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Maritimes Region

Canadian Science Advisory Secretariat
Science Response 2026/024

STOCK STATUS UPDATE OF LOBSTER (*HOMARUS AMERICANUS*) IN LOBSTER FISHING AREA 36 FOR 2025

CONTEXT

The Resource Management Branch of Fisheries and Oceans (DFO) has requested an update to stock status for the American Lobster (*Homarus americanus*) stocks in Lobster Fishing Area (LFA) 36. This Fisheries Science Response is from the regional peer review of January 29, 2026, on the Stock Status Update for American Lobster in Lobster Fishing Area 36 and 38.

SCIENCE ADVICE

Status

- The 2025 LFA 36 Lobster commercial biomass index is 4,871.1 tonnes (t), which is approximately 47 times the limit reference point (LRP) of 104.4 t.

Trends

- Landings in LFA 36 have been trending downward since the time series high in 2018 of 4,073 t. Landings of 2,036 t in the terminal year are 50% of the peak landings in 2018.
- Catch per unit effort (CPUE) has decreased since the 2014 time-series high with current estimates comparable to 2011. Hyperstability in the CPUE index is likely occurring.
- The commercial survey biomass index has been stable since 2022. In 2025, the commercial biomass index is 58% of the mean from the three highest estimates from the time series.
- Relative fishing mortality decreased from 2007 to 2013 and has remained low and stable since that time. Relative fishing mortality is likely underestimated due to illegal and unreported harvesting.
- Trends in benthic recruitment densities match the trends observed in commercial biomass when accounting for time to reach minimum legal size. Settler density in 2025 decreased relative to the 2024 estimate, and the overall series continues to exhibit variability.

Ecosystem and Climate Change Considerations

- The Bay of Fundy is experiencing rising temperatures and changes in salinity, affecting Lobster development and ecosystem productivity. These changes, combined with ocean acidification, will impact Lobster productivity, phenology, distribution, and catchability.
- In addition to long-term baseline changes in environmental conditions, short-term extremes (e.g., marine heatwaves) may further influence fishery performance.

Stock Advice

- The LFA 36 Lobster stock has been managed with consistent measures since the late-1990s to early-2000s, although stock indicators have fluctuated through this time. Trends in primary and secondary indicators are above the long-term averages, but are lower than recent high productivity periods. Commercial biomass is above the LRP.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2024 (Cook et al. In press.)

Assessment Type

Interim-Year Update

Most Recent Assessment Date

1. Last Full Assessment: February 2025 (DFO 2025)
2. Last Interim-Year Update: September 2023 (DFO 2023)

Stock Assessment Approach

1. Broad category: Index-based
2. Specific category: Index-based (including fishery-dependent and fishery-independent indices).

Commercial biomass with a corresponding LRP is the primary indicator for LFA 36 Lobster. Secondary indicators include landings, effort, CPUE, relative fishing mortality, bottom temperature anomalies, and benthic recruitment.

Stock, Ecosystem and Fishery Overview Information

The LFA 36 Lobster fishery is an effort-controlled, trap-based fishery along the New Brunswick coast in the Bay of Fundy (Figure A1 in Appendix A). It is prosecuted as a split fishing season (second Tuesday in November–January 14th; March 31st–June 29th) annually. The fishing season spans calendar years, and in this report, the closing year of the season is used as the season year (e.g., 2023–2024 is 2024) (Cook et al. In press; DFO 2022a).

Stock Structure Assumption

The LFA 36 Lobster stock is part of the broader Lobster population on the Scotian Shelf, Gulf of Maine, and Bay of Fundy. LFA 36 is a management-based stock unit and does not represent a biological unit. The stock structure in the Bay of Fundy is not fully understood, but it is thought that the area consists of sub-components that are linked through adult migration and larval drift. Biomass indices are developed through spatial analyses, which incorporate information from adjacent areas. The LRP for LFA 36 is estimated independently of adjacent LFAs.

Reference Points

- Limit Reference Point (LRP): 104.4 t commercial biomass estimate (Cook et al. In press), which is a proxy for $B_{recover}$ ($B_{recover}$ is the lowest biomass from which the stock has rebuilt).

- Upper Stock Reference (USR): Not available. It is expected to be developed under a separate process.
- Removal Reference (RR): Not available.
- Target Reference Point (TRP): Not available.

Data

- Commercial sales slips (landings and landings per vessel 1990–2025).
- Commercial logbook data (effort and CPUE 2006–2025).
- Food Social Ceremonial (FSC) and Moderate Livelihood (ML) (landings 2023–2025).
- Inshore Lobster Trawl Survey (ILTS) (catch counts and length frequency 2000–2025).
- DFO Summer Ecosystem Research Vessel Survey (RV Survey) (catch counts and length frequency 2000–2025).
- Northeast Fisheries Science Center Trawl Surveys (catch counts and length frequency 2000–2024).
- Department of Marine Resources (DMR) Maine New Hampshire Inshore Trawl Survey (catch counts and length frequency 2000–2025).
- Beaver Harbour Settlement index (lobster density 1991–2025).

Data changes: Data validation is an ongoing process; corrections to calibration coefficients from the RV survey and the filtering of historical ILTS data have been made since the last assessment. These updates altered the shape of the commercial biomass and relative fishing mortality indices, but did not change the conclusion on stock status (see Appendix B for description and associated figures).

ASSESSMENT

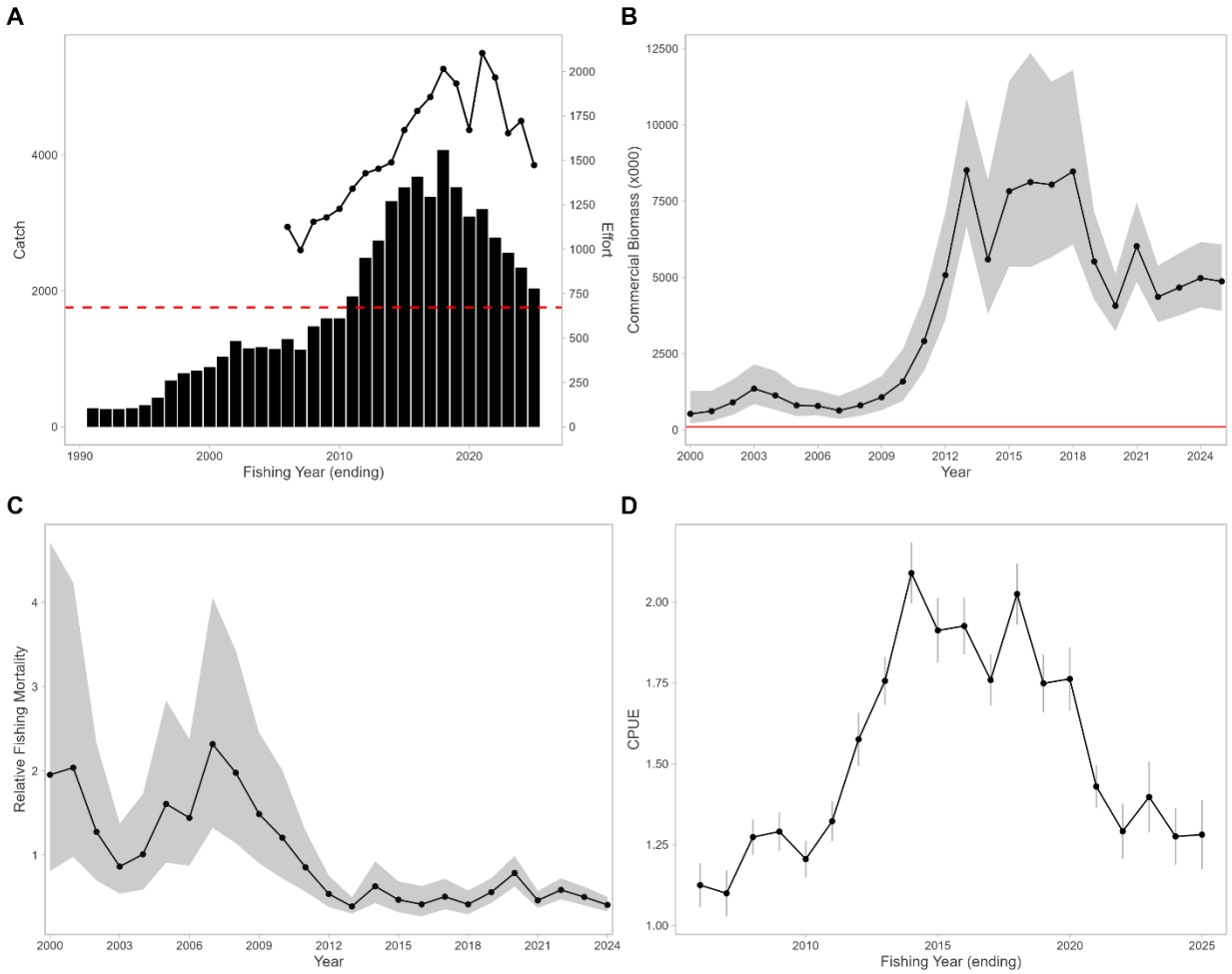

Figure 1. Lobster Fishing Area 36. (A) Landings (catch in tonnes, bars), and effort (number of trap hauls [TH]) ('000s, solid line) and the 30-year median of landings (red horizontal dashed line). (B) Commercial biomass index (points and solid black line) with 95% confidence interval (grey shading) from combined surveys, and the limit reference point (LRP) (solid red horizontal line); year represents the biomass for the season of the data informing the coming year's pre-fishery biomass estimate. (C) Relative fishing mortality estimates (landings/commercial biomass) from the combined survey model (points and solid line) with 95% confidence interval (grey shading). (D) Commercial catch per unit effort (CPUE) in kilograms per trap haul (kg/TH) by year (points and line) with 95% confidence interval (vertical lines).

Table 1. Seasonal landings in tonnes (t) in Lobster Fishing Area (LFA) 36 from 2001–2025 and catch per unit effort (CPUE) in kilograms per trap haul (kg/TH) from 2006–2025. A dash (—) indicates no logbook information.

Fishing Season	Landings (t)	CPUE (kg/TH)
2001	1032	—
2002	1261	—
2003	1155	—
2004	1169	—
2005	1143	—
2006	1295	1.12
2007	1138	1.10
2008	1477	1.27
2009	1596	1.29
2010	1594	1.21
2011	1916	1.32
2012	2488	1.58
2013	2739	1.76
2014	3325	2.09
2015	3524	1.91
2016	3681	1.93
2017	3382	1.76
2018	4073	2.03
2019	3526	1.75
2020	3094	1.76
2021	3205	1.43
2022	2786	1.29
2023	2560	1.40
2024	2345	1.28
2025	2036	1.28

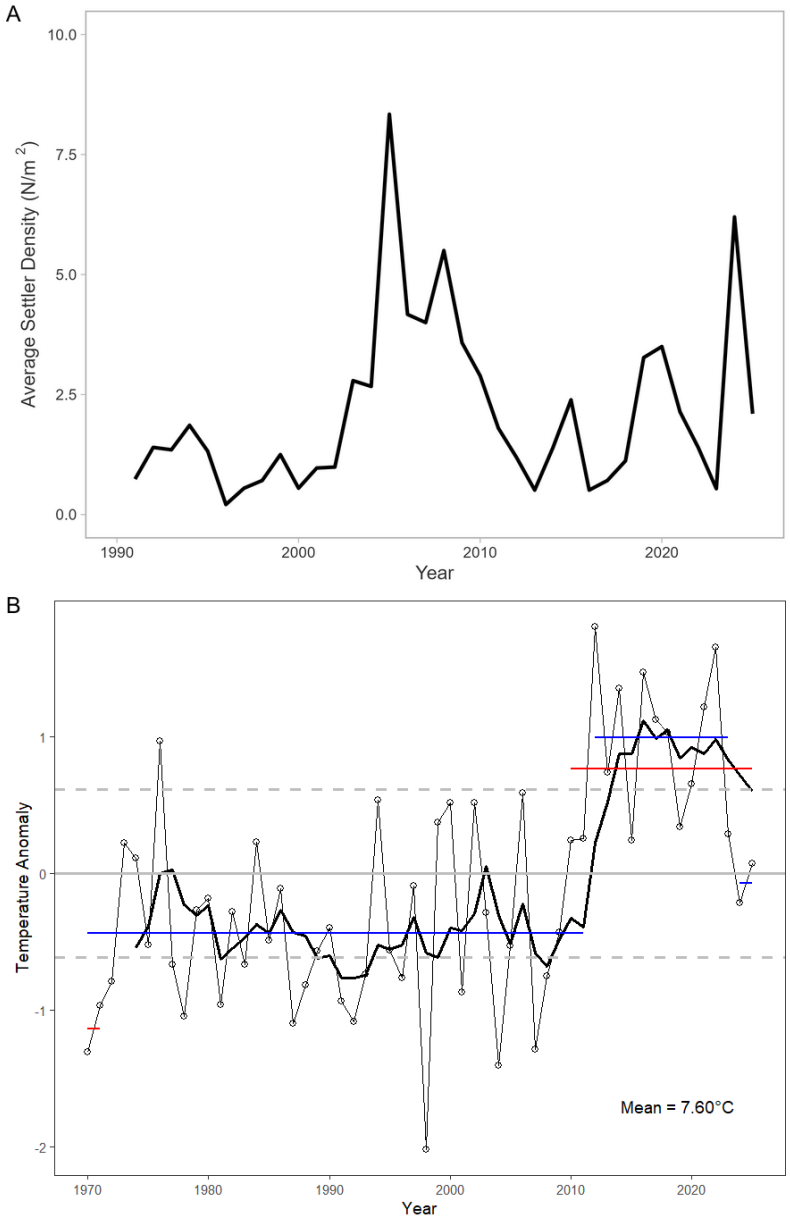

Figure 2. (A) Temporal trends in average settler density (number per square metre N/m^2) from Beaver Harbour, New Brunswick estimated from scuba suction sampling (solid line). (B) Time series of July bottom-temperature anomalies (thin line with circles) and five-year-running mean filtered series (heavy black line) for Northwest Atlantic Fisheries Organization (NAFO) Division 4X from the DFO Summer Ecosystem Research Vessel (RV) Survey and the Inshore Lobster Trawl Survey (ILTS). The solid grey horizontal line is the 1991–2020 mean and dashed lines represent ±0.5 Standard Deviation (SD). Regime shift analysis results from running the method forwards and backwards on the time series depicted by the blue and red horizontal lines, respectively.

Stock Status and Trends

Landings, Effort, and CPUE

Landings more than doubled from 2010 to 2018 reaching 4,073 t. Since 2018, landings steadily declined while remaining above the previous 30-year low of 318 t (1995) and are approaching

the 30-year median landings of 1,756 t. Landings have continued to decline in the last three years (mean of 2,313 t) and are comparable to the landings in 2012 of 2,488 t (Figure 1A, Table 1). Landings in the terminal year are 50% of peak landings in 2018 of 4,073 t (Figure 1A, Table 1). Effort (trap hauls) showed substantial year-to-year variability during the 2017–2022 10-day season extension pilot, including peaks in 2018–2019 and 2021–2022, and a notable dip in 2020. Effort declined again after 2022 (Figure 1A). CPUE estimates have decreased since the 2014 time series high with current estimates comparable to 2011 (Figure 1D). Hyperstability in the CPUE index is likely occurring, suggesting that this index may not reflect the available biomass of Lobster (Cook et al. In press).

Commercial communal landings and effort are reported and included in the commercial landings data. Reported FSC landings in LFAs 35-38 for May 2024–May 2025 were 23.1 t. It is unknown what proportion of total FSC removals for LFAs 35-38 this reported amount represents. FSC removals are not included in the total landings in this report, nor are catch rates. In addition, five Indigenous communities received Lobster access through ML understandings in LFAs 35-38. This fishing occurs during the commercial fishing season for each LFA, with the reported landings for 2025 in LFAs 35-38 being 46.3 t.

Commercial Biomass

The commercial biomass index, estimated from multiple surveys through a spatio-temporal modelling approach (Cook et al. In press), indicated a time series high of Lobster in 2013, followed by a steep decline in 2014. The commercial biomass index has been stable from 2022–2025 (mean 4,718.9 t) and the 2025 commercial biomass index is 57% of the peak in 2013 and 58% of the mean from the three highest estimates from the time series. The commercial biomass index in 2025 represents the pre-fishery biomass estimate for the 2026 fishing season. The 2025 biomass estimate is 4,871.1 t, which is 47 times the LRP of 104.4 t (Figure 1B).

Relative Fishing Mortality

Relative fishing mortality is an estimated index of exploitation calculated as the ratio of landings to the commercial biomass index. This index showed a decrease from 2007 to 2013, but has been low and stable since that time. Relative fishing mortality is likely underestimated due to illegal and unreported harvesting (Figure 1C).

Recruitment

Benthic recruitment is the process of Lobsters settling to the seabed during their first year of life, and is represented as average settler (individuals less than 13 mm carapace length) densities from scuba suction sampling. The settler densities in Beaver Harbour remained relatively consistent from 1991 to 2002 at a mean of 1 individual in a square metre (N/m^2), but then markedly increased to a peak of 8.34 N/m^2 in 2005 (Figure 2A). This peak in settlement aligns with the 2013 peak in commercial biomass index (assuming 8 years from settlement to recruitment into the fishery). Densities subsequently decreased between 2006 to 2011 and have remained at 1.4–1.9 N/m^2 since 2011. Settler density in 2025 decreased relative to the 2024 estimate (the second highest value in the time series). The overall series continues to exhibit variability.

History of Management

The LFA 36 Lobster fishery is effort-controlled with consistent management measures, including limited entry licensing, traps per licence, season length, minimum legal size, and no retention of v-notched or berried Lobsters. As a pilot study from 2017 to 2022, the LFA 36 season was

extended for 10-days at the end of the regular season, ending on July 9th. The LFA 36 season returned to its regulated dates in the 2023 season. Access to LFA 37 is provided to both LFA 36 and LFA 38 licence holders by way of licence conditions. Landings from LFA 37 are attributed to the respective LFA stated on the licence. Beginning in the 2023 fishing season, DFO implemented a boundary line to provide separate areas of access to LFA 36 and LFA 38 commercial licence holders. The boundary was implemented in commercial communal conditions for the 2025 season. The boundary line is considered interim.

In the DFO Maritimes Region, the Department issues Lobster harvest documents for FSC in LFAs 35-38, whereby fishing can occur both within and outside the commercial season. Management measures in the FSC fishery may be different than in the commercial fishery (DFO 2022b). The quantitative detail and coverage of FSC landing reports vary by licence holder. Some FSC harvest records have been received to date and there continues to be an increase in reporting. The ML landings are currently reported at an aggregate level, with the accuracy of reporting expected to increase as harvesters become more familiar with reporting requirements and as new reporting tools are deployed.

Ecosystem and Climate Change Considerations

Shifts toward warmer waters in NAFO Division 4X (Figure A1 in Appendix A) are evident from 2012–2022, followed by cooler conditions in 2023–2025 that align more closely with the 1991–2020 mean. Climate models project continued increases in both surface and bottom temperatures in NAFO Division 4X (Figure 2), influencing Lobster phenology, larval connectivity, recruitment, and disease incidence. Temperature anomalies, such as marine heatwaves or cold spells, may intensify ecosystem impacts to the Lobster resource.

Changes in phytoplankton and zooplankton bloom timing and magnitude are already occurring, and warming in the Gulf of Maine has been linked to declines in the zooplankton *Calanus finmarchicus,* which is a key prey species for larval Lobster. These projected shifts in zooplankton abundance and timing may reduce food availability for larval and recruitment success of Lobster. Ocean acidification has lowered seawater pH on the Scotian Shelf. Early Lobster larvae are sensitive to environmental stress, and early juveniles appear most vulnerable to decreasing pH, suggesting reduced juvenile fitness and potential impacts on recruitment. Although warming and increased salinity at depth may temporarily buffer declines in calcium carbonate saturation for adults, nearshore areas critical for early life stages may not experience the same buffering. Combined warming, ocean acidification, and variable food availability are expected to affect Lobster stocks in multiple ways, though the magnitude of these impacts remains uncertain.

SOURCES OF UNCERTAINTY

Stock abundance estimates were previously based on fishery performance; specifically, commercial CPUE. In recent years, CPUE has shown patterns of hyperstability, remaining high even as biomass declines, thereby reducing its reliability as an indicator of stock health (Cook et al. In press). The transition to fishery-independent metrics (survey-based biomass estimates) in the new stock assessment framework can help eliminate this fishery-behaviour driven hyperstability. However, this shift introduces challenges in comparing current assessments under the new framework with the output of past assessments that relied on CPUE.

A source of uncertainty in trawl survey approaches is the uneven sampling of potential Lobster habitat. This uncertainty can be mitigated by expanding the survey coverage. The likely

movement of Lobster between assessment areas introduces another source of uncertainty in the estimation of abundance for LFAs.

Illegal and unreported removals contribute to uncertainty in exploitation estimates, as reported landings may not reflect true Lobster catch levels.

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SOURCES OF INFORMATION

Cook, A., Howse, V., Asselin, N., Armsworthy, S., Denton, C., Gurney-Smith, H., Tam, J.C., White, L., and Quinn, B. In press. Framework Assessment of American Lobster (*Homarus americanus*) in Lobster Fishing Areas 35-38. DFO Can. Sci. Advis. Sec. Res. Doc.

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DFO. 2022b. Food, social and ceremonial fisheries.

DFO. 2023. Stock Status Update of Lobster (*Homarus americanus)* in Lobster Fishing Areas 36 and 38 for 2023. DFO Can. Sci. Advis. Sec. Sci. Resp. 2023/041.

DFO. 2025. Stock Assessment of Lobster (*Homarus americanus*) in Lobster Fishing Area 36 for 2024. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/061.

APPENDIX A

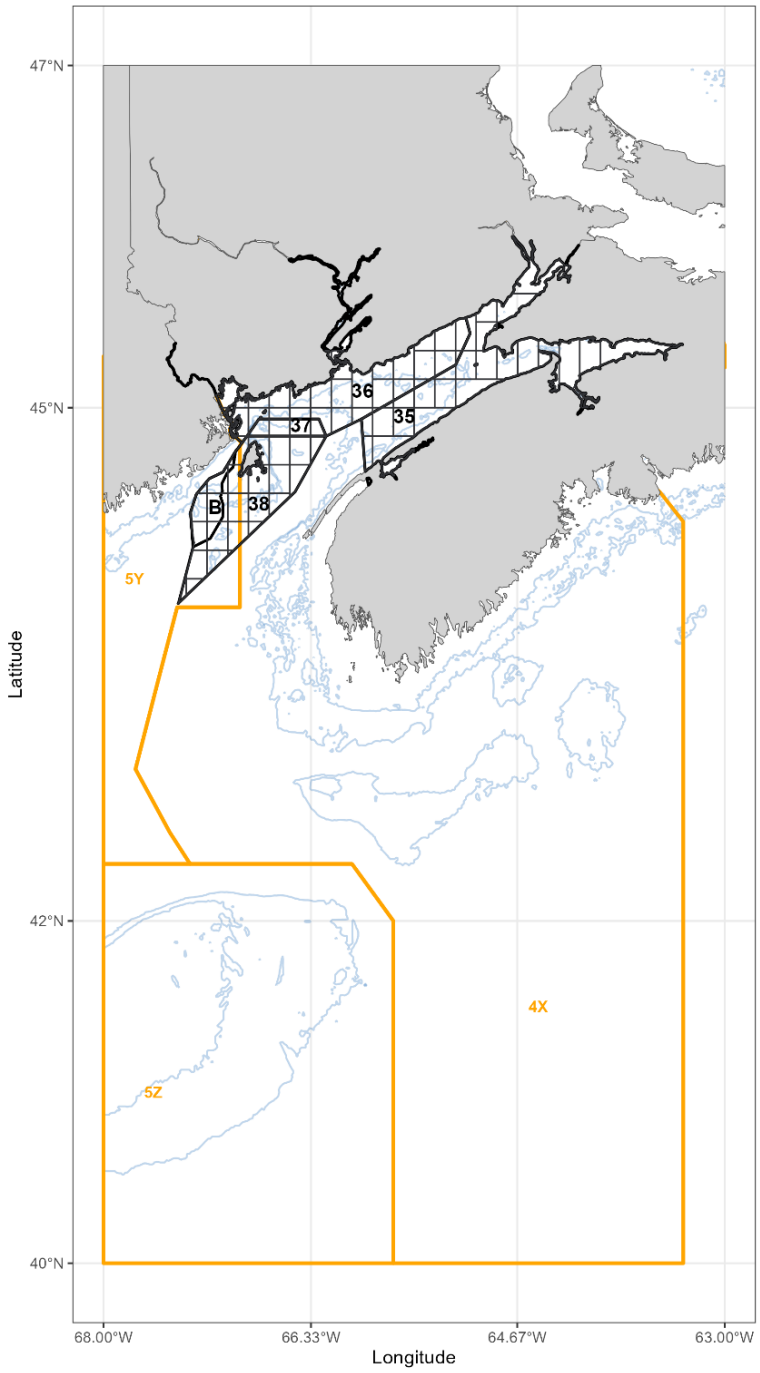

Figure A1. Map of Lobster Fishing Areas (LFAs) 35-38 and Area 38B with logbook reporting grids (small black squares) in the Bay of Fundy and overlapping Northwest Atlantic Fisheries Organization (NAFO) Divisions (orange boundaries).

APPENDIX B

In 2024, a science peer review process was conducted to develop a Stock Assessment Framework for American Lobster in Lobster Fishing Areas (LFAs) 35-38 (see: Cook et al. In press). During this peer review, indices of abundance and biomass for commercial Lobster in these areas were developed using multiple modelling approaches. The accepted modelling approach was to use a spatio-temporal model that incorporated available fisheries-independent trawl survey data for the targeted LFAs as well as adjacent areas. Given uncertainties in the availability of survey data and potential changes to those data, an approach that focused on model selection and validation was adopted, rather than a prescribed model structure. This approach provides the assessment team with the opportunity to evaluate models and provide transparent advice, without having to schedule a new stock assessment framework (Cook et al. In press) when minor data changes occur.

During preparation for the LFA 35, 36, and 38 Stock Assessment updates for 2025, two issues with the trawl survey data set were identified:

1. issues with the implementation of the DFO RV survey calibration coefficients for the most recent years of data; and
2. the lack of Lobster length frequencies from all stations on the ILTS prior to 2013.

During the framework and assessment, the stations with Lobster catches, but without length frequency, were excluded from the analyses as the catch could not be partitioned to only commercial sizes. Conversely, all stations with no Lobster catch were included, therefore biasing the data. In this update, ILTS stations prior to 2013 with no Lobster catch are only retained if sampling protocol would have generated a length frequency.

After data corrections, the approved model selection methods (Cook et al. In press) were applied (Table B1; Figure B1). Model *m6* with time-varying basis splines for depth, and fixed survey effects, was chosen as it was the lowest for each of Akaike information criterion (AIC), root mean squared error (RMSE), median absolute error (MAE), and the sum of the negative loglikelihoods (Table B1). Further, there were no spatial or temporal patterns in the simulated residuals (Figure B1).

Scaled indices for the overall spatial domain showed similar patterns to those results presented at the last assessment (DFO 2025) (Figure B2), apart from the earlier part of the time series, where the inclusion of the ‘extra zeros’ in the previous assessment negatively biased the index. Although biomass over the spatial domain remained relatively constant, biomass trends in some LFAs were impacted to a greater extent (Figure B3). LFAs 35 and 36 contain only data from the DFO RV survey and the ILTS. Therefore, changes to those data sets were more impactful in modelled trends for LFAs 35 and 36. In contrast, LFA 38 also includes Northeast Fisheries Science Center (NEFSC) and Department of Marine Resources (DMR) Maine New Hampshire Inshore Trawl Survey data, so biomass trends were less affected by the updated approach used in this update.

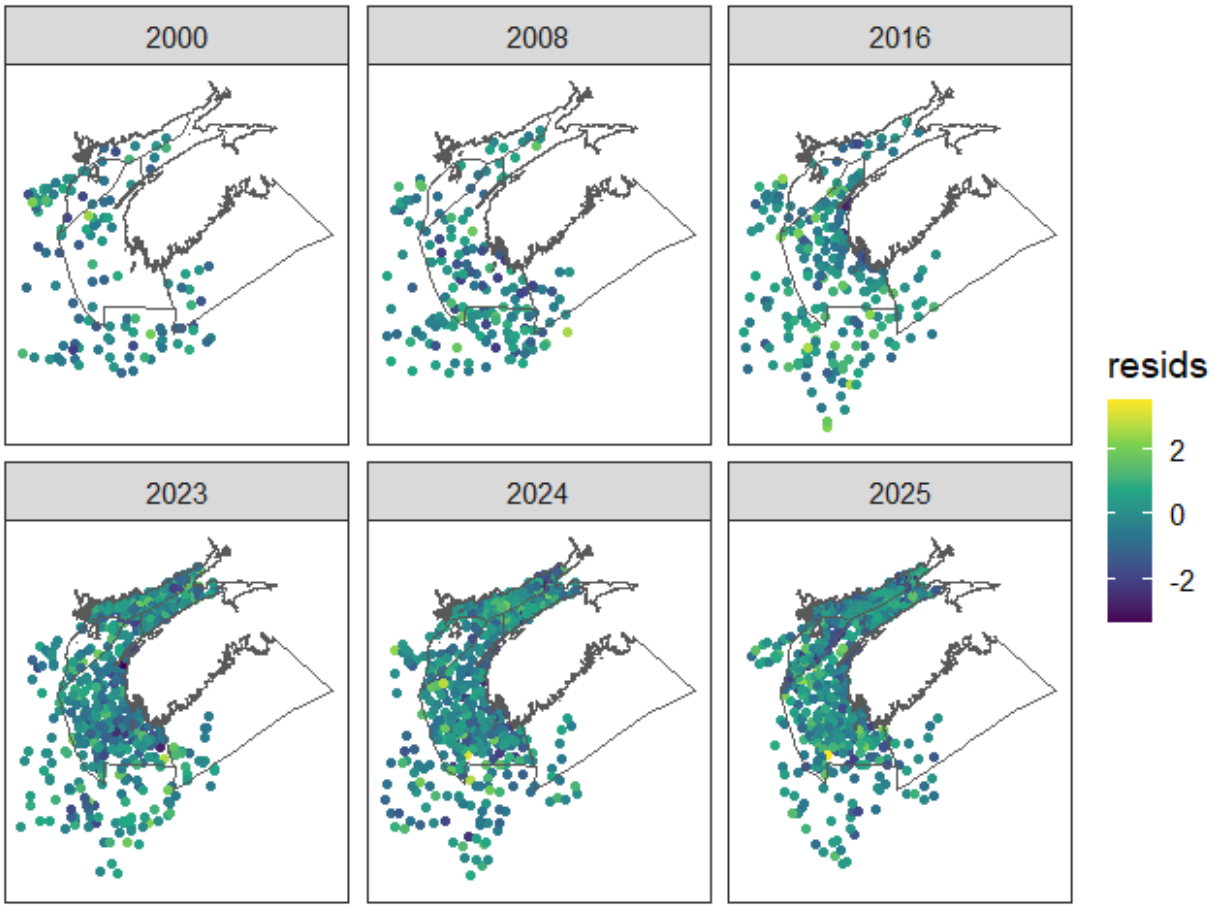

Figure B1. Selection of years for displaying model residuals from the selected spatio-temporal model (m6) used to describe commercial biomass in the Lobster Fishing Area 35, 36, and 38 stock assessments.

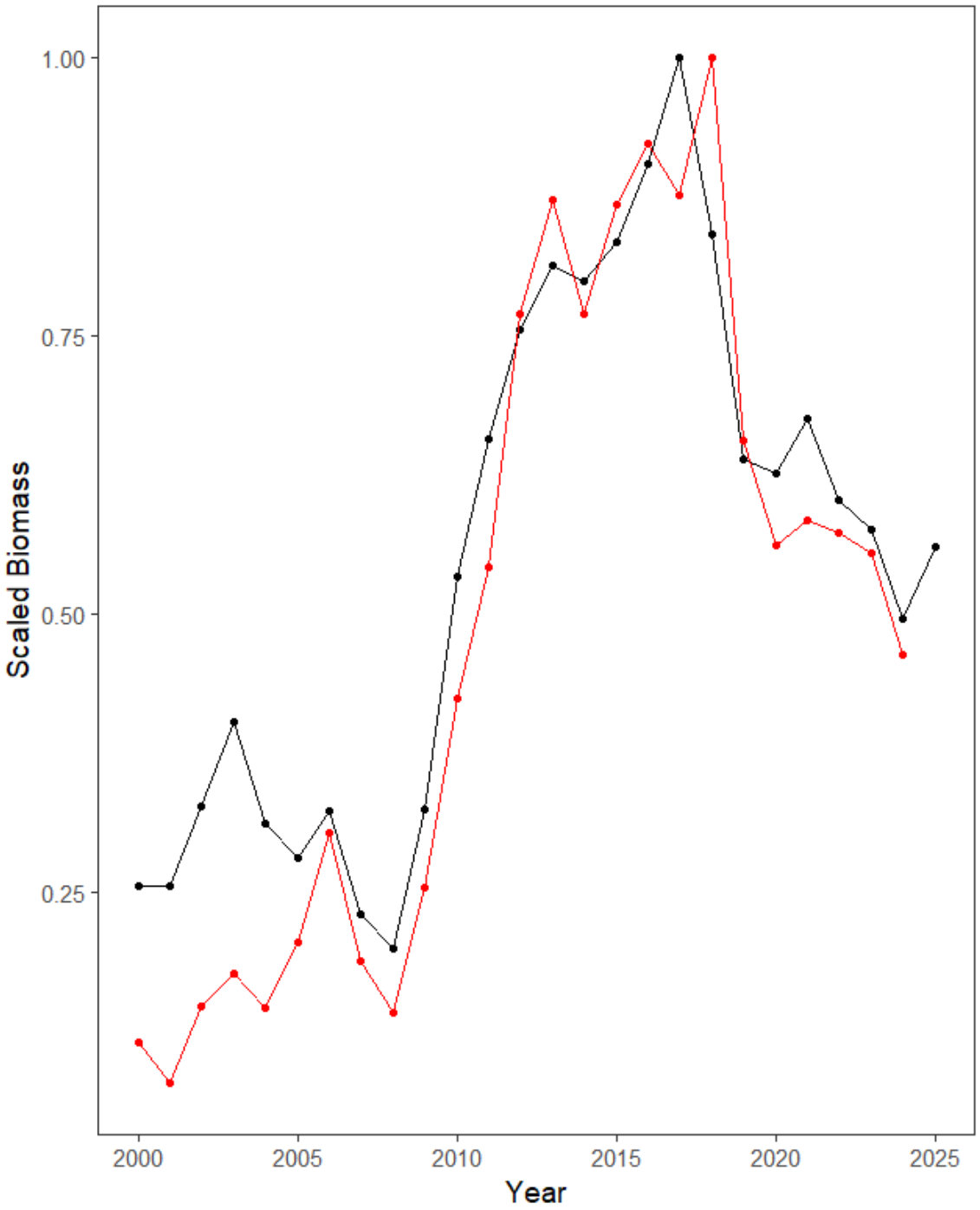

Figure B2. Trends in commercial biomass indices from the entire model domain from the 2025 (red) and 2026 (black) model runs.

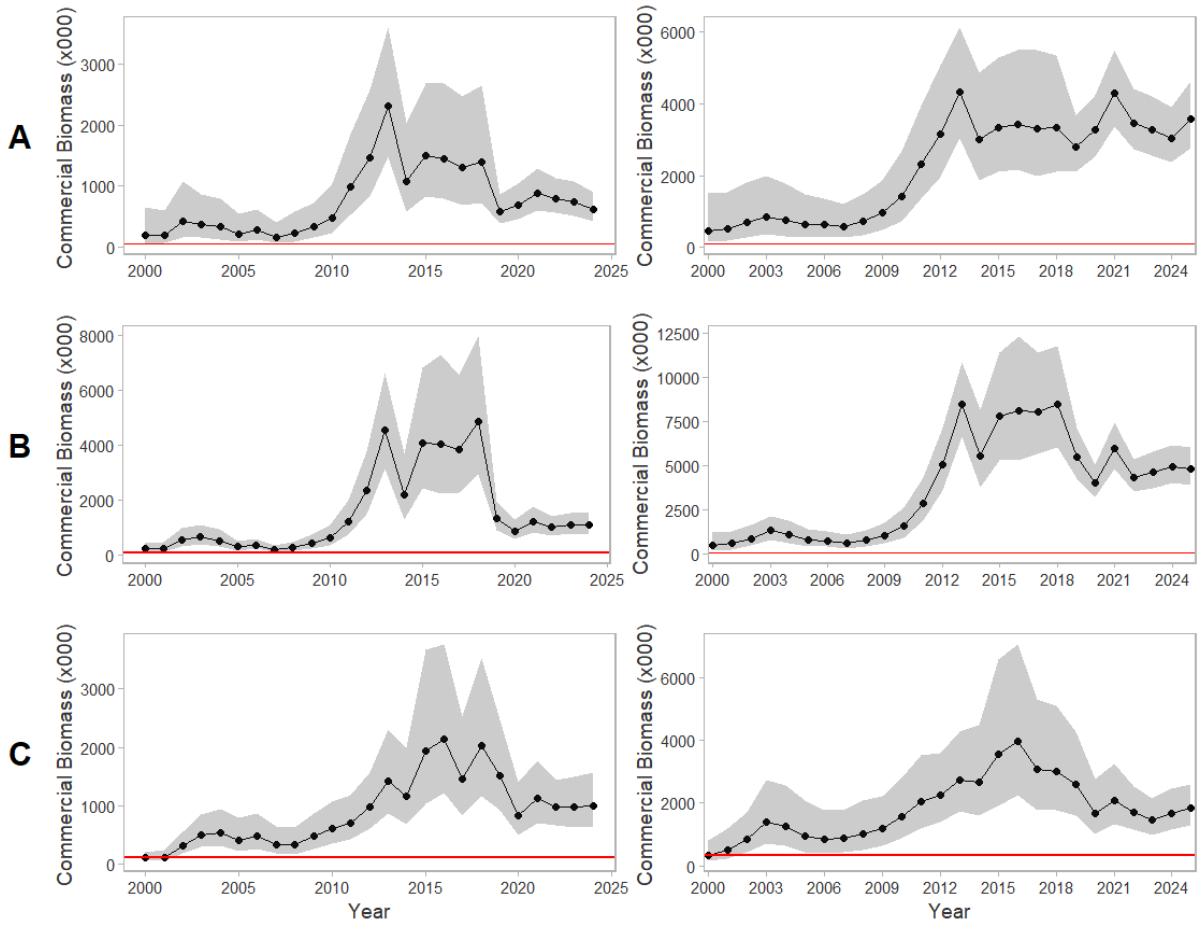

Figure B3. Comparison of commercial sized Lobster biomass indices (black line) with 95% confidence interval (grey shading) and estimated limit reference points (red lines) from Lobster Fishing Areas 35, 36, and 38 (top, middle, bottom) between 2025 assessment (left) and 2026 update (right).

Table B1: Model selection criteria for the Bay of Fundy (i.e., Lobster Fishing Areas 35-38) Lobster stock assessment. AIC represents Akaike information criterion, (loglik) log likelihood, (MAE) median absolute error, and (RMSE) root mean squared error. For additional detail on the model see Cook et al. In press.

Model	Formula	Time varying	AIC	Sum.loglik	MAE_test	RMSE_test
m3	n ~ depth.scaled + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	N/A	83541	-41844	652	2780
m4	n ~ 0 + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	~ 1 + depth.scaled	83530	-41837	650	2763
m6	n ~ 0 + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	~ 1 + bs1 + bs2 + bs3 + bs4 + bs5	83494	-41852	645	2731
m7	n ~ 0 + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	~ 1 + bs1 + bs2 + bs3 + bs4	83497	-41839	646	2743
m9	n ~ 0 + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	~ 1 + depth.scaled + depth.scaled2	83529	-41846	648	2751
m10	n ~ 0 + s(depth.scaled, year) + ILTS_Fall + MNH_Fall + MNH_NEFSC_Fall	~ 1	83529	-41851	651	2774

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