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 2025/050

SFA 26A (BROWNS BANK NORTH) SEA SCALLOP (*PLACOPECTEN MAGELLANICUS*) STOCK ASSESSMENT IN 2024

CONTEXT

The Fisheries Management Branch of Fisheries and Oceans Canada (DFO) has requested that the Scallop Fishing Area (SFA) 26A (Browns Bank North) Sea Scallop (*Placopecten magellanicus*) stock be assessed relative to reference points that are consistent with the DFO Precautionary Approach (DFO 2009), and provide harvest advice based on various potential catch levels for the 2025 fishery. This Science Advisory Report is from the May 15, 2025, regional peer review on the Assessment of Stock Status for Offshore Scallop (*Placopecten magellanicus*) on Georges Bank 'a' and Browns Bank North. 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 median biomass estimate in 2024 was 4,724 t (meats) for fully-recruited scallop; the probability the stock was below the limit reference point (LRP; 2,000 t) was less than 0.01.
- The median recruit biomass estimate in 2024 was 362 t, which is above the long-term median (1994–2023) of 325 t.
- The 2023 proportional exploitation rate (0.05) was comparable to recent years (2021–2022).

Trends

- Fully-recruited biomass has increased following a historical low in 2017. The full time series is above the LRP.
- Recruit biomass has been stable near the long-term median since 2017.
- The estimated proportional exploitation rate has been around 0.05 and below the long-term median for the last three years (2021–2023).
- The estimated proportional natural mortality of fully-recruited scallop has varied without trend between 0.1–0.5 throughout the time series (1994–2023).

Ecosystem and Climate Change Considerations

- Research vessel survey data from Canada and the United States suggest that predator abundance, notably sea stars (*Asterias spp.*) and crabs (*Cancer spp.*), has increased within areas of known scallop distribution. Aggregations of predators in areas of high scallop density contribute to increases in natural mortality.

Stock Advice

- Based upon preliminary analysis of the 2024 fishery and DFO Maritimes Offshore Scallop Survey data, an interim total allowable catch (TAC) of 275 t (meats) was set in December 2024 for the 2025 SFA 26A fishery.
- The interim TAC of 275 t is estimated to result in an exploitation rate of 0.055 and an expected 0.4% decrease in biomass.
- All evaluated catch scenarios for 2025 indicate a very low probability (less than 0.01) that fully-recruited biomass will decrease below the LRP.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2024 (Keith et al. In prep. a[1])

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2013 (DFO 2013, Hubley et al. 2014)
2. Last Interim Year Update: 2024 (DFO 2024a)

Assessment Approach

1. Broad category: Single stock assessment model
2. Specific category: Delay difference, biomass dynamics, state-space

Science advice is provided for this stock using a new Spatially Explicit Assessment Model (SEAM) that integrates both fishery and DFO Maritimes Offshore Scallop Survey (hereafter referred to as the 'survey') data (Keith et al. In prep. a[1]; Keyser et al. In prep.[2]; McDonald et al. 2021).

Stock Structure Assumption

The offshore Sea Scallop fisheries conducted on Browns Bank SFA 26 were split into SFA 26A (Browns Bank North) and SFA 26B (Browns Bank South) in 1998 based on productivity and historical fishing patterns (Figures A1 and A2). SFA 26A was identified as being more productive, while SFA 26B is less productive and has separate management measures. Greater biomass densities are generally found on the northern and southeastern portions of the surveyed area in SFA 26A (Figures 3 and 4).

[1] Keith, D.M., Keyser, F.M., McDonald, R., Pearo Drew, T., and Sameoto, J.A. Framework Development for Scallop Fishing Areas 25a, 25b, 26a, 26b, 26c, and 27b: Stock Assessment Models for SFAs 25 and 26. DFO Can. Sci. Advis. Sec. Res. Doc. In prep, a.

[2] Keyser, F.M., Glass, A., Keith, D.M., McDonald, R.R., Pearo Drew, T., and Sameoto, J.A. Framework Development for Scallop Fishing Areas 25a, 25b, 26a, 26b, 26c, and 27b: Data Inputs. DFO Can. Sci. Advis. Sec. Res. Doc. In prep.

Reference Points

- Limit reference point (LRP): 2000 t.
- Upper stock reference (USR): Not yet determined.
- Removal reference (RR): Not yet determined.
- Target reference point (TRP): Not yet determined.

Candidate reference points for SFA 26A have been developed and considered based on maximum sustainable yield (MSY) simulations (DFO 2025; Keith et al. in prep b[3]). The LRP of 2,000 t was adopted in 2025, and corresponds to $0.4B_{MSY}$ (biomass at maximum sustainable yield).

Data

- DFO Maritimes Offshore Scallop Survey data (1994–2024)
- Commercial logbook landings (1994–2024)

In 2020, the survey was cancelled due to challenges associated with the COVID-19 pandemic. For 2020 and 2021, the median growth rate was used in the model, while the remainder of the inputs for 2020 were estimated by the model (Keith et al. In prep a[1]).

[3] Keith, D.M., Keyser, F.M., McDonald, R., Pearo Drew, T., and Sameoto, J.A. Framework Development for Scallop Fishing Areas 25a, 25b, 26a, 26b, 26c, and 27b: Reference Points. DFO Can. Sci. Advis. Sec. Res. Doc. In prep, b.

ASSESSMENT

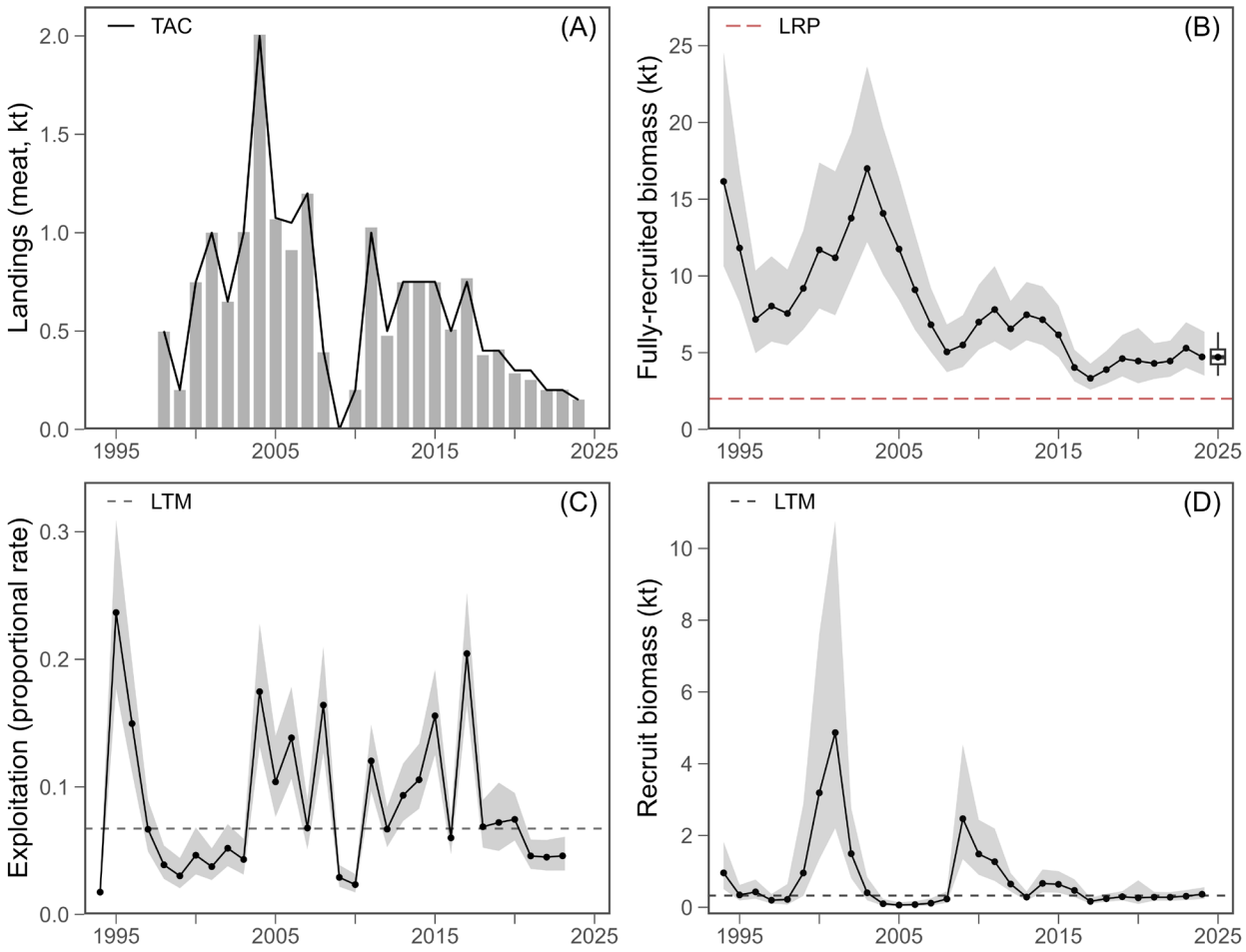

Figure 1. (A) Annual landings of scallop meats (kilotonnes, kt) from scallop fishing area (SFA) 26A between 1998 and 2024. The black solid line represents total allowable catch (TAC). Note that prior to 1998, landings from SFA 26A were combined with SFA 26B. (B) Mean model predicted biomass estimates (kt) for fully-recruited scallops (black solid line) in relation to the limit reference point (LRP) of 2,000 t (red dashed line). The grey shaded region represents the upper and lower 95% confidence intervals. The forecasted fully-recruited biomass for 2025, assuming a catch of 275 t, is displayed as a box plot with median (black dot, •), 50% confidence intervals (white box), and 95% confidence intervals (black whiskers). (C) Estimated proportional exploitation rate (black solid line) in relation to long-term median (1994–2023, LTM) exploitation rate (grey dashed line). The shaded region represents the upper and lower 95% confidence intervals. (D) Mean model predicted biomass estimates (kt) for recruit scallops (black solid line) in relation to long-term median (1994–2023, LTM) recruit biomass (grey dashed line). The grey shaded region represents the upper and lower 95% confidence intervals.

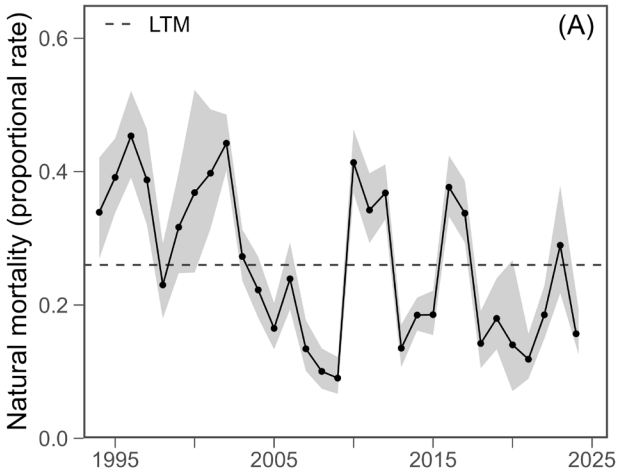

Figure 2. Estimated proportional natural mortality (black solid line) of fully-recruited scallop, in relation to long-term median (1994–2023, LTM) natural mortality rates (grey dashed line). The grey shaded region represents the upper and lower 95% confidence intervals.

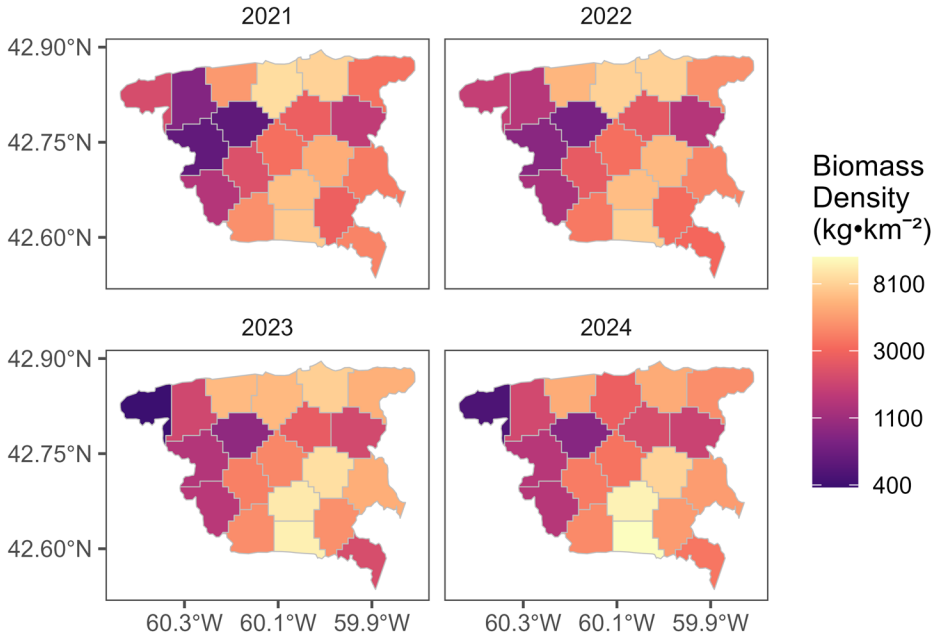

Figure 3. Model-estimated biomass densities (kg•km $^{-2}$) of fully-recruited scallops across the scallop fishing area 26A model domain from 2021 to 2024.

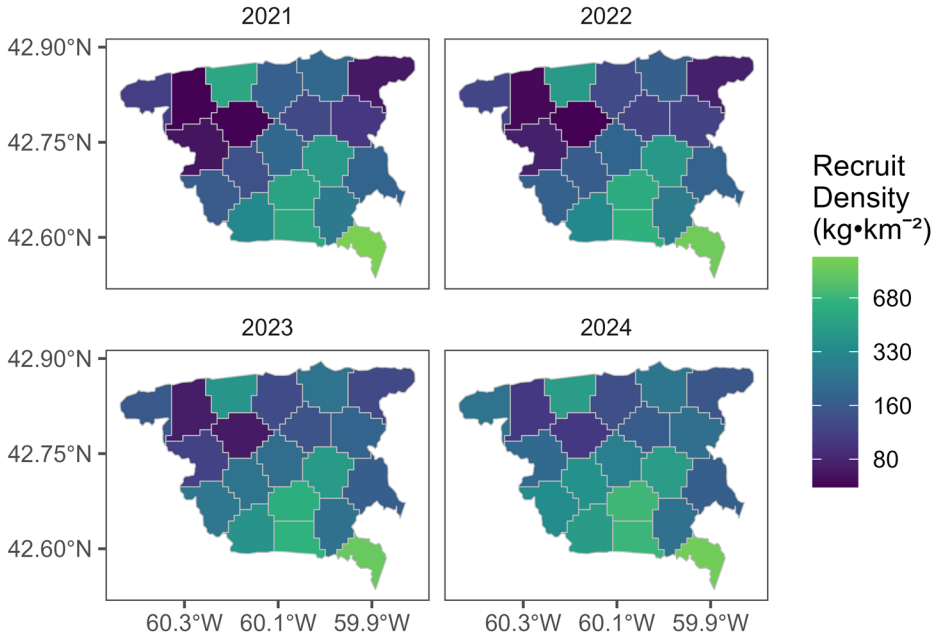

Figure 4. Model-estimated biomass densities (kg•km $^{-2}$) of recruit scallops across the scallop fishing area 26A model domain from 2021 to 2024.

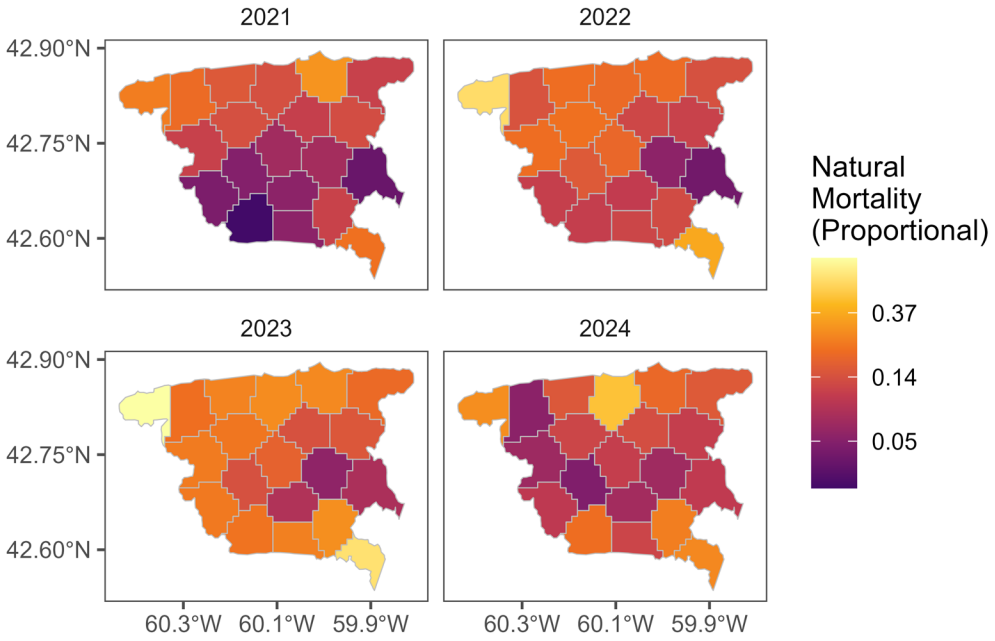

Figure 5. Model-estimated proportional natural mortality of fully-recruited scallops across the scallop fishing area 26A model domain from 2021 to 2024.

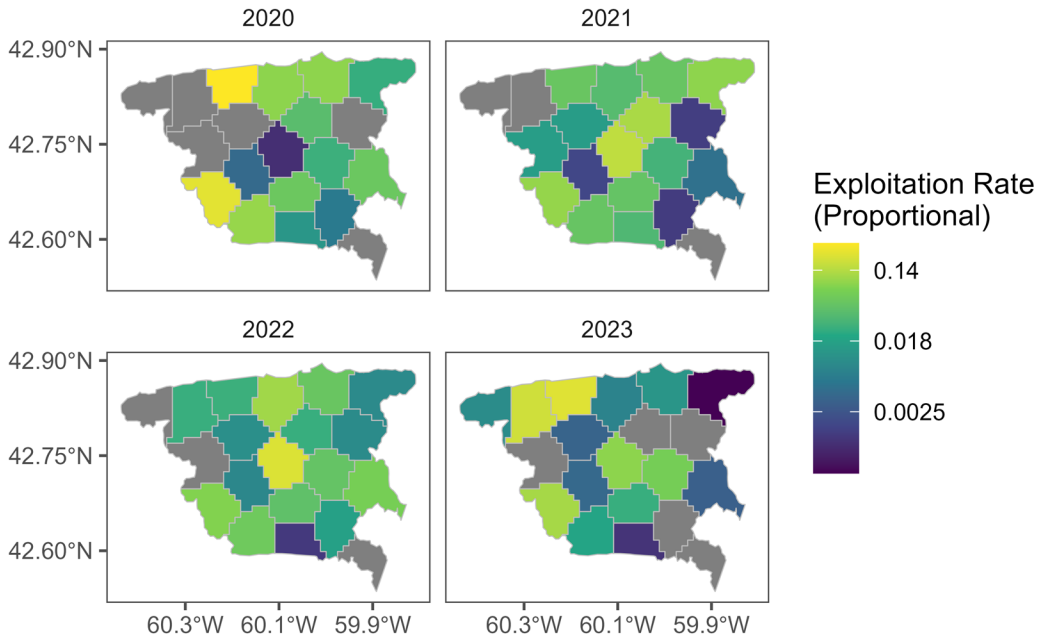

Figure 6. Model-estimated proportional exploitation rates across the scallop fishing area 26A model domain from 2020 to 2023. Proportional rates represent the exploitation over a survey year (June–May) and are reported under the preceding calendar year (e.g., the 2023 value reflects exploitation from June 2023–May 2024). Grey polygons indicate an exploitation rate of zero.

Stock Status and Trends

Fully-recruited Biomass

The modelled median fully-recruited biomass has increased following a historical low in 2017 (Figure 1B). Although biomass has remained above the LRP throughout the time series, current levels are relatively low compared to the elevated values seen between 2000–2005 and the record high in 2003. The spatial distribution of biomass has been relatively stable since 2021, with higher densities on the northern and southeastern edges of the model domain, and lower densities towards the west (Figure 3).

Recruit Biomass

Since 2017, the modelled median recruit biomass has remained relatively close to the long-term median of 325 t. The last large recruitment event occurred between 2009 and 2011 (Figure 1D). The spatial distribution of recruit biomass has been relatively stable since 2021 with higher recruitment occurring in locations with higher fully-recruited biomass, such as the southeastern edge of the model domain (Figure 4).

Natural Mortality

The estimated proportional natural mortality of fully-recruited scallop has fluctuated over the time series, with elevated values occurring approximately every 5–7 years. The 2024 estimate of 0.16 decreased from 0.29 in 2023. The 2024 estimate is comparable to levels observed between 2018 and 2021, and falls below the long-term median of 0.26 (Figure 2). The proportional natural mortality of fully-recruited scallop across the model domain in 2024 ranged between 0.05 and 0.63. Since 2021, natural mortality of fully-recruited scallop has generally

been higher in the northwestern portion of the model domain, although mortality was higher in 2023 than 2024 (Figure 5).

Fishing Mortality

Estimated proportional exploitation rates have fluctuated without any clear trend for most of the time series. Exploitation rates have decreased since reaching a historical high in 2017, and have been comparably low since (Figure 1C). Exploitation rates have been higher in the central portion and northern edge of the model domain since 2021 (Figure 6), while exploitation rates on the southeastern edge have declined in recent years.

Current Status

The 2024 biomass of 4,724 t places the stock above the LRP with a probability greater than 0.99.

History of Landings and Total Allowable Catch

Scallop landings have been monitored for Browns Bank (SFA 26) since 1990. The current monitoring structure began in 1998 (Figure 1A), when Browns Bank was divided into SFA 26A (Browns Bank North) and SFA 26B (Browns Bank South) for quota allocation purposes (DFO 2024b). Table 1 shows the TAC, and associated TACs, for SFA 26A since the separation of Browns Bank.

Table 1. Total allowable catch (TAC) and scallop landings (meats, weight in tonnes) by calendar year for scallop fishing area 26A from 1998 to 2024. The 2024 value is used in the model.

Year	1998-2015 Average	2016	2017	2018	2019	2020	2021	2022	2023	2024
TAC	810	500	750	400	400	300	300	200	200	150
Landings	801	508	768	377	407	285	251	200	202	152

Projections

The projected fully-recruited scallop biomass for 2025 is 4,710 t. This projection accounts for fisheries removals (109 t) occurring after the survey in 2024, and assumes:

- a catch of 275 t (the interim TAC set in December 2024),
- that growth will be unchanged from 2024 (1.2), and
- that proportional natural mortality of fully-recruited scallops will be unchanged from 2024 (0.16).

Catch scenarios ranging from 0 t to 525 t are presented in Table 2. The 2025 projections indicate that biomass is expected to increase under catch scenarios of up to 275 t and to decrease for catch scenarios greater than 275 t. The probability of biomass decline (i.e., projected biomass being below current biomass) ranges between 0.36 with no catch, 0.51 for a catch of 275 t, and 0.64 for a catch of 525 t. The expected change in biomass varies from 5.3% with no catch to -5.5% for a catch of 525 t. All catch scenarios presented indicate a very low probability (less than 1%) that biomass will be below the LRP. Catch of 275 t (the 2025 interim TAC) is projected to result in a proportional exploitation rate of 0.055, and an expected -0.4% change in fully-recruited biomass from 2024 to 2025. The exploitation rates reported for the

various catch scenarios are calculated for the 2025 calendar year using the projected 2025 removals (it does not include the post-survey catch from 2024).

Table 2. Decision table for the limit reference point (LRP) for 1–year projections using catch scenarios ranging from 0 t to 525 t for scallop fishing area 26A. Potential catches in 2025 are evaluated in terms of the expected exploitation rate (proportional) and change in fully-recruited biomass, and the probability of a decline in biomass. These probabilities account for uncertainty in the biomass forecasts. The interim total allowable catch is marked with an asterisk (*).

Catch (t)	Exploitation Rate	Expected Change in Biomass (%)	Probability of Biomass Decline	Probability biomass will be below LRP
0	0.000	5.3	0.36	< 0.01
25	0.005	4.8	0.37	< 0.01
75	0.015	3.7	0.40	< 0.01
125	0.025	2.7	0.43	< 0.01
175	0.035	1.7	0.46	< 0.01
225	0.045	0.6	0.48	< 0.01
275*	0.055	-0.4	0.51	< 0.01
325	0.065	-1.5	0.54	< 0.01
375	0.075	-2.5	0.56	< 0.01
425	0.085	-3.5	0.59	< 0.01
475	0.095	-4.5	0.62	< 0.01
525	0.110	-5.5	0.64	< 0.01

Ecosystem and Climate Change Considerations

Sea scallops are largely sedentary molluscs and are susceptible to climate change stressors such as rising bottom temperatures and ocean acidification which affect scallop physiology and growth (Rheuban et al. 2018); however, direct climate change research for SFA 27A or other Scotian Shelf stocks is limited. As a result, potential effects are inferred from findings in other regions. Shifts in predator distributions and increasing predator abundance in northern waters may also present emerging risks. Research survey data suggest that predator abundance, including sea stars (*Asterias spp.*) and crabs (*Cancer spp.*), has increased within areas of known scallop distribution, although the reasons for this are unclear. Aggregations of predators in areas of high scallop density may contribute to increases in natural mortality, particularly for pre-recruit (less than 85 mm shell height) sized scallops (Elner and Jamieson 1979, Barbeau and Scheibling 1994, Wong and Barbeau 2005). High densities of predators and dead scallops (clappers) observed in other regions reinforce the need for continued monitoring of the distribution and abundance of predators.

SOURCES OF UNCERTAINTY

The basis for the science advice for 2025 assumes the 2024 estimate of natural mortality and the median growth. If growth and/or natural mortality differ from these estimates in 2025, the biomass projections (and consequent decision table probabilities) would be affected.

LIST OF MEETING PARTICIPANTS

Name	Affiliation
Bennett, Lottie	DFO Science, Maritimes
Cassista-DaRos, Manon	DFO Science, Maritimes
Coughlan, Elizabeth	DFO Science, Newfoundland and Labrador
Despres, Lise	Comeau's Sea Foods Ltd
English, Gregory	DFO Science, Maritimes
Haar, Clair	DFO Science, Maritimes
Hart, Dvora	National Oceanic and Atmospheric Administration
Keith, David	DFO Science, Maritimes
Keyser, Freya	DFO Science, Maritimes
MacDonald, Raphael	DFO Science, Maritimes
McIntyre, Tara	DFO Science, Maritimes
McIsaac, Ian	Seafood Producers Association of Nova Scotia
Mosher, Jim	Clearwater Seafoods
Olmstead, Melissa	DFO Science, National Capital Region
Penney, Christine	Clearwater Seafoods
Reeves, Alan	DFO Resource Management, Maritimes
Robert, Ginette	Seafood Producers Association of Nova Scotia
Roman, Sally	Virginia Institute of Marine Science
Sameoto, Jessica	DFO Science, Maritimes
Sarty, Matt	Clearwater Seafoods
Townsend, Kathyrn	Maritime Aboriginal Peoples Council
Veniot, Blair	Nova Scotia Fisheries and Aquaculture
Yin, Yihao	DFO Science, Maritimes

SOURCES OF INFORMATION

Barbeau, M.A., and Scheibling, R.E. 1994. Behavioral mechanisms of prey size selection by sea stars (*Asterias vulgaris* Verrill) and crabs (*Cancer irroratus* Say) preying on juvenile sea scallops (*Placopecten magellanicus* (Gmelin)). Journal of Experimental Marine Biology and Ecology. 180(1): 103–136. doi:10.1016/0022-0981(94)90082-5.

DFO. 2009. A Fishery Decision-Making Framework Incorporating the Precautionary Approach.

DFO. 2013. Assessment of Browns Bank North scallops (*Placopecten Magellanicus*). DFO Can. Sci. Advis. Sec. Sci. Resp. 2013/059.

DFO. 2024a. Stock Status Update of Browns Bank North Scallops (Placopecten magellanicus) for the 2024 Fishing Season. DFO Can. Sci. Advis. Sec. Sci. Resp. 2024/022.

DFO. 2024b. Integrated Fisheries Management Plan: Offshore scallop, Maritimes Region, Fisheries and Oceans Canada.

DFO. 2025. Science Advice on Reference Points for Scallop Fishing Areas 25, 26, and 27B. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/049.

Elner, R.W., and Jamieson, G.S. 1979. Predation of sea scallops, *Placopecten magellanicus*, by the Rock Crab, *Cancer irroratus*, and the American Lobster, *Homarus americanus*. Journal of the Fisheries Research Board of Canada. 36(5): 537–543. doi:10.1139/f79-077.

Hubley, P.B., Reeves, A., Smith, S.J., and Nasmith, L. 2014. Georges Bank 'a' and Browns Bank North scallop (*Placopecten Magellanicus*) stock assessment. DFO Can. Sci. Advis. Sec. Res. Doc. 2013/079: vi + 58 p.

McDonald, R.R., Keith, D.M., Sameoto, J.A., Hutchings, J.A., and Flemming, J.M. 2021. Explicit incorporation of spatial variability in a biomass dynamics assessment model. ICES Journal of Marine Science (fsab192). doi:10.1093/icesjms/fsab192.

Rheuban, J.E., Doney, S.C., Cooley, S.R., and Hart, D.R. 2018. Projected impacts of future climate change, ocean acidification, and management on the US Atlantic sea scallop (Placopecten magellanicus) fishery. PLOS ONE 13(9): e0203536. Public Library of Science. doi:10.1371/journal.pone.0203536.

Wong, M.C., and Barbeau, M.A. 2005. Prey selection and the functional response of sea stars (*Asterias vulgaris* Verrill) and rock crabs (*Cancer irroratus* Say) preying on juvenile sea scallops (*Placopecten magellanicus* (Gmelin)) and blue mussels (*Mytilus edulis* Linnaeus). Journal of Experimental Marine Biology and Ecology. 327(1): 1–21. doi:10.1016/j.jembe.2005.05.018.

APPENDIX

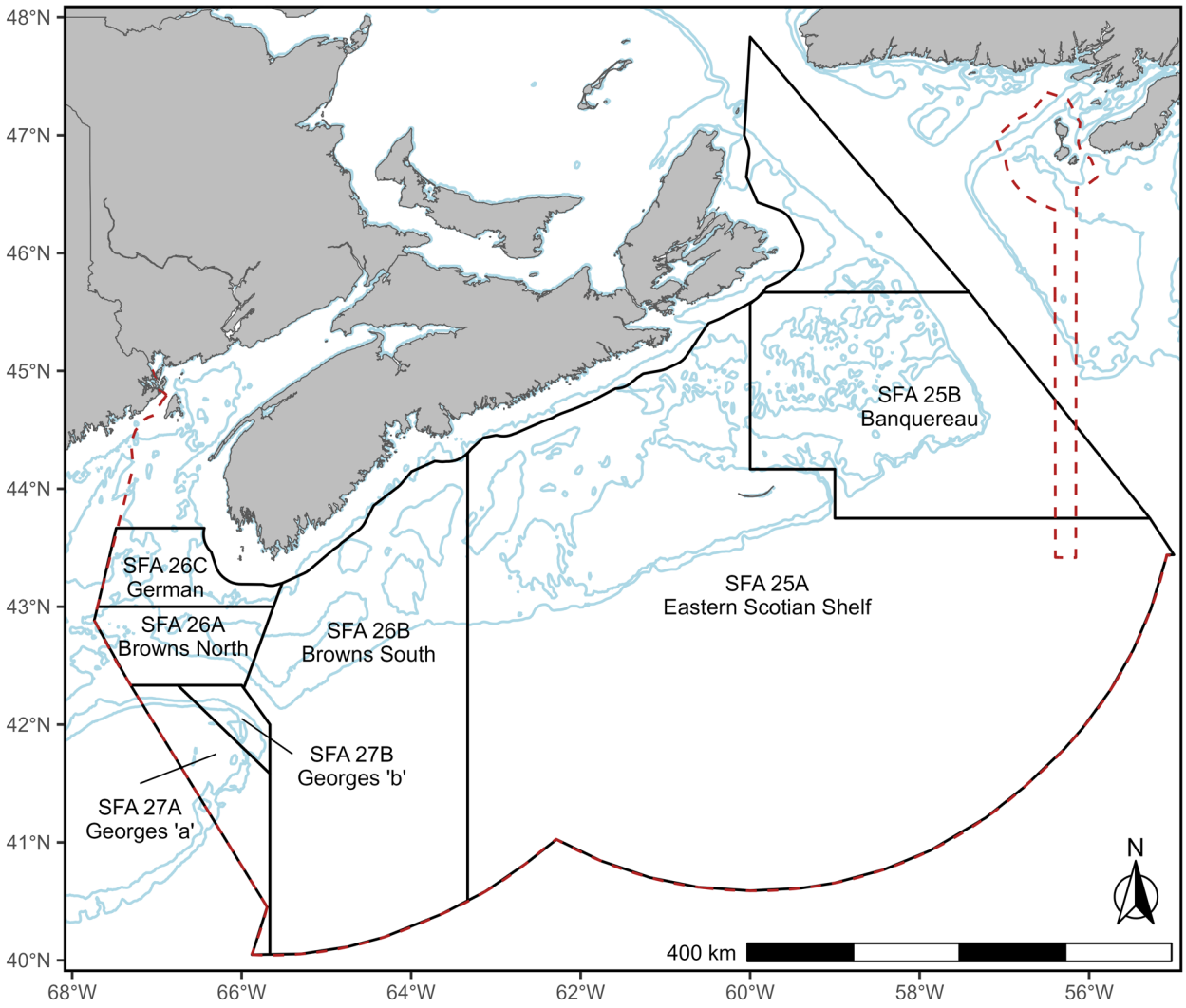

Figure A1. Offshore scallop fishing areas (SFAs) 25–27 used for management purposes in the DFO Maritimes Region. Bathymetry is shown as 50 m contours (blue lines), SFAs are outlined in black, and the Exclusive Economic Zone (EEZ) boundary is indicated by a red dashed line.

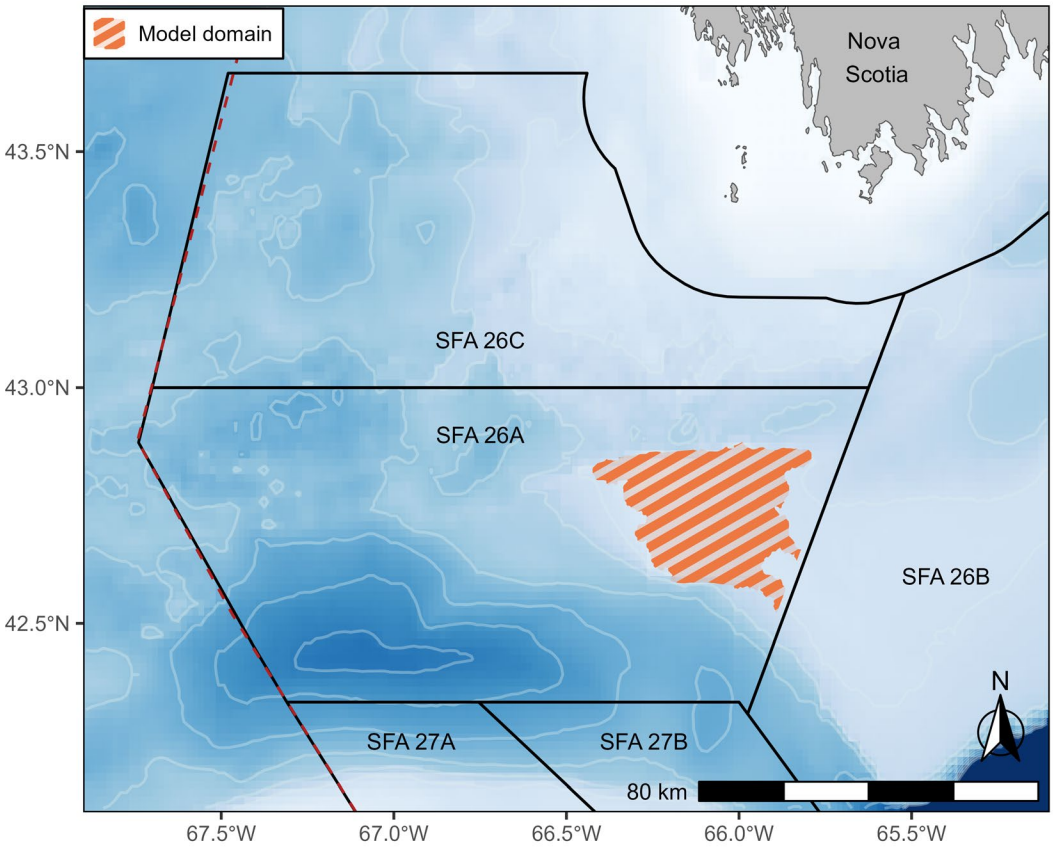

Figure A2. Location of scallop fishing area (SFA) 26A (Browns Bank North) and the spatial extent of the model domain (orange striped polygon) used for monitoring and management in the Maritimes region. Bathymetry is shown as blue shading with 50 m contours (white lines). SFAs are outlined in black. Portions of adjacent SFAs are also shown, including SFA 26B (Browns Bank South), SFA 26C (German Bank), and the northern sections of SFA 27A (Georges Bank 'a') and SFA 27B (Georges Bank 'b').

THIS REPORT IS AVAILABLE FROM THE:

Centre for Science Advice (CSA)
Maritimes Region
Fisheries and Oceans Canada
1 Challenger Drive, PO Box 1006
Dartmouth, Nova Scotia B2Y 4A2
Canada

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

ISSN 1919-5087
ISBN 978-0-660-78933-0 Cat. No. Fs70-6/2025-050E-PDF
© His Majesty the King in Right of Canada, as represented by the Minister of the Department of Fisheries and Oceans, 2025

This report is published under the Open Government Licence - Canada

Correct Citation for this Publication:

DFO. 2025. SFA 26A (Browns Bank North) Sea Scallop (*Placopecten magellanicus*) Stock Assessment in 2024. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/050.

Aussi disponible en français:

*MPO. 2025. Évaluation du stock de pétoncle géant (*Placopecten magellanicus*) de la ZPP 26A (nord du Browns Bank) en 2024. Secr. can. des avis sci. du MPO. Avis sci. 2025/050.*