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Quebec Region

Canadian Science Advisory Secretariat
Science Advisory Report 2025/009

NORTHERN CONTINGENT ATLANTIC MACKEREL (*SCOMBER SCOMBRUS*) STOCK ASSESSMENT IN 2024

CONTEXT

The Fisheries Management Branch requested that northern contingent Atlantic mackerel be assessed relative to established reference points that are consistent with the DFO precautionary Approach (DFO 2009), advice is provided on ecosystem and climate change considerations relevant to stock status, and the impacts of harvest rules for the 2025 and 2026 fishing seasons are evaluated and advice on specific elements to inform the update of the rebuilding plan.

This Science Advisory Report is from the February 26–27, 2025 regional peer review of the Northern Contingent Atlantic Mackerel (*Scomber scombrus)* Stock Asesment in 2024. 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

- The 2023 and 2024 SSB were estimated at 32% and 35% of the LRP, placing the stock in the Critical Zone of the precautionary approach (PA) with a high probability (greater than 95%).
- The 2023-2024 fishing mortalities were below the RR with moderate to high probability (58 and 83%), respectively.

Trends

- The stock has been near or below the LRP since 2011.
- Recent average recruitment (2011–2024) was at 26% of levels estimated before the stock fell below the LRP (1969–2010). There have been no signs of a notable recruitment event since 2015.
- Fish older than 6 years have been uncommon in the stock since the early 2010s.

Ecosystem and Climate Change Considerations

- Uncertainty associated with environmental effects on mackerel recruitment is implicitly accounted for in the assessment model.

Stock Advice

- The probability of the SSB growing out of the Critical Zone by 2027 ranges from 30% under a TAC of 0 t to 13% under a TAC of 8,000 t. Both scenarios assume continued unaccounted-for Canadian recreational and U.S. landings.

- Under the same scenarios, the probability that the SSB in 2027 will be greater than in 2025 ranges from 81% under a TAC of 0 t to 27% under a TAC of 8,000 t. There is a high probability (greater than 75%) that the SSB in 2027 would be greater than in 2025 with a TAC not exceeding 500 t.
- In the absence of all fishing (F=0), the stock is expected to grow out of the Critical Zone between 2031 and 2033. This timeline increases to 2032 and 2035 when annual removals by the U.S. fisheries are included.

Other Management Questions

- The L50 of all cohorts from 2014 onwards (average = 260 mm) has been below the current minimum legal size of 268 mm. This decrease is not outside the scope of historical fluctuations.
- There is currently no evidence that fishing on spawning grounds during the spawning period is more selective, more efficient or causes habitat or spawning disturbances that could negatively affect the stock rebuilding potential.

BASIS FOR ASSESSMENT

Assessment Details

The stock is assessed with a custom statistical catch-at-age model. It features a censored catch approach to account for U.S. catches, recreational fishery and other unaccounted-for landings.

Year Assessment Approach was Approved

2019 (DFO 2019)

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2023 (DFO 2023)
2. Last Interim Year Update: N/A

Assessment Approach

1. Broad category: Single stock assessment model
2. Specific category: State-space model (Van Beveren et al. 2020)

Stock, Ecosystem and Fishery Overview Information

This stock is prescribed under section 6 of the *Fisheries Act* and has a rebuilding plan (2024) and an integrated fishery management plan (IFMP 2022). More information on the biology of this species can be found on the DFO website.

Stock Structure Assumption

The stock in the Northwest Atlantic (NWA) is genetically distinct from the one in the Northeast Atlantic. Within the NWA there are two spawning contingents; a northern contingent that spawns predominantly in the southern Gulf of St. Lawrence in June-July and a southern contingent that spawns in the Western Gulf of Maine and offshore southern New England from mid-April to

June. The northern contingent mixes with the southern contingent in U.S. waters during winter, where it is subject to fishing. The proportion of the northern contingent fish in U.S. catches is assumed to be between 20 and 80%.The available evidence indicates that there are no significant, temporally stable spawning areas for the northern contingent outside of the southern Gulf of St. Lawrence.

Reference Points

- Limit Reference Point (LRP): $40\%SSB_{F40\%}$
- Upper Stock Reference (USR): $80\%SSB_{F40\%}$
- Removal Reference (RR): $F_{40\%}$
- Target (TRP): N/A

Management Objectives

A management strategy evaluation was conducted by Van Beveren et al. (2020). The rebuilding plan (DFO 2024) indicates that the overarching goal is for the stock to grow out of the Critical Zone with a high likelihood (greater than 75% probability). Secondary objectives aim to promote stock growth while providing opportunities for fishing.

Data

Landings (1969–2024**) :** Canada and U.S. landing statistics. For the 2025 assessment, U.S. landings were adjusted to account for the recreational fishery that may contain the northern contingent (November to April).

June GoSL egg survey (1979, 1983–2024, with no survey in 1995,1997 and 2020). 1991 and 1999 were removed as in previous assessments.

Canadian catch-at-age (1969–2024**)**

Biological data (1969–2024**)**: Maturity-, fecundity- and weight-at-age.

ASSESSMENT

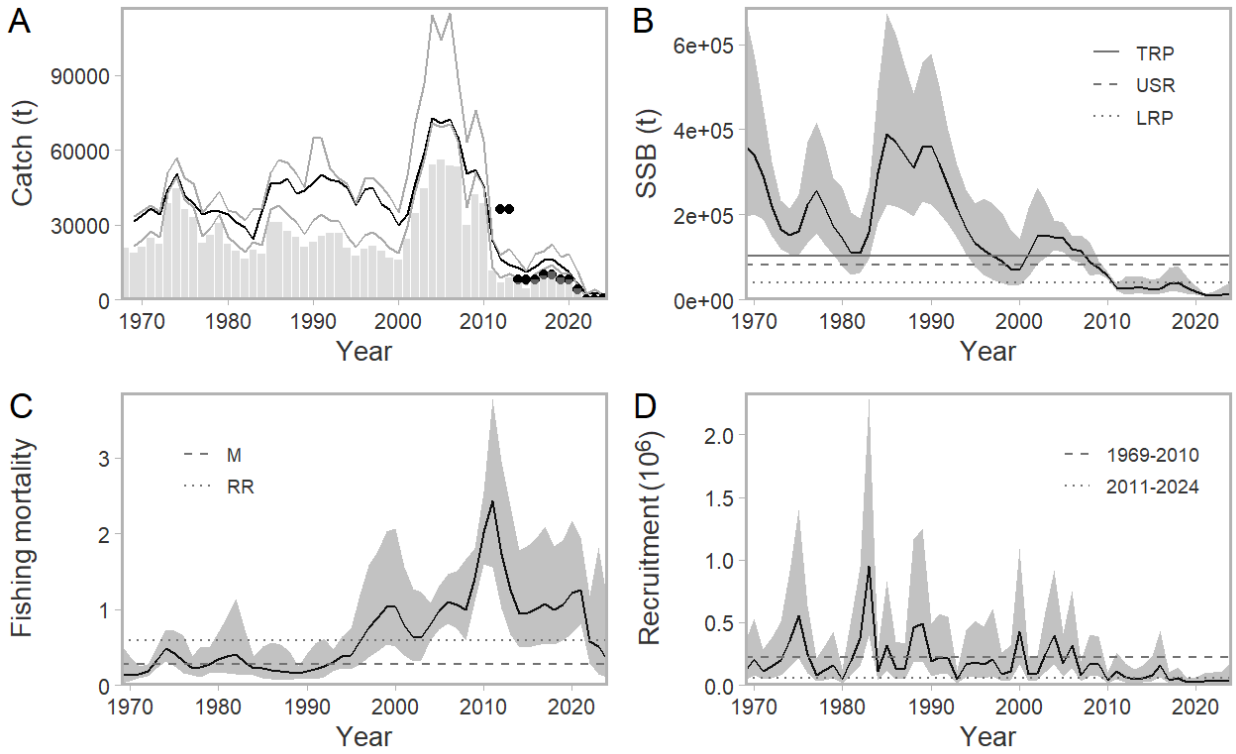

Figure 1: (A) Estimated catch (t, black line) between the predetermined bounds (grey solid lines) and Canadian landings (grey bars) and TAC (black dots), (B) SSB (t) estimated by the model (black line) with 95% confidence intervals (grey) in relation to the LRP (dotted horizontal line), the USR(dashed horizontal line), and the proposed TRP (solid horizontal line), (C) Fishing mortality (F averaged over the fully selected age classes 5–10) with removal reference (RR=0.56, horizontal dotted line), and natural mortality (M=0.28, horizontal dashed line), (D) Recruitment (millions of age 1 fish) with averages for the 1969–2010 period (horizontal dashed line) and the 2011–2024 period (dotted horizontal line).

Historical and Recent Stock Trajectory and Trends

Spawning stock biomass

The SSB dropped below the LRP in 2011 (Figure 1B). SSB approached the LRP in 2017 and 2018 with the arrival of the 2015 cohort but decreased and reached a time series low in 2021–2022 (26% and 24% of the LRP). In 2023 and 2024, the SSB was at 32% and 35% of the LRP. The stock has been stable in the Critical Zone with a very high probability (greater than 95%) since 2020.

Fishing mortality

The fishing mortality rate (*F*; Figure 1C) of fully exploited mackerel (ages 5 to 10) was above the RR from 1996 to 2021. The highest *F* were reached in the 2000s when catches were high (Figure 1A). In 2022, *F* was near the RR. In 2023 and 2024, *F* was below the RR due to the commercial fishery closure in Canada and a sharp decrease in U.S. catches (Figure 1A).

The *F* calculated for all age classes (1–10) was 0.17 and 0.12 for 2023 and 2024 respectively.

Recruitment

Recruitment has on average been lower from 2011 onwards (Figure 1D). The last notable recruitment event occurred in 2015 (age 1 in 2016). Recruitment in 2023 and 2024 has remained near all-time low values.

Age structure

Since the 1990s, the age structure of the population has become truncated, and fish 10 years and older became rare. By the early 2010s, fish older than 6 were uncommon. The stock has been dominated by ages 1–3 (~ 90%) since 2022 with no dominant cohort.

History of landings and TAC

Up to 2020, Canadian TACs were equal to or above 8,000 t (Figure 1A). In 2021, the TAC was reduced to 4,000 t. The commercial and bait fisheries were closed in 2022–2023 with landings limited to by-catch, sampling programs, recreational fishing and U.S. catches. A small bait fishery was opened in 2024 with a TAC of 470 t. The landings in Canada were 161 t and 118 t in 2022 and 2023, respectively, and 454 t were landed in 2024. Data for the last two years are preliminary.

Ecosystem and Climate Change Considerations

Mackerel recruitment is influenced by stock state (including SSB and maternal body condition) and the temporal and spatial match between mackerel larvae and their prey. Uncertainty in future recruitment was acknowledged using different statistical assumptions.

A likely increase in overall mackerel consumption by a combination of predators in combination with low mackerel SSB might have increased the natural mortality rate. However, uncertainty in both trends and scales of natural mortality, compounded with technical challenges, currently prevent the explicit incorporation of time-varying mortality into the assessment model.

The ecosystem factors affecting northern contingent mackerel body growth have not yet been specifically investigated. However, no directional trends in weight-at-age have been observed, which suggests that growth-related ecosystem effects are unlikely to affect the stock's rebuilding potential in the near-future.

Short term projections

Projections were made over a three-year period to estimate the impact of different TACs (0–8000 t) and recruitment scenarios (stock-recruitment relationship or average recruitment since 2011) on the projected SSB. All projections included unaccounted-for catches for Canada and the US separately (Table 1; grey columns).

There is a high probability (greater than 75%) that the SSB in 2027 would increase compared to the SSB in 2025 with a TAC lower or equal to 500 t (Table 1). This TAC includes all landings considered to be under Fisheries Management control, including from commercial, bait, Section 52 Licenses for scientific sampling, and mackerel caught for bait in the Bluefin Tuna fishery.

Table 1: Three-year projections under different constant TAC. All projections were performed under the assumption that mackerel will also be caught outside of the TAC, by both the Canadian (recreational fishing) and U.S. fleets (with 20–80% assumed to be northern contingent fish) (grey columns show 95% confidence intervals). Recruitment was projected using two different methods (individual values in grey), and the average of both is provided in black. For each TAC scenario, the ratios and probabilities of June SSB being greater than the LRP in 2026 and 2027 are provided. The probabilities of SSB growth from 2025 to 2027 are also provided (SSB2027 > SSB2025).

TAC (t)	Prob(SSB > LRP)		$SSB_{2027} > SSB_{2025}$	SSB/LRP		Unaccounted-for landings			
	2026	2027		2026	2027	Canada		U.S.	
						2.5%	97.5%	2.5%	97.5%
0	21% (21-21%)	30% (30-30%)	81 % (78–84%)	0.56 (0.55-0.56)	0.66 (0.64-0.67)	192	674	154	1678
250	20.5% (20–21%)	29% (29-29%)	78 % (74–82%)	0.54 (0.54-0.55)	0.64 (0.62-0.65)	192	674	154	1678
500	20.5% (20–21%)	28% (28-28%)	75 % (71–79%)	0.54 (0.53-0.54)	0.62 (0.6-0.63)	192	674	154	1678
750	19.5% (19–20%)	27% (27-27%)	72.5 % (68–77%)	0.52 (0.52-0.53)	0.6 (0.58-0.61)	192	674	154	1678
1,000	19.5% (19–20%)	27% (27-27%)	69.5 % (65–74%)	0.52 (0.51-0.52)	0.58 (0.57-0.6)	192	674	154	1678
2,000	18.5% (18–19%)	24% (24-24%)	59 % (54–64%)	0.47 (0.47-0.47)	0.51 (0.5-0.52)	192	674	154	1678
3,000	17% (17-17%)	21.5% (21–22%)	51 % (46–56%)	0.42 (0.42-0.43)	0.44 (0.42-0.46)	192	674	154	1678
4,000	16% (16-16%)	19% (19-19%)	44 % (40–48%)	0.38 (0.38-0.38)	0.37 (0.35-0.39)	192	674	154	1678
6,000	13% (13-13%)	16% (16-16%)	33 % (29–37%)	0.3 (0.29-0.3)	0.24 (0.22-0.27)	192	674	154	1678
8,000	12% (12-12%)	13% (13-13%)	27 % (23–31%)	0.23 (0.23-0.24)	0.18 (0.16-0.2)	192	674	154	1678

Long-term projections

Long-term projections (10 years), with key uncertainties reflected by using a range of operating models were used to update the minimum time required for the stock to rebuild above the LRP with a 75% likelihood in the absence of all fishing ($F = 0$) (Tmin). The Tmin was estimated at 9 years (7–9 years across scenarios) or in 2031–2033 (compared to 2028–2029 in DFO 2023).

SOURCES OF UNCERTAINTY

Various key uncertainties (unaccounted for fisheries removals, spawning grounds, natural mortality, catch-at-age, egg index, selectivity, recruitment) have been addressed or accounted for by the current stock assessment model. Stock status and trends and derived conclusions were consistent across a wide range of sensitivity analyses.

The two main uncertainties are considered to be (not in order of importance) 1) potential variations in the natural mortality rate and 2) the proportion of northern contingent mackerel

caught in the U.S. mackerel fishery. An increased understanding of both factors should improve model estimates and hence projections, but would not alter overall conclusions about the stock's biomass relative to the LRP.

Research Recommendations

Available evidence on the influence of environmental factors on mackerel recruitment was available until 2017, an update would be appropriate considering observed changes in the ecosystem.

LIST OF MEETING PARTICIPANTS

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SOURCES OF INFORMATION

DFO. 2009. A fishery decision-making framework incorporating the precautionary approach.

DFO. 2019. Assessment of the Atlantic Mackerel stock for the Northwest Atlantic (Subareas 3 and 4) in 2018. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2019/035.

DFO. 2023. Assessment of the northern contingent of Atlantic mackerel (*Scomber scombrus* L.) In 2022. Can. Sci. Advis. Sec. Sci. Advis. Rep. 2023/015.

DFO. 2024. Rebuilding plan - Atlantic mackerel (*Scomber scombrus* L.): Northwest Atlantic Fisheries Organization sub-areas 3 and 4.

Van Beveren, E., Marentette, J.R., Smith, A., Castonguay, M., and Duplisea, D.E. 2020. Evaluation of rebuilding strategies for northwestern Atlantic mackerel (NAFO subareas 3 and 4). DFO Can. Sci. Advis. Sec. Res. Doc. 2020/021: v + 56 p.

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