



2025 STOCK ASSESSMENT OF NORTHERN SHRIMP (*PANDALUS BOREALIS*) ON THE EASTERN SCOTIAN SHELF (SFAS 13–15)

CONTEXT

Advice on the status of the Eastern Scotian Shelf (ESS) Northern Shrimp (*Pandalus borealis*) stock is requested annually by Fisheries and Oceans Canada (DFO), Resource Management, to help determine a total allowable catch (TAC) that is consistent with the fishery's Integrated Fisheries Management Plan ([DFO 2013](#)). This is the first full stock assessment since a new science stock assessment framework was adopted (see: McDonald et al. 2025).

This Fisheries Science Advisory Report is from the regional peer review of December 16–17, 2025, on the Stock Assessment of Northern Shrimp on the Eastern Scotian Shelf. 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

- In 2025, the model-estimated spawning stock biomass (SSB) of 13,365 metric tonnes (mt) was above the limit reference point (LRP) and below the upper stock reference (USR), placing the stock in the cautious zone according to the DFO Precautionary Approach for fishery decision-making.

Trends

- In 2025, the model-estimated SSB increased by 11.3% compared to 2024, exhibiting the second annual increase in a row, following large annual decreases from 2021 to 2023. SSB remains in the cautious zone for the fourth consecutive year.
- In 2025, the model-estimated total biomass increased by 18.9% compared to 2024, exhibiting the second annual increase in a row, following large annual decreases from 2021 to 2023.
- In 2025, the TAC increased to 700 mt from 500 mt in 2024, with 2025 exhibiting the second lowest exploitation rates on the total population and on the female population since 2005, which marks the first year of data available for the model fit.
- In 2025, the model-estimated recruitment decreased by 47.7% compared to 2024, with 2024 exhibiting the highest value on record. The model-estimated recruitment remains above the long-term average from 2005 to 2025.
- In 2025, the model-estimated natural mortality slightly increased compared to 2024. The model-estimated natural mortality remains below the long-term average from 2005 to 2025 and well below the highest values on record from 2021 to 2023.

Maritimes Region

- A large recruitment of Northern Shrimp in 2024 resulted in the highest number of shrimp of less than 15 mm carapace length (CL) that has been observed since 2014. These shrimp would be expected to recruit to the SSB in 2028 should environmental conditions be favourable. No large increases in recruitment to the SSB are expected until 2028, due to poor recruitment in 2022 and 2023, although the total biomass is expected to increase before 2028.

Ecosystem and Climate Change Considerations

- In 2025, bottom temperatures observed during the DFO-Industry Northern Shrimp trawl survey increased compared to slightly lower temperatures observed from 2023 to 2024, although bottom temperatures remain high compared to the time series (1995–2025). Northern shrimp are considered to be a cold-water species, so warm bottom temperatures are believed to have a negative impact on the ESS Northern Shrimp stock.
- In 2025, spring sea surface temperatures (SST) obtained from satellite data decreased compared to previous years, potentially indicating more favorable conditions for early recruits, although SST still remain high compared to the time series (1995–2025).
- In 2025, the Predation indicator, which is an indicator of groundfish and finfish abundance in the Shrimp Fishing Areas, increased compared to 2024. This indicator is at its highest level in the time series (1995–2025). In contrast, the Cod, Turbot, and American Plaice Predation indicator, which is an indicator of abundance for these three species specifically within areas of higher shrimp densities in the Shrimp Fishing Areas, only slightly increased in 2025 compared to 2024. This indicator is near its historical low in the time series (1995–2025).

Stock Advice

- A range of catch scenarios up to 900 mt were included in decision tables for the 2026 fishing season. All scenarios exhibited probabilities greater than 99% that the SSB will remain above the LRP and probabilities of less than 1% that the SSB will increase above the USR.
- All catch scenarios were projected to result in small SSB decreases, which ranged from -0.02% to -3.53%. Some scenarios were associated with projected increases in total biomass. Biomass changes ranged from an increase of 2.1% to a decrease of -1.5%. The projected changes may underestimate biomass and SSB, as the main trawl growth rate in 2026 is expected to be above average due to the abundance of small shrimp.
- In 2025, 11 Traffic Light Analysis (TLA) indicators performed better and 10 TLA indicators performed worse compared to 2024 of the 21 TLA indicators examined in this stock assessment (the three commercial CPUE indicators were replaced by the Joint CPUE indicator). In 2025, there were clear improvements in the Productivity Characteristic, mixed signals in the Abundance Characteristic and Ecosystem Characteristic, and minimal change in the Fishing Effects Characteristic. Based on the TLA, 8 of the indicators were in the green zone, 7 were in the yellow zone, and 6 were in the red zone in 2025.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

2025 (McDonald et al. 2025).

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2021 (DFO 2022).
2. Last Interim-Year Update: 2024 (DFO 2025).

Stock Assessment Approach

1. Broad category: Multiple approaches.
2. Specific category: State Space; Delay Difference; Indicator-based (both fishery-dependent and -independent); Biomass Dynamics.

The ESS Northern Shrimp stock is assessed using a single stock assessment model and a TLA. The stock assessment model, known as the Spatially Explicit Assessment Model (SEAM), is a spatio-temporal state-space delay-difference model that provides information used to inform stock status. The TLA has 23 indicators that supplement the modeled outputs and are also used to inform stock status (five of the indicators are estimated from the model). The model and TLA are described in McDonald et al. (2025).

Ecosystem and Climate Change Assessment Approach

Applicable TLA indicators examined in the assessment included survey bottom temperatures, spring SST, overall predation, and abundance of predators Cod, Turbot, and American Plaice (McDonald et al. 2025).

Stock Structure Assumption

The ESS Northern Shrimp stock in Shrimp Fishing Areas (SFAs) 13–15 is a management-based stock unit and does not represent a biological unit. The survey focuses on core shrimp habitat and is closer to a biological unit.

Reference Points

- Limit reference point (LRP): 20% of the model-estimated maximum SSB from 2005 to 2025 (historical proxy for B_0).
- Upper stock reference (USR): 50% of the model-estimated maximum SSB from 2005 to 2025 (historical proxy for B_0).
- Removal reference (RR): Not Applicable.
- Target reference point (TRP): Not Applicable.

Data

- DFO-Industry Cooperative Trawl Survey (main trawl, 1995–2025).
- DFO-Industry Cooperative Trawl Survey (belly-bag, 2005–2025).
- Commercial Logbook Data (1995–2025).
- DFO Maritimes Summer Ecosystem Research Vessel Survey (1995–2025).
- Snow Crab Survey (2005–2025).

Maritimes Region

- Commercial Port Sampling (1995–2025).
- Sea Surface Temperatures from GHRSSST NOAA/STAR ACSPO v.2.80 0.02 degree L3S Dataset from Afternoon LEO Satellites (GDS v2) (1995–2025).

Data changes: Changes in the years utilized are due to methodological changes from the new science framework, as well as changes to some indicators (see: McDonald et al., 2025).

ASSESSMENT

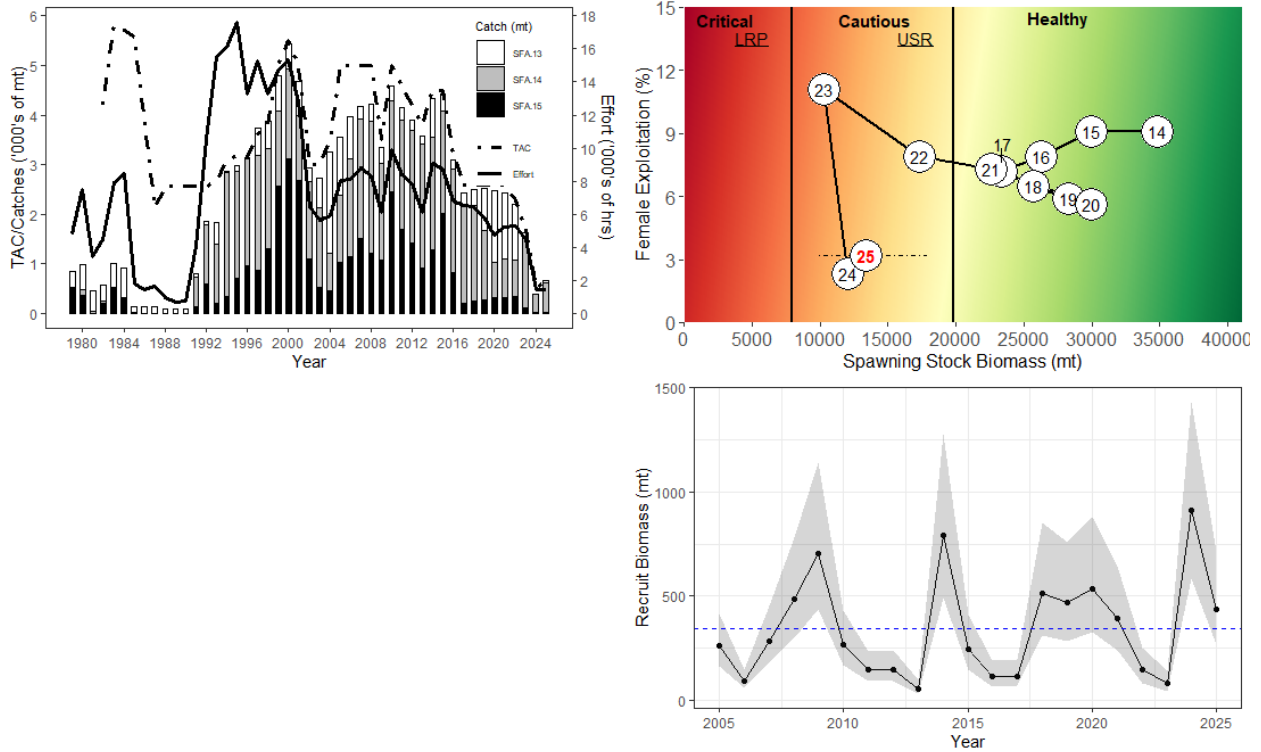


Figure 1. Top left panel: Time series of Eastern Scotian Shelf Northern Shrimp catches by Shrimp Fishing Area (SFA) 13–15, total allowable catch (TAC) (thousands of metric tonnes, mt), and effort (thousands of hours) from 1979–2025. Catches and effort for 2025 are based on data available as of November 18, 2025, with the TAC increasing in 2025 compared to 2024, with effort in 2025 being similar to 2024. Top right panel: Model-estimated spawning stock biomass (SSB) versus female exploitation rate from 2014 to 2025, with dashed lines representing the 2025 confidence interval for SSB and the coloured gradient representing the healthy zone (green), which is separated by the upper stock reference (USR) from the cautious zone (yellow), which is separated by the limit reference point (LRP) from the critical zone (red). Bottom left panel: A plot of female exploitation rate is omitted from this panel given this data is shown in the top right panel. Bottom right panel: Model-estimated Recruit Biomass (in mt) from 2005 to 2025, with the blue dashed line representing the long-term average and grey bands representing the 95% confidence intervals.

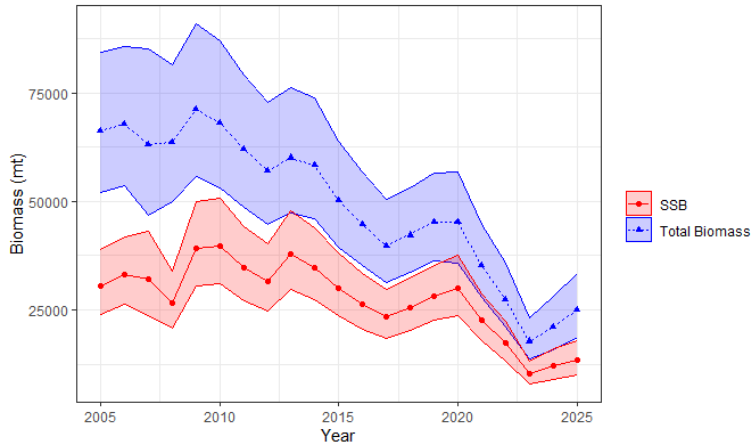


Figure 2. Model-estimated spawning stock biomass (SSB) and total biomass in metric tonnes (mt) from Shrimp Fishing Areas (SFA) 13–15 combined from 2005 to 2025, with the bands representing the 95% confidence interval.

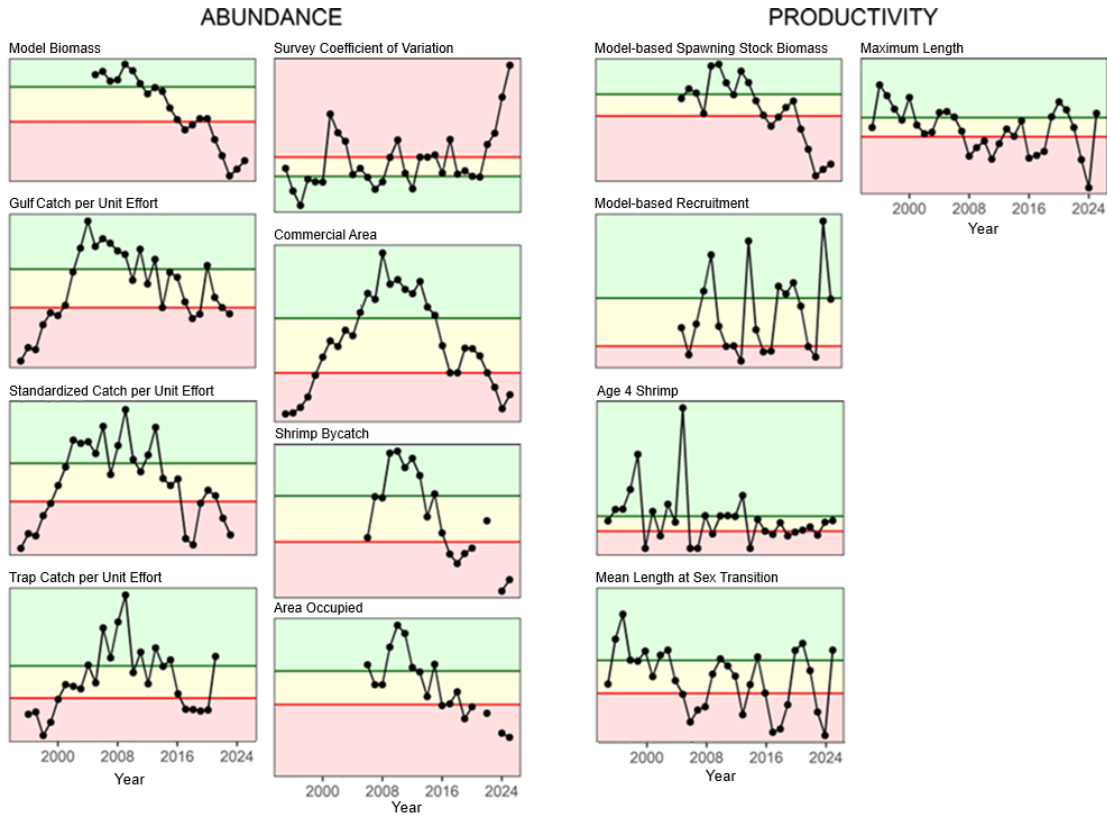


Figure 3. Time series of individual Traffic Light Analysis (TLA) indicators for the Abundance and Productivity Characteristics. Due to privacy considerations associated with a limited number of active licences, the three commercial catch per unit effort (CPUE) indicators (i.e., Gulf CPUE, Std CPUE, Trap CPUE) have not been updated for several years, with an alternative commercial CPUE indicator is provided in Figure 4. Refer to McDonald et al. (2025) for a description of each indicator.

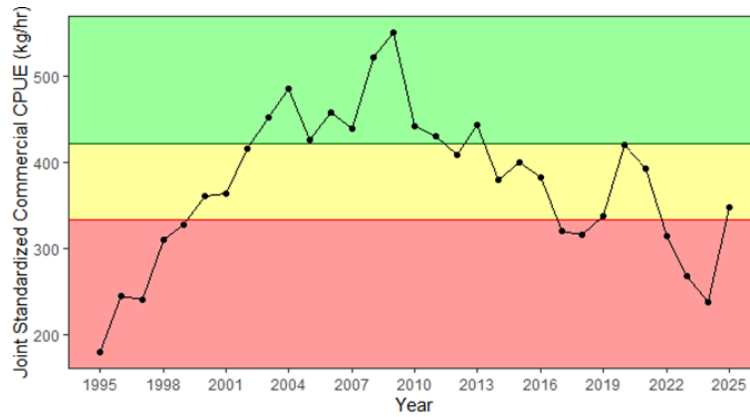


Figure 4. Joint (i.e., Gulf and Nova Scotia fleets) Standardized Commercial catch per unit effort (CPUE) indicator associated with the Abundance characteristic. Refer to McDonald et al. (2025) for a description of the indicator.

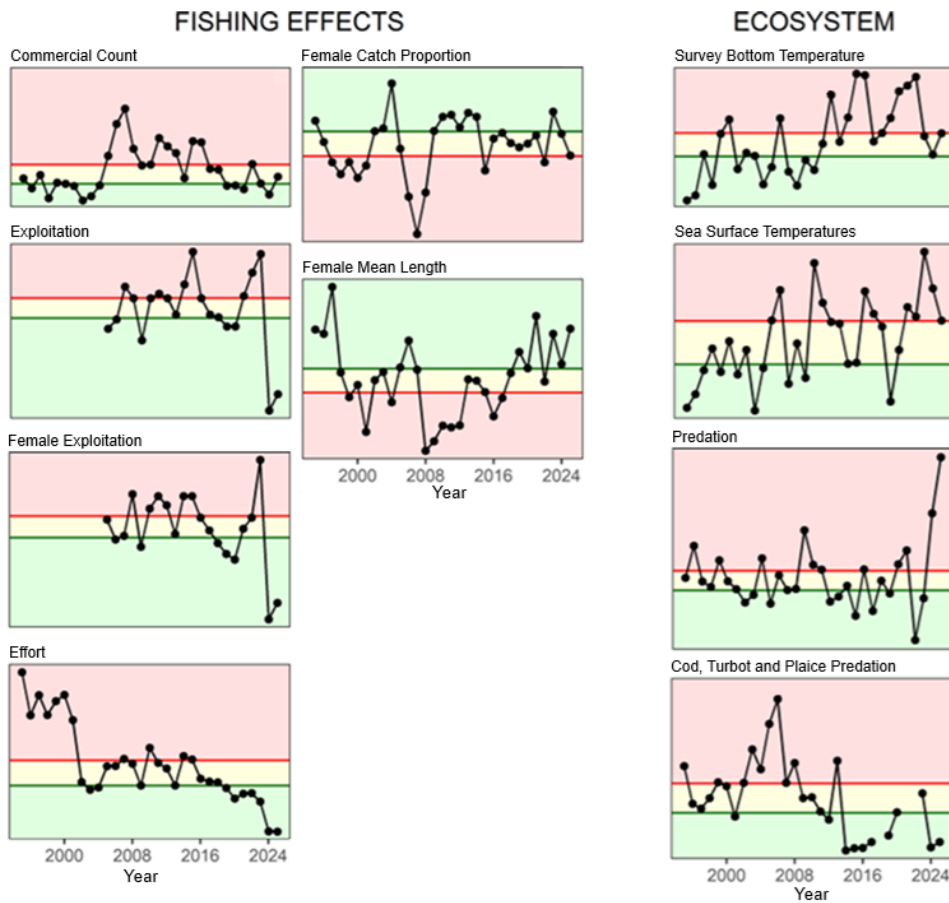


Figure 5. Time series of individual Traffic Light Analysis (TLA) indicators for the Fishing Effects and Ecosystem Characteristics. Refer to McDonald et al. (2025) for a description of each indicator.

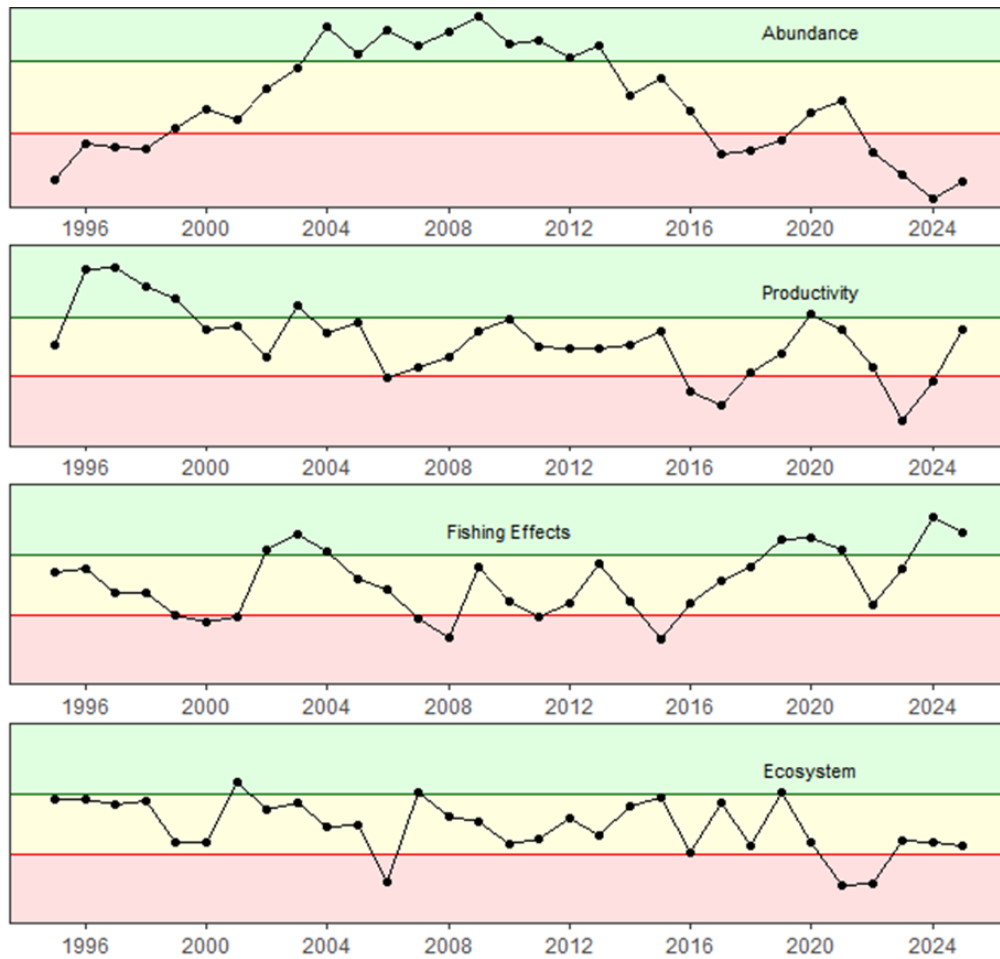


Figure 6. Time series of the Traffic Light Analysis (TLA) Mean Indicators for the Abundance, Productivity, Fishing Effects, and Ecosystem Characteristics from 1995 to 2025. These Mean Indicators provide a summary and trend by combining all individual indicators available in each characteristic (Abundance, Productivity, Fishing Effects, and Ecosystem Characteristics). Thresholds between red, yellow, and green are at the 33rd and 66th percentile of the 1995 to 2024 data series for each indicator. Refer to McDonald et al. (2025) for a description of the Mean Indicators.

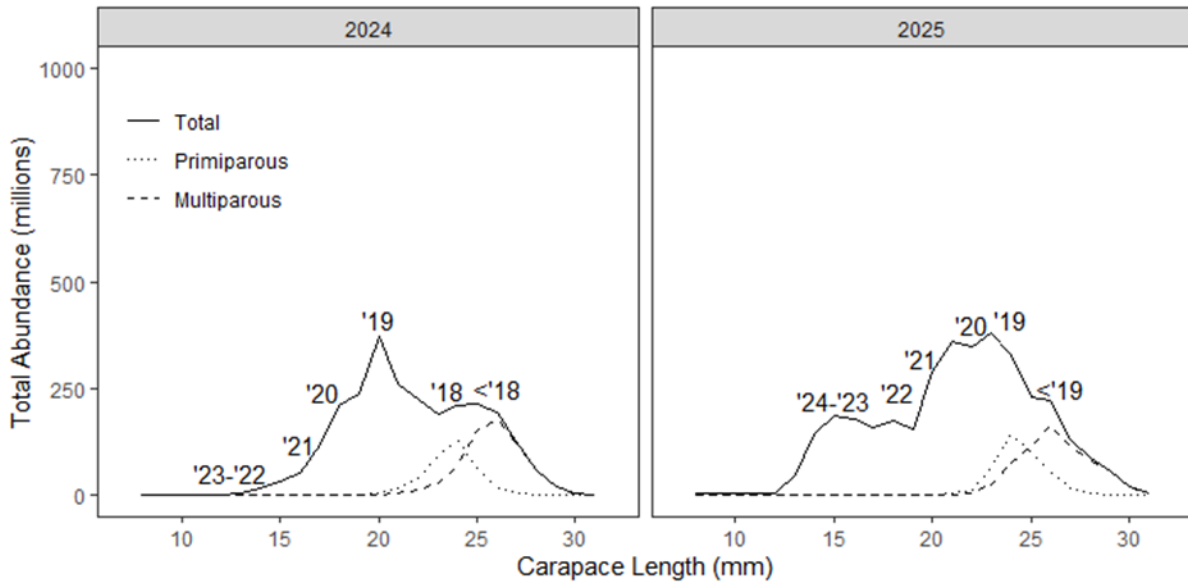


Figure 7. Population estimates of number of shrimp-at-length reported as total abundance scaled to millions from the 2024 and 2025 DFO-Industry Northern Shrimp trawl survey (solid line). The dotted line in each figure represents transitional and primiparous Eastern Scotian Shelf (ESS) Northern Shrimp and the dashed line represents multiparous ESS Northern Shrimp. Year-classes associated with ESS Northern Shrimp at given carapace lengths are indicated.

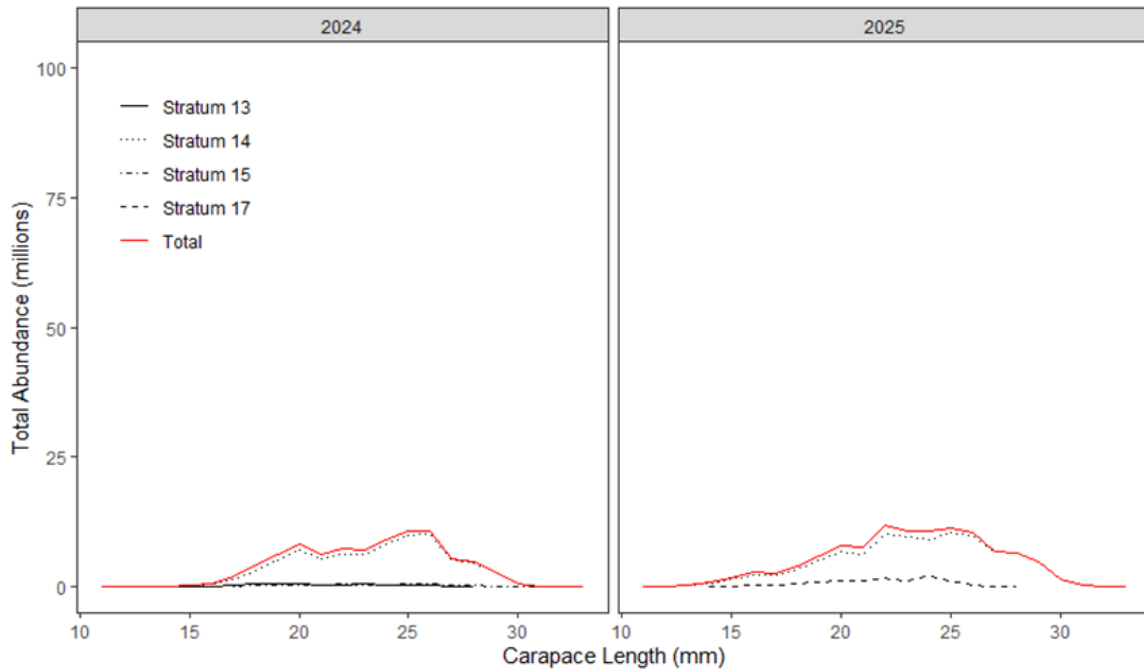


Figure 8. Catch-at-length from commercial sampling reported as total abundance scaled to millions by Stratum for 2024 and 2025. Twenty samples were collected in 2024 and in 2025.

Stock Status and Trends

The model-estimated SSB of 13,365 mt is above the limit reference point (LRP) and below the upper stock reference (USR), placing the stock in the cautious zone according to the DFO Precautionary Approach for fishery decision-making. SSB remains in the cautious zone for the fourth consecutive year. In 2025, the model-estimated SSB increased by 11.3% compared to 2024, exhibiting the second annual increase in a row, following large annual decreases from 2021 to 2023. (Figures 1 and 2). In 2025, model-estimated total biomass from survey data increased by 18.9% compared to 2024, exhibiting the second annual increase in a row following large annual decreases from 2021 to 2023 (Figure 2). Figures 3 through 5 illustrate trends in the TLA indicators used in the ESS Northern Shrimp assessment. Refer to McDonald et al. (2025) for a description of the TLA indicators.

In 2025, the Abundance Characteristic indicators demonstrated minor improvement compared to 2024 although it remained in the red zone; the indicators were similar to 2023 (Figures 3 and 6). This determination is based on slight improvements in the Model Biomass, Commercial Area, and Shrimp Bycatch indicators in 2025, which offset decreased performance in the Area Occupied and Survey Coefficient of Variation (CV) indicators (Figure 3). The Joint Standardized Commercial CPUE indicator, though not included in the Mean Indicator for the Abundance characteristic, also demonstrated improvement in 2025 compared to 2024, suggesting that the population may have stabilized (Figure 4). Shrimp length frequencies also suggest the continued survival of the 2024 age-class, which exhibits the first recruitment signal since 2020, with the population structure demonstrating a shift towards lower sizes (Figure 7). In 2025, the number of shrimp expected to transition (i.e., approximately 4 years old) is similar to the number in 2024 (Figure 7).

In 2025, the Productivity Characteristic improved for the second consecutive year placing it in the yellow zone, with its Mean Indicator remaining at similar levels to those observed in the early-2010s (Figures 3 and 6). This determination is based on improvements in the SSB and Age 4 indicators in 2025, as well as improvements in the Mean Length at Sexual Transition and Maximum Length indicators; the last two indicators likely reflect colder waters over the past three years (2023–25) that improved shrimp growth conditions, resulting in slower growing and bigger shrimp. The modeled recruitment indicator in 2025 was not as high as its peak observed in 2024; it remained above the long-term average (Figures 1 and 3). Overall, recruitment appears promising in terms of future population growth that may support potential for continued recovery of the stock. In 2025, the presence of large numbers of shrimp approximately 15 mm CL and less in the length frequencies, which is around the expected size of Age 2 shrimp, further supports an improved outlook in terms of stock productivity (Figures 7 and 8).

Status and trends in the Fishing Effects Characteristic and Ecosystem Characteristic indicators are discussed in the following sections.

History of Landings, Harvest, Effort, and Other Fishing Indicators

The 2025 fishing season exhibited the lowest fishing effort since introduction of the Nordmøre grate in 1991, although it exhibited a substantial increase in commercial CPUE compared to 2024 (Figures 1 and 4). The low effort and increased CPUE coincided with the second lowest TAC (i.e., 700 mt) set for the fishery since 1991. The 2025 TAC resulted in only eight active licences (all fleets combined), which prevented inclusion of the fleet-specific commercial CPUE indicators in the TLA for this assessment, resulting in inclusion of the Joint Standardized Commercial CPUE indicator instead (Figure 4). In 2025, port sampling yielded 20 samples due

to the low fishing effort compared to the 50 sample target that has been set for the fishery. In 2024, only 20 samples were collected as well.

In 2025, the Fishing Effects Characteristic remained in the green zone (Figure 6). This determination is based on low exploitation rates and effort levels resulting from the historically low TACs set in 2024 and 2025 (Figures 1 and 5). The total exploitation rate in 2025 was 2.6% (average between 2005 and 2023 was 6.6%) and the female exploitation rate in 2025 was 3.2% (average between 2005 and 2023 was 7.8%). Although the female mean length in commercial catches reflects an improved outlook for ESS Northern Shrimp in 2025, as highlighted in the Productivity Characteristic discussed above, a larger proportion of small shrimp in the catch may warrant caution, in order to protect the 2024 year class that is essential to the stock's recovery (Figure 8).

Commercial length frequencies exhibited low abundance in 2024 and 2025 due to the 20 port samples being collected in these years versus the target of 50 samples (Figure 8). Despite the lower number of samples, the commercial length frequencies are still believed to be representative of the fishery for those two years, although this will require further formal validation in the future. In 2025, the distribution of commercial length frequencies remained similar to those observed in the past, exhibiting a larger proportion of large females in commercial landings than were observed in the survey, with a slight increase in the smallest-sized shrimp also being observed.

Ecosystem and Climate Change Considerations

In 2025, the Ecosystem Characteristic slightly worsened for the second consecutive year, but remained in the yellow zone (Figures 5 and 6). This determination is based on conflicting indicators, with improvement in spring SST and slight negative trends for both survey Bottom Temperatures and levels of Cod, Turbot, and American Plaice, as well as a negative trend for overall Predation (Figure 5). Although the environmental conditions appeared to allow for shrimp recruitment and survival into age 2, a continuation of environmental conditions that are conducive to shrimp growth are likely needed to ensure further recruitment and survival moving forward. Long-term environmental conditions (e.g., water temperatures) on the Eastern Scotian Shelf are unlikely to be conducive to shrimp productivity given recent trends and climatic projections.

Projections

Two decision tables are provided, with both providing one-year projections on the impacts of various catch levels in 2026 on total biomass (Table 1) and spawning stock biomass (Table 2). Table 1 is interpreted as follows assuming the same TAC as 2025 as an example; in 2026, a catch of 700 mt would correspond to an exploitation of 2.8%, which is projected to result in a 0.7% decrease in total biomass and a probability of stock decline (a measure of uncertainty) of 51.9%. Given the use of a mean growth approach, the decision table likely underestimates the potential for an increase in total biomass due to the abundance of small shrimp observed in 2025, as these small shrimp are expected to result in above-average growth rates in the coming year. A range of different catch scenarios has been provided for comparison purposes. The historical exploitation rates between 2005 and 2023 were all between 5.5% and 8.6%, with an average of 6.6%.

Table 1. Decision table for total biomass using the 2025 modeled output to predict total biomass of Eastern Scotian Shelf Northern Shrimp in 2026. Projections assume long-term mean growth and account for uncertainty in total biomass, total recruit biomass, and natural mortality. The greyed row aligns with the example of table interpretation discussed in the text above.

Catch (mt)	Exploitation (%)	Biomass Change (%)	Probability of Decline (%)
0	0.0	2.1	45.0
100	0.4	1.7	46.2
200	0.8	1.3	46.6
300	1.2	0.9	47.5
400	1.6	0.5	48.9
450	1.8	0.3	49.3
500	2.0	0.1	49.9
550	2.2	-0.1	50.2
600	2.4	-0.3	50.7
650	2.6	-0.5	51.4
700	2.8	-0.7	51.9
750	3.0	-0.9	52.4
800	3.2	-1.1	52.9
850	3.4	-1.3	53.4
900	3.6	-1.5	53.8

Table 2 is interpreted as follows assuming the same TAC as 2025 as an example; in 2026, a catch of 700 mt (inclusive of all sizes and not specific to the SSB) would correspond to a female exploitation of 3.7%, which is projected to result in a 2.75% decrease in the SSB and probability of SSB decline of 56.6%, probability of SSB remaining above the LRP being greater than 99%, and probability of SSB increasing above the USR of less than 1%. This decision table likely underestimates the potential for an increase in SSB due to the abundance of small shrimp observed in 2025, given that SSB is calculated as a proportion of the biomass. A range of different catch scenarios has been provided for comparison purposes. The historical female exploitation rates between 2005 and 2023 were all between 5.6% and 11.1%, with an average of 7.8%.

Table 2. Decision table for spawning stock biomass (SSB) using the 2025 modeled output to predict the percentage of biomass that is SSB and mean proportion of females in the commercial catch to predict the SSB of Eastern Scotian Shelf Northern Shrimp in 2026. Projections assume long-term mean growth and account for uncertainty in total biomass, total recruit biomass, and natural mortality. LRP represents limit reference point; USR represents upper stock reference; > represents greater than; < represents less than. The greyed row aligns with the example table interpretation discussed in the text above.

Catch (mt)	Female Exploitation (%)	SSB Change (%)	Probability of Decline (%)	Probability of being above LRP (%)	Probability of being above USR (%)
0	0.0	-0.02	50.1	>99	<1
100	0.5	-0.41	51.1	>99	<1
200	1.0	-0.80	52.3	>99	<1
300	1.5	-1.19	53.2	>99	<1
400	2.1	-1.58	54.0	>99	<1
450	2.3	-1.77	54.4	>99	<1
500	2.6	-1.97	54.9	>99	<1
550	2.9	-2.17	55.4	>99	<1
600	3.1	-2.36	55.7	>99	<1
650	3.4	-2.56	56.2	>99	<1

Catch (mt)	Female Exploitation (%)	SSB Change (%)	Probability of Decline (%)	Probability of being above LRP (%)	Probability of being above USR (%)
0	0.0	-0.02	50.1	>99	<1
100	0.5	-0.41	51.1	>99	<1
200	1.0	-0.80	52.3	>99	<1
300	1.5	-1.19	53.2	>99	<1
700	3.7	-2.75	56.6	>99	<1
750	3.9	-2.94	57.1	>99	<1
800	4.2	-3.14	57.8	>99	<1
850	4.5	-3.34	58.2	>99	<1
900	4.7	-3.53	58.6	>99	<1

SOURCES OF UNCERTAINTY

The 2025 Survey CV indicator represents the highest recorded value over the time series (1995–2025) (Figure 4). This represents a proportionally-greater uncertainty in total biomass and SSB compared to past years.

The 2025 TAC led to very low fishing effort, which resulted in a lower number of port samples. Although this lower number would increase the size of confidence intervals if statistical analyses were performed, it is plausible to believe they are still representative of the active fishery, and the consequence of the low fishing effort in 2025.

Due to the limited number of active licenses, the Commercial Area indicator is more uncertain and harder to interpret than usual. This is due to mobile license holders being less likely to explore more grounds for economic and efficiency reasons and preferring to fish areas with known CPUE, therefore making the indicator obtained from this data potentially less representative of the stock status than in years with higher fishing effort. The 2025 TAC, and associated very low fishing effort, has resulted in the replacement of three commercial CPUE indicators with the Joint Standardized Commercial CPUE indicator, which has resulted in only 21 of the 23 TLA indicators being used in the stock assessment.

LIST OF MEETING PARTICIPANTS

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Thériault, Stéphane	Association des Crevettiers Acadiens du Golfe

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