Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Maritimes Region

Canadian Science Advisory Secretariat
Science Advisory Report 2025/039

STOCK ASSESSMENT FOR ATLANTIC COD (*GADUS MORHUA*) ON EASTERN GEORGES BANK IN 2024

CONTEXT

The Fisheries Management Branch of Fisheries and Oceans Canada (DFO) has requested a review of resource status for eastern Georges Bank Atlantic Cod (*Gadus morhua*) in support of the decision-making process for the 2026 fishery. This Science Advisory Report is from the regional peer review of June 10–12, 2025 on the Stock Assessment of Atlantic Cod and Haddock on Eastern Georges Bank. 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 2024 spawning stock biomass (SSB, 10.9 kt) is at 42% of the limit reference point (LRP; 24.9 kt), placing the stock in the critical zone with a very high probability (>98%).

Trends

- The 2024 SSB is 10.9 kt, which represents a small increase from the series low of 7.96 kt in 2022.
- Fishing mortality (F) has remained below 0.05 since 2017 and the 2024 estimate is 0.03.
- Over the last three years, recruits (per unit of SSB) have been the highest since 1978, within the context of record low spawning stock biomass. However, this has not resulted in sustained increases in the number of fish at ages 3+.
- Estimated loss of aged 4+ fish continues to be high, with natural mortality (M) inferred to be the primary cause.

Ecosystem and Climate Change Considerations

- The most commonly identified contributors to natural mortality for Atlantic Cod in this region are high temperature and predation. Both have undergone substantial changes in recent years.
- The presence of older fish in deeper waters within the area indicates earlier movement off the bank post-spawning. Although the mechanism for this shift has not been identified, it is likely related to ecosystem changes (e.g., temperature, predation, competition).

Stock Advice

- Given the long-term projection of biomass, it is unlikely that the SSB will exceed the LRP within two generations, even in the absence of fishing. Projections for this stock are

provided for 2026 under various fishing scenarios, including no catch. There is no fishing level which will improve stock outlook under current productivity dynamics.

- Removals of 473 mt (F=0.052) correspond to the maximum F associated with a very low probability (<5%) of preventable decline in two generations (2032).

Other Management Questions

- A review of the May Test Fishery data found higher proportions of ripe and spawning Cod and Haddock in May compared to June through August. While an acceptable risk threshold for interactions with spawning Cod and/or Haddock has not been established, the results of the analysis demonstrate an earlier opening of the fishery would have a higher risk of interaction with spawning Cod and/or Haddock.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2025 (Andrushchenko et al. In Prep a[1])

Assessment Type

Full assessment: Full peer-reviewed stock assessment.

Most Recent Assessment Date

1. Last Full Assessment: July 2018 (TRAC 2018; Andrushchenko et al. 2018)
2. Last Interim-Year Update: July 2024 (DFO 2024)

Stock Assessment Approach

1. Broad category: single stock assessment model
2. Specific category: age structured state-space model

Stock Structure Assumption

Atlantic Cod on eastern Georges Bank is a single stock spanning United States of America (US) and Canadian waters. There is some mixing with adjacent stock units. In Canada, the stock is assessed as eastern Georges Bank (DFO statistical unit areas 5Zejm).

Reference Points

- Limit Reference Point (LRP): SSB below which surplus production is not significantly different from zero (Andrushchenko et al. In Prep b[2])
- Upper Stock Reference (USR): Not yet determined

[1] Andrushchenko, I.V., H.P. Benoit, C.M. Clark, and E. Way-Nee. In Prep a. 5Z Cod Framework: Review of Modelling Approaches. DFO Can. Sci. Advis. Sec. Res. Doc.

[2] Andrushchenko, I.V., T.J. Barrett, N. Hebert, C.M. Clark, and E. Way-Nee. In Prep b. 5Z Cod Assessment Framework: Projections and Reference Points. DFO Can. Sci. Advis. Sec. Res. Doc.

- Removal Reference (RR): F=0.052 (F associated with a very low likelihood (<5%) of preventable decline)
- Target Reference Point (TRP): Not available

Data

- DFO Winter Ecosystem Research Vessel (RV) Survey (1987–2024)
- US National Marine Fisheries Service (NMFS) Spring RV Survey (1978–2024; except 2020 and 2023)
- US NMFS Fall RV Survey (1978–2024; except 2020)
- Canadian fishery data (1978–2024)
- US fishery data (total removals 1978–2024; catch-at-age 1978–2020)

Data changes since 2025 assessment framework review:

- DFO Winter RV Survey was conducted in 2022 with a new vessel and gear. Length-based calibration factors were applied to make the 2022 data comparable to other years.
- Inclusion of data from DFO Winter RV Survey stratum 5Z9 (2010–2024). This survey stratum is a deepwater stratum that falls within the EGB management area. The decision was made to include the data from this stratum in the assessment going forward.

ASSESSMENT

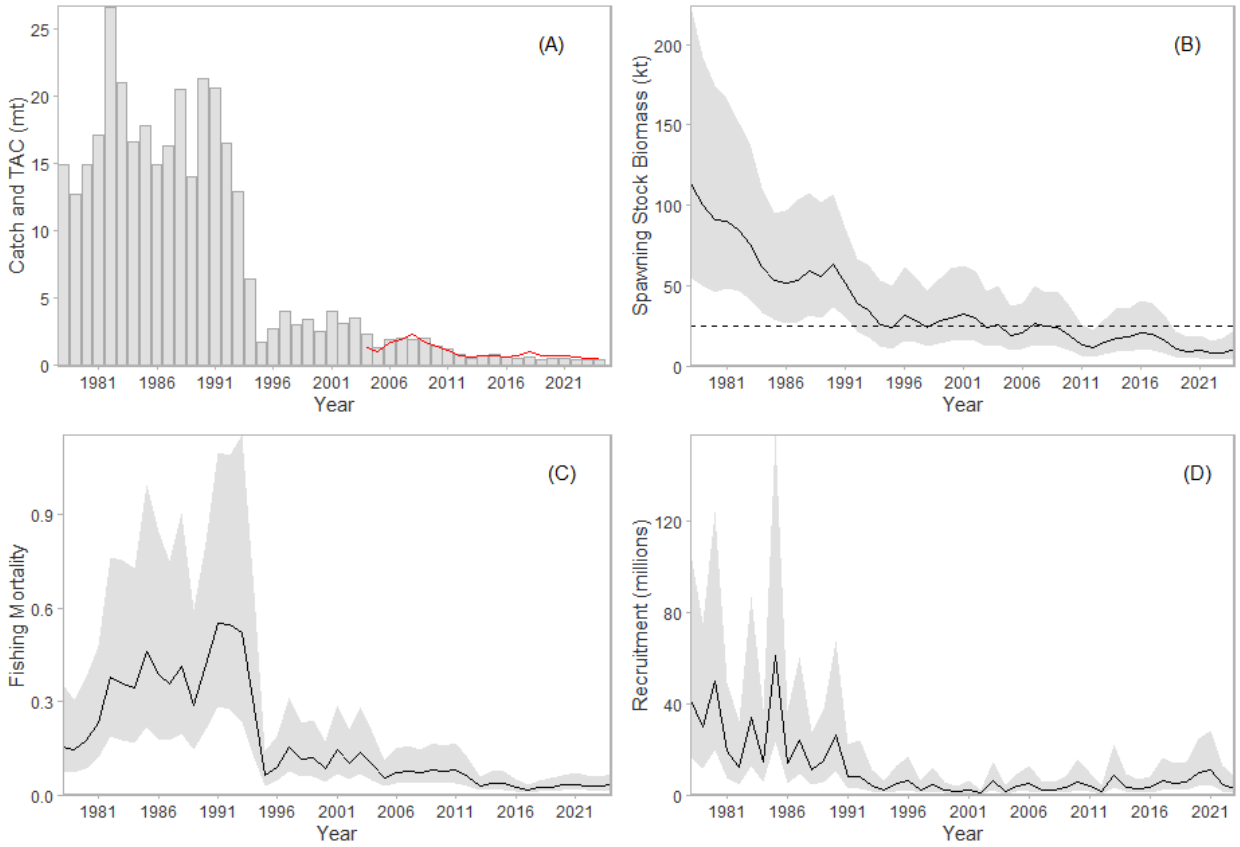

Figure 1. (A) Catch (bars) and total allowable catch (TAC, red solid line) for eastern Georges Bank Cod, (B) spawning stock biomass (kt=kilotonnes, solid black line) in relation to the 2024 limit reference point (24.9 kt, black dashed line), (C) instantaneous fully-selected fishing mortality (solid black line), and (D) recruitment (numbers in 000s, solid black line) for the eastern Georges Bank model. In panels B–D, the grey shading around the solid line represents 2.5 and 97.5 confidence intervals.

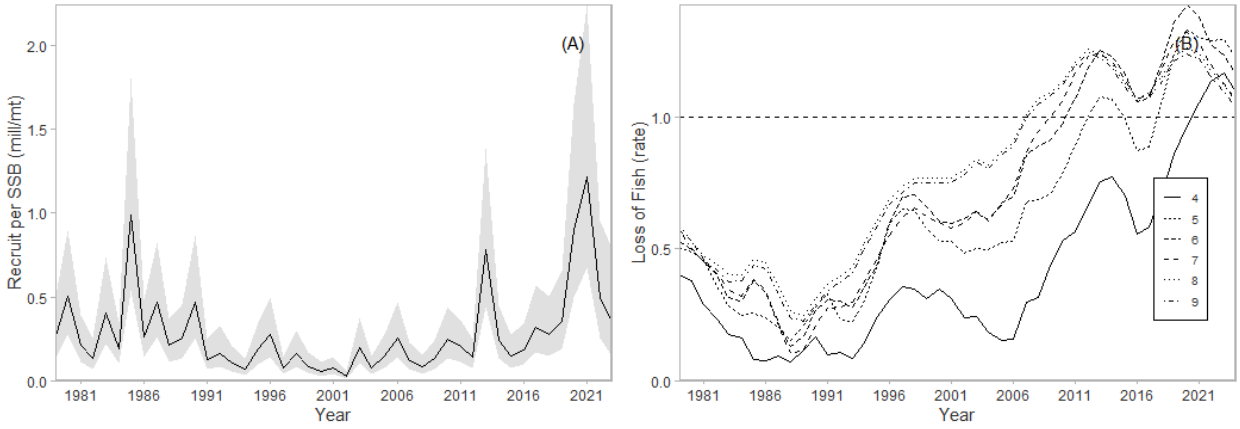

Figure 2. (A) Recruitment rate represented by solid black line (recruitment in millions over spawning stock biomass [SSB] in metric tonnes). Grey sharing represents 2.5 and 97.5 confidence intervals. (B) Instantaneous rate of fish loss at each age due to natural mortality and process error for ages 4+.

Stock Status and Trends

Biomass

Following a notable decrease in estimated SSB in the early 1990s, the stock has experienced a gradual decline and reached a series low in 2022 (7.96 kt). The SSB has since increased to 10.9 kt (2024), driven by a stronger year-class recruiting to the population. Another temporary increase in SSB throughout the mid-2010s appears to have been caused by an influx and subsequent departure of fish from outside of the assessment unit (Figure 1B).

Fishing Mortality

Estimated F was high in the 1980s (0.15–0.60) but declined throughout the 2000s and 2010s to a series low in 2017 (<0.02) and has since remained below 0.05. The 2024 value is estimated at 0.03 (Figure 1C). Currently, factors other than fishing are limiting stock productivity of eastern Georges Bank Cod (Figure 2B).

Recruitment

Recruitment has remained low for this stock since the mid-1990s (Figure 1D). Recruits per SSB in the last three years have been the highest since 1978, within the context of record low SSB (Figure 1B, Figure 2A). However, the higher recruitment has not resulted in sustained increases in the number of fish at ages 3+.

Natural Mortality

Loss of fish aged 4+ in the population continues to be estimated at a high rate, and M is inferred to be the primary cause. There are no indications that the high level of M will decrease in the near future and appears to be the main factor limiting productivity for this stock.

Current Status

The estimated 2024 median SSB (10.4 kt) is at 42% of the LRP (24.9 kt), and there is a very high (>0.98) probability that the stock remains in the critical zone.

The EGB Cod stock has declined since the 1990s and remains in the critical zone. Despite signs of improved recruitment and growth in the early 2020s, the productivity of the stock remains low with the annual rate of fish loss (combined annual natural mortality and process error) for older ages remaining above one. There is a very high probability that SSB remains in the critical zone in the projections under all fishing scenarios, including in the absence of fishing. Stock outlook is not expected to change in the future unless productivity improves.

History of Landings and Total Allowable Catch

Table 1. Canadian and US Landings and total allowable catch (TAC) for the eastern Georges Bank Atlantic Cod assessment unit. All landings and TAC are for calendar year (Jan 1–Dec 31) in metric tonnes (mt). Values in the 2004–2019 column are the annual average between 2004 and 2019.

Year	2004–2019	2020	2021	2022	2023	2024
TAC (mt)	1,118	650	635	571	520	520
Landings-Canada (mt)	799	377	431	326	329	327
Landings-US (mt)	273	67	41	38	32	51

Ecosystem and Climate Change Considerations

The model indicates that a high number of adult fish are disappearing in excess of fishery removals from this stock. This disappearance is attributed to M. The most commonly identified

contributors to M for Cod in this region are high temperature and predation (McBride and Smedbol 2022). Both of these have undergone substantial changes in recent years, with bottom temperature anomalies registering record highs on Georges Bank and the grey seal population which had increased considerably over the past several decades.

The presence of older fish in deeper waters within the area indicates earlier movement off the bank post-spawning. Although the mechanism for this shift has not been identified, it is likely related to ecosystem changes (e.g., temperature, predation, competition).

From 2015 to 2017, abundance suddenly increased across ages and is interpreted as movement of fish from outside of Georges Bank into and then out of the area.

Projections and Stock Advice

Given the long-term projection of biomass, it is highly unlikely that the estimated SSB will exceed the LRP, even in the absence of fishing. Consequently, there is no fishing level which will improve stock outlook under current productivity dynamics. Sporadic good recruitments (i.e., 2020 and 2021) and temporary influx of fish (i.e., 2015–2017) should be monitored for signs of improved productivity.

Projected SSB for 2025 is 7,899 mt. Projections assume that the 2025 TAC (452 mt) is removed in full during the 2025 fishing year, which equates to an F of 0.041. Projections for 2026–2027 are provided under various fishing scenarios (Table 2). Catch advice is only provided for 2026; projected SSB for 2027 is provided for information. Removals of 473 mt (F=0.052) correspond to the maximum F associated with a very low probability (<5%) of preventable decline (i.e., decline relative to F=0 scenario) in two generations (2032).

Table 2. Projected spawning stock biomass (SSB), catch for 2026, fishing mortality (F), and associated probability of preventable decline under the various fishing scenarios. Fpd is F associated with <5% of preventable decline. Frecent is the median F of the last six years. mt=metric tonnes.

F Scenario	SSB (mt) 2026	Catch (mt) 2026	F 2026	SSB (mt) 2027	Probability of Preventable Decline
Fpd	6,462	473	0.052	6,749	4.95%
Frecent	6,462	300	0.031	6,830	4.75%
No Fishing	6,462	0	0.000	6,949	0%

OTHER MANAGEMENT QUESTIONS

In 2018, an industry-led May Test Fishery began as an initiative to explore the possibility of opening the Georges Bank groundfish fishery before June 1. With six years of data available (2018–2019 and 2021–2024), Resource Management asked Science to provide advice on whether there is a conservation concern to an earlier opening than June 1st for the groundfish fishery in NAFO Division 5Z.

A review of the data was conducted as well as a literature search on the benefits of spawning closures (Clark et al, In Prep[3]). The analysis demonstrated higher proportions of ripe and spawning Cod and Haddock in May compared to June through August. While an acceptable risk threshold for interactions with spawning Cod and/or Haddock has not been established, the

[3] Clark, C.M., I.V. Andrushchenko, and N. Hebert. In prep. Characterizing the May Test Fishery: 2018–2024. DFO Can. Sci. Advis. Sec. Res. Doc.

results of the analysis demonstrate an earlier opening of the fishery would have a higher risk of interaction with spawning Cod and/or Haddock.

SOURCES OF UNCERTAINTY

Accounting for the movement of fish within the EGB management unit requires further work. Currently, the assessment assumes that there were no fish in deeper waters prior to 2010.

The absence of US fishery age composition since 2020 means the model assumptions are that the US fishery selectivity has not changed since then. It is uncertain whether that assumption is true and what the implications are on the model outputs.

LIST OF MEETING PARTICIPANTS

Name	Affiliation
Andrushchenko, Irene	DFO Science - Maritimes Region
Barrett, Melanie	DFO Science - Maritimes Region
Barrett, Tim	DFO Science - Maritimes Region
Belliveau, Ray	Charlesville Fisheries
Brunsdon, Eric	DFO Science - Maritimes Region
Byrne, Vanessa	Atlantic Groundfish Council
Cadrin, Steve	University of Massachusetts
Clancey, Lewis	Nova Scotia Department of Fisheries and Aquaculture
Clark, Caira	DFO Science - Maritimes Region
Cooper-MacDonald, Kathryn	DFO Resource Management - Maritimes
Couture, John	Oceans North
d'Entremont, Aaron	Charlesville Fisheries
d'Entremont, Alain	Scotia Harvest Fisheries
Dinning, Kristin	New Brunswick Department of Aquaculture and Fisheries
Greenlaw, Michelle	DFO Science - Maritimes Region
Hebert, Nathan	DFO Science - Maritimes Region
Kraska, Kelly	DFO Science - Maritimes Region
Martin, Ryan	DFO Science - Maritimes Region
McIntyre, Tara	DFO Science - Maritimes Region
Mohan, Selvan	DFO Science - National Capital Region
Mussells, Claire	DFO Science - Maritimes Region
O'Keefe, Cate	New England Fishery Management Council
Paul, Tyson	Unama'ki Institute of Natural Resources
Regnier-McKellar, Catriona	DFO Science - Maritimes Region
Ricard, Daniel	DFO Science - Gulf Region
Robertson, Matthew	Marine Institute of Memorial University of Newfoundland
Salerno, Dan	New England Fishery Management Council
Talmage, Spencer	National Oceanic and Atmospheric Administration - Fisheries
Wang, Yanjun	DFO Science - Maritimes Region
Way-Nee, Emily	DFO Science - Maritimes Region

SOURCES OF INFORMATION

Andrushchenko, I, C.M. Legault, R. Martin, E.N. Brooks, and Y. Wang 2018. Assessment of Eastern Georges Bank Atlantic Cod for 2018. TRAC Ref. Doc. 2018/01: 101 p.

DFO. 2024. Georges Bank Atlantic Cod (*Gadus morhua*) Assessment to 2023. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2024/057.

TRAC. 2018. Eastern Georges Bank Cod. TRAC Status Report 2018/01.

THIS REPORT IS AVAILABLE FROM THE:

Center for Science Advice (CSA)
Maritime Region
Fisheries and Oceans Canada
Bedford Institute of Oceanography
1 Challenger Drive, PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2

E-Mail: DFO.MaritimesCSA-CASMaritimes.MPO@dfo-mpo.gc.ca
Internet address: www.dfo-mpo.gc.ca/csas-sccs/

ISSN 1919-5087
ISBN 978-0-660-78288-1 Cat. No. Fs70-6/2025-039E-PDF

Correct Citation for this Publication:

DFO. 2025. Stock Assessment for Atlantic Cod (*Gadus morhua*) on Eastern Georges Bank in 2024. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/039.

Aussi disponible en français :

*MPO. 2025. Évaluation du stock de morue franche (*Gadus morhua*) de l'est du banc de Georges en 2024. Secr. can. des avis sci. du MPO. Avis sci. 2025/039.*