



STOCK ASSESSMENT OF DIVISIONS 2J+3KL CAPELIN TO 2025

CONTEXT

Fisheries and Oceans Canada (DFO) Fisheries Management has requested Science Advice on the status of the 2J3KL Capelin (*Mallotus villosus*) stock ([Capelin Newfoundland & Labrador \[NL\] Region Divisions 2+3 \[Capelin Fishing Areas 1–11\]](#)). This species was last fully assessed in March 2025 (DFO 2025). This Fisheries Science Advisory Report is from the regional peer review meeting of March 3–5, 2026, for the Stock Assessment of Capelin in Divisions 2J+3KL. 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 2025 Capelin acoustic biomass index was 766 kt (90% CI: 560 – 1,070 kt), and above the Limit Reference Point (LRP, 155 kt) with greater than 95% probability.

Trends

- The 2025 Capelin acoustic biomass index was higher than the post-collapse median (190 kt) and similar to the post-collapse time series highs in 2013–14 and 2024.
- Since 1991, the Capelin acoustic biomass index has remained well below the pre-collapse level (1982–90: median 3,697 kt).
- The larval abundance index was below average in 2025, but the spawning timing index was earlier than average suggesting the 2025 year-class may be stronger than expected.

Ecosystem and Climate Change Considerations

- The warm phase in ocean climate that started around 2020 continues in 2025. Ocean climate controls productivity at the ecosystem level and the current warm phase and recent zooplankton biomass levels are considered favourable for Capelin productivity and condition. However, long-term impacts of increasing temperatures due to climate change on Capelin are unknown.
- The NL ecosystem collapsed during the late 1980s to early 1990s. Current ecosystem biomass levels are around the post-collapse highs of the 2010s. While these increases have been driven by groundfish, Capelin has also improved.
- Despite high uncertainty, evidence from environmental, fish predators' diet, and food web components analyses indicate a generally positive outlook for Capelin in 2026.

Stock Advice

- The Capelin forecast model projects the acoustic biomass index in 2026 to be above the LRP (332 kt, 80% Prediction Interval 147–725 kt). This projection is interpreted as a minimum as the model underestimates the biomass index when age-3+ Capelin compose a high proportion of the biomass, as observed in 2025.
- Given favourable environmental conditions, the food web components analyses, and Capelin biological trends, the stock outlook is positive for 2026.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2019 (DFO 2021)

Assessment Type

Full Assessment: Full peer-reviewed stock assessment.

Most Recent Assessment Date

1. Last Full Assessment: March 4–6, 2025. (DFO 2025)
2. Last Interim-Year Update: March 14–15, 2022. (DFO 2023)

Stock Assessment Approach

1. Broad category: Index-based (fishery-independent indices)
2. Specific category: Other (Capelin forecast model)

The Capelin forecast model (Lewis et al. 2019, Lewis et al. 2025) is used to generate predictions of the Capelin acoustic biomass index for the current year incorporating information on timing of sea ice retreat, Capelin condition, Capelin larval abundance, and Capelin larvae's key prey (zooplankton) abundance.

Ecosystem and Climate Change Assessment Approach

The physical environment was characterized by examining trends in ocean climate using oceanographic indicators and the Newfoundland and Labrador Climate Index (NLCI). Food web components examined included lower trophic levels characterized using primary production and zooplankton indicators; status and trends of the fish community; and seabird and marine mammal information. The characterization of ecological and environmental interactions included the linkage between the NLCI and Capelin per capita productivity strength; fish diets; estimations of food consumption; and modelling of Capelin biomass as a function of predators' diets. Habitat elements included a summary on Significant Benthic Areas and existing fisheries closures. Aggregated fisheries metrics considered included fishing footprint and the risk of ecosystem overfishing. Explored pathways for climate change impacts included the link between ocean climate and ecosystem productivity.

Model Scenarios

In 2026, a forecast model scenario that limited Capelin biomass to ages 1 and 2 was examined to determine why the Capelin forecast model underestimated the acoustic biomass index in 2025. The Capelin forecast model was successful in forecasting the biomass of Capelin

Newfoundland and Labrador Region

younger than age-3 but underestimated the acoustic biomass index when ages 3+ represented a large proportion of the biomass.

Stock Structure Assumption

Since 1992, due to accumulated biological evidence (Nakashima 1992), it was recommended that Capelin in Northwest Atlantic Fisheries Organization (NAFO) Subarea 2 + Division 3K and Division 3L be considered one stock complex (hereafter referred to as 2J+3KL Capelin).

Reference Points

- Limit Reference Point (LRP): 155 kt in the Capelin spring acoustic biomass index. The Capelin LRP is based upon the amount of Capelin required to maintain Northern cod at its LRP in the absence of fishing on Northern cod (DFO 2024).
- Upper Stock Reference (USR): N/A
- Removal Reference (RR): N/A
- Target Reference Point (TRP): N/A

Data

- Spring acoustic Capelin survey (1982–2025; no survey data 1983–84, 1993–95, 1997–98, 2006, 2016, 2020–21).
- Commercial landings and biological samples (1978–2025; no fishery in 1994, 1995, or 2022).
- Fall DFO-NL Research Vessel (RV) bottom trawl survey (1982–2025).
- Bellevue Beach (BB) larval survey (2001–25).
- Capelin spawning diary program (1991–2025).
- Day of year of the most southerly position of contiguous sea ice (sea ice retreat; t_{ice}) (1999–2025).
- DFO-NL Ecosystem Research Program Indicators (1960–2025).
- Atlantic Zone Monitoring Program Indicators (1950–2025).
- NASA Moderate Resolution Imaging Spectroradiometer Aqua Ocean Color observation (2003–25).

ASSESSMENT

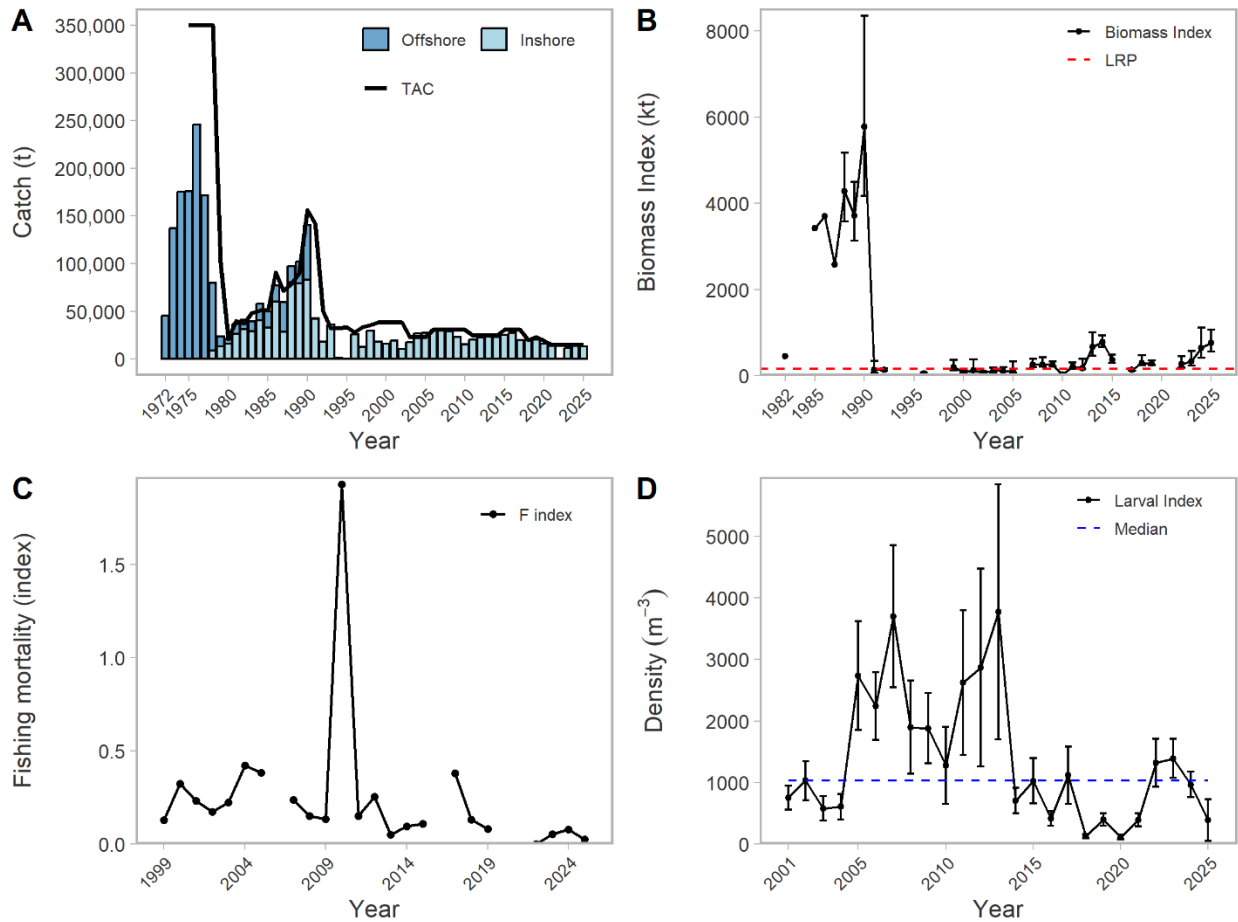


Figure 1. (A) Catch (t) and Total Allowable Catch (TAC, t); (B) Biomass Index (kt) in relation to the Limit Reference Point (155 kt); (C) Maximum Fishing Mortality (F) Index; (D) Recruitment indicator for 2J3KL Capelin based on the Bellevue Beach (BB) Larval Index (individuals [ind.] m⁻³).

Stock Status and Trends

Biomass Index

The Capelin acoustic biomass index in 2025 was 766 kt (90% confidence interval [CI]: 560 – 1,070 kt), similar to recent time series highs in 2013 (668 kt), 2014 (779 kt), and 2024 (647 kt) (Figure 1B). Since the collapse of the stock in 1991, the median annual Capelin acoustic biomass index was 190 kt (1991–2024), well below the pre-collapse (1982–90) median of 3,697 kt.

Age Structure and Maturity

The age structure of the population is truncated in the post-collapse period with a very low proportion of age-4+ fish. In the 2025 spring acoustic survey, the proportions of age-2 and age-3 fish were similar, which is not typical in the post-collapse period where age-2 fish commonly compose the bulk of the abundance. Such a high proportion of age-3 fish was last observed in 2013. The percentage of maturing age-2 female Capelin in the 2025 spring acoustic survey (34%) increased from 2024 (20%) but remains relatively low compared to other years in

Newfoundland and Labrador Region

the post-collapse period; lower proportions of maturing age-2 females are indicative of higher stock biomass.

Recruitment

The BB larval index was $388 \pm$ standard error (SE) 339 ind. m^{-3} in 2025, which was lower than 2024 and the time series median (1075 ind. m^{-3} ; 2001 – 24) (Fig. 1D). This suggests production of a below average 2025 year-class relative to the post-collapse period. However, the earlier than average spawning time observed in 2025 may produce a stronger year class than expected (Murphy et al. 2021).

Fishing Mortality (F) Index

A maximum F index was calculated using the mature fraction of the acoustic biomass index and fishery landings. The F index was generally low (median: 0.15, range 0.02–1.92), suggesting that the exploitation rate of Capelin is low, particularly in the most recent years (2023 – 25: 0.02 – 0.08) (Figure 1C).

Current Status

The 2J+3KL Capelin stock collapsed in 1991 during a cold phase in the Newfoundland and Labrador ecosystem. The 2025 spring acoustic biomass index was above the LRP (>95% probability) and is similar to the post-collapse time series highs in 2013 – 14 and 2024; however, it remains well below pre-collapse levels.

History of Management, Landings, and TAC

The inshore commercial Capelin fishery occurs from June to August each year. Capelin fishery effort and landings can be negatively impacted by market factors. In 2025, the Total Allowable Catch (TAC) for Capelin was 14,533 t and landings in 3KL were 12,935 t (Table 1). There has been no fishery in 3Ps since 2011, and no fishery in 2J for at least 25 years. The science advice developed for 2J+3KL is applied to the 3Ps stock and typically, the quota allocated to 3Ps is transferred to 3KL.

Table 1. Inshore commercial Capelin fishery landings (tonnes) and combined TAC from two Capelin management areas (NAFO Divisions 2J+3KL and 3Ps) since 1980.

Management Year	1980–90 Avg.	1991–2000 Avg.	2001–10 Avg.	2011–20 Avg.	2021	2022	2023	2024	2025
TAC (t)	66,750	46,334	29,734	25,107	14,533	14,533	14,533	14,533	14,533
Landings (t)	46,075	19,984	22,788	21,813	13,945	0	11,392	14,109	12,935

Ecosystem and Climate Change Considerations

The ocean climate in the NL bioregion shows multi-year to decadal scale cold and warm phases and has an important role in controlling ecosystem-level productivity. The warm phase that started around 2020 continued in 2025, and this is associated with generally favourable conditions for Capelin. However, the long-term impacts of continued warming on Capelin and changes in ocean climate related to climate change remain unknown.

Newfoundland and Labrador Region

Recent phytoplankton blooms have been early, which favours recruitment of the copepod *Calanus finmarchicus*, a key food item for many fish, including Capelin. Total zooplankton biomass, including prey taxa relevant to Capelin, have been improving since the lows in the early-mid 2010s. These changes suggest improved foraging conditions for Capelin and have been reflected in Capelin's fall body condition which has been above average since 2017.

Newfoundland and Labrador marine ecosystems collapsed in the late 1980s and early 1990s associated with extreme cold ocean conditions and ecosystem overfishing. Declines in biomass of groundfish and Capelin were not offset by increases in shellfish, with ecosystem biomass remaining below pre-collapse levels. Some rebuilding of ecosystem biomass, also linked to increases in Capelin, was observed between the mid-2000s and early 2010s, after which declines occurred. While these ecosystems continue experiencing overall low productivity compared to the pre-collapse period, likely related to bottom-up processes (e.g., food limitation), improvements have been observed in recent years. The ecosystem biomass has increased from the mid-late 2010s lows and has reached levels around the post-collapse highs in 2025. While these increases have been driven by groundfish, Capelin has also improved.

Capelin's seasonal diets suggest increased intraspecific competition for food offshore. While feeding activity is high, the proportion of fish feeding on lower quality prey and/or few prey items is also high. Potential impacts on stock dynamics are slower juvenile growth and delayed maturation, which is consistent with population dynamics in the pre-collapse period.

Predictions of Capelin biomass from Northern cod and Turbot stomachs, and estimates of Capelin consumption by fish predators, indicate that Capelin has shown improvements from the late 2010s biomass levels.

Despite high uncertainty, the evidence from environmental, fish predators' diet, and food web components analyses indicate a generally positive outlook for Capelin in 2026.

Stock Advice

The Capelin forecast modelling suite is used to predict the 2026 acoustic biomass index. Ten models were examined based on those developed in Lewis et al. (2019) and three formulations introduced in the 2025 assessment (DFO 2025). The model selected from this suite in the current assessment includes timing of sea ice retreat, an index of Capelin larval abundance, a zooplankton index, and Capelin condition from the fall RV survey.

As timing of sea ice retreat for the current year is not known at the time of the assessment, prediction scenarios were run with weekly sea ice timing covering the period from March 4 to April 1, 2026 (Table 2). Fall Capelin condition and zooplankton densities were above average, and the larval abundance index was below average.

It is unknown if the proportion of age 3+ Capelin in the 2026 acoustic biomass index will be similar to 2025, and this has an important impact on the projections of the forecast model. The forecast model was designed to project biomass under the assumption that the age-3+ biomass is not the dominant fraction in the acoustic biomass index. Years with high proportions of age-3+ fish tend to be underestimated by the forecast model (i.e., 2013 and 2025; Figures 2 and 3); therefore, the projection in 2026 is considered to be an indicator of the minimum acoustic biomass index. The upper boundary of the projection is highly uncertain. The stock is expected to remain above the LRP in 2026 (Figure 2), even if the proportion of age-3+ fish is more typical of the post-collapse period (Figure 3).

Newfoundland and Labrador Region

Given positive environmental conditions, the food web components analyses, and Capelin biological trends, like earlier spawning timing and favourable age structure, the stock outlook is positive for 2026.

Table 2. Forecast model median biomass index and prediction intervals for different dates of maximal sea ice retreat in 2026.

Date	Median Biomass (kt)	Prediction Interval (kt)	
		10th percentile	90th percentile
3/4/2026	332	147	725
3/11/2026	367	161	812
3/18/2026	352	157	803
3/25/2026	300	134	664
4/1/2026	241	105	572
Median	332	147	725

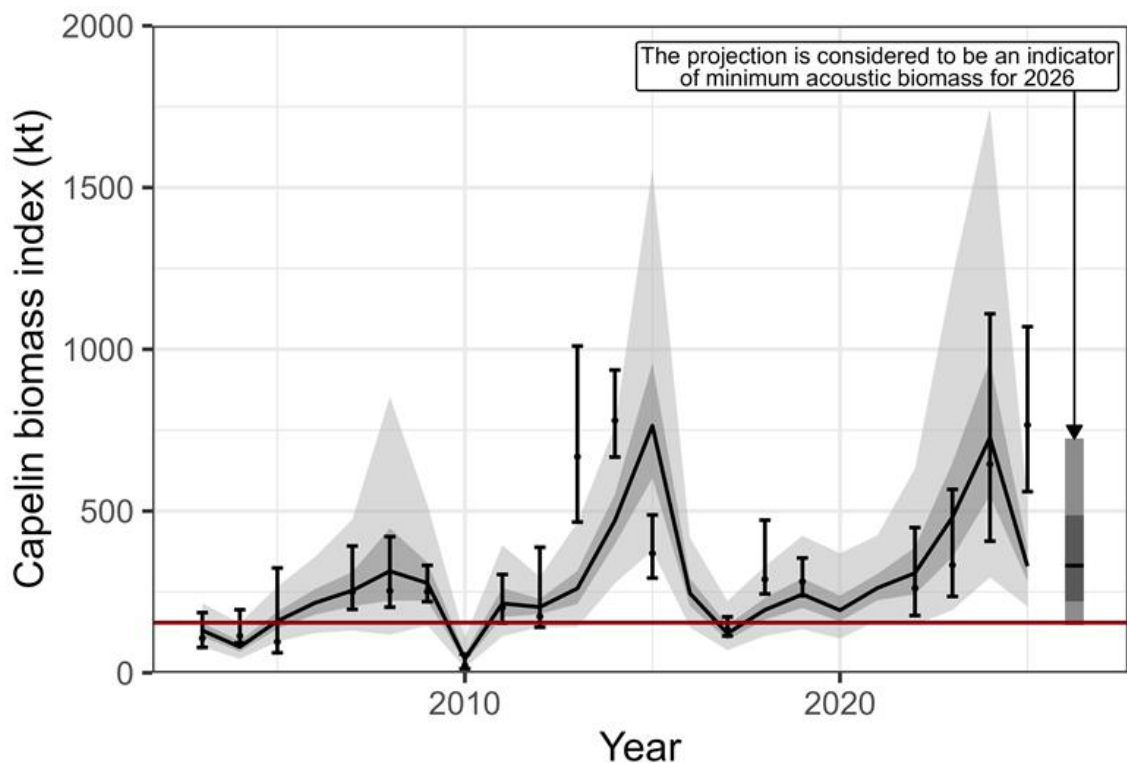


Figure 2. Forecast model credible intervals (2.5th to 97.5th percentiles) from 2003–25, and prediction intervals (10th to 90th percentiles) from 2026 using a March 4 timing of the sea ice retreat for the 2026 prediction. Solid lines show the median of the credible or prediction intervals. Observed biomass index values (black circles) with 90% confidence intervals (black lines with whiskers) and the LRP (red horizontal line) are also shown.

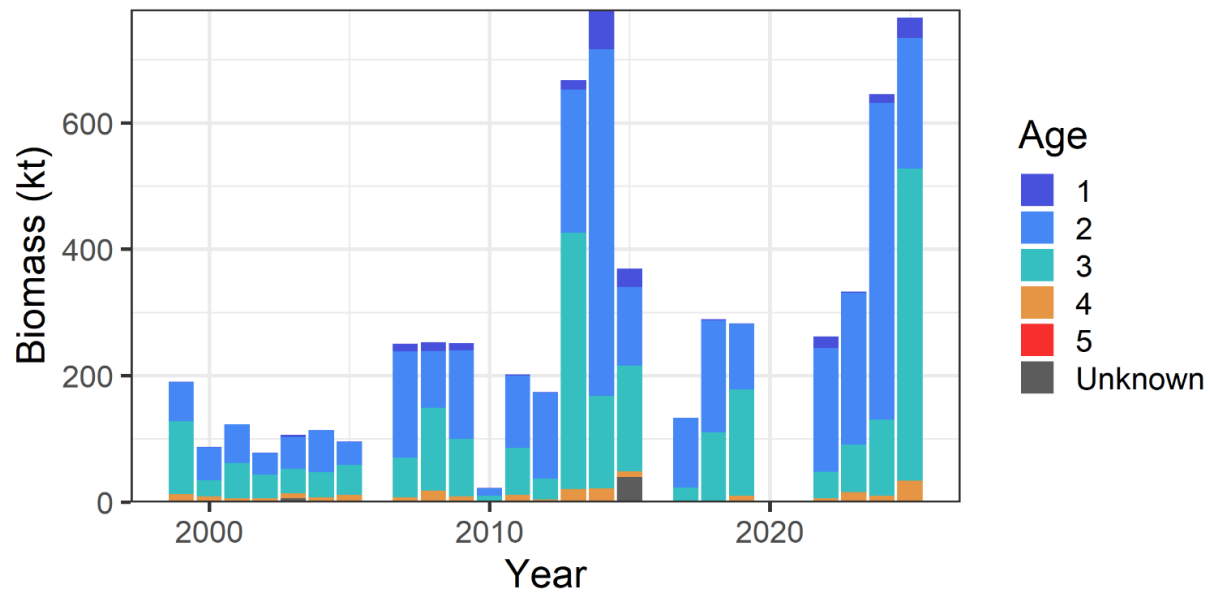


Figure 3. Capelin spring acoustic age disaggregated biomass index from 1985–2025.

SOURCES OF UNCERTAINTY

While the acoustic survey only covers a portion of the stock area (Division 3L and southern 3K), the index from this survey is considered representative of overall stock trends and status.

While the forecast model has an acceptable fit, it underestimates the acoustic biomass index when it is dominated by age-3+ fish (i.e., 2013 and 2025). This implies that the forecast model can provide a minimum for the Capelin acoustic biomass index but underestimates the magnitude of the index when the proportion of age-3+ fish is high.

Fishes are the main consumers of Capelin although the estimates are variable and highly dependent on how well these species represent overall predation. Consumption of Capelin by marine mammals and seabirds remains an important source of uncertainty.

The maximum F index suggests that the exploitation rate is low, but the impact of fishing on the Capelin stock is generally poorly understood because this fishery targets pre-spawning fish.

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Newfoundland and Labrador Region

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