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Maritimes Region

Canadian Science Advisory Secretariat
Science Advisory Report 2026/002

STOCK ASSESSMENT OF LOBSTER (*HOMARUS AMERICANUS*) IN LOBSTER FISHING AREA 38 FOR 2024

CONTEXT

The Fisheries Management Branch of Fisheries and Oceans (DFO) has requested an assessment for the American Lobster (*Homarus americanus*) stocks in lobster fishing areas (LFAs) 35-38. Framework meetings were held from October 8–9 and November 7, 2024, to establish the scientific basis for the provision of management advice for these stocks.

This Science Advisory Report is from the February 26-27, 2025, regional peer review on the Stock Assessment for American Lobster in Lobster Fishing Areas 35, 36-38. 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 LFA 38 Lobster commercial biomass index is 1,001 t, which is approximately 10 times the limit reference point (LRP; 99.4 t).

Trends

- Landings in LFA 38 have been trending downward since the time series high in 2016. Landings in the terminal year are 48% of the peak landings in 2016.
- Catch per unit effort (CPUE) has decreased since the time series high in 2016 with current estimates comparable to 2013. Hyperstability in the CPUE index is likely occurring.
- The commercial survey biomass index has been stable since 2021. In 2024 the commercial biomass estimate is 49% of the mean of the 3 highest estimates from the time series.
- Relative fishing mortality decreased following 2002 remaining low and variable through the time series. Given the reports on increased unreported harvesting, the increase in relative fishing mortality is likely underestimated.

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 life cycle timing, distribution, and catchability.
- Short-term climate fluctuations will influence annual fisheries performance irrespective of population changes.
- Longer-term decreases in pH, increases in temperature, and variability in food availability will likely affect lobster populations in a multitude of ways; however, the magnitude of these impacts is currently unknown.

Stock Advice

- The LFA 38 Lobster stock has been managed with consistent measures since the late 1990s – early 2000s, and 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 well above the LRP.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2024 (Cook et. al. In prep.[1])

Assessment Type

Full assessment

Most Recent Assessment Date

1. Last Full Assessment: September 2019 (DFO 2021)
2. Last Interim-Year Update: September 25, 2023 (DFO 2023)

Stock Assessment Approach

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

Stock, Ecosystem and Fishery Overview Information

The LFA 38 fishery is an effort-controlled trap-based fishery in the lower Bay of Fundy and is prosecuted from the second Tuesday of November to the following 29th of June, annually (DFO 2024). A summer fishery is authorized in the western portion of LFA 38, which occurs outside of the LFA 38 season, in an area referred to as Area 38B, also known as the disputed zone, an area claimed as territorial waters by both Canada and the US. Harvesters who hold a licence for LFA 38 are eligible to be issued a licence to fish Area 38B. The fishing season spans calendar years, and in this document the closing year of the season is used as the season year (e.g., 2023– 24 is 2024).

Stock Structure Assumption

The LFA 38 stock is part of the broader lobster population on the Scotian Shelf, Gulf of Maine and Bay of Fundy. LFA 38 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 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 incorporates information from adjacent areas. The LRP for LFA 38 is estimated independently of adjacent LFAs. Trends in

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

indicators discussed in this document are mirrored in adjacent areas and the larger Gulf of Maine complex increasing confidence in the conclusions.

Access to LFA 37 is provided to both LFAs 36 and 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 2022-23 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 2024-25 season. The boundary line is considered interim.

Reference Points

- Limit Reference Point (LRP): 99.7 t commercial biomass estimate (Cook et al. In prep.[1]), a proxy for $B_{recover}$.
- Upper Stock Reference (USR): Not available. 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 1990–2024)
- Commercial logbook data (catch per unit effort (CPUE) 2005–2024)
- Food, social, ceremonial (FSC, landings 2023–2024)
- Inshore Lobster trawl survey (catch counts and length frequency 2000–2024)
- DFO Summer Ecosystem Research Vessel survey (catch counts and length frequency 2000-2024)
- Northeast Fisheries Science Centre trawl surveys (catch counts and length frequency 2000-2024)
- Maine New Hampshire inshore trawl survey (catch counts and length frequency 2000-2024)

ASSESSMENT

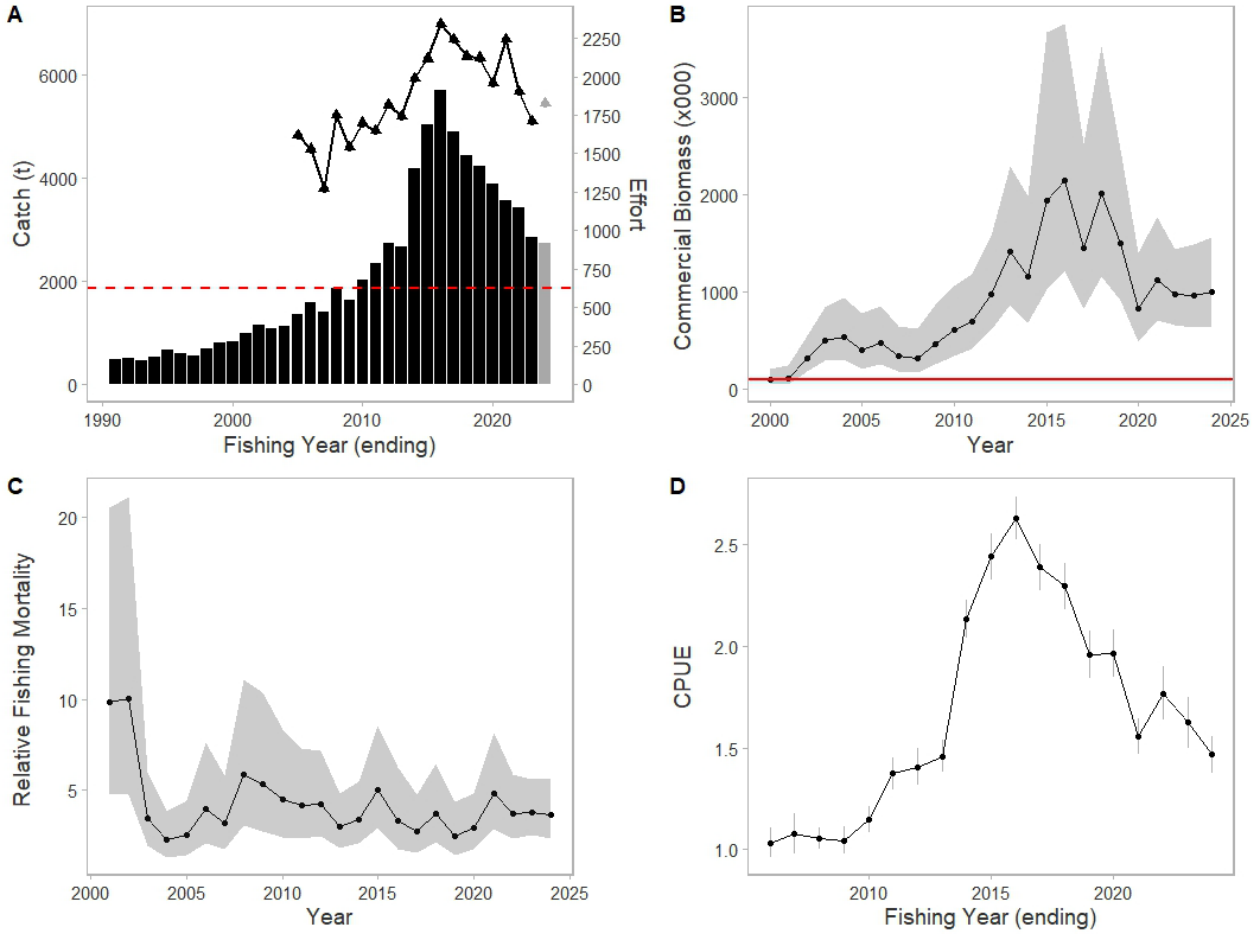

Figure 1. (A) Landings (t, bars) and effort ('000s trap hauls, solid line) and the 30-year median of landings (red horizontal dashed line); the grey bar and grey triangle represent the most recent fishing season of 2024. (B) Commercial biomass index (points and solid line) with 95% confidence interval (grey shading) from combined surveys, along the lower reference point (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 combined survey model for LFA 38 (points and solid line) with 95% confidence interval (grey shading). (D) Commercial catch per unit effort (kg/TH) by year (points and line) with 95% confidence interval (vertical lines).

Table 1. Seasonal landings in lobster fishing area 38 from 2001–2024 and catch per unit effort from 2006-2024. Dash indicates grid referenced and effort distribution information was not available until after 2005.

Fishing Season	LFA 38 Landings (t)	CPUE (kg/TH)
2001	826	-
2002	984	-
2003	1145	-
2004	1073	-

Fishing Season	LFA 38 Landings (t)	CPUE (kg/TH)
2005	1133	-
2006	1363	1.03
2007	1595	1.08
2008	1413	1.05
2009	1855	1.04
2010	1638	1.15
2011	2035	1.37
2012	2352	1.41
2013	2741	1.46
2014	2682	2.13
2015	4196	2.44
2016	5045	2.63
2017	5711	2.39
2018	4915	2.29
2019	4442	1.96
2020	4231	1.96
2021	3882	1.56
2022	3563	1.77
2023	3422	1.62
2024	2857	1.47

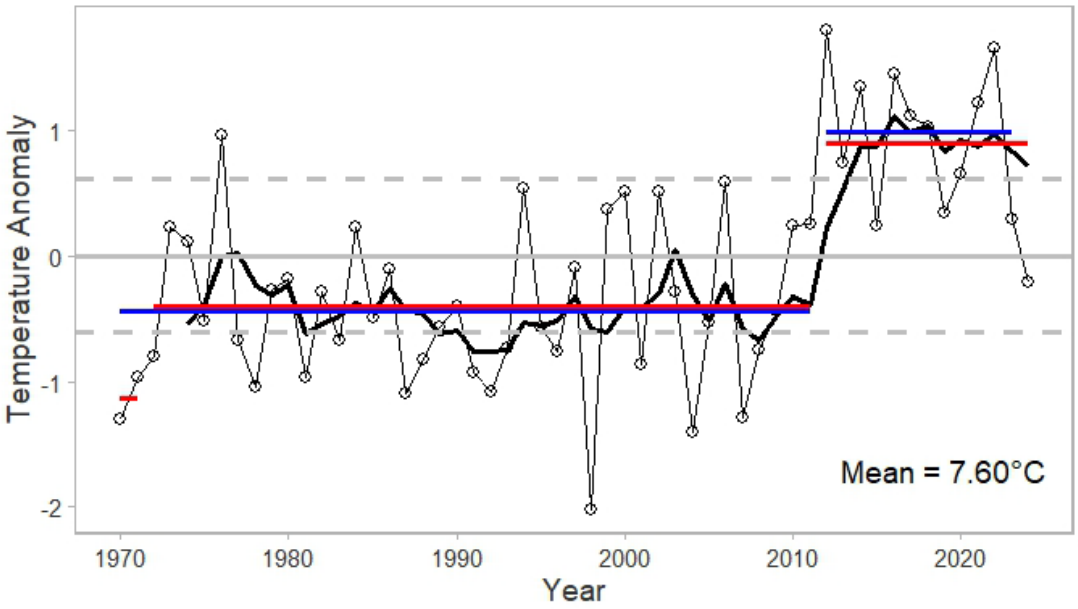

Figure 2. Time series of July bottom-temperature anomalies (thin lines with circles) and five-year-running mean filtered series (heavy black line) for NAFO Division 4X from DFO research vessel and inshore lobster trawl surveys. The solid grey horizontal line is the 1991-2020 mean and dashed grey lines represent ±0.5 standard deviation. 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 Catch Per Unit Effort

Landings more than doubled between 2010 and 2016 reaching 5,711 t. From the 2016 record high, landings steadily declined while remaining well above previous 30-year low of 472 t (1993) and the 30-year median of 1,855 t. Landings have continued to decline in the last 3 years (mean of 3,009 t) and are comparable to landings in 2012 (2,741 t) (Figure 1 (A) and Table 1). The mean annual percent decline in landings since the time series high is 8.62%. Landings in the terminal year are 48% of peak landings in 2016 (5045 t, Fig 1 (A) and Table 1). In recent years the estimates of fishing effort (total trap hauls) in LFA 38 have declined since 2021 (Figure 1 (A)). The evidence of hyperstability in CPUE suggests that this index does not reflect the available biomass of lobster (Cook et al. In prep.[1]). CPUE has shown an overall decline since 2016, remaining low in recent years with estimates comparable to 2013 (Figure 1 (D)).

Communal commercial landings and effort are reported and included in the commercial landings data. In Maritimes Region, DFO issues lobster harvest documents for FSC in LFAs 35-38, whereby fishing can occur both within and outside the commercial season (DFO 2022). The quantitative detail and coverage of the FSC landing reports vary by licence holder. Some FSC harvest records have been received to date and there continues to be an improvement in reporting. Reported FSC landings in LFAs 35-38 for May 2023-May 2024 were 24.4 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 nor are catch rates reported in this document.

Commercial Biomass

The commercial lobster biomass index, estimated from multiple surveys through a spatio-temporal modelling approach (Cook et al. In prep[1]), indicated a time series high in 2016 (2,143.9 t), followed by a decline to 2019. The commercial biomass index has been stable from 2021 to 2024 (mean 1,016.5 t) and the 2024 index is 47% of the peak in 2016, and 49% of the mean from the three highest estimates of the time series. The mean annual percent decline from the time series high to the terminal year is 4.90%. The biomass index in 2024 represents the pre-fishery estimates for the 2025 fishing season. The 2024 commercial biomass estimate is 1,001 t which is 10 times the LRP of 99.4 t (Figure 1 (B)).

Relative Fishing Mortality

Relative fishing mortality is an estimated index of exploitation calculated with landings and biomass from the combined surveys. This index shows a decrease following 2002 remaining low and variable through the time series. Given the reports on increased unauthorized harvesting, the increase in relative fishing mortality is likely underestimated (Figure 1 (C)).

Recruitment

No recruitment index available in LFA 38.

Current Status

The 2024 LFA 38 lobster commercial biomass of 1001 t places the stock above the LRP.

History of Management

The LFA 38 Lobster fishery is an effort-controlled fishery with consistent management measures in the commercial fishery including limited entry licensing, traps per licence, season length, minimum legal size and no retention of v-notched or berried lobsters.

In Maritimes Region, DFO 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.

Ecosystem and Climate Change Considerations

Shifts toward warmer waters within NAFO Division 4X are evident beginning in 2012 through 2022. Cooler bottom temperature years were observed in 2023 and 2024 and are closer to the mean of the 1991-2020 period (Figure 2). Future climate projection models show increases in both surface and bottom temperatures for the 4X region. Continued temperature increases will affect lobster phenology, larval connectivity, recruitment success, and incidence of disease. Water temperature anomalies, such as marine heatwaves or cold-water anomalies, can further exacerbate impacts to the ecosystem and resources. Short-term climate fluctuations will influence annual fisheries performance irrespective of population changes. Phytoplankton and zooplankton bloom timings and magnitude have shifted, and overall, there are predicted declines in zooplankton indicating lower ecosystem productivity potential. Warming in the Gulf of Maine has been linked to declines in zooplankton species, such as *Calanus finmarchicus*, a known prey item for larval lobster. Projected changes in C. *finmarchicus* abundance and timing may have food availability implications for survival of lobster larvae and recruitment success (Greenan et al. 2019, Pershing et al. 2021, and Carloni et al. 2024).

Ocean acidification has already decreased seawater pH on the Scotian Shelf. Studies suggest that early lobster larval stages are sensitive to environmental conditions, and that early juveniles are most sensitive to ocean acidification, suggesting a reduction in juvenile fitness that may

have implications for fisheries and population recruitment. While ocean acidification will continue, the current phase of localized warming and saltier waters at depth may buffer calcium carbonate saturation state declines, slowing impacts for the adult fisheries resource; nearshore areas with projected salinity decreases may not have the same level of buffering. Nearshore regions are key habitat for early lobster life stages and recruits, and combined warming and acidification will have greater negative impacts. These longer-term decreases in pH, increases in temperature, and variability in food availability will likely affect lobster populations in a multitude of ways; however, the magnitude of these impacts is currently unknown (Cook et al. In prep.[1]).

PROCEDURE FOR INTERIM-YEAR UPDATES

Given a changing ecosystem and a recruitment driven fishery, monitoring of indicators is important. The 2024 commercial biomass index is 47% of the peak in 2016 and 49% of the mean from the three highest estimates from the time series. The mean annual percent decline from the time series high to the terminal year is 4.9%. Indicators should be monitored annually to check for triggers that may flag a need for earlier than scheduled assessment/review of the data inputs.

An earlier than scheduled framework would be triggered if

1. 25% of the distribution of the last years of commercial biomass index (25% of the distribution of 2024 index is 931.9 t) falls below the LRP or
2. a significant loss of survey data, as this would strongly affect model performance.

SOURCES OF UNCERTAINTY

Stock abundance estimates were previously based on fishery performance, specifically commercial catch per unit effort (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. The transition to fishery-independent metrics (survey-based biomass estimates) in the new stock assessment framework can help eliminate this fishery-behavior 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 lobsters between assessment areas introduces another source of uncertainty in the estimation of abundance for LFAs.

Additionally, presumed underreporting of total removals contributes to uncertainty in exploitation estimates, as reported landings may not reflect true lobster catch levels.

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