2027	0	0.03	0.06	0.09	0.13	0.17	0.21	0.25	0.30	0.35
	2031	0	0.02	0.04	0.07	0.1	0.14	0.18	0.22	0.28	0.36

Table 3. Risk analysis table of annual catch options for the Middle Region (between 2 and 18 kilotonnes (kt) for 2026 to 2031, with predicted resulting SSB in kilotonnes (kt), resulting probabilities (%) of SSB being less than the LCP, resulting probabilities (%) of SSB being above the UCP, resulting probabilities (%) of increases in SSB by 5%, resulting probabilities (%) of decreases in SSB by 5%, and resulting average fishing mortality rate (Average F5-9) for the fall spawner component of Atlantic Herring from the southern Gulf of St. Lawrence.

Year		Catch options (kilotonnes)									
		0	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*
SSB (kt)	2026	59.7	58.3	56.9	55.5	54	52.5	51	49.5	47.9	46.3
	2027	64.5	61.9	59.2	56.5	53.7	50.9	48.1	45.2	42.3	39.4
	2031	65.2	61.4	57.4	53.1	48.4	43.2	37.5	31.3	25	18.7
P (SSB < LCP) (%)	2026	0.2	0.3	0.5	0.7	1	1.4	1.9	2.5	3.4	4.4
	2027	0.2	0.4	0.7	1.2	2	3.3	5.1	7.6	10.7	14.5
	2031	1	1.8	3.3	5.7	9.7	15.8	24	33.1	41.9	49.3
P (SSB > UCP) (%)	2026	88.3	86.6	84.8	82.7	80.5	78.2	75.7	73	70.3	67.5
	2027	90.6	87.9	84.8	81.2	77.2	72.9	68.4	63.8	59.2	54.8
	2031	85.9	81.9	77.1	71.4	65.1	58.3	51.5	45.6	40.9	37.7
P (Increase in SSB) (%)	2026	59.6	58	56.3	54.6	52.8	51	49.2	47.4	45.5	43.7
	2027	51.9	50.7	49.4	48.2	46.9	45.7	44.5	43.3	42.1	40.9
	2031	45.9	46.2	46.5	46.8	47	47.2	47.2	47.1	46.9	46.7
Average F5-9	2026	0	0.1	0.21	0.33	0.47	0.63	0.81	1.01	1.25	1.53
	2027	0	0.08	0.17	0.3	0.45	0.66	0.93	1.3	1.78	2.42
	2031	0	0.05	0.11	0.21	0.36	0.62	1.17	2.44	5.51	13.17

Table 4. Risk analysis table of annual catch options for the South Region (between 2 and 18 kilotonnes (kt)) for 2026 to 2031, with predicted resulting SSB in kilotonnes (kt), resulting probabilities (%) of SSB being less than the LCP, resulting probabilities (%) of SSB being above the UCP, resulting probabilities (%) of increases in SSB by 5%, resulting probabilities (%) of decreases in SSB by 5%, and resulting average fishing mortality rate (Average F5-9) for the fall spawner component of Atlantic Herring from the southern Gulf of St. Lawrence.

Year		Catch options (kilotonnes)									
		0	*2*	*4*	*6*	*8*	*10*	*12*	*14*	*16*	*18*
SSB (kt)	2026	134.7	133.3	132.0	130.6	129.2	127.8	126.4	125	123.6	122.1
	2027	138.7	136.1	133.4	130.8	128.1	125.4	122.7	120	117.3	114.6
	2031	128.3	124.1	119.8	115.5	111.1	106.6	102	97.3	92.5	87.5
P (SSB < LCP) (%)	2026	0	0	0	0	0	0	0	0	0.1	0.1
	2027	0	0	0	0	0	0.1	0.1	0.2	0.3	0.5
	2031	0	0	0	0	0	0.1	0.3	1	2.5	5.7
P (SSB > UCP) (%)	2026	67.8	65.8	63.7	61.5	59.4	57.2	55	52.8	50.7	48.5
	2027	72.6	68.9	65.1	61.2	57.3	53.3	49.4	45.5	41.8	38.2
	2031	60.9	52	43.1	34.7	27.2	20.8	15.6	11.5	8.5	6.2
P (Increase in SSB) (%)	2026	38.4	37.1	35.7	34.4	33.1	31.8	30.5	29.3	28	26.8
	2027	47.2	46	44.7	43.5	42.3	41.1	39.9	38.7	37.5	36.3
	2031	37.2	37.4	37.5	37.6	37.7	37.8	37.8	37.9	37.9	37.9
Average F5-9	2026	0	0.02	0.05	0.07	0.1	0.13	0.15	0.18	0.21	0.24
	2027	0	0.02	0.05	0.07	0.1	0.13	0.16	0.19	0.23	0.27
	2031	0	0.02	0.05	0.08	0.11	0.15	0.19	0.25	0.32	0.41

Table 5. Risk analysis table of annual catch options for the sGSL combined (between 6 and 54 kilotonnes (kt) for 2026 to 2031, with predicted resulting SSB in kilotonnes (kt), resulting probabilities (%) of SSB being less than the LRP, resulting probabilities (%) of SSB being above the USR, resulting probabilities (%) of increases in SSB by 5%, resulting probabilities (%) of decreases in SSB by 5%, and resulting average fishing mortality rate (Average F5-9) for the fall spawner component of Atlantic Herring from the southern Gulf of St. Lawrence.

Year		Catch options (kilotonnes)									
		0	*6*	*12*	*18*	*24*	*30*	*36*	*42*	*48*	*54*
SSB (kt)	2026	354	350	346	341	337	333	329	324	320	315
	2027	366	358	350	342	334	326	317	309	301	293
	2031	337	325	312	298	284	270	255	239	223	207
P (SSB < LRP) (%)	2026	0	0	0	0	0	0	0	0	0	0
	2027	0	0	0	0	0	0	0	0	0	0
	2031	0	0	0	0	0	0	0	0	0.3	1.1
P (SSB > USR) (%)	2026	74.6	74.6	74.4	74.5	74.9	74.7	74.5	74.7	74.6	74.7
	2027	90.3	88.6	86.8	84.9	82.7	80.4	78	75.2	72.7	69.5
	2031	89.6	83	74.7	64.7	54.5	44.4	36.2	29.8	25.3	22.9
P (Increase in SSB) (%)	2026	50.7	50.6	50.4	50.2	50	49.8	49.6	49.5	49.2	49
	2027	49.8	49.6	49.5	49.3	49.2	49	48.9	48.7	48.4	48.2
	2031	48.9	48.9	48.9	48.9	48.9	48.8	48.8	48.7	48.6	48.3
Average F5-9	2026	0	0.04	0.09	0.13	0.19	0.24	0.30	0.36	0.43	0.51
	2027	0	0.03	0.07	0.12	0.17	0.23	0.31	0.4	0.51	0.64
	2031	0	0.03	0.06	0.1	0.15	0.22	0.34	0.55	0.94	1.65

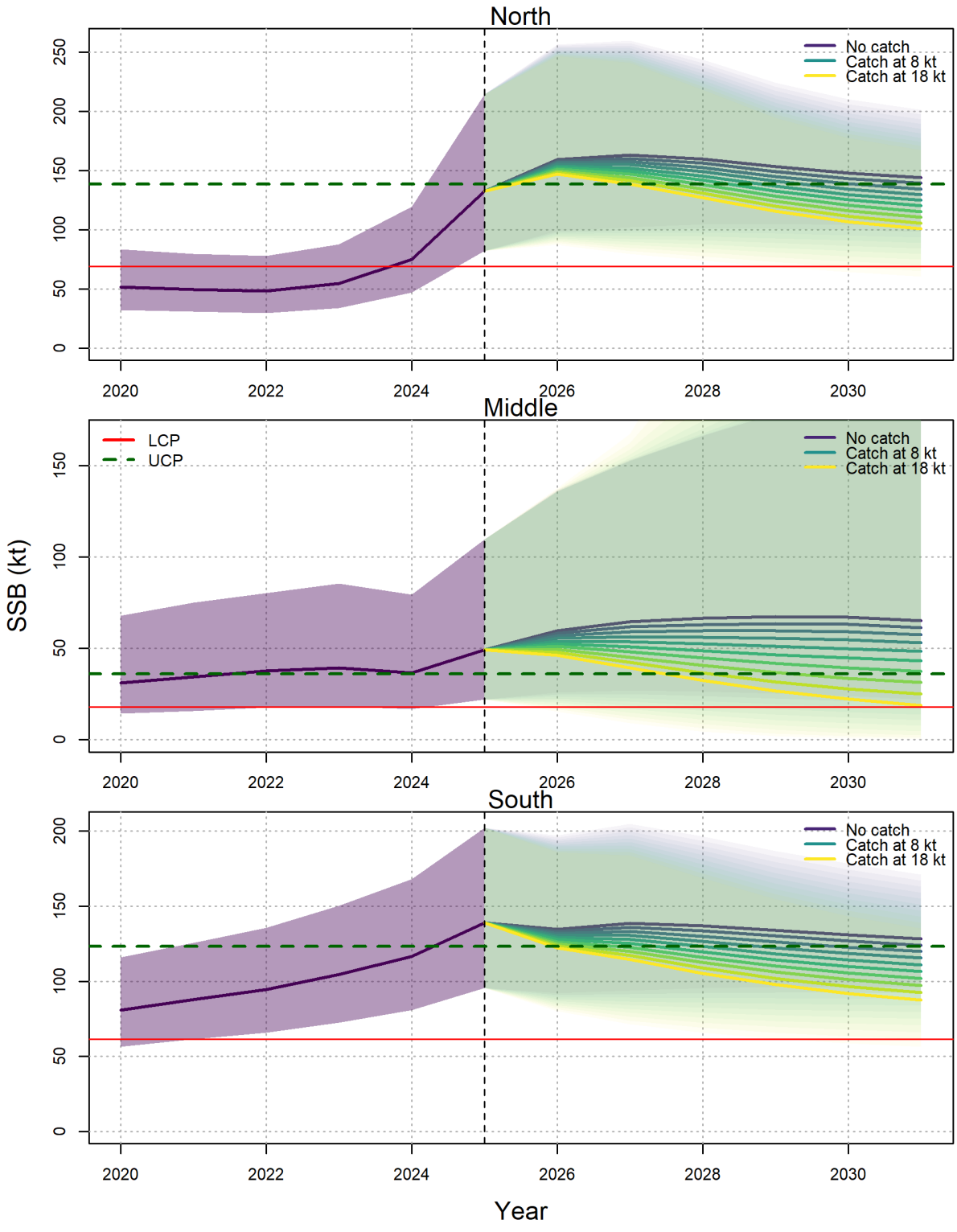

Figure 7. Regional projections (North, Middle, South) of SSB (in kt) for 2026 to 2031 of fall spawning Atlantic Herring from the southern Gulf of St. Lawrence at various catch levels (0-18 kt), using 2020-2024 average recruitment and average natural mortality scenario.

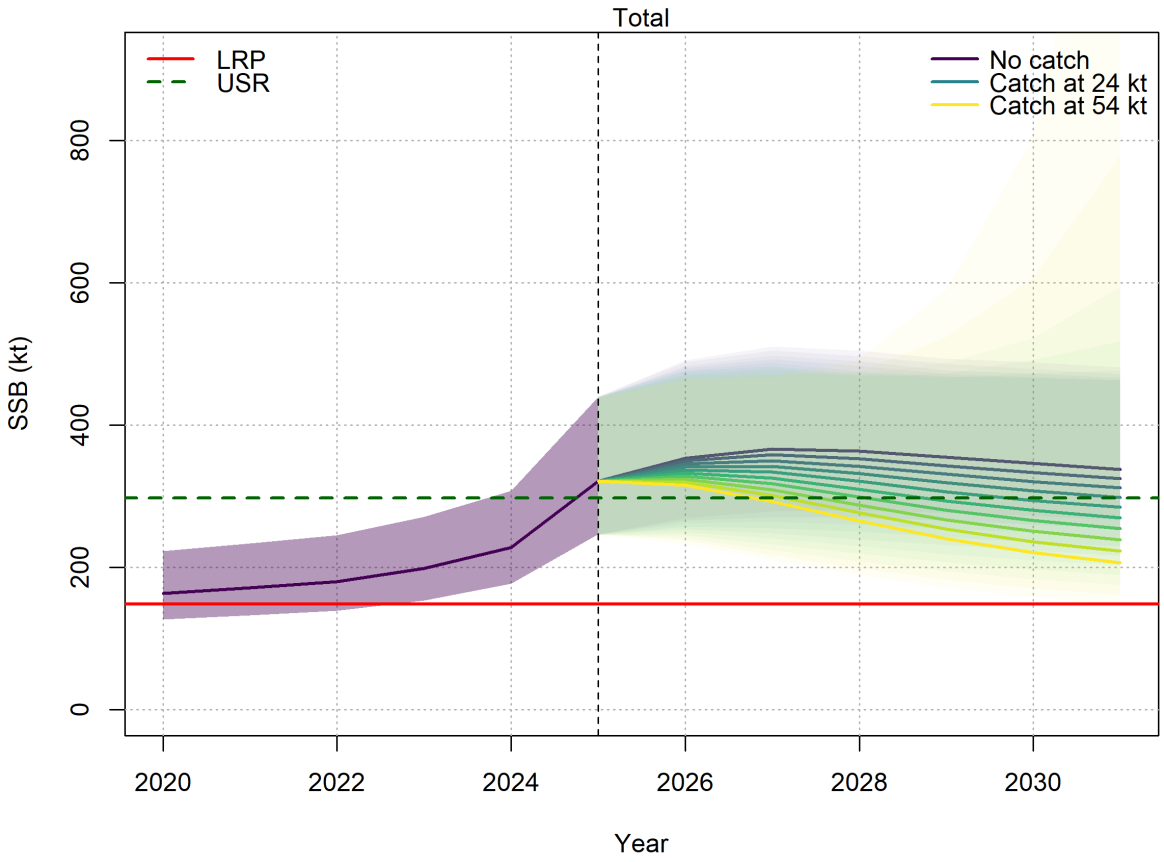

Figure 8. Projected SSB (in kt) for 2026 to 2031 of fall spawning Atlantic Herring from the southern Gulf of St. Lawrence at various catch levels (0-54 kt), using 2020-2024 average recruitment and average natural mortality scenario.

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The modelling approach considers the population dynamics of fall Herring in three stock regions. The dynamics are modelled independently among stock regions and assume closed populations. This is an assumption that can have consequences on region-specific estimates of abundance and dynamics. Recent research in the Baltic Sea has provided direct evidence of natal homing in Atlantic Herring, indicating a relatively high proportion (56-73%) of individuals return to their natal spawning grounds (Moll et al. 2025). These findings suggest homing to be the prevalent strategy, lending some support for closed populations, but considerable straying and regional mixing still occurs.

While projections seem optimistic, caution should be taken when interpreting projections in the long-term. Six-year projections show a stable SSB, but are dependent on relatively high recruitment and lowered natural mortality seen in recent years relative to the decadal average. Recruitment may decrease or natural mortality may increase in future years because of changes in environmental conditions or predation and may not be able to keep the population in the Healthy Zone.

Catches of fall spawning Herring in bait fisheries and at-sea discards are presently accounted for in the assessments through natural mortality estimates, but the proportion of unreported

catch, disease, or predation mortality cannot be disentangled. Catches in the bait fisheries are meant to be recorded in harvester logbooks but compliance with the requirement to complete and return logbooks to DFO is low. It is expected that for the next assessment, the continued development of a mandatory electronic logbook will increase reporting of the bait fishery.

Finally, the experimental net biomass indices for the Middle and South stock regions are not expected to properly reflect population abundance dynamics. These gillnet surveys suffer from the same issues identified for the CPUE indices. It is currently impossible to estimate the required time variation in the catchability of these surveys.

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