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 2025/040

STOCK ASSESSMENT OF EASTERN GEORGES BANK HADDOCK (*MELANOGRAMMUS AEGLEFINUS*) IN 2024

CONTEXT

The Fisheries Management Branch of Fisheries and Oceans Canada (DFO) requested advice for eastern Georges Bank (EGB) Haddock (*Melanogrammus aeglefinus*) in support of the decision making process for the 2026 fishing season. 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 model-estimated spawning stock biomass (SSB; 27,343 mt) is above the LRP with a probability of 100% and above the USR with a probability of 70%, placing the stock in the healthy zone.

Trends

- The estimated SSB has declined from 81,453 mt in 2016 to 27,342 mt in 2024; however, SSB is still above the median of the time series.
- The model estimates of age-1 recruitment in 2020 and 2021 (90 million and 69 million, respectively) are above median recruitment of 8.8 million.
- Fishing mortality (F) was estimated to be 0.48 on average over the last five years with a decrease to 0.31 for 2024.
- The model-estimated natural mortality rate (M; 0.502) in recent years (2010–2024) continues to be high.

Ecosystem and Climate Change Considerations

- Higher M estimates have been attributed to both density-dependent impacts of the 2013 year-class, and changes in spatial distribution related to environmental conditions.
- Haddock presence in deeper water strata off EGB indicates increased movement off the bank throughout the year, likely corresponding with ecosystem changes.

Stock Advice

- Catch advice for 2026 ranged from 2,480–3,850 mt based on the 25–75% risk of exceeding F_{ref}.

BASIS FOR ASSESSMENT

Assessment Details

Data from the 5Z9 stratum for the DFO Winter RV Survey were added to the assessment model, improving some of the poor model diagnostics of the base model. Additional improvements to the model were discussed in the meeting, and suggested to be explored in the future.

Year Assessment Approach was Approved

2025 (Barrett and Barrett, In Prep[1])

Assessment Type

Full assessment

Most Recent Assessment Date

1. Last Full Assessment: 2024 (DFO 2024)

Stock Assessment Approach

1. Single stock assessment model
2. Statistical catch-at-age

Stock Structure Assumption

Based on the physical and oceanographic characteristics of Georges Bank, larval dispersal and adult movement are thought to be limited (Kronlund et al. 2023). Tagging studies have suggested seasonal mixing of Haddock between the Bay of Fundy, Gulf of Maine, Great South Channel, and Georges Bank, with movement varying yearly (Brodziak et al. 2008). When abundance is high, boundaries may become more continuous (Sosebee and Cadrin 2006). Based on the most recent review of stock structure (Kronlund et al. 2023), Haddock on Georges Bank are assumed to be a single stock. EGB Haddock are currently assessed as a single unit, although some mixing may exist with adjacent stock units.

Reference Points

1. Limit Reference Point (LRP): $B_{recover}$ (minimum model-estimated SSB between 1991–1996 [SSB_{1993}]; Wang and Carruthers 2025)
2. Upper Stock Reference (USR): Rago-Razor method (minimum model-estimated SSB for which further increases in SSB did not produce markedly improved recruitment, applied to recruitments up to 2019)
3. Fishing Mortality Reference (F_{ref}): 0.339 based on $F_{40\%SPR}$ (fishing mortality rate at 40% spawner per recruit; TRAC 2022)

[1] Barrett, M.A. and T.J. Barrett. In prep. Stock Assessment of Haddock (*Melanogrammus aeglefinus*) on Eastern Georges Bank. DFO Can. Sci. Advis. Sec. Res. Doc.

Data

- DFO Winter Ecosystem Research Vessel (RV) Survey index (1986–2024)
- National Marine Fisheries Service (NMFS) Spring Survey (1968–2024, except 2020 and 2023)
- NMFS Fall Survey (1963–2024, except 2020)
- Canadian commercial fishery data (1969–2024)
- USA commercial fishery data (1969–2024)

Data changes: The DFO Winter RV Survey was conducted in 2022 with a new vessel and gear. Length-based calibration factors were applied to convert the 2022 survey data to be comparable to survey data collected by the previous vessel and gear. Data from 5Z9 were included from 2010–2024 for the DFO Winter RV Survey.

ASSESSMENT

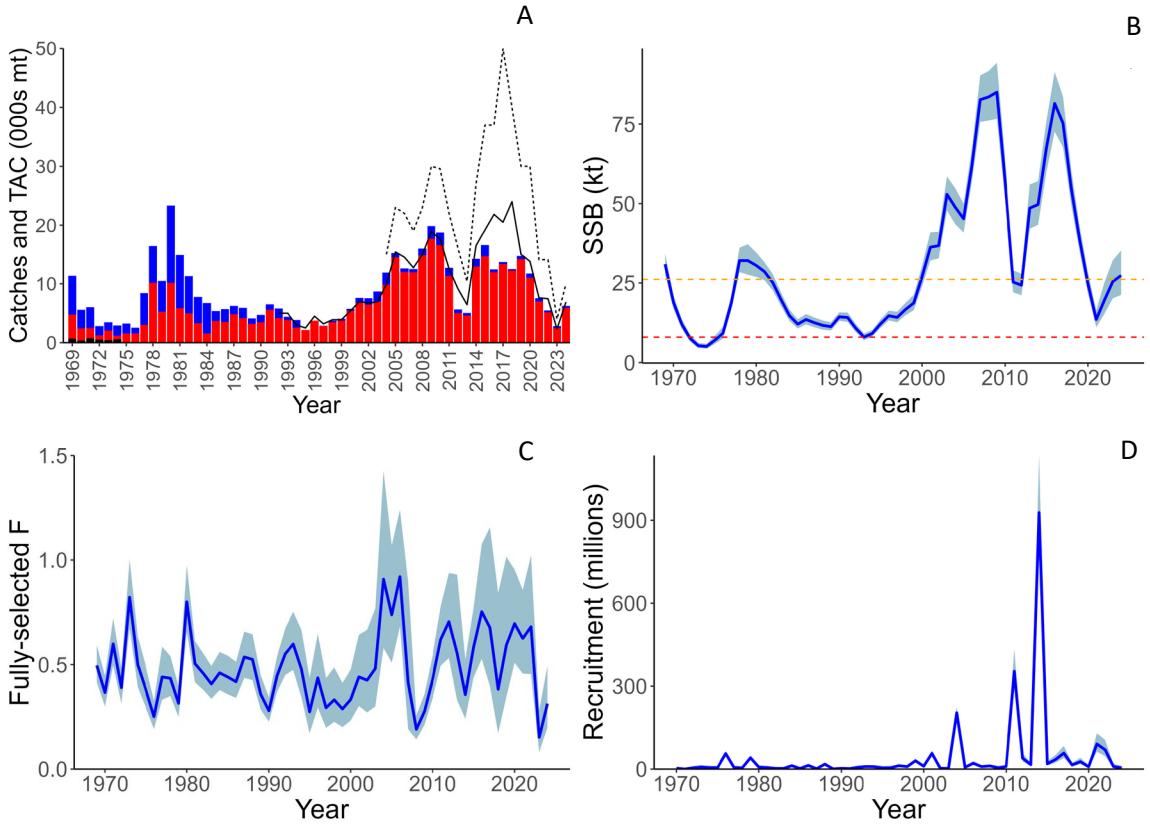

Figure 1. (A) Catch and total allowable catch (TAC) by country, where blue is USA, red is Canada, and black is foreign. TAC is represented by the black line (dashed for total, solid for Canadian). (B) Spawning stock biomass (SSB), the dashed red line is the limit reference point and the dashed orange line is the upper stock reference point. (C) Fully-selected instantaneous fishing mortality rate (F). (D) Recruitment (numbers at age-1; millions). 95% confidence intervals provided in light blue shading for Figures B–D.

Stock Status and Trends

Spawning Stock Biomass

Higher recruitment since 1990, lower exploitation, and reduced capture of small fish in the fishery have contributed to the SSB estimate increasing to 53,000 mt in 2003. A subsequent increase to 85,000 mt in 2009 was largely due to the strong 2003 year-class. When the strong 2010 and 2013 year-classes became sexually mature, the estimated SSB increased to 81,000 mt in 2016, followed by a continued decline in the subsequent years. Despite the recruitment being much higher for the 2010 and 2013 year-classes compared to the 2003 year-class, the SSB did not increase as much, hypothesized to be due to a higher M beginning in 2010. The current SSB estimate for 2024 is 27,343 mt, which is above the median SSB of 24,553 mt for the time series (1969–2024, Figure 1B).

Recruitment

Model estimated recruitment at age-1 has fluctuated between 1.7 and 90 million since 1990, except for the strong year-classes. The recruitment of the 2003, 2010, and 2013 year-classes was 204, 353, and 928 million, respectively. The recruitment of the 2020 and 2021 year-classes was 90 and 69 million fish, exceeding the median recruitment of 8.8 million for the time series (Figure 1D).

Fishing Mortality

Fully-selected F has varied throughout the time series, fluctuating between 0.18 in 2008 to 0.71 during the mid-2010s (Figure 1C). F was estimated to be 0.48 on average over the last five years with a decrease to 0.31 for 2024.

Natural Mortality

The model estimates an increase in M from the assumed historical level of 0.2 to 0.502 in the recent time block (2010–2024). The high M in recent years likely reflects potential changes in additional factors including migrations, catch reporting errors, ageing error, and misspecification of selectivity.

Current Status

The 2024 model-estimated spawning stock biomass (SSB; 27,343 mt) is above the LRP with a probability of 100% and above the USR with a probability of 70%, placing the stock in the healthy zone.

History of Landings and TAC

Combined Canada and USA catches for EGB Haddock were 6,219 mt in 2024 (Figure 1A, Table 1). In 2024, the total catch represented 62% of the combined (Canada and USA) quota.

The Canadian catch increased from 2,507 mt in 2023 to 5,908 mt in 2024. Discards of Haddock by the Canadian Scallop fishery were 9 mt in 2024, and have ranged between 4 mt and 186 mt over the time series. Canada caught 86% of its 6,900 mt allocation and the USA catches were 311 mt in 2024. USA landings in 2024 were 285 mt and discards were estimated to be 26 mt. The USA caught 10% of its 3,100 mt allocation.

The 2021 year-class (age 3) was a major contributor to the 2024 Canadian fishery catch (61% of the fish by number), followed by the 2020 year-class (age 4; 30% by number). Catches peaked at lengths of 40.5 cm, 46.5 cm, and 38.5 cm for otter trawl, longline, and scallop dredge gears in 2024.

Table 1. Landings and total allowable catch (TAC) in metric tons by Canada and the USA for the eastern Georges Bank Haddock fishery by calendar year (January 1– December 31). A dash (-) indicates data are not currently available.

Calendar Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Canadian TAC (mt)	19,200	21,830	20,500	24,000	15,000	13,800	7,614	7,473	2,320	6,900	5,854
Canadian Landings (mt)	14,631	11,935	13,377	12,216	14,156	11,045	6,997	5,143	2,499	5,889	-
Canadian Discards (mt)	17	8	8	5	4	7	5	7	8	9	-
USA TAC (mt)	17,800	15,170	29,500	16,000	15,000	16,200	6,486	6,627	1,520	3,100	1,556
USA Landings (mt)	1,506	341	214	253	544	633	518	327	299	285	-
USA Discards (mt)	415	125	81	21	50	50	6	8	33	26	-
Total TAC (mt)	**37,000**	**37,000**	**50,000**	**40,000**	**30,000**	**30,000**	**14,100**	**14,100**	**3,840**	**10,000**	**7,410**
Total Catch (mt)	**16,569**	**12,409**	**13,679**	**12,495**	**14,735**	**11,735**	**7,526**	**5,485**	**2,840**	**6,219**	**-**

Ecosystem and Climate Change Considerations

Higher M estimates in the model have been attributed to both density dependent impacts of the 2013 year-class (e.g., reduced growth, condition, spatial distribution expanded) and changes in spatial distribution from environmental conditions (Friedland et al. 2015; Wang et al. 2021; Wang et al. 2024).

Haddock presence in deeper waters within the EGB management area indicates that fish movement off the bank may be occurring. Although the mechanism driving changes in movement has not been identified, it is likely related to ecosystem changes occurring in the EGB area (e.g., temperature, predation, competition). The 2024 assessment model includes the adjacent 5Z9 DFO Winter RV survey stratum data to account for changes in the distribution observed in the spring.

Projections

Table 2 shows the projected median estimates of recruitment, biomass, SSB, and F with an assumed 2025 catch of 7,410 mt. The 2020 and 2021 year-classes are projected to be the dominant contributors to fishery catch in 2026 (Barrett and Barrett In Prep[1]).

Table 2. Projections from the assessment model with an assumed catch of 7,410 mt in the 2025 fishery (median value across 2,000 simulations) and F_{ref}=0.339. SSB=Jan 1st spawning stock biomass. A dash (-) indicates not applicable.

Year	Age 1 Recruitment (000s)	Biomass (mt)	SSB (mt)	Catch (mt)	Fishing Mortality (F)
2025	15,143	26,543	23,713	7,410	0.534
2026	19,397	19,794	15,180	2,990	0.339
2027	-	20,575	13,963	-	-

Catch Advice

Model-projected catch advice for 2026 ranged from 2,480–3,850 mt based on the 25–75% risk of exceeding F_{ref} (Table 3). The probabilities that the 2027 SSB is above the LRP ranged from 68–75% and above the USR ranged from 28–30%.

Table 3. Catch advice for eastern Georges Bank Haddock for 2026 for the assessment model which includes 5Z9 for the DFO survey. The probabilities are based on spawning stock biomass (SSB) as of Jan 1st, 2027, and takes into account the removal of catch in 2026. LRP=limit reference point. USR =upper stock reference point. F_{ref}=fishing mortality reference point.

Probability of exceeding F_{ref}	25%	50%	75%
2026 catch advice	2,480 mt	3,170 mt	3,850 mt
$P(SSB_{2027}>LRP)$	0.746	0.709	0.679
$P(SSB_{2027}>USR)$	0.298	0.290	0.281

SOURCES OF UNCERTAINTY

Natural mortality remains an uncertainty for the EGB Haddock stock. The expectation was that with the exit of the 2013 year-class and the reduction in overall stock biomass, the model-estimated M would decrease. Contrary to expectations, model-estimated M remains high. However, our understanding of the factors leading to high M in recent years is incomplete.

Poor model diagnostics led to the base model being adjusted with the addition of the 5Z9 stratum data. This was an interim decision to address the concerns identified in the model including the magnitude of retrospective patterns in F and recruitment. Additional uncertainties

identified during the peer-review were related to potential misspecification of survey and fishery selectivity, and the disconnect between the M used in the F_{ref} calculation and M assumed in the projections.

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

Brodziak J., Traver, M.L., Col, L.A. 2008. The nascent recovery of the Georges Bank haddock stock. Fish. Res. 94(2): 123–132.

DFO 2024. Eastern Georges Bank Haddock (*Melanogrammus aeglefinus*) Assessment to 2023. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2024/056.

Friedland, K.D., Leaf, R.T., Kristiansen, T. and Large, S.I. 2015. Layered effects of parental condition and larval survival on the recruitment of neighboring haddock stocks. Can. J. Fish. Aquat. Sci. 72(11): 1672–1681.

Kronlund, A., Merrick, R., Nielson, A., Powers, J., and Stokes, K. 2023. Summary Report of the Georges Bank and eastern Georges Bank Haddock Research Track Stock Assessment Peer Review.

Sosebee K.A., and Cadrin, S.X. 2006. A Historical Perspective on the Abundance and Biomass of Northeast Complex Stocks from NMFS and Massachusetts Inshore Bottom Trawl Surveys, 1963–2002. US Dept. Commer. Northeast Fish. Sci. Cent. Ref. Doc. 06-05: 200 p.

TRAC. 2022. Eastern Georges Bank Haddock. TRAC Status Report 2022/03.

Wang, Y., Gharouni, A., Friedland, K.D., and Melrose, D.C. 2021. Effect of environmental factors and density dependence on somatic growth of eastern Georges Bank Haddock (*Melanogrammus aeglefinus*). Fish. Res. 240: 105954.

Wang, Y., Gao, J., and McCurdy, Q. 2024. Density-dependent habitat selection and warming determine the spatial distribution of Haddock (*Melanogrammus aeglefinus*) on Georges Bank. ICES J. Mar. Sci. 81(5): 961–971.

Wang, Y., and Carruthers, T. 2025. Identification of a Limit Reference Point and Proposal of an Upper Stock Reference Point for Canadian Fishery Management of Eastern Georges Bank (5Zjm) Haddock (*Melanogrammus aeglefinus*). DFO Can. Sci. Advis. Sec. Res. Doc. 2025/010. iv + 27 p.

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 978-0-660-78290-4 Cat. No. Fs70-6/2025-040E-PDF

Correct Citation for this Publication:

DFO. 2025. Stock Assessment of Eastern Georges Bank Haddock (*Melanogrammus aeglefinus*) in 2024. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/040.

Aussi disponible en français :

*MPO. 2025. Évaluation du stock d'aiglefin (*Melanogrammus aeglefinus*) de l'est du Banc de Georges en 2024. Secr. can. des avis sci. du MPO. 2025/040.*