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### **Eastern Scotian Shelf Northern Shrimp 2025 Assessment**

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## Foreword

This series documents the scientific basis for the evaluation of aquatic resources and ecosystems in Canada. As such, it addresses the issues of the day in the time frames required and the documents it contains are not intended as definitive statements on the subjects addressed but rather as progress reports on ongoing investigations.

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## ACRONYMS

AZMP – Atlantic Zone Monitoring Program  
CL – Carapace Length  
CPUE – Catch per Unit Effort  
CV – Coefficient of Variation  
DFO – Fisheries and Oceans Canada  
ESS – Eastern Scotian Shelf  
IFMP – Integrated Fisheries Management Plan  
ITQ – Individual Transferable Quotas  
LRP – Limit Reference Point  
LRR – Limit Removal Reference  
LW – Length-Weight  
NAFO – Northwest Atlantic Fisheries Organization  
NOAA – National Oceanic and Atmospheric Administration  
PA – Precautionary Approach  
QA/QC – Quality-Assured and Quality-Controlled  
RR – Removal Reference  
RV – Research Vessel  
SEAM – Spatially Explicit Assessment Model  
SSB – Spawning Stock Biomass  
SFA – Shrimp Fishing Area  
SST – Sea Surface Temperatures  
TAC – Total Allowable Catch  
TLA – Traffic Light Analysis  
U.S. – United States  
USR – Upper Stock Reference Point  
VMS – Vessel Monitoring System  
VRN – Vessel Registration Number

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## ABSTRACT

The Eastern Scotian Shelf (ESS) Northern Shrimp fishery has been ongoing since the early-1980s, although its contemporary history began in 1991 with introduction of the Nordmøre grate that reduced bycatch and enabled the fishery to expand. Northern Shrimp on the ESS are located in Shrimp Fishing Areas (SFA) 13 to 15, which are near the southernmost extreme of the species' spatial distribution. The ESS Northern Shrimp stock assessment is based on a spatial delay-difference model that is fit to data from the joint DFO-Industry Shrimp survey (the survey runs annually in June) and a Traffic Light Analysis (TLA) that presents a holistic view of the different pressures on the stock and its status. The model supports the Precautionary Approach (PA) by presenting decision tables used to support management decision-making guided by a new limit reference point (LRP) that was adopted at a new framework developed for the fishery. The TLA presents indicators on four characteristics of the stock: Abundance, Productivity, Fishing Effects, and Ecosystem; the model informs the TLA by providing various indicators in the Abundance and Productivity characteristics. Based on the 2025 review of the TLA, and changes in indicators since the previous year, the Abundance characteristic improved through positive trends in three out of five indicators, with only the Survey Coefficient of Variation (CV) and the Area Occupied indicators trending negatively. The Productivity characteristic also noticeably improved, with positive trends observed in all indicators except for model recruitment, which decreased but remains relatively high. The Fishing Effects characteristic remained similar to 2024, suggesting that fishing activity is unlikely impacting the population in a strong way. Last, the Ecosystem characteristic remained relatively unchanged, with mixed signals coming from different indicators. For 2025, the model-estimated spawning stock biomass (SSB) places the ESS Northern Shrimp stock firmly in the cautious zone, representing a second consecutive increase in SSB since a low estimated in 2023. Model-based decision tables forecast a stable population biomass in 2026, albeit with a slight decrease in SSB. This is largely due to a large 2024 year class that is expected to continue to grow the stock's biomass, but with poor recruitment between 2022 and 2023 that means fewer males are expected to transition and contribute to the SSB before 2028.

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## INTRODUCTION

Biology of Northern Shrimp (*Pandalus borealis*) is described in Shumway et al. (1985) with specific conditions and biology of the Eastern Scotian Shelf (ESS) Northern Shrimp stock described in Koeller (1996, 2000, 2006). ESS Northern Shrimp are at the southern end of the species' range and, by inference, close to the limits of the species' ecological and physiological preferences (Koeller, 1996). The original rationale for the ESS Northern Shrimp stock assessment and management approach is described in Koeller et al. (2000). Although there has been shrimp fishing on the Scotian Shelf since the 1960s, the fishery began to expand towards its full potential when groundfish bycatch restrictions were overcome with introduction of the Nordmøre grate in 1991 (Figure 1; Table 1).

The ESS Northern Shrimp total allowable catch (TAC) was first reached in 1994 when individual Shrimp Fishing Area (SFA) quotas were combined into one overall TAC. From 1994 to 2018, the TAC fluctuated between 2,600 and 5,500 metric tonnes (mt), declined to a low of 500 mt in 2024, and has since increased slightly to 700 mt in 2025. The TAC has been reduced through time to maintain low exploitation rates when biomass indices (using the approaches before the implementation of a stock assessment model; see: Hardie et al. 2018) and/or catch rates were decreasing, or expected to decrease, based on cohort tracking and environmental conditions.

The ESS Northern Shrimp fishery operates in SFAs 13 to 15 under an “evergreen” [Integrated Fisheries Management Plan \(IFMP\)](#) (Figure 2). The fishery consists of 28 DFO Maritimes Region-based licences and 14 DFO Gulf Region-based licences. All mobile licences have been under Individual Transferable Quotas (ITQs) since 1998. A competitive trap fishery that consists of 14 licences is largely restricted to Chedabucto Bay, Nova Scotia. Licence information for the recent period covered under sharing agreements between the Scotia and Gulf mobile fleets, including the number of active vessels, is shown in Table 2. An exploratory trap fishery for ESS Northern Shrimp began in 1995 (Koeller 1996) and was made permanent in 1999, with the trap quota set at 10% of the TAC at the time. In years where the trap fishery does not plan to catch its whole quota, excess quota is often reallocated to the mobile fleet. Reallocation of the uncaught portion of the trap quota late in the year sometimes results in some fishers being unable to take advantage of the additional quota and can contribute to an overall catch being lower than the TAC. In 2005, the trap allocation was reduced to 8%, as trap fishing effort and catch were low due to poor market conditions; these remain variable.

This stock assessment presents up-to-date results by applying 2025 survey and fishery data to the new stock assessment framework that was also adopted in March 2025 (McDonald et al. 2025). The stock assessment framework is based on a spatial delay-difference model that is fit to data from the joint DFO-Industry Shrimp survey (the survey runs annually in June) and a Traffic Light Analysis (TLA) that presents a holistic view of the different pressures on the stock and its status. The model supports the Precautionary Approach (PA) by presenting decision tables used to support management decision-making guided by a new limit reference point (LRP) and upper stock reference (USR). The TLA presents 23 indicators grouped under four different characteristics of the stock: Abundance, Productivity, Fishing Effects, and Ecosystem; the model informs the TLA by providing various indicators in the Abundance and Productivity characteristics. The TLA is implemented alongside the new stock assessment, while the model is also used to inform several TLA indicators, projections, and decision tables in regard to catch scenarios.

The status of ESS Shrimp stock was last assessed under the previous stock framework adopted in December 2021 (DFO 2022), with the last stock status update conducted under the older framework being completed in December 2024 (DFO 2025). Given the new stock assessment

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framework being adopted in March 2025 (McDonald et al. 2025), the analyses discussed herein marks the first stock assessment that utilizes the new framework approach, including application of a new stock assessment model and updated TLA indicators that are used to provide advice in support of the 2026 fishery.

## **METHODS**

### **DATA SOURCES**

Descriptions of data are separated into fishery dependent (i.e., data representative of commercial fishing activity and shrimp targeted by the fishery) and fishery independent (i.e., data representative of overall stock and environment). More detailed descriptions of each data source are available in McDonald et al. (2025).

#### **Fishery Dependent**

##### **Logbook Information**

ESS Northern Shrimp catch, effort, and self-reported location information have been available for SFAs 13–15 since 1993. Commercial logbooks provide information on date, location, depth fished, effort, and estimated catch. Mobile sector logbooks historically reported catch and effort data-by-day, grouping several fishing sets together. However, from an analytical perspective, recording commercial catch and effort by set provides a more accurate record of spatial distribution. Trap sector logbooks report catch and effort by trip, with a single entry summarizing all strings fished less than three nautical miles apart on a given trip. Any strings of traps laid farther apart are recorded as separate entries. The logbook data are entered into the DFO ESS Shrimp Science Database after they have been quality-assured and quality-controlled (QA/QC) for errors.

##### **Port Sampling of Commercial Catch**

Annually, all trap samples and a maximum of 50 commercial trawl samples are analyzed (Tables 3 and 4). Approximately 305 ESS Northern Shrimp are analyzed from every trap sample and commercial mobile trawl samples using a consistent protocol. Prior to 2006, samples of 500 ESS Northern Shrimp were analyzed. Each individual shrimp is sampled for:

- sexual development stages;
- egg development stages;
- sternal spine condition;
- presence/absence of head roe; and
- presence and identification of disease.

Each individual shrimp is also weighed and measured for carapace length. These data are QA/QC and then uploaded to the DFO Shrimp Science Database.

A population length-frequency is estimated from carapace lengths of shrimp measured in each of the main trawl survey samples. This length-frequency is then extrapolated to estimate total number of shrimp of each length within the swept area. The total population estimate is then subdivided into length-frequencies of primiparous/transitional and multiparous shrimp by multiplying the total population estimate of each length by the percentage of primiparous/transitional and multiparous shrimp in the samples, respectively. The male population length-frequency is obtained by subtracting the primiparous/transitional and

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multiparous estimates for each length from population totals. Due to a low amount of fishing effort in 2025, only 20 port samples were obtained for this analysis.

### **At-sea Observations and Bycatch**

No observer trips were recorded in 2025, so no new information can be reported about bycatch. The last available information is presented in McDonald et al. (2025).

## **Fishery Independent**

### **DFO-Industry Collaborative Trawl Survey**

The 31<sup>st</sup> annual DFO-Industry Collaborative Shrimp Trawl Survey was completed in June 2025, which continued the time series initiated in 1995. The 2025 survey represented the first full implementation of a stratified random design, replacing the former mix of fixed and random stations. Survey design and station selection methods in 2025 were the same as in 2024, after a comparative analysis conducted in 2023 showed no impact of switching to a stratified random design for Stratum 14, including the expansion of a depth boundary to 85 fathoms (McDonald et al. 2025). Fifteen stations per stratum were surveyed, with tows set to 30-minute lengths at a target vessel speed of 2.5 knots. Survey sets were carried out between 0500 and 2000 hrs (daylight hours) when shrimp are concentrated on the bottom and catchability is presumed to be highest. Survey stations for Strata 13 and 15 were randomly selected within areas that have water depths greater than 100 fathoms, while stations in Stratum 14 were randomly selected within areas that have water depths greater than 85 fathoms. Last, stations in Stratum 17 (inshore) were randomly selected at all water depths having LaHave clay bottom type, as identified on Atlantic Geosciences Centre surficial geology maps. The 2025 survey was completed by the *Nanny Bessie*, which has been conducting the survey since 2021, using a standard trawl that has been in use since 1997 (i.e., Gourock #1126 2-bridle shrimp trawl and #9 Bison doors). The trawl net was outfitted with a full complement of trawl mensuration sensors that recorded door spread, headline height, and wing spread.

### **DFO Summer Ecosystem Research Vessel Trawl Survey**

The DFO Summer Ecosystem Research Vessel Trawl Survey (Summer RV survey) is operated by DFO Science. The Summer RV survey collects information on species distribution, abundance, and composition, as well as hydrographic data and other sampling across the Scotian Shelf. The Summer covers Northwest Atlantic Fisheries Organization (NAFO) Divisions 4VWX5Yb, respectively (DFO 2020). The ESS Northern Shrimp stock assessment has relied on the Summer RV survey to provide data from tows within SFAs 13–15 on species thought to predate shrimp.

### **Snow Crab Survey**

The Snow Crab survey occurs annually between the months of August and December, overlapping with areas of ESS Northern Shrimp abundance. Zisserson et al. (2021) and Choi (2023) describe the survey specifications in further detail. Historically, the survey has provided a recruitment index for immature male Snow Crab less than 56 mm carapace length. Due to timing of the Snow Crab survey, data typically are not available within the same year, so indicators usually only represent the previous year. This is the case for the results shown herein, and in future years, where the entire time series was shifted forward by one year. At the 2025 ESS Northern Shrimp stock assessment framework peer review meeting, it was agreed that the Snow Crab recruitment index is to be replaced with two new indicators based on the Snow Crab survey: shrimp bycatch abundance, and shrimp spatial distribution (i.e., area occupied) (McDonald et al. 2025).

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## **Vessel Monitoring System Monitoring**

Use of Vessel Monitoring System (VMS) has been mandatory since 2011–12 for the mobile sector (both Scotian and Gulf fleets). It provides periodic satellite positioning of vessel activity. The information collected includes vessel identifiers (i.e., Vessel Registration Number, or VRN), position (i.e., latitude and longitude), date, time, direction of movement, and vessel speed while on water. VMS positions, which are stored in a secure database, are used by shrimp science in validating logbook spatial information, as well as in making estimates of effort across SFAs to ensure a representative allocation of port sampling.

## **Satellite Sea Surface Temperatures**

Sea Surface Temperatures (SST) were obtained from the DFO Maritimes Region [Atlantic Zone Monitoring Program \(AZMP\)](#) up to 2023, which monitored satellite output from the U.S. National Oceanic and Atmospheric Administration (NOAA). Since 2023, SST have been monitored and maintained by the DFO Québec Region. The SST indicator for the TLA represents a combination of the two approaches for DFO monitoring SST on the Scotian Shelf. SST are calculated from satellite data as averaged temperatures within defined rectangles that encompass the shrimp holes (Figure 3). See Galbraith et al. (2025) for a description of the SST analysis methodology.

## **MODAL ANALYSIS**

Cohorts and approximate ages are often identified using mixture model-based modal analyses (Hardie et al. 2018) given there is no known discrete physiological indicator for shrimp age. This is done by estimating the mean carapace length (CL) of different Gaussian distributions with fixed standard deviations (fixed at 0.9) and then visually identifying cohorts based on the Gaussian mixtures. After identifying cohorts, ages are assigned based on visual inspection and general knowledge of approximate size-at-age of shrimp. The modal analysis is combined with a swept-area method to obtain estimates of shrimp numbers at age, with details presented in McDonald et al. (2025). The swept-area method is utilized to provide an Age 1 number estimate, which used to be presented as the Belly bag indicator. The Belly bag indicator, however, has since been replaced by the Model Recruitment indicator that presents the recruit biomass, as estimated by the stock assessment model (McDonald et al. 2025).

## **Growth Modelling**

Once ages are attributed to individual shrimp with measured lengths, as part of the model analysis, a Von Bertalanffy length-at-age curve is fitted and combined with yearly spatial Length-Weight (LW) relationships to obtain yearly growth rates. A mistake in the main trawl growth rates presented at the recent stock assessment framework peer review meeting (i.e., McDonald et al. [2025]) was identified and corrected (Figure 4), although the recruit growth rates were not modified (Figure 5). Individual shrimp growths are intended to be calculated by aging them one year, predicting their length at that age, and then predicting their weight at that length based on the next year's LW model (described in McDonald et al., 2025). The mistake identified and since corrected in McDonald et al. (2025), was that instead of the next year's LW being used the same year's LW model was inadvertently used, which resulted in reasonable looking but oversmoothed estimates of growth. Most of the analyses presented at the stock assessment framework peer review have since re-run to assess the impact of this correction, with the differences being minimal (Figure 6); the modifications did not change any of the conclusions from the stock assessment framework peer review meeting.

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## STOCK ASSESSMENT MODEL

### Spatially Explicit Assessment Model

The ESS Northern Shrimp biomass, SSB, recruitment, and natural mortality are all modeled using a Spatially Explicit Assessment Model (SEAM). SEAM is a spatio-temporal, delay-difference model that accounts for strata-specific yearly growth rates, spatial dynamics in population densities, and recruit densities across the survey strata. Details about model development, validation, and rationale behind its selection for stock assessment purposes are presented in McDonald et al. (2025).

### Decision Tables

Two decision tables are presented herein that account for catch scenarios between 400 mt and 900 mt: 1) one table forecasts the total biomass for the ESS Northern Shrimp stock in 2026; 2) one table forecasts SSB. The results account for the delay-difference structure, biomass, and recruitment in 2025, mean natural mortality, mean growth rates between 1995 and 2025, and relationship of proportion of Age 4+ males over the total number of females, as identified in the modal analysis for the SSB table. Detailed descriptions and rationale for use of the two decision tables for stock assessment purposes are presented in McDonald et al. (2025).

### PRECAUTIONARY APPROACH

There are two reference points currently used to assess the ESS Northern Shrimp stock. Limit reference point (LRP) was set to 20% of the maximum model-estimated spawning stock biomass (SSB) as a historical proxy of the ESS Northern Shrimp stock's carrying capacity  $B_0$ . Given that no critical harm to the stock has been identified at the historically-low ESS Northern Shrimp SSB in 2023, that the stock has increased from the very low levels of the 1990s (Cassista-Da Ros and Cosham 2020), and the important role of shrimp in the ESS ecosystem as a prey species, this LRP was set to avoid a decrease in shrimp abundance below the level at which the stock can continue to fulfill its ecosystemic roles. The choice of the LRP as a percentage of the SSB, instead of being a set value, was due to the retrospective patterns in the model, where the overall magnitude had changed over time (Figure 7). This choice ensured that the model fit and the LRP would always be consistent. According to the PA, the fishery is to be closed when SSB levels fall below the LRP.

Upper stock reference (USR) was set by Fisheries and Oceans Canada (DFO) Resource Management to be 50% of the maximum model-estimated SSB. This value, above the default value of 40% of  $B_0$ , was selected due to the large single-year decreases in ESS Northern Shrimp SSB seen between 2021 and 2023. If the USR was set at 40% of  $B_0$ , these large decreases suggest that it would have been possible for the stock to go directly from the healthy zone to the critical zone in a single year if a similar decline happened again. Such an instance would be against guidance for selecting USRs within the PA. The value of 50% of  $B_0$  was therefore selected to allow enough time for management to react to worst-case scenarios in case of future, large declines in SSB.

A third reference point typically used to inform stock assessment is a removal reference (RR). However, despite a large amount of work put into identifying an RR at the stock assessment framework peer review in March 2025, arriving at a suitable RR point was unsuccessful due to significant environmentally-driven shifts in the ESS Northern Shrimp population (McDonald et al. 2025). Identifying a suitable RR point remains a high research priority for this stock.

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## TRAFFIC LIGHT ANALYSIS INDICATORS

A suite of 23 indicators were considered in TLA analysis. Indicators were assigned a color (i.e., green, yellow, or red) for each year data were available according to their percentile value relative to the period between 1995–2024 (McDonald et al. 2025). Default boundaries between traffic lights for individual indicators (i.e., transition from red to yellow and yellow to green) were arbitrarily defined as being the 33<sup>rd</sup> and 66<sup>th</sup> percentile of the 1995–2024 data series for each indicator, meaning new years of data are compared to the 1995–2024 time series. If an increase was considered detrimental to stock health, high values were associated with red and low values were associated with green, while the opposite is true if an increase was considered positive to stock health. The “polarity” of the commercial catch per unit effort (CPUE) indicators (i.e., whether an increase or decrease in commercial CPUE is considered a positive sign) should be considered in the context of other indicators. For example, increased CPUE coupled with increased aggregation and decreased survey abundance would be viewed as a negative development.

Data series vary in length from 21- to 31-years, with detailed descriptions of indicator-specific calculations presented in McDonald et al. (2025). Indicators are not weighted in terms of their importance, with the grouped characteristics being an average of individual indicator percentiles (and after removing indicators which could not be updated in that year). As presented in the 2025 stock assessment framework (see: McDonald et al. 2025), the Age 2 indicator, Snow Crab Recruitment indicator, and overall Mean indicator have been removed from the TLA, with the Atlantic Cod (*Gadus morhua*) and Turbot (*Reinhardtius hippoglossoides*) indicators being replaced by a new Atlantic Cod, Turbot, and American Plaice (*Hippoglossoides platessoides*) (combined) indicator. Further, the Survey CPUE and SSB indicators have been replaced by Model Biomass and Model SSB indicators, respectively, all of which present the same type of information; being estimated by the model instead of indices.

Both the Exploitation and Female Exploitation indicators are now based on modeled estimates. As noted previously, the Belly bag indicator has been replaced by the Model Recruitment indicator, which presents a similar type of information, but focuses on the weight (biomass) of recruits instead of their abundance in numbers. The Belly bag indicator is estimated using the stock assessment model, instead of the swept-area method used in the past. An alternative Joint Standardized Commercial CPUE indicator has been adopted for years where fishing activity is too low, in order to demonstrate the separate Gulf CPUE and Standardized CPUE indicators, while the Commercial Area indicator has also been modified to focus on areas where catches are above 450 kilograms per hour (kg/hr). Last, the Shrimp Bycatch and Area Occupied indicators, measured using shrimp caught by the Snow Crab survey (Christie et al. 2025; Zisserson 2015), have been adopted herein.

### Indicator Modification Since the 2025 Framework Peer Review

#### Predation

The previously-used Predation indicator was derived from the mean stratified catch per tow of the annual Summer RV survey in the strata that encompass the core shrimp distribution (i.e., Strata 443–445, 459). This indicator was used as a proxy for predation pressure. However, this constrained survey area has caused issues both in the past and in 2025 for interpreting this indicator. For example, given that shrimp is not always the priority for the Summer RV survey, there are years where Strata 443–445 and 459 are not sampled (e.g., 2018, 2021, and 2022), so Predation cannot be incorporated into the ESS Northern Shrimp stock assessment for those years. Even in years where the indicator is included in stock assessment, the sample size tends to be very low (e.g., 24 tows in 2025), making the indicator less reliable and less robust to

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outliers. This was evident in 2025, where a single, exceedingly large redfish tow (over 10,000 lbs.) was responsible for 90% of the final value of the indicator, pushing it to never before seen highs in the red zone (Figure 8). If that single tow is removed, the indicator value falls into the green zone for 2025 (Figure 9). Given this, interpretation of the indicator is difficult and, combined with the framework results indicating that it was not correlated with any of the stock's modeled characteristics, questions the use of the indicator for stock assessment purposes.

As noted in MacDonald et al. (2025), expanding the area utilized to obtain a Predation value from the Summer RV survey was considered an important future step. Instead of focusing on the specific strata mentioned above, the inclusion criteria was expanded herein to any Summer RV survey tows within SFAs 13–15. This adjustment resulted in slightly different patterns over time; however, it also increased the sample size and visibly-diminished the effect of the large 2025 outlier tow, which is now responsible for approximately 30% of the estimate instead of 90% of the estimate (Figure 10). Removing this outlier still results in a decrease in the Predation indicator value instead of an increase, although the decline is less substantial, with the indicator remaining in the red zone for 2025. This makes interpretation of the indicator more robust and consistent, whether or not the outlier is included (Figure 11). Furthermore, unlike the previous indicator that did not correlate with any stock components, this new indicator is correlated with the model-estimated total recruitment of shrimp in the Belly Bag (Figure 12). This at least has some biological plausibility if predators tend to prefer smaller shrimp. This new approach to estimating the Predation indicator is therefore proposed to be used moving forward; it is utilized in the 2025 stock assessment described herein.

## **RESULTS**

### **MODAL ANALYSIS**

For modal analysis that combined all SFAs together, a 7-mode mixed distribution was identified as the best fit ( $p\text{-value} = 2.6 \times 10^{-6}$ , Figure 13). Notably, there is a mode below 15 mm CL, which is potentially a result of the strong 2024 year class (Figure 14). A large presence of shrimp less than 15 mm CL has not been noticeable in the length-frequencies since 2015, which likely contained a proportion of the strong 2014 year class (Figure 13). A substantial proportion of smaller shrimp in the length-frequencies come from Strata 14 and 15, which is unusual for the shrimp holes further offshore as those are usually in Stratum 17 (Figure 15). There is a gap in the length-frequencies around 17 mm CL in these two strata as well, potentially reflecting the low recruitment of 2022 and 2023 (Figure 15).

Comparing these to the catch-at-length distributions for the commercial port samples, there is evidence of small shrimp around 15 mm CL, although the bulk of the shrimp are still around 20–25 mm CL (Figure 16). This provides more evidence that recruitment from 2024 is surviving and growing, increasing the likelihood that they will start contributing to SSB in 2028.

### **Growth Rates**

Main trawl growth estimates for the 2024–25 year decreased slightly in Stratum 15, but increased in Strata 13, 17, and especially in Strata 14, reflecting the large quantity of very small shrimp in the length-frequencies (Figure 4). Outside of Stratum 14, which exhibited decreased growth rates, the recruit growth rates substantially increased in Strata 13, 15, and 17; potentially indicating later spawning and/or hatching time similar to the high productivity periods observed in the mid-2000s (Figure 5).

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## STOCK ASSESSMENT MODEL

### Model Outputs

SEAM converged successfully for 2025 and the updated residuals appear to indicate that model assumptions have been respected (Figures 17–20). In 2025, total biomass increased by 18.9% to 25,086 mt, marking the second increase in a row since a historical low of 17,785 mt in 2023 (Figure 21). The total recruit biomass decreased by 47.7% to 436 mt, lower than the highest recruit biomass on record in 2024 and similar to recruit biomass levels seen between 2018–21; it remains above the long-term average of 343 mt (Figure 22). The instantaneous natural mortality increased by 17.7% to 0.27, remaining below the long-term average of 0.33 (Figure 23). Adding the 2025 total biomass time series to previous retrospectives shows very little difference compared to the 2024 time series (Figure 7).

The spatial distribution of biomass densities in 2025 remains fairly consistent compared to 2023 and 2024, but the highest densities have shifted from the center of Stratum 14 to the western end of Stratum 17 (Figure 24). This matches up with three very large tows in that area, including the single largest tow ever observed on the survey. However, the bulk of the biomass remains in Stratum 14, where its overall biomass has remained consistent between 2024 and 2025. The other three strata demonstrated slight increases in terms of strata-specific total biomass (Figure 25). In 2025, the highest recruit biomass densities remain in Stratum 17, although some recruitment was still present in Stratum 15 but marginal in Stratum 14 (Figure 26).

The proportion of total biomass that is SSB decreased by 6.4% to 53.3% (Figure 27), reflecting a larger presence of small shrimp in the length-frequencies. In 2025, total SSB increased by 11.3% to 13,365 mt, marking the second increase in SSB since 2023 (Figure 21 and 28). This places the SSB above the LRP and below the USR, almost exactly in the centre of the cautious zone under the PA policy, with neither the LRP or the USR being included within the confidence interval (Figure 28). Both the overall exploitation rate and female/SSB exploitation rate increased, but remain very low compared to historical levels (Figure 29).

### Decision Tables

Decision tables for the 2025 fishing season are presented in Tables 5 and 6, based on the total biomass and SSB, respectively. The tables are estimated by projecting the biomass forward based on the 2025 estimates and the delay-difference equation 5,000 times, while accounting for uncertainties in the biomass, natural mortality, and recruitment. The projections assume mean growth. Probabilities are then obtained by looking at the proportion of iterations above/below certain values. The projected biomass estimate (from which projected increase/decline is calculated) is the median simulated biomass from the 5,000 iterations. In each table, a single row represents the projected outcome associated with the presented catch scenario.

In interpreting the total biomass table (Table 5), an example catch scenario of 600 mt in 2026 is associated with a projected exploitation rate of 2.4%, a projected decline of 0.3% for the total biomass, and an associated probability of 50.7% that the population will decline. For the SSB (Table 6), a same catch scenario of 600 mt is associated with a female/SSB exploitation rate of 3.1%, a 2.4% decrease in the SSB, a 55.7% probability that the SSB will decline, a greater than 99% probability that the population will remain above the LRP, and a lower than 0.4% probability that the population will move above its USR.

The biomass decision table predicts an increase in total biomass for all catch scenarios below 550 mt and marginal biomass decreases from 550 mt to 900 mt (Table 5). These are associated with low exploitation rates that are similar to those in 2024 and 2025 (Figure 29), which resulted

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in increases in the total biomass and a marginal increase in the SSB (Figures 21 and 28). It is likely that this decision table underestimates the potential increase in biomass, given the growth rate would be expected to increase in the coming year due to the large presence of small shrimp.

The SSB decision table predicts very small decreases for all catch scenarios (Table 6). This is not surprising given the small amount of successful recruitment since 2021, which has resulted in low amounts of shrimp transitioning between 2024 and 2025. While all scenarios have negligible probabilities of being above the USR (between 0.7 and 0.4%), the probabilities of remaining above the LRP are extremely high (all above 99%).

## **PRECAUTIONARY APPROACH**

The PA plot shows that the current model-estimated SSB sits in the middle of the cautious zone, with its confidence intervals not crossing-over the LRP or USR (Figure 28).

## **TRAFFIC LIGHT ANALYSIS INDICATORS**

All TLA indicators are shown in Figure 30, with the characteristic-specific mean indicators shown in Figure 31. Data from the commercial fishery (i.e., logbooks and port sampling) includes all data that was available as of November 18, 2025, which accounts for total landings of 656.4 mt. All indicator trends outlined below (i.e., increases, decreases, or unchanged) are described relative to their 2024 values unless otherwise specified.

### **Abundance Characteristic**

#### **Model Biomass**

The Model Biomass indicator is based on ESS Northern Shrimp survey data. It provides a fishery-independent account of shrimp abundance trends in ESS. The model-estimated total biomass (based on the 2025 model fit) for all SFAs combined, increased by 18.9%, from 21,099 mt to 25,086 mt, marking a second annual increase since the historical low of 2023 (Figure 21 and 30). In 2025, this indicator remains in the red zone, where it has been since 2021.

#### **Gulf, Standardized, and Trap CPUE**

Three separate commercial CPUEs cannot be presented for stock assessment purposes herein, due to a low number of active licences the past year. As such, a Joint Standardized Commercial CPUE is used herein (see below), as its formulation and results cannot be linked back to any individual active licence holder.

#### **Joint Standardized Commercial CPUE**

The modeled Joint Standardized Commercial CPUE provides CPUE estimates based on the combined activity of the Gulf and Mobile fleet fisheries, accounting for the impact of individual fishing vessels and seasonality. This indicator increased by 46.2% (Figure 32). This is the largest single-year increase recorded for this indicator. In 2025, this indicator enters the yellow zone for the first time since it entered the red zone in 2022.

#### **Survey Coefficient of Variation**

Survey Coefficient of Variation (CV) is a measure of uncertainty in the survey data, where high values are associated with larger uncertainties. The Survey CV indicator increased by 18.9% and sits at a new record high, with the previous record happening in 2024. This is mainly caused by three very large tows in the western end of Stratum 17, while the rest of Stratum 17

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had relatively low survey catches (Figures 33 and 34). This is the same area where the survey also observed two very large tows in 2024 (Figure 34). In 2025, this indicator remains in the red zone for the fourth year in a row.

### **Commercial Area**

Commercial Area is calculated as the total area of commercial catch rates greater than 450 kg/hr and is meant to represent the size of the area with the highest densities as captured by the commercial fishery. The Commercial Area indicator increased by more than 100% in 2025, but remains at historically low levels that are comparable to the late-1990s when the fishery was still somewhat exploratory (Figure 30). In 2025, this indicator remains in the red zone for the fourth year in a row.

### **Shrimp Bycatch**

Shrimp Bycatch quantifies the average number of shrimp caught on the Snow Crab survey within a set area encompassing the shrimp holes. Due to snow crab survey timing, the Shrimp Bycatch indicator shows a value associated with Fall 2024. This indicator increased by 58%. In 2025, this indicator remains in the red zone at its second lowest level on record (Figure 30).

### **Area Occupied**

The Area Occupied indicator uses ESS Northern Shrimp presence/absence data from the Snow Crab survey to assess broader trends in shrimp distribution. Similar to the Shrimp Bycatch indicator, the Area Occupied indicator is associated with Fall 2024. This indicator declined by 2.4%. In 2025, this indicator is at its lowest level on record and is firmly in the red zone (Figure 30).

### **Mean Indicator**

The Abundance Characteristic Mean indicator, calculated as the mean percentile of each individual Abundance characteristic except those that are not updated, increased in 2025, and now sits at a level similar to what was observed in 2023. The slight improvement in 2025 arises from slightly more indicators improving (three of the five used in the mean indicator improved) versus some declining (two of the five used in the mean indicator declining), but most changes were fairly minimal. In 2025, this indicator remains well within the red zone (Figure 31).

## **Productivity Characteristic**

### **Model SSB**

The model-estimated SSB, the total weight of females in the population, is calculated by scaling the model-based total biomass according to the proportion estimated to be transitionals and females. Based on the 2025 model fit, this indicator increased by 11.3%, from 12,006 mt to 13,365 mt, marking the second consecutive increase since the lowest estimate on record in 2023 (Figure 30). In 2025, this indicator remains in the red zone for the fifth consecutive year.

### **Model Recruitment**

Model-estimated total recruit biomass is the estimated weight of ESS Northern Shrimp of less than 10 mm CL in the stock. Based on the 2025 model fit, this indicator decreased by 47.7% in 2025, from 914 mt (a time series record high) to 436 mt (Figure 30). In 2025, this indicator enters the yellow zone, but remains at the boundary between the yellow and green zones.

### **Age 4 Indicator**

The Age 4 indicator is obtained from the modal analysis results (Table 7) and is thought to be a partial indicator of the number of shrimp expected to recruit into the SSB in the following year.

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The Age 4 indicator increased by 6%, from 839 million to 889 million (Figure 30). In 2025, this indicator remains in the yellow zone, marking its second year above the red zone since 2019.

### **Mean Length at Sexual Transition**

Larger mean length at sexual transition is generally associated with a delayed sexual transition, slow growth, and with larger females. This indicator increased by 4.3%, from 23.7 mm to 24.7 mm, the largest single-year increase recorded between 1995 and 2025 (Figure 30). In 2025, this indicator marked the first year being in the green zone since 2021.

### **Maximum Length**

Maximum length attained is an indicator of growth, where a change in this indicator likely indicates a change in growth rates of individual shrimp that can indicate longer living shrimp, which tend to be slower growing but also grow to larger sizes. In 2025, this indicator increased by 5.3%, from 27.9 mm to 29.4 mm, marking the largest single-year increase recorded between 1995 and 2025 (Figure 30). In 2025, this indicator marked the first year being in the green zone since 2021.

### **Mean Indicator**

The Productivity Characteristic Mean indicator increased in 2025 and now sits at levels similar to what was observed in 2021 (Figure 31). This improvement stems from across the board improvements outside of the Model Recruitment indicator, which remains above average. In 2025, this indicator enters the yellow zone for the first time since 2022 and is approaching the green zone.

## **Fishing Effects Characteristic**

### **Commercial Count**

Commercial count, or the average number of ESS Northern Shrimp per pound, is reported in commercial logbooks and is inversely correlated with shrimp size. In 2025, the Commercial Count indicator increased by 4.4%, from 53.7 shrimp per pound to 56.1 shrimp per pound (Figure 30). This provides more evidence of the presence of smaller shrimp in the SFAs. In 2025, this indicator enters the yellow zone after spending a single year in the green zone.

### **Exploitation**

The Exploitation indicator tracks the portion of the model-estimated total stock biomass that is being fished. The Exploitation indicator increased slightly, from 1.9% to 2.6% (Figure 30). In 2025, this indicator marks the second lowest exploitation rate since 2005 and remains well in the green zone, aligning with the second lowest TAC since 2005.

### **Female Exploitation**

Similar to Exploitation, this indicator tracks the portion of the model-estimated SSB that is being fished. The Female Exploitation indicator increased slightly, from 2.3% to 3.2% (Figure 30). In 2025, this indicator marks the second lowest female exploitation rate since 2005 and remains well in the green zone, aligning with the second lowest TAC since 2005.

### **Effort**

Effort is tracked in the ESS Northern Shrimp fishery as the sum of fishing hours for the year, presented in thousands of hours. The Effort indicator decreased slightly, from 145.55 to 142.2. In 2025, this indicator remains in the green zone for the seventh consecutive year, matching up with the second lowest TAC since 2005 (Figure 30).

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### **Proportion of Females in Commercial Catch**

This indicator is calculated using the lengths and individual weights of female shrimp in commercial catch samples relative to the total catch weight. Similar to the slight increase in commercial count, the proportion of females in commercial catches decreased slightly, from 69.7% to 65.2%. In 2025, this indicator marks the second decrease in a row, with the indicator entering the red zone for the first time since 2022 (Figure 30).

### **Female Mean Length**

The Female Mean Length indicator represents the average length of females in the commercial catch and is seen as an indication of the size. This indicator increased from 25.75 mm to 26.07 mm and sits at levels comparable to those observed in 2021 and 2023 (Figure 30). In 2025, this indicator remains in the green zone for the third consecutive year or the sixth consecutive year when excluding 2022.

### **Mean Indicator**

The Fishing Effects Characteristic Mean indicator decreased, mirroring the reduced impact of fishing given the historically low TACs of the last few years (Figure 31). In 2025, this indicator remains well within the green zone.

## **Ecosystem Characteristic**

### **Survey Bottom Temperatures**

This indicator has been correlated with negative outcomes for the ESS Northern Shrimp stock, with the declines over the last 10 years matching the timing of an increased temperature regime (McDonald et al. 2025). Although survey bottom temperatures declined in 2023 and 2024, they increased by 19% in 2025, from 2.7 °C to 3.3 °C (Figure 30). Most of the temperature increases are from Strata 13 and 17, both of which increased by almost a full degree, while the temperatures in Strata 14 and 15 both increased by less than 0.2 °C. In 2025, this indicator is now at the boarder of the yellow zone and red zone.

### **Spring Sea Surface Temperatures**

Given spawn timing of the ESS Northern Shrimp stock, and correlations between SST and natural mortality, it is thought that this indicator may be related to conditions for shrimp recruits, as high values have been associated with higher natural mortality estimates (McDonald et al. 2025). The SST indicator has declined by 36.4%, from 1.1 °C to 0.4 °C. In 2025, this indicator enters the yellow zone for the first time since 2020, but remains at the boundary between the yellow and red zone (Figure 30).

### **Predation**

The Predation indicator is intended to represent overall predatory pressure on the ESS Northern Shrimp stock, as estimated from Summer RV survey catches. This indicator increased, from 214 kg/tow to 289 kg/tow. In 2025, this indicator remains in the red zone (Figure 30).

### **Cod, Turbot, and American Plaice**

The Cod, Turbot, and American Plaice indicator was correlated with a lagged decrease in the SSB indicator (McDonald et al. 2025). This indicator increased from 10.4 fish per tow to 12.1 fish per tow. In 2025, this indicator remains well within the green zone (Figure 30).

### **Mean Indicator**

The Ecosystem Characteristic Mean indicator decreased very slightly (Figure 31). This stems mainly from a lack of consistent directions between indicators, with improvements (e.g., SST),

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similar conditions (e.g., Cod, Turbot, and American Plaice as well as the Survey Bottom Temperatures), and higher predation (e.g., Predation). In 2025, this indicator remains within the yellow zone for the third year in a row.

## **DISCUSSION AND ADVICE**

The 2025 total biomass estimated from SEAM using the Joint DFO-Industry Northern Shrimp Survey data exhibited an 18.9% increase compared to 2024. The model-estimated SSB showed a less pronounced increase of 11.3% in 2025, placing it firmly in the cautious zone for 2025 with respect to the PA framework. Both of these increases are mainly due to three very large tows in the western end of Stratum 17. As this same area saw two large tows in 2024, shrimp appear to be congregating in this area during the time that the survey is active. Given the very large 2024 recruitment event, it is reassuring to see this year class show up early in the survey data, marking a promising sign for potential recovery of the stock in the years to come. However, given a lack of recruitment in 2022 and 2023, and the poor performance of the 2020–2021 year classes, it is not surprising that the SSB has mostly remained stable, as the two increases in 2024 and 2025 are mainly due to increased survey catches.

This suggests a stabilization of the population and at least some presence of the 2020–2021 year classes, but not as much as was expected given their size. Both of these facts are reflected in the decision tables, where the biomass is generally expected to be stable, while the SSB is expected to decrease given the low recruitment of 2022 and subsequent low numbers of shrimp expected to transition in the coming year. While it is likely that the growth rate for the total biomass will be higher than the average (and the biomass decision table likely underestimates increases), the SSB is expected to remain the same or decline slightly given the low levels of Age 3 and Age 4 in the data. Although the uncertainties around these projections are high, as shown in the associated probabilities of decline, the catch scenarios presented are not expected to move the population into the critical zone or cause serious harm to the stock.

In terms of TLA indicators, 2025 represents a marginal improvement in the Abundance Characteristic compared to 2024, with a similar outcome to 2023. This outlook is derived from slight improvements in the Model Biomass, Commercial Area, and Shrimp Bycatch indicators, which offset decreased performance in the Area Occupied and Survey CV indicators. The Joint Standardized Commercial CPUE, while not included in the Mean Indicator, also showed improvement in 2025, supporting a marginal improvement and an overall stabilization of the population.

The stock Productivity Characteristic continued to improve for the second year in a row, placing the Productivity Mean Indicator at similar levels to those observed in the early-2010s. This is derived from improvements in the SSB and Age 4 abundance, and marked improvements in the Mean Length at Sexual Transition and Maximum Length; the last two indicators likely reflect improved and colder conditions for shrimp growth, resulting in slower growing and bigger shrimp. While modeled recruitment was not as high as the peak observed in 2024, it remains above average. Overall, recruitment seems promising in terms of future population growth, supporting a potential continued recovery of the stock above and away from the critical zone. The appearance of large numbers of shrimp around 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 productivity.

The Fishing Effects Characteristic remains in the green zone and indicates that current levels of fishing were unlikely to be hindering the ESS Northern Shrimp population in 2024 and 2025. This is mostly derived from low exploitation rates and effort levels stemming from historically low

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TACs. While the female mean length in commercial catches reflects an improved outlook for shrimp highlighted by the Productivity Characteristic, a larger presence of small shrimp in the catch warrants extra caution to protect the 2024 year class that is essential to the stock's recovery.

The Ecosystem Characteristic slightly worsened for the second year in a row, but remains in the yellow zone. This is largely due to conflicting indicators, with improved SST in the spring, but 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. While these conditions appear to allow for shrimp recruitment, and at least some survival into Age 2, further improvements in temperature and ecosystem conditions are likely essential for the stock to recover to its full potential, as was seen in the high productivity periods of the mid-2000s. While long-term oceanographic models predict increasing water temperatures, there are some indications of either a cooling or a stabilization of water temperatures in the ESS region in the coming decade (Koul et al. 2024). This may improve the chances of an ESS Northern Shrimp stock recovery.

In conclusion, a notable and persistent increase in SSB is still a few years away, as the 2024 year class is not expected to transition until 2028. As the current levels of exploitation do not appear to be harming the stock, continuation of low exploitation rates is advisable, in order to reduce the likelihood of impacting the 2024 year class and to improve its chance to increase the SSB in 2028. In terms of TLA, out of the 21 indicators examined herein (with the three commercial CPUE indicators replaced by the Joint CPUE indicator), 11 improved while 10 performed worse compared to 2024, with clear improvements in the Productivity Characteristic, mixed signals in the Abundance and Ecosystem Characteristics, and a continuation of the low impact of the Fishing Effects Characteristic. The ESS Northern Shrimp stock is to be assessed on a biennial schedule, with stock assessments conducted every two years and stock status updates, which are to include a full model run, completed in the interim years.

## **SOURCES OF UNCERTAINTY**

Three spatially-aggregated survey tows are responsible for the highest Survey CV on record, indicating a larger uncertainty around the biomass estimates in Stratum 17. This is the same area where two tows caused a large increase in Survey CV observed in 2024 (DFO 2025). There is currently no explanation as to why this area appears to be associated with substantial shrimp densities, although this aligns with the historical expectation around the species life cycle, as the inshore area has shown better conditions for recruitment.

Given Northern Shrimp cannot be aged accurately as individuals, modal groups identified in the modal analysis for yearly length-frequencies are used to approximate age cohorts based on expert opinion and cohort tracking. Improving the modal analysis methodology and/or identifying a more exact aging method would improve growth estimation, improving the stock assessment.

There is an underlying assumption within stock management that juveniles and mature females can move between areas. However, SEAM as currently formulated cannot account for this, so more research into verifying such an assumption is pertinent.

Continued low TAC in 2025 resulted in a second year of extremely low fishing effort, resulting in a lower number of port samples (i.e., 20 samples). Although this would increase the size of confidence intervals if statistical analyses were performed, these are believed to still be fulfilling their intended purpose of being representative of the fishery.

The low fishing effort in 2025 also resulted in the omission of the three commercially-derived CPUE indicators, as they do not meet the 'rule of five' guideline pursuant to the *Privacy Act*.

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Replacing these three indicators with a Joint Standardized Commercial CPUE indicator results in the use of only six Abundance indicators, increasing uncertainty due to the lower amount of information available.

Last, the effects of climate change and the susceptibility of ESS Northern Shrimp to environmental changes makes long-term projections for the stock difficult. This is especially challenging given the high water temperatures observed over the last decade.

## REFERENCES CITED

- Cassista-Da Ros, M., and Cosham, J. 2020. [Eastern Scotian Shelf Shrimp \(\*Pandalus Borealis\*\): 2018–2019](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2020/045. v + 47 p.
- Choi, J.S. 2023. [A Framework for the Assessment of Snow Crab \(\*Chionoecetes Opilio\*\) in Maritimes Region \(NAFO Div 4VWX\)](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2023/077. v + 101 p.
- Christie, K.L., Cameron, B.J., Glass, A.C., and Choi, J.S. 2025. [Assessment of Scotian Shelf Snow Crab in 2023](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2025/031:v + 54 p.
- DFO. 2020. [Maritimes Research Vessel Survey Trends on the Scotian Shelf and Bay of Fundy](#). DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/019.
- DFO. 2022. [2021 Assessment of Northern Shrimp on the Eastern Scotian Shelf \(SFAs 13–15\)](#). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2022/033.
- DFO. 2025. [2024 Stock Status Update of Eastern Scotian Shelf Northern Shrimp \(\*Pandalus Borealis\*\) in SFAs 13–15](#). DFO Can. Sci. Advis. Sec. Sci. Resp. 2025/020.
- Galbraith, P.S., Chassé, J., Shaw, J-L., Lefavre, D., and Bourassa, M.N. 2025. Physical Oceanographic Conditions in the Gulf of St. Lawrence during 2024. Can. Tech. Rep. Hydrogr. Ocean Sci. 397: v + 95 p.
- Hardie, D., Covey, M., and Cook, A. 2018. [Eastern Scotian Shelf Shrimp \(\*Pandalus borealis\*\) Framework](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2018/005.
- Koeller, P.A. 1996. [The Scotian Shelf Shrimp \(\*Pandalus Borealis\*\) Fishery in 1995](#). DFO Atl. Fish. Res. Doc. 1996/08.
- Koeller, P.A. 2000. Relative Importance of Environmental and Ecological Factors to the Management of the Northern Shrimp (*Pandalus Borealis*) Fishery on the Scotian Shelf. Northwest Atlantic Fisheries Organization (NAFOR) Serial No. N4113 (NAFO SCR Doc. 99/70): 22 p.
- Koeller, P., Savard, L., Parsons, D.G., and Fu., C. 2000. A Precautionary Approach to Assessment and Management of Shrimp Stocks in the Northwest Atlantic. J. Northw. Atl. Fish. Sci. 27: 235–46.
- Koeller, P.A. 2006. [Inferring Shrimp \(\*Pandalus Borealis\*\) Growth Characteristics from Life History Stage Structure Analysis](#). J. Shellfish Res. 25(2): 595–608.
- Koul, V., Ross, A.C., Stock, C., Zhang, L., Delworth, T., Wittenberg, A. 2024. [A Predicted Pause in the Rapid Warming of the Northwest Atlantic Shelf in the Coming Decade](#). Geophys. Res. Lett. 51(17).
- McDonald, R.R., Cassista-Da Ros, M., and Cosham, J. 2025. [Eastern Scotian Shelf Northern Shrimp \(\*Pandalus Borealis\*\) Stock Assessment Framework: Model, Indicators, and Reference Point Development](#). DFO Can. Sci. Advis. Sec. Res. Doc. 2025/063. viii + 209 p.

- 
- Shumway, S. E., Perkins, H.C., Schick, D.F., and Stickney, A.P.. 1985. [Synopsis of Biological Data on the Pink Shrimp, \*Pandalus Borealis\* Krøyer, 1838](#). NOAA Tech. Rept. NMFS 30.
- Zisserson, B.M., Cameron, B.J., Glass, A.C., and Choi, J.S. 2021. [Assessment of Scotian Shelf Snow Crab in 2018](#)." DFO Can. Sci. Advis. Sec. Res. Doc. 2021/048. ix + 148 p.
- Zisserson, B. 2015. Maritimes Region Snow Crab Trawl Survey: Detailed Technical Description. Can. Tech. Rep. Fish. Aquat. Sci. 3128: v + 38 p.

## TABLES

*Table 1. Time series (1980–2025) of Eastern Scotian Shelf Northern Shrimp fishery by annual total allowable catch (TAC) quotas in metric tonnes (mt) and total catch (mt) for Shrimp Fishing Areas (SFA) 13–15. Dashes (—) indicate no data; < indicates less than. TAC values indicate amounts allocated at the start of the season and do not reflect mid-season TAC transfers between fleets.*

| Year              | Trawl<br>TAC | Trap<br>TAC | Trawl<br>Catch<br>SFA 13 | Trawl<br>Catch<br>SFA 14 | Trawl<br>Catch<br>SFA 15 | Total | Trap<br>Catch | Total<br>Catch |
|-------------------|--------------|-------------|--------------------------|--------------------------|--------------------------|-------|---------------|----------------|
| 1980              | 5,021        | —           | 491                      | 133                      | 360                      | 984   | —             | 984            |
| 1981              | —            | —           | 418                      | 26                       | 10                       | 454   | —             | 454            |
| 1982              | 4,200        | —           | 316                      | 52                       | 201                      | 569   | —             | 569            |
| 1983              | 5,800        | —           | 483                      | 15                       | 512                      | 1,010 | —             | 1,010          |
| 1984              | 5,700        | —           | 600                      | 10                       | 318                      | 928   | —             | 928            |
| 1985              | 5,560        | —           | 118                      | —                        | 15                       | 133   | —             | 133            |
| 1986              | 3,800        | —           | 126                      | —                        | —                        | 126   | —             | 126            |
| 1987              | 2,140        | —           | 148                      | 4                        | —                        | 152   | —             | 152            |
| 1988              | 2,580        | —           | 75                       | 6                        | 1                        | 82    | —             | 82             |
| 1989              | 2,580        | —           | 91                       | 2                        | —                        | 93    | —             | 93             |
| 1990              | 2,580        | —           | 90                       | 14                       | —                        | 104   | —             | 104            |
| 1991 <sup>a</sup> | 2,580        | —           | 81                       | 586                      | 140                      | 807   | —             | 807            |
| 1992              | 2,580        | —           | 63                       | 1,181                    | 606                      | 1,850 | —             | 1,850          |
| 1993 <sup>b</sup> | 2,650        | —           | 431                      | 1,279                    | 317                      | 2,027 | —             | 2,027          |
| 1994 <sup>c</sup> | 3,100        | —           | 8                        | 2,656                    | 410                      | 3,074 | —             | 3,074          |
| 1995              | 3,170        | —           | 168                      | 2,265                    | 715                      | 3,148 | —             | 3,148          |
| 1996              | 3,170        | —           | 55                       | 2,299                    | 817                      | 3,171 | 158           | 3,329          |
| 1997              | 3,600        | —           | 570                      | 2,422                    | 583                      | 3,575 | 208           | 3,783          |
| 1998              | 3,800        | —           | 562                      | 2,014                    | 1,223                    | 3,799 | 107           | 3,906          |
| 1999              | 4,800        | 200         | 723                      | 1,525                    | 2,456                    | 4,704 | 134           | 4,838          |
| 2000              | 5,300        | 200         | 486                      | 1,822                    | 2,927                    | 5,235 | 200           | 5,435          |
| 2001              | 4,700        | 300         | 692                      | 1,298                    | 2,515                    | 4,505 | 263           | 4,768          |
| 2002              | 2,700        | 300         | 267                      | 1,573                    | 860                      | 2,700 | 245           | 2,945          |
| 2003              | 2,700        | 300         | 612                      | 1,623                    | 373                      | 2,608 | 154           | 2,762          |
| 2004              | 3,300        | 200         | 2041                     | 755                      | 376                      | 3,172 | 96            | 3,268          |
| 2005              | 4,608        | 392         | 1190                     | 1,392                    | 1,054                    | 3,636 | 9             | 3,645          |
| 2006              | 4,608        | 392         | 846                      | 1,997                    | 1,111                    | 3,954 | 32            | 3,986          |
| 2007              | 4,820        | 200         | 267                      | 2,633                    | 1,678                    | 4,578 | 4             | 4,582          |
| 2008              | 4,912        | 100         | 349                      | 2,703                    | 1,265                    | 4,317 | 4             | 4,321          |
| 2009              | 3,475        | 25          | 315                      | 1,949                    | 1,078                    | 3,342 | 5             | 3,347          |
| 2010              | 4,900        | 100         | 280                      | 1,847                    | 2,453                    | 4,580 | 2             | 4,582          |
| 2011              | 4,432        | 168         | 254                      | 2,340                    | 1,653                    | 4,247 | 111           | 4,358          |
| 2012              | 3,954        | 246         | 197                      | 2,269                    | 1,227                    | 3,693 | 199           | 3,892          |
| 2013              | 3,496        | 304         | 158                      | 2,514                    | 708                      | 3,380 | 224           | 3,604          |
| 2014              | 4,140        | 360         | 773                      | 2,263                    | 1,043                    | 4,079 | 250           | 4,329          |
| 2015              | 4,140        | 360         | 341                      | 2,067                    | 1,701                    | 4,109 | 314           | 4,423          |
| 2016              | 2,990        | 260         | 177                      | 2,097                    | 719                      | 2,993 | 108           | 3,101          |

| Year | Trawl<br>TAC | Trap<br>TAC | Trawl<br>Catch<br>SFA 13 | Trawl<br>Catch<br>SFA 14 | Trawl<br>Catch<br>SFA 15 | Total | Trap<br>Catch | Total<br>Catch |
|------|--------------|-------------|--------------------------|--------------------------|--------------------------|-------|---------------|----------------|
| 2017 | 2,392        | 208         | 278                      | 1947                     | 150                      | 2,375 | 65            | 2,440          |
| 2018 | 2,392        | 208         | 320                      | 1927                     | 148                      | 2,395 | 116           | 2,511          |
| 2019 | 2,392        | 208         | 846                      | 1397                     | 149                      | 2,392 | 130           | 2,522          |
| 2020 | 2,392        | 208         | 1,443                    | 714                      | 264                      | 2,421 | 58            | 2,479          |
| 2021 | 2,392        | 208         | 1,321                    | 782                      | 326                      | 2,429 | <1            | 2,429          |
| 2022 | 2,116        | 184         | 1,118                    | 737                      | 344                      | 2,199 | <1            | 2,200          |
| 2023 | 1,590        | 138         | 112                      | 1,405                    | 123                      | 1,640 | <1            | 1,641          |
| 2024 | 460          | 40          | 18                       | 359                      | 22                       | 399   | 1             | 400            |
| 2025 | 644          | 56          | 36                       | 598                      | 22                       | 656   | <1            | 656            |

<sup>a</sup> Nordmøre separator grate introduced.

<sup>b</sup> Total TAC not caught because TAC for SFA 14 and 15 were exceeded.

<sup>c</sup> Individual SFA TAC combined.

*Table 2. Number of active vessels and total licences (in brackets) for the Eastern Scotian Shelf Northern Shrimp fishery.*

| Year | Trap<br>Sector <sup>a</sup> | Scotia<br>Trawl<br>Sector <sup>b</sup> | Gulf Trawl<br>Sector <sup>c</sup> |
|------|-----------------------------|----------------------------------------|-----------------------------------|
| 1993 | 0                           | 23                                     | 6                                 |
| 1994 | 0                           | 22                                     | 6                                 |
| 1995 | 4                           | 23(23)                                 | 6(23)                             |
| 1996 | 12(17)                      | 21(23)                                 | 6(23)                             |
| 1997 | 10(17)                      | 18(23)                                 | 6(23)                             |
| 1998 | 19(26)                      | 17(28) <sup>d</sup>                    | 10(23) <sup>e</sup>               |
| 1999 | 15(22)                      | 19(28) <sup>d</sup>                    | 10(23) <sup>e</sup>               |
| 2000 | 13(21)                      | 18(32) <sup>f</sup>                    | 10(23) <sup>e</sup>               |
| 2001 | 12(28)                      | 21(28) <sup>d</sup>                    | 10(23) <sup>e</sup>               |
| 2002 | 13(14) <sup>g</sup>         | 16(23)                                 | 6(23)                             |
| 2003 | 9(14)                       | 15(23)                                 | 5(23)                             |
| 2004 | 6(14)                       | 18(23)                                 | 6(23)                             |
| 2005 | 7(14)                       | 20(28) <sup>h</sup>                    | 7(24) <sup>i</sup>                |
| 2006 | 11(14)                      | 18(28)                                 | 7(24)                             |
| 2007 | 5(14)                       | 19(28)                                 | 7(24)                             |
| 2008 | 1(14)                       | 18(28)                                 | 7(24)                             |
| 2009 | 1(14)                       | 17(28)                                 | 6(14) <sup>j</sup>                |
| 2010 | 4(14)                       | 17(28)                                 | 7(14)                             |
| 2011 | 9(14)                       | 23(28)                                 | 5(14)                             |
| 2012 | 11(14)                      | 16(28)                                 | 5(14)                             |
| 2013 | 11(14)                      | 13(28)                                 | 6(14)                             |
| 2014 | 10(14)                      | 10(28)                                 | 5(14)                             |
| 2015 | 11(14)                      | 10(28)                                 | 5(14)                             |
| 2016 | 9(14)                       | 11(28)                                 | 5(14)                             |
| 2017 | 8(14)                       | 9(28)                                  | 4(14)                             |
| 2018 | 8(14)                       | 9(28)                                  | 5(14)                             |
| 2019 | 7(14)                       | 8(28)                                  | 7(14)                             |
| 2020 | 8(14)                       | 8(28)                                  | 7(14)                             |

| Year | Trap Sector <sup>a</sup> | Scotia Trawl Sector <sup>b</sup> | Gulf Trawl Sector <sup>c</sup> |
|------|--------------------------|----------------------------------|--------------------------------|
| 2021 | 1(14)                    | 7(28)                            | 7(14)                          |
| 2022 | 2(14)                    | 5(28)                            | 8(14)                          |
| 2023 | 3(14)                    | 5(28)                            | 6(14)                          |
| 2024 | 1(14)                    | 3(28)                            | 1(14)                          |
| 2025 | 1(14)                    | 5(28)                            | 2(14)                          |

<sup>a</sup> All but one active trap licence are vessels less than 45'. Trap licences receive 8% of the total allowable catch (TAC).

<sup>b</sup> Vessels receive approximately 70% of the TAC according to the Eastern Scotian Shelf (ESS) Northern Shrimp integrated fishery management plan. Inactive Northwest Atlantic Fisheries Organization (NAFO) 4X licences (15) not included in total.

<sup>c</sup> All licences 65-100' length over all (LOA). Eligibility to fish in ESS for about 23% of the TAC.

<sup>d</sup> Temporary allocation divided among five (5) vessels.

<sup>e</sup> Temporary allocation divided among four (4) vessels.

<sup>f</sup> Temporary allocation divided among nine (9) licences.

<sup>g</sup> Nine (9) licences were made permanent for 2002. The reduction in the total number of trap licences is due to the cancellation of some non-active exploratory licences.

<sup>h</sup> Five (5) temporary licences made permanent.

<sup>i</sup> One (1) temporary licence made permanent.

<sup>j</sup> The previously reported number of licences included ten (10) that were invalid for a number of reasons.

*Table 3. Annual mobile sector port sampling by survey stratum. Total number of samples collected annually and the number of ESS Northern Shrimp these represent. The target size for port samples decreased from 500 to 305 shrimp in 2006. Dashes (—) indicate no data.*

| Year | Stratum 13 | Stratum 14 | Stratum 15 | Stratum 17 | Total Number of Samples | Total Number of Northern Shrimp Analyzed |
|------|------------|------------|------------|------------|-------------------------|------------------------------------------|
| 1995 | —          | 14         | 18         | —          | 32                      | 7,959                                    |
| 1996 | —          | 11         | 11         | —          | 22                      | 8,544                                    |
| 1997 | 1          | 17         | 5          | 1          | 24                      | 10,553                                   |
| 1998 | 4          | 16         | 3          | 5          | 28                      | 12,495                                   |
| 1999 | 7          | 12         | 1          | 31         | 51                      | 20,409                                   |
| 2000 | —          | 17         | 13         | 21         | 51                      | 23,084                                   |
| 2001 | 5          | 12         | 13         | 20         | 50                      | 23,092                                   |
| 2002 | 6          | 28         | 6          | 10         | 50                      | 20,334                                   |
| 2003 | 16         | 37         | 1          | 5          | 59                      | 22,851                                   |
| 2004 | 34         | 13         | 5          | 5          | 57                      | 26,898                                   |
| 2005 | 15         | 24         | 9          | 12         | 60                      | 28,919                                   |
| 2006 | 3          | 24         | 5          | 5          | 37                      | 11,656                                   |
| 2007 | 1          | 32         | 13         | 5          | 51                      | 15,867                                   |
| 2008 | 2          | 30         | 5          | 3          | 40                      | 12,361                                   |
| 2009 | —          | 19         | 6          | 25         | 50                      | 15,359                                   |
| 2010 | —          | 20         | 11         | 23         | 54                      | 16,400                                   |
| 2011 | —          | 26         | 6          | 17         | 49                      | 14,817                                   |
| 2012 | —          | 30         | 8          | 12         | 50                      | 14,832                                   |
| 2013 | —          | 37         | 9          | 4          | 50                      | 15,103                                   |
| 2014 | —          | 22         | 7          | 21         | 50                      | 15,215                                   |
| 2015 | 1          | 24         | 1          | 24         | 50                      | 15,249                                   |
| 2016 | 1          | 35         | —          | 14         | 50                      | 15,248                                   |
| 2017 | 3          | 43         | —          | 4          | 50                      | 15,240                                   |
| 2018 | 6          | 41         | —          | 3          | 50                      | 15,250                                   |
| 2019 | 13         | 29         | —          | 8          | 50                      | 15,249                                   |
| 2020 | 26         | 19         | —          | 4          | 49                      | 14,710                                   |
| 2021 | 19         | 20         | —          | 13         | 52                      | 15,858                                   |

| <b>Year</b>  | <b>Stratum<br/>13</b> | <b>Stratum<br/>14</b> | <b>Stratum<br/>15</b> | <b>Stratum<br/>17</b> | <b>Total Number<br/>of Samples</b> | <b>Total Number of<br/>Northern Shrimp<br/>Analyzed</b> |
|--------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|---------------------------------------------------------|
| 2022         | 21                    | 18                    | —                     | 12                    | 51                                 | 15,553                                                  |
| 2023         | 1                     | 41                    | —                     | 5                     | 47                                 | 14,333                                                  |
| 2024         | 1                     | 18                    | 1                     | —                     | 20                                 | 6,098                                                   |
| 2025         | —                     | 18                    | —                     | 2                     | 20                                 | 6,099                                                   |
| <b>Total</b> | <b>186</b>            | <b>747</b>            | <b>157</b>            | <b>314</b>            | <b>1,404</b>                       | <b>485,635</b>                                          |

*Table 4. Annual trap sector port sampling by survey stratum. Total number of samples collected annually and the number of ESS Northern Shrimp these represent. The target size for port samples decreased from 500 to 305 shrimp in 2005. Dashes (—) indicate no data.*

| <b>Year</b>  | <b>Stratum<br/>13</b> | <b>Stratum<br/>14</b> | <b>Stratum<br/>15</b> | <b>Stratum<br/>17</b> | <b>Total Number<br/>of Samples</b> | <b>Total Number of<br/>Northern Shrimp<br/>Analyzed</b> |
|--------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------------------|---------------------------------------------------------|
| 1995         | —                     | —                     | 1                     | 5                     | 6                                  | 2,448                                                   |
| 1996         | —                     | —                     | —                     | 10                    | 10                                 | 4,614                                                   |
| 1997         | —                     | —                     | —                     | 6                     | 6                                  | 2,627                                                   |
| 1998         | —                     | —                     | —                     | 4                     | 4                                  | 1,468                                                   |
| 1999         | —                     | —                     | —                     | 7                     | 7                                  | 3,312                                                   |
| 2000         | —                     | —                     | —                     | 18                    | 18                                 | 8,056                                                   |
| 2001         | —                     | —                     | —                     | 12                    | 12                                 | 5,657                                                   |
| 2002         | —                     | —                     | —                     | 13                    | 13                                 | 6,212                                                   |
| 2003         | —                     | —                     | —                     | 11                    | 11                                 | 5,210                                                   |
| 2004         | —                     | —                     | —                     | 6                     | 6                                  | 2,639                                                   |
| 2005         | —                     | —                     | —                     | 1                     | 1                                  | 323                                                     |
| 2007         | —                     | —                     | —                     | 2                     | 2                                  | 905                                                     |
| 2011         | —                     | —                     | —                     | 4                     | 4                                  | 1,216                                                   |
| 2012         | —                     | —                     | —                     | 11                    | 11                                 | 3,386                                                   |
| 2013         | —                     | —                     | —                     | 7                     | 7                                  | 2,189                                                   |
| 2014         | —                     | —                     | —                     | 7                     | 7                                  | 2,128                                                   |
| 2015         | —                     | —                     | —                     | 11                    | 11                                 | 3,364                                                   |
| 2016         | —                     | —                     | —                     | 6                     | 6                                  | 1,845                                                   |
| 2017         | —                     | —                     | —                     | 2                     | 2                                  | 601                                                     |
| 2018         | —                     | —                     | —                     | 6                     | 6                                  | 1,803                                                   |
| 2019         | —                     | —                     | —                     | 9                     | 9                                  | 2,730                                                   |
| 2020         | —                     | —                     | —                     | 5                     | 5                                  | 1,525                                                   |
| 2021         | —                     | —                     | —                     | —                     | —                                  | —                                                       |
| 2022         | —                     | —                     | —                     | —                     | —                                  | —                                                       |
| 2023         | —                     | —                     | —                     | 1                     | 1                                  | 305                                                     |
| 2024         | —                     | —                     | —                     | —                     | —                                  | —                                                       |
| 2025         | —                     | —                     | —                     | —                     | —                                  | —                                                       |
| <b>Total</b> | <b>—</b>              | <b>—</b>              | <b>1</b>              | <b>164</b>            | <b>165</b>                         | <b>64,563</b>                                           |

Table 5. 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. mt indicates metric tonnes; % indicates percent. The greyed row aligns with the example of table interpretation discussed in the text above.

| Catch<br>(mt) | Exploitation<br>(%) | Biomass Change<br>(%) | Probability of Decline<br>(%) |
|---------------|---------------------|-----------------------|-------------------------------|
| 0             | 0.0                 | 2.1                   | 45                            |
| 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 6. 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 indicates limit reference point; USR indicates upper stock reference; mt indicates metric tonnes; % indicates percent; > indicates greater than; < indicates less than. The greyed row aligns with the example table interpretation discussed in the text above.

| Catch<br>(mt) | Female<br>Exploitation<br>(%) | SSB Change<br>(%) | Probability of<br>Decline<br>(%) | Probability of<br>being above<br>LRP<br>(%) | Probability<br>of being<br>above USR<br>(%) |
|---------------|-------------------------------|-------------------|----------------------------------|---------------------------------------------|---------------------------------------------|
| 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                                          |
| 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                                          |

Table 7. Estimated population numbers-at-age from the survey data by the modal analysis in millions (i.e., 10 indicates 10 million) for all Shrimp Fishing Areas combined.

| Age            | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | Mean <sup>4</sup> | Median <sup>4</sup> |
|----------------|------|------|------|------|------|------|------|------|------|-------------------|---------------------|
| 1 <sup>1</sup> | 83   | 267  | 272  | 279  | 244  | 52   | 77   | 436  | 239  | 275               | 242                 |

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| <b>Age</b>                   | <b>2017</b> | <b>2018</b> | <b>2019</b> | <b>2020</b> | <b>2021</b> | <b>2022</b> | <b>2023</b> | <b>2024</b> | <b>2025</b> | <b>Mean<sup>4</sup></b> | <b>Median<sup>4</sup></b> |
|------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------------------|---------------------------|
| 2                            | 166         | 37          | 68          | 72          | 154         | 106         | 62          | 56          | 509         | 183                     | 129                       |
| 3                            | 581         | 361         | 195         | 368         | 462         | 309         | 230         | 422         | 457         | 569                     | 396                       |
| 4                            | 1,468       | 822         | 392         | 522         | 583         | 687         | 426         | 839         | 889         | 957                     | 839                       |
| 5+                           | 1,734       | 2,231       | 3,155       | 3,000       | 2,109       | 1,341       | 889         | 1,231       | 1,639       | 2,807                   | 2,688                     |
| Total                        | 4,032       | 3,718       | 4,082       | 4,241       | 3,552       | 2,495       | 1,683       | 2,984       | 3,733       | 4,705                   | 4,191                     |
| Age 4+<br>Males <sup>2</sup> | 1,776       | 1,647       | 2,001       | 1,858       | 1,367       | 994         | 572         | 1,018       | 1,469       | 2,108                   | 1,915                     |
| Primiparous <sup>3</sup>     | 453         | 433         | 435         | 573         | 398         | 388         | 251         | 379         | 401         | 698                     | 664                       |
| Multiparous                  | 973         | 973         | 1,111       | 1,091       | 927         | 646         | 491         | 673         | 658         | 938                     | 937                       |
| Total Females                | 1,426       | 1,406       | 1,546       | 1,664       | 1,325       | 1,034       | 742         | 1,052       | 1,059       | 1,600                   | 1,546                     |

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<sup>1</sup> Belly-bag. Time series began in 2002.

<sup>2</sup> Total population less Ages 1, 2, and 3 males, transitionals (i.e., males that will potentially change to females in the following year) and females.

<sup>3</sup> Include transitionals

<sup>4</sup> Mean and median values based on data from 1999 to 2025

## FIGURES

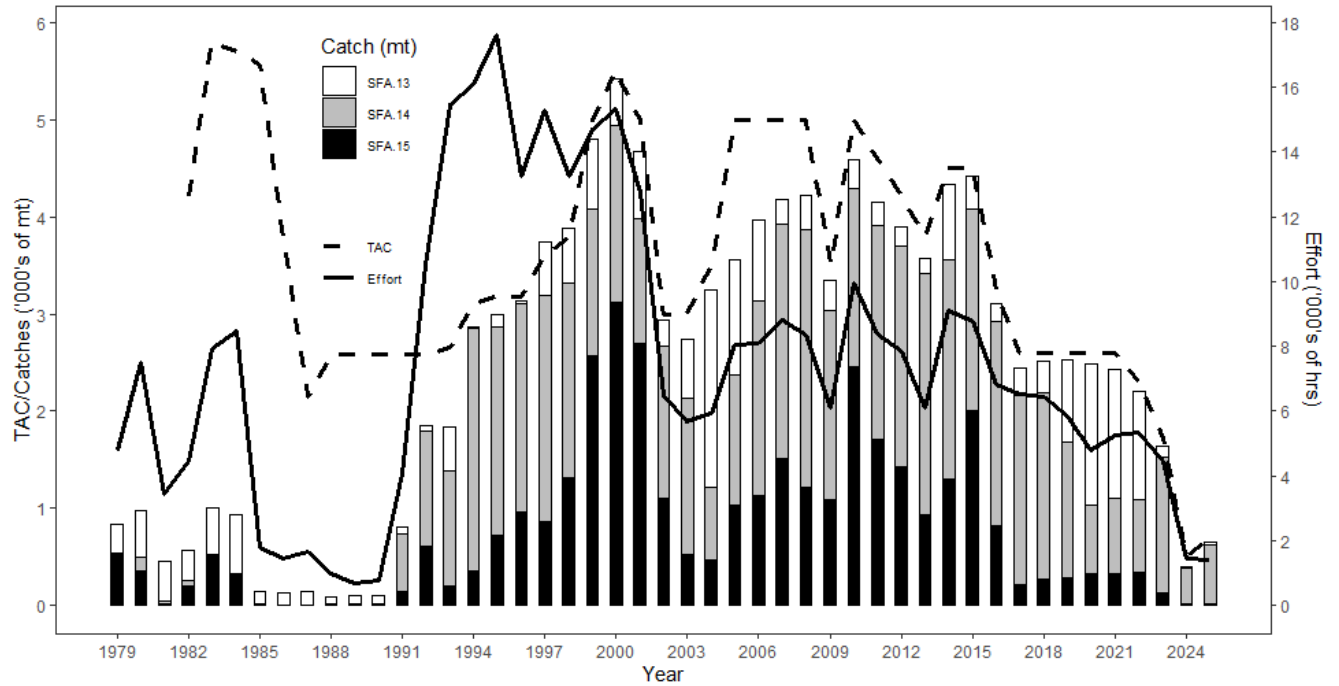


Figure 1. History of Eastern Scotian Shelf Shrimp fishery catches for Shrimp Fishing Areas (SFA) 13–15, total allowable catch (TAC) (thousands of metric tonnes [mt]) and effort (thousands of hours [hrs]) from 1979–2025. Effort and catches for 2025 represent available logbook data as of November 18, 2025.

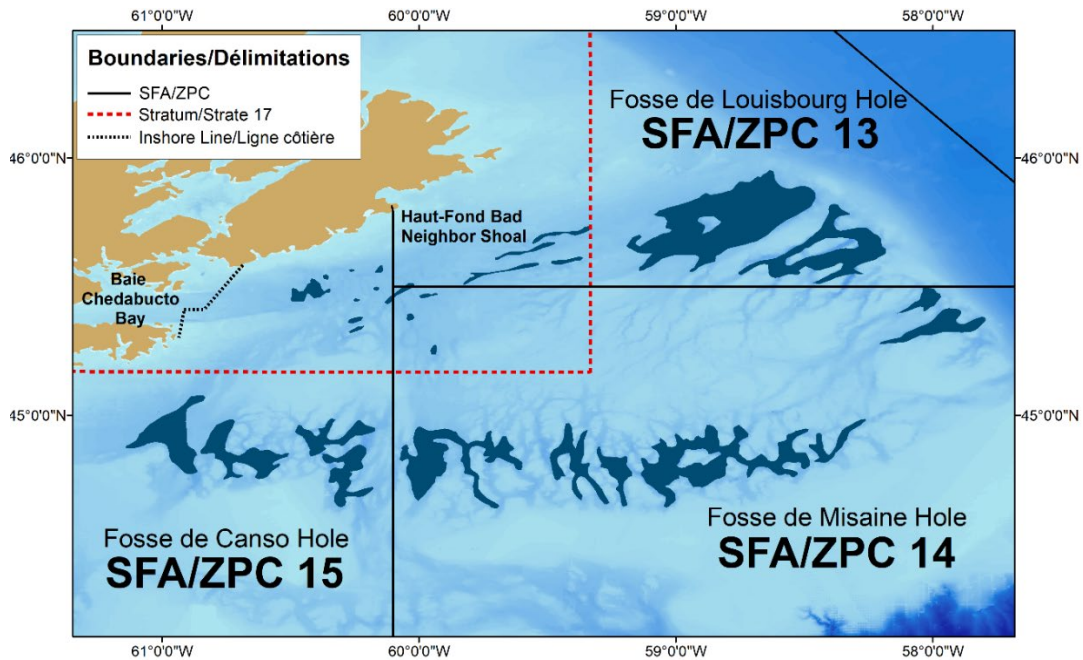


Figure 2. Boundaries of the Eastern Scotian Shelf Northern Shrimp fishery. The Shrimp Fishing Areas (SFA) fall within Northwest Atlantic Fishing Organization divisions 4Vn and 4VsW. The fishery is characterized by four areas: Louisbourg Hole (SFA 13); Misaine Hole (SFA 14); Canso Hole (SFA 15); and an inshore area within SFA 13–15 known as Bad Neighbour shoal (Stratum 17).

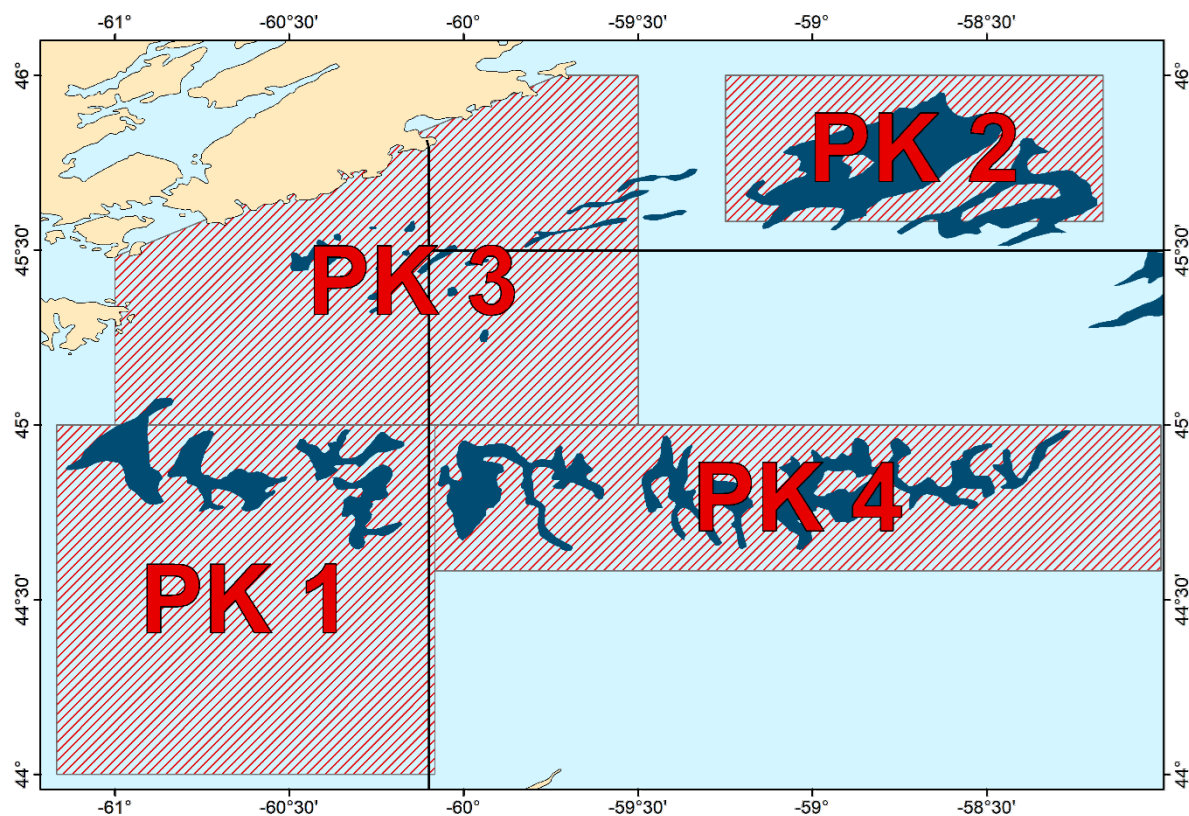


Figure 3. Coverage of satellite data utilized for the calculation of sea surface temperature.

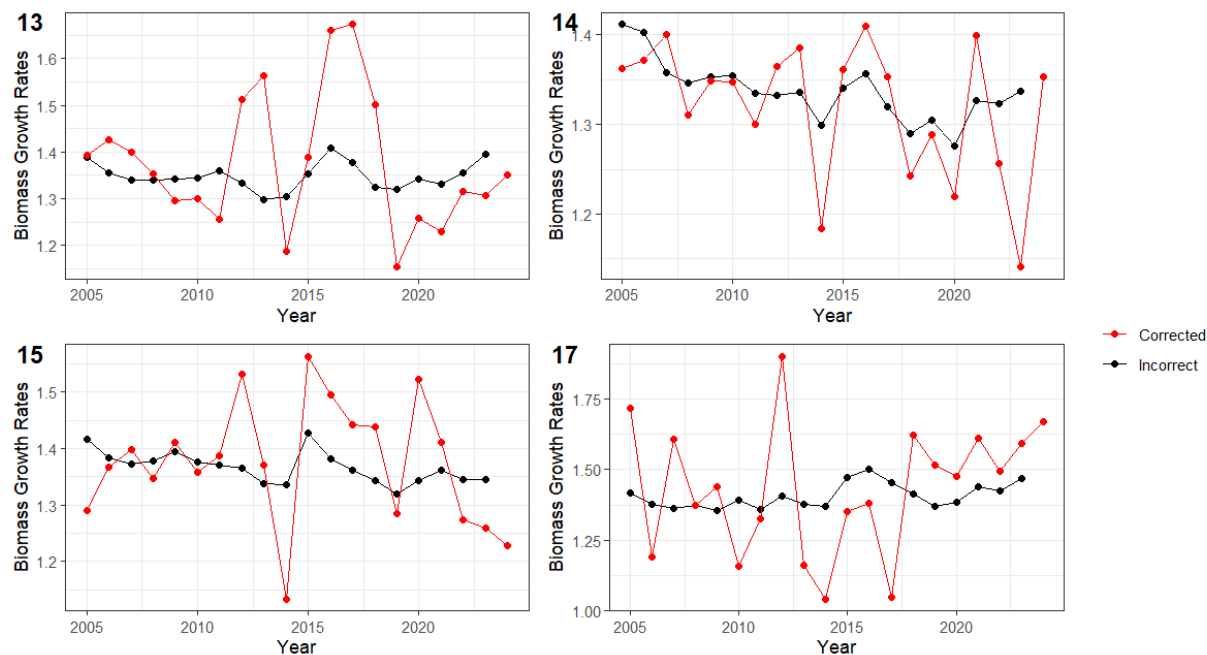


Figure 4. Differences in main trawl growth rates between mistaken ones and corrected ones between 2005 and 2024 by strata.

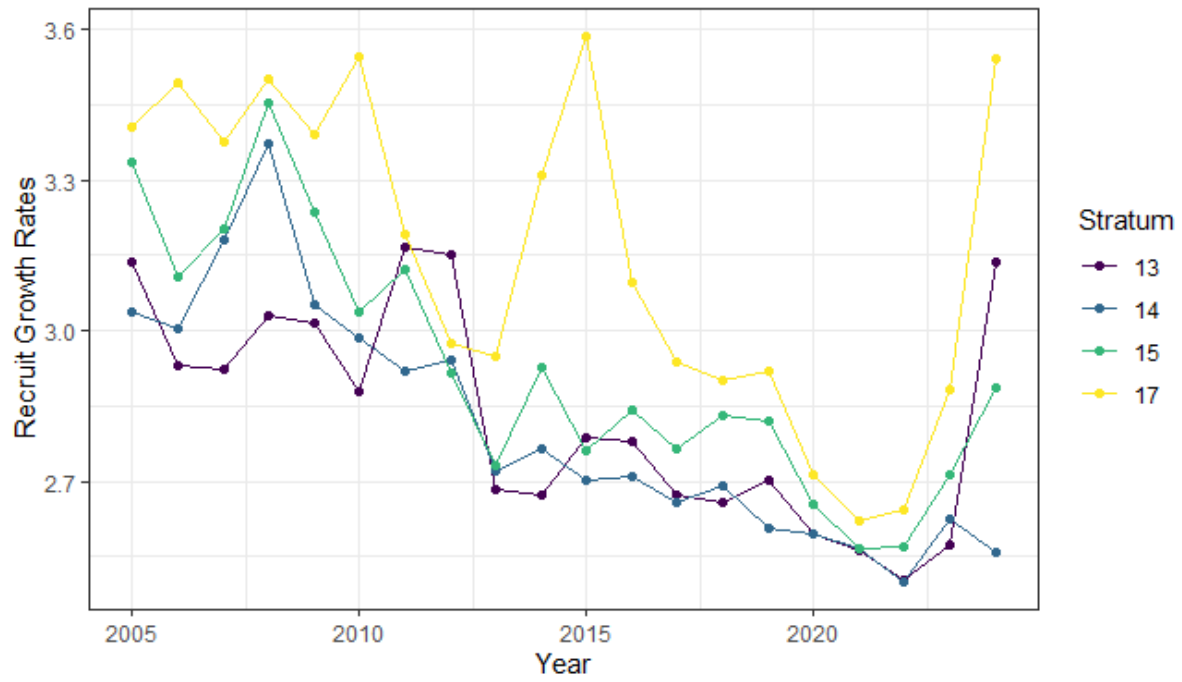


Figure 5. Recruit growth rates between 2005 and 2024.

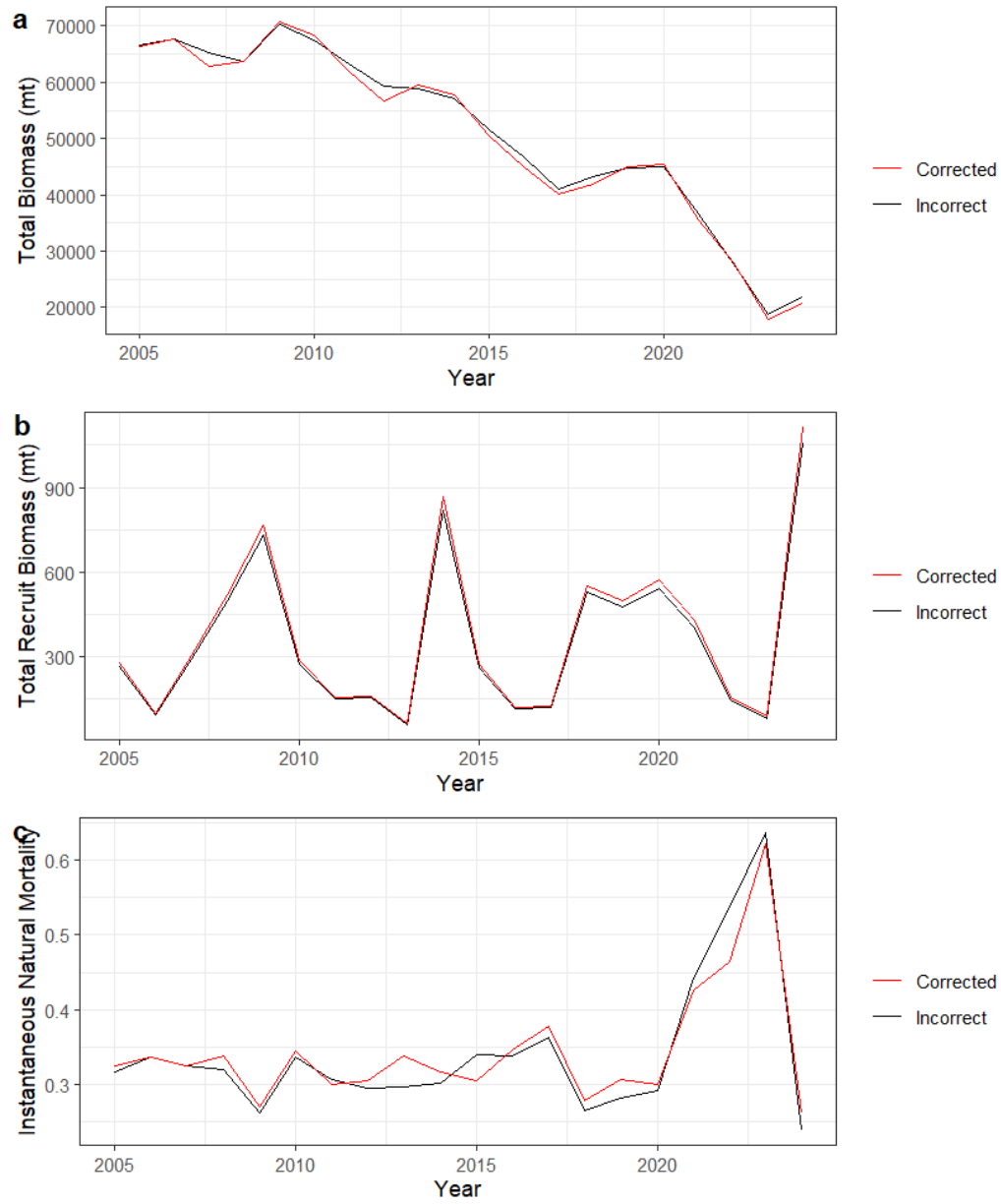


Figure 6. Differences in total biomass in metric tonnes (mt) (a), total recruitment (b), and natural mortality (c) after correcting main trawl growth rates.

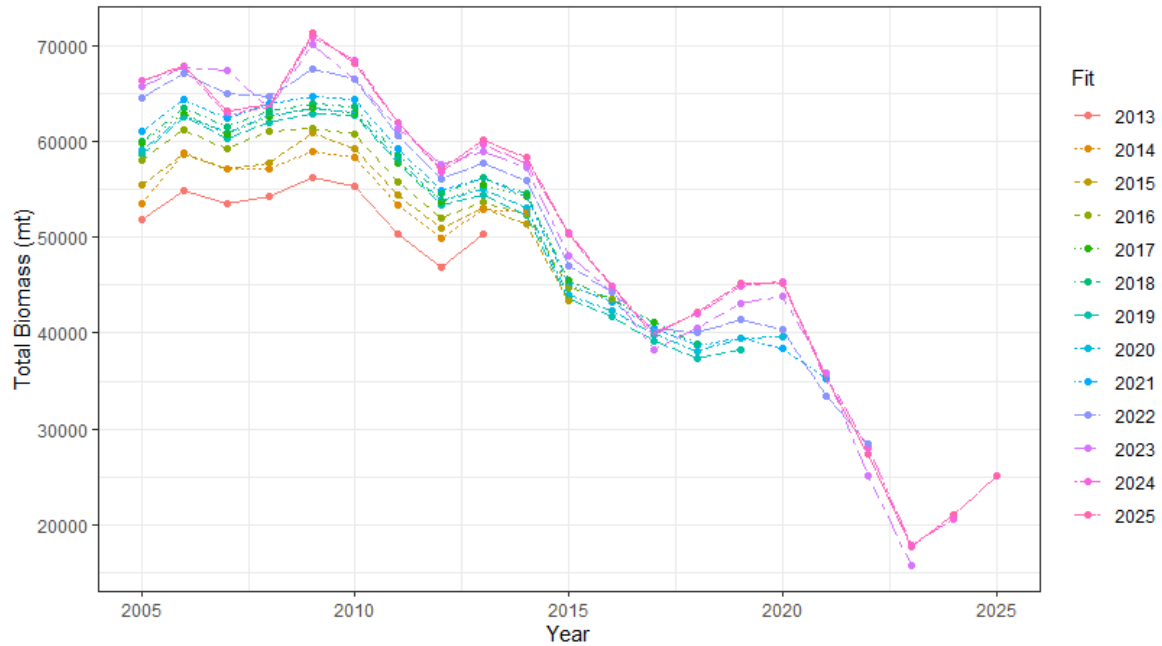


Figure 7. Estimated total biomass in metric tonnes (mt) of each retrospective fit of the Spatially Explicit Assessment Model to data from 2005 to the retrospective fit's year.

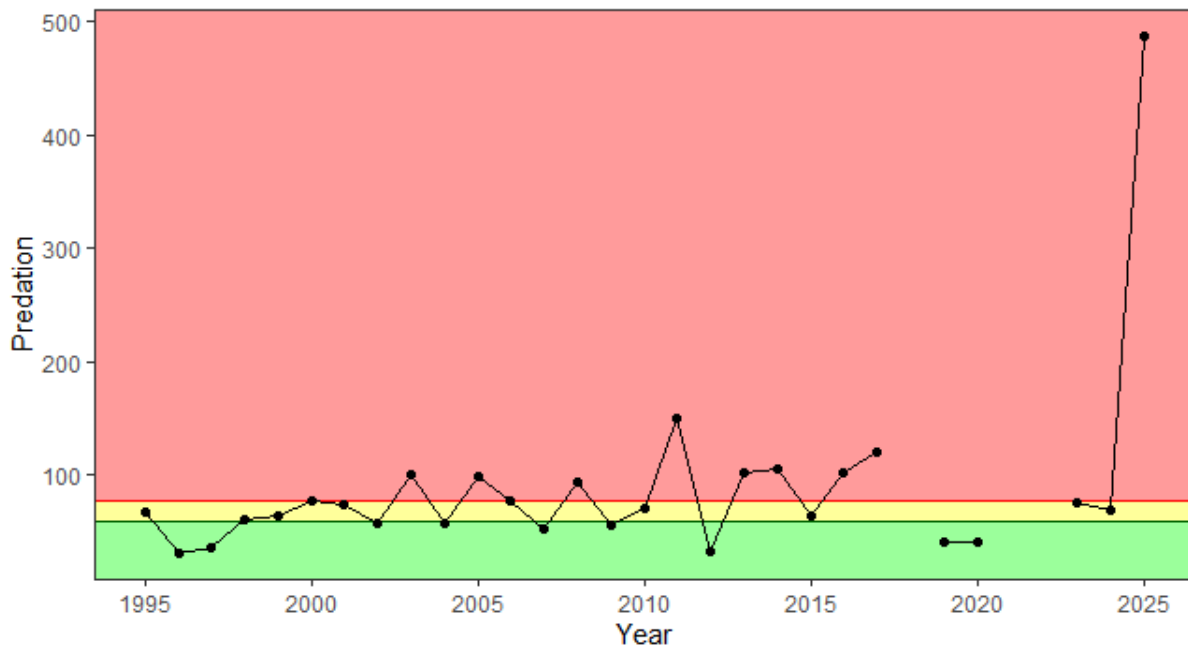


Figure 8. Predation indicator obtained from the DFO Summer Ecosystem Research Vessel Trawl Survey using Strata 443–445 and 459 with the outlier in 2025.

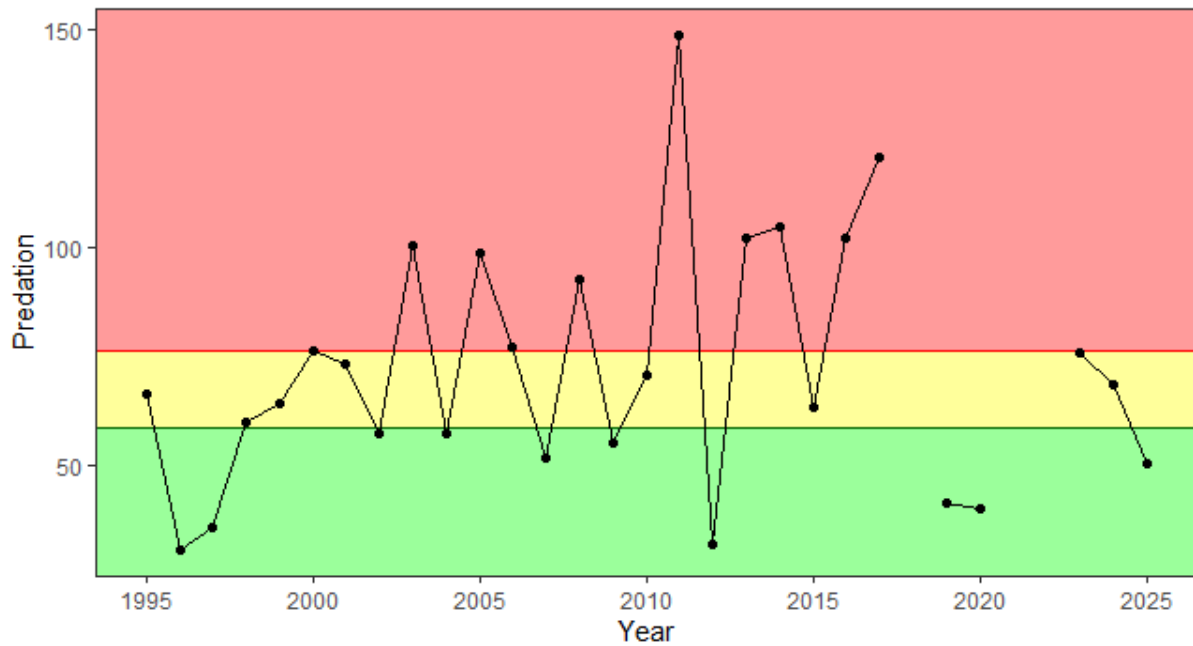


Figure 9. Predation indicator obtained from the DFO Summer Ecosystem Research Vessel Trawl Survey using Strata 443–445 and 459 after removing the outlier in 2025.

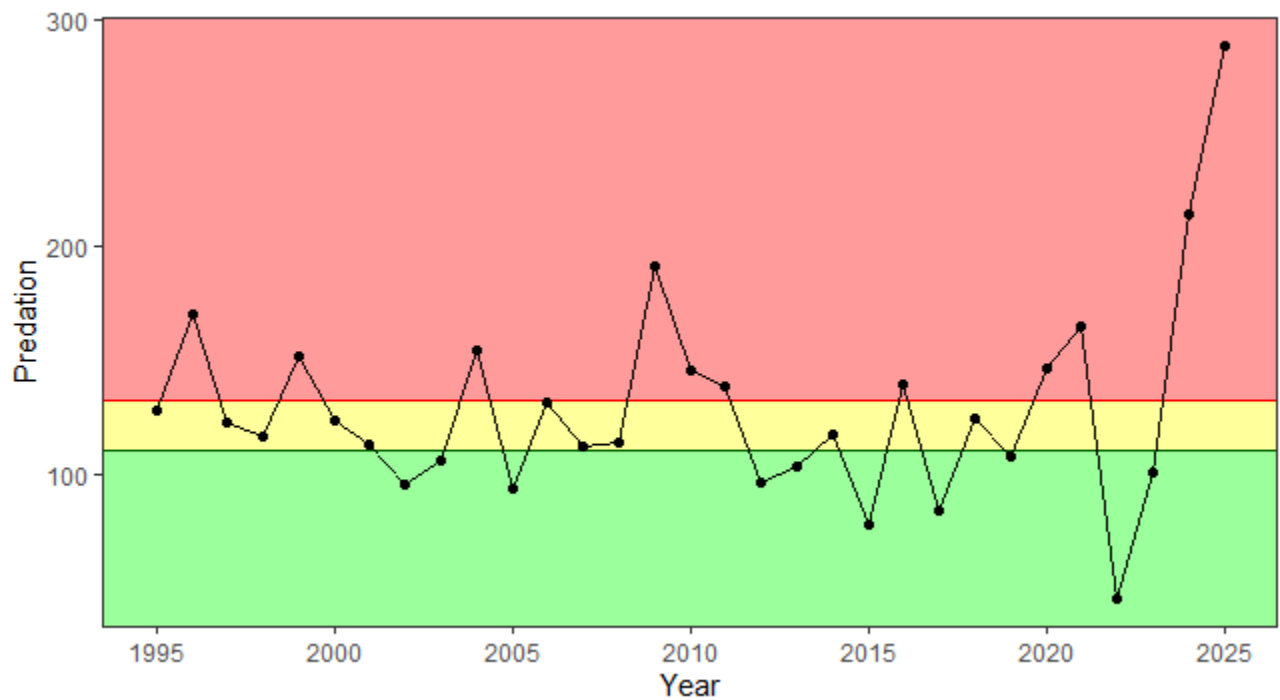


Figure 10. Predation indicator obtained from the DFO Summer Ecosystem Research Vessel Trawl Survey using all tows within Shrimp Fishing Areas 13–15 with the outlier in 2025.

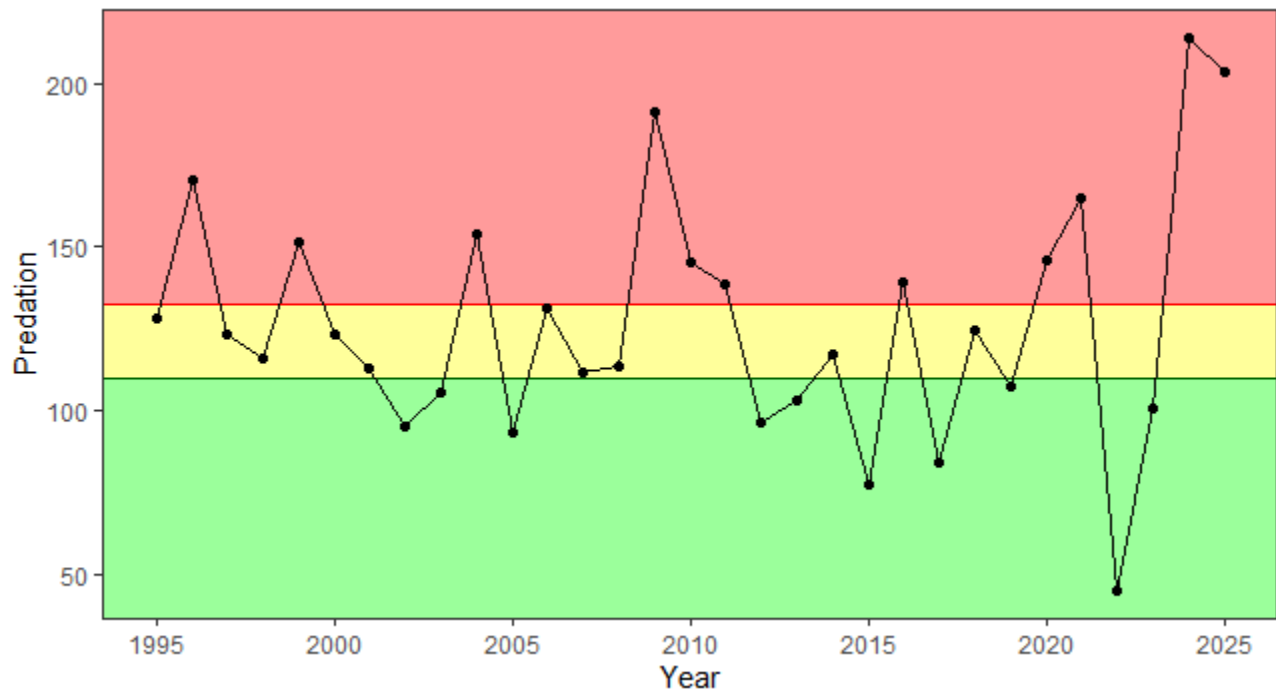


Figure 11. Predation indicator obtained from the DFO Summer Ecosystem Research Vessel Trawl Survey using all tows within Shrimp Fishing Areas 13–15 after removing the outlier in 2025.

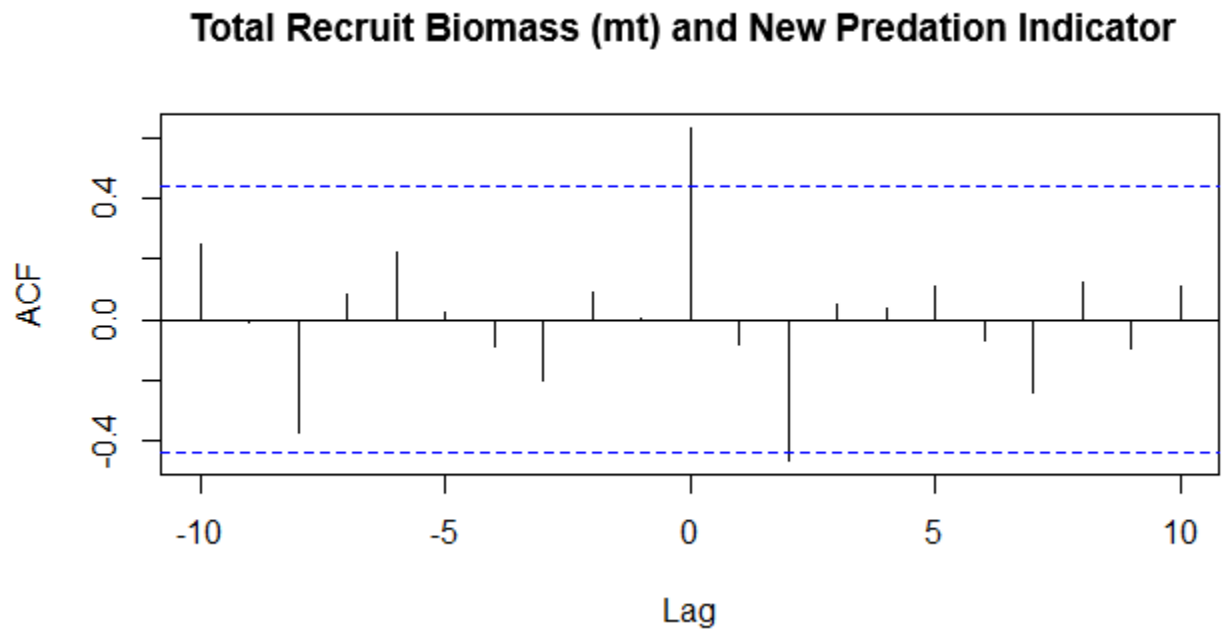


Figure 12. Auto-correlation function (ACF) between the Total Recruit Biomass in metric tonnes (mt) and the new Predation indicator based on the DFO Summer Ecosystem Research Vessel Trawl Survey using all tows within Shrimp Fishing Areas 13–15.

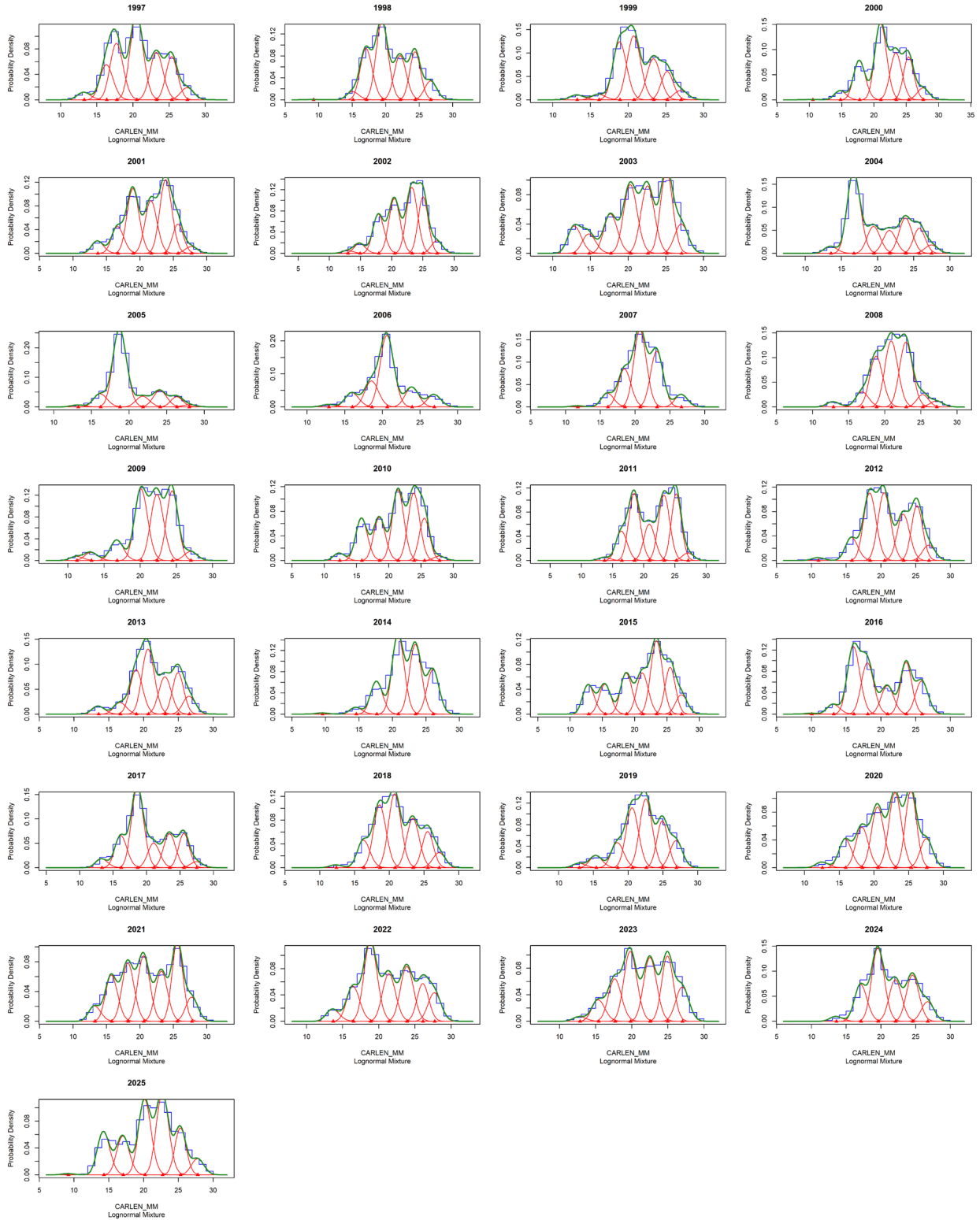


**Figure 13.** Length-frequency and log-Gaussian mixture distributions identified by modal analysis between 1997 and 2025 for all Shrimp Fishing Areas combined. Individual log-Gaussian distribution modes identified by red triangles on the x-axis.

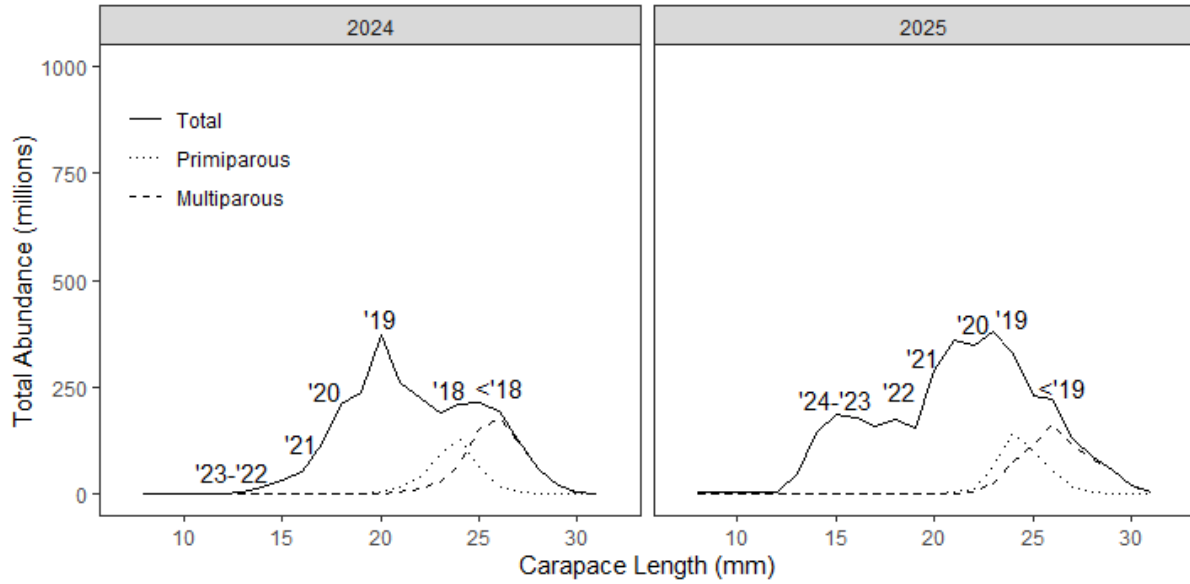


Figure 14. Population estimates of number of shrimp-at-length from the 2024 and 2025 DFO-Industry survey (solid line). The dotted line in each figure represents transitional and primiparous Eastern Scotian Shelf (ESS) Northern Shrimp and the dashed line represents multiparous ESS Northern Shrimp. Year classes associated with ESS Northern Shrimp at given carapace lengths are indicated.

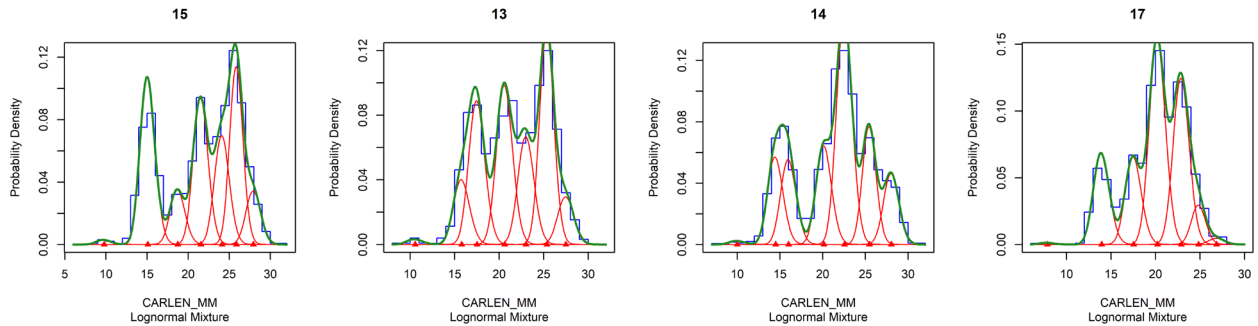


Figure 15. Length-frequency and log-Gaussian mixture distributions identified by modal analysis for Strata 13, 14, 15, and 17 in 2025. Individual log-Gaussian distribution modes identified by red triangles on the x-axis.

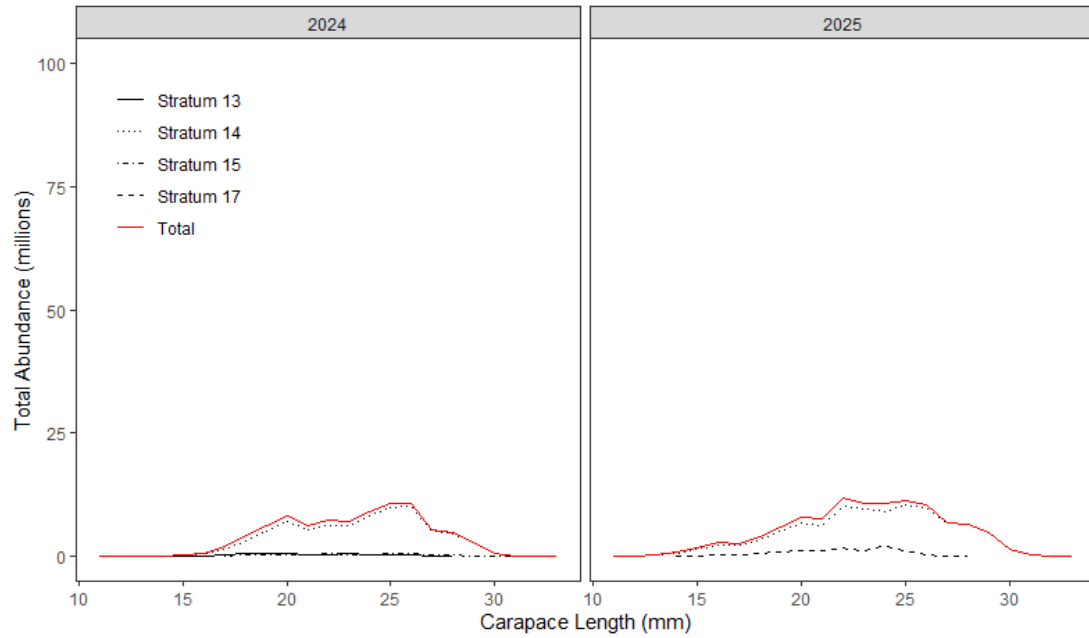


Figure 16. Catch-at-length from commercial sampling by stratum for 2024–25. Sampling extent is usually based on 50 samples, but only 20 samples per year were available for both 2024 and 2025.

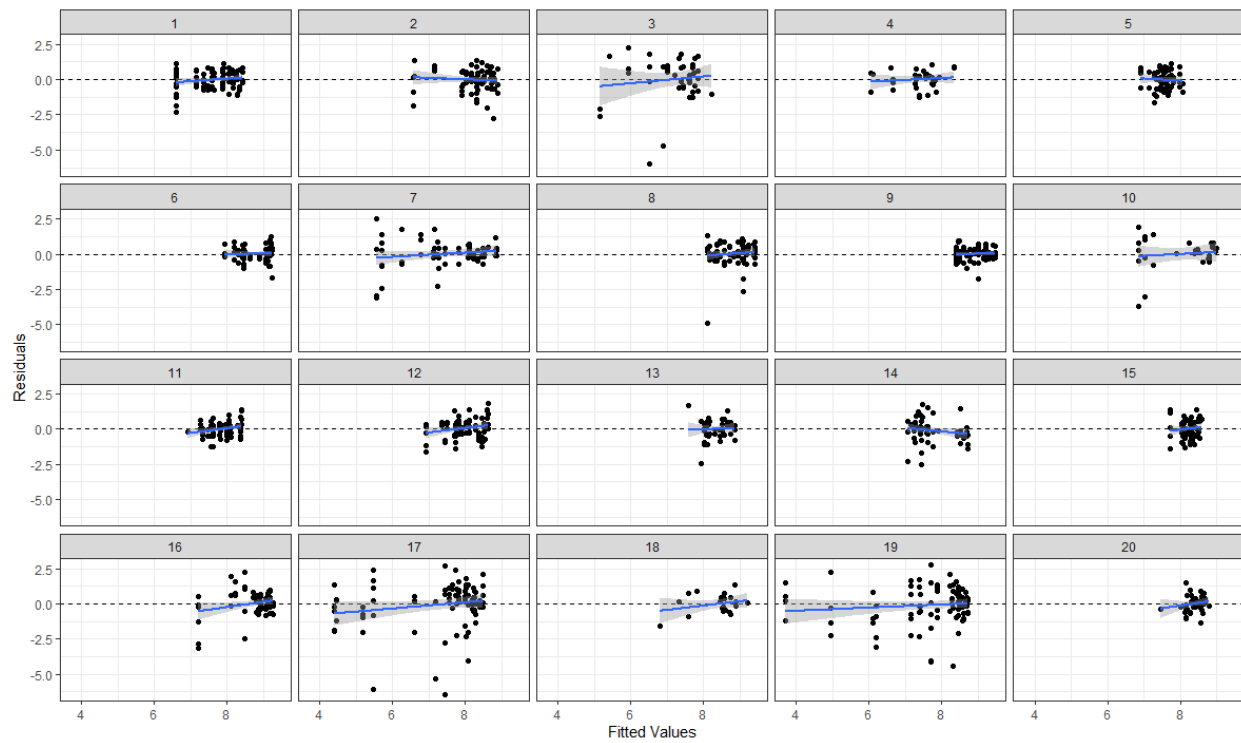


Figure 17. Scatterplot of model residuals against fitted values by knot.

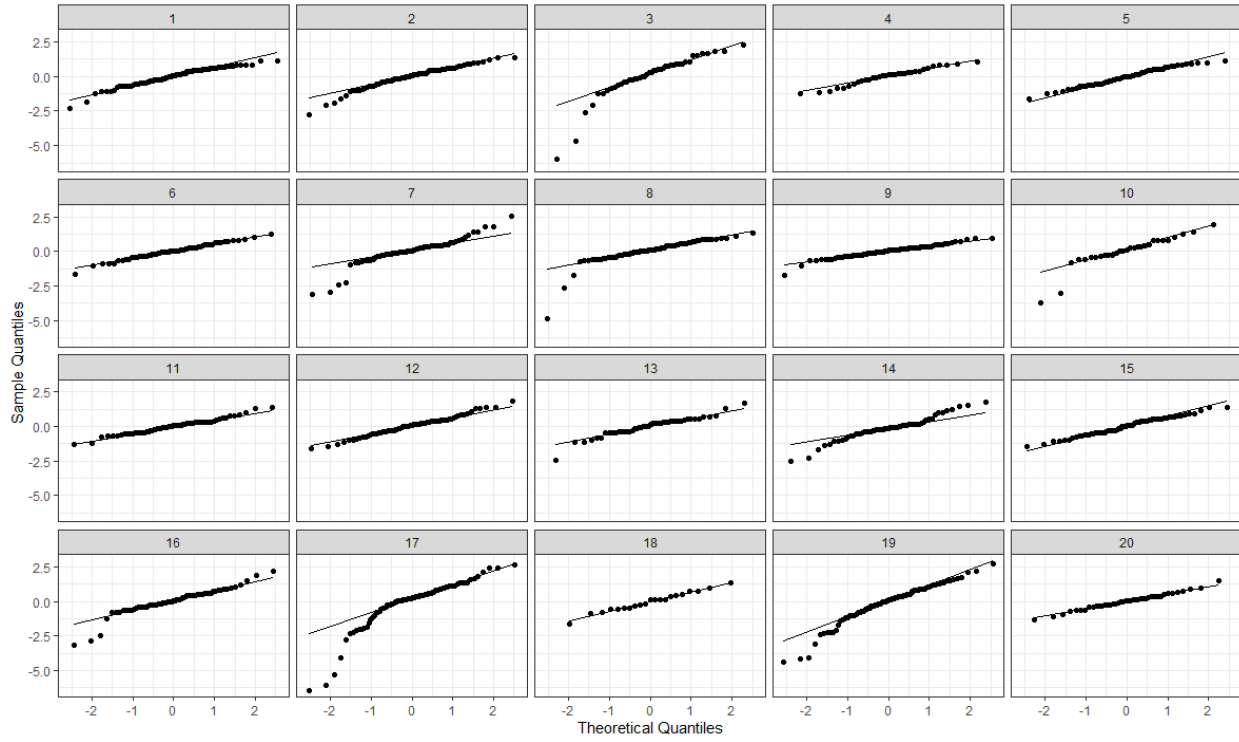


Figure 18. Quantile-quantile plots of residuals by knot.

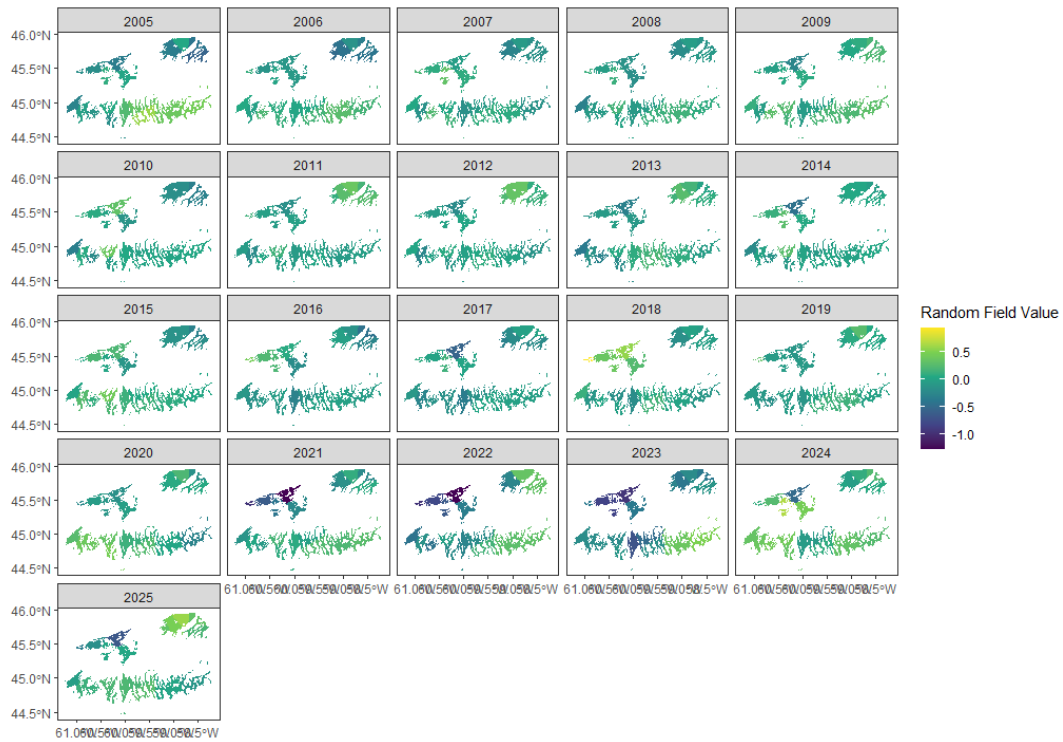


Figure 19. Biomass random field values between 2005 and 2025 across all knots.

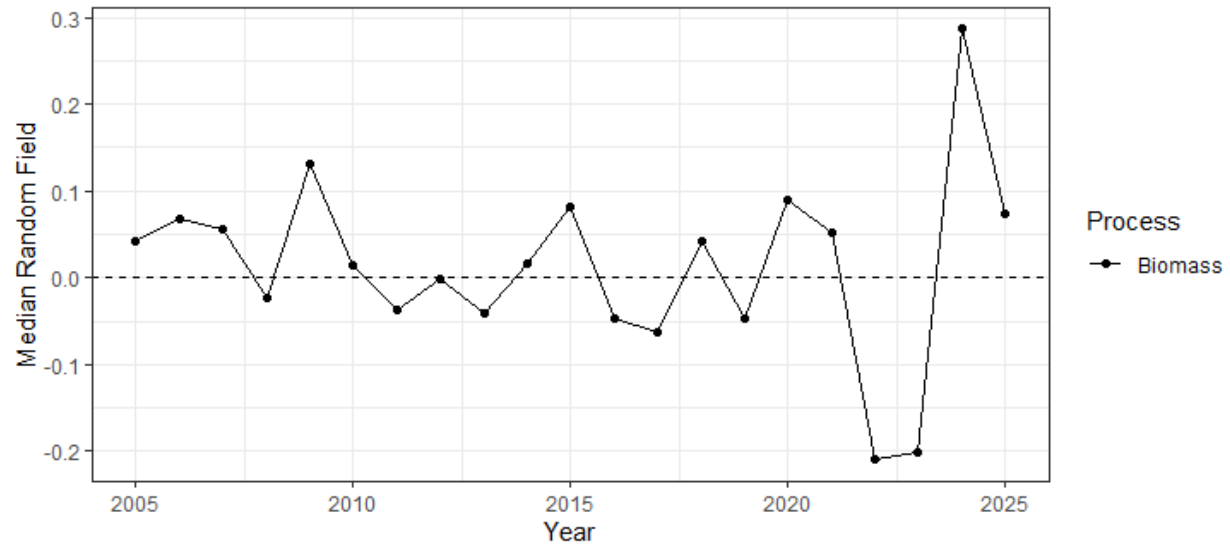


Figure 20. Biomass median random field value between 2005 and 2025, with dashed line indicating zero.

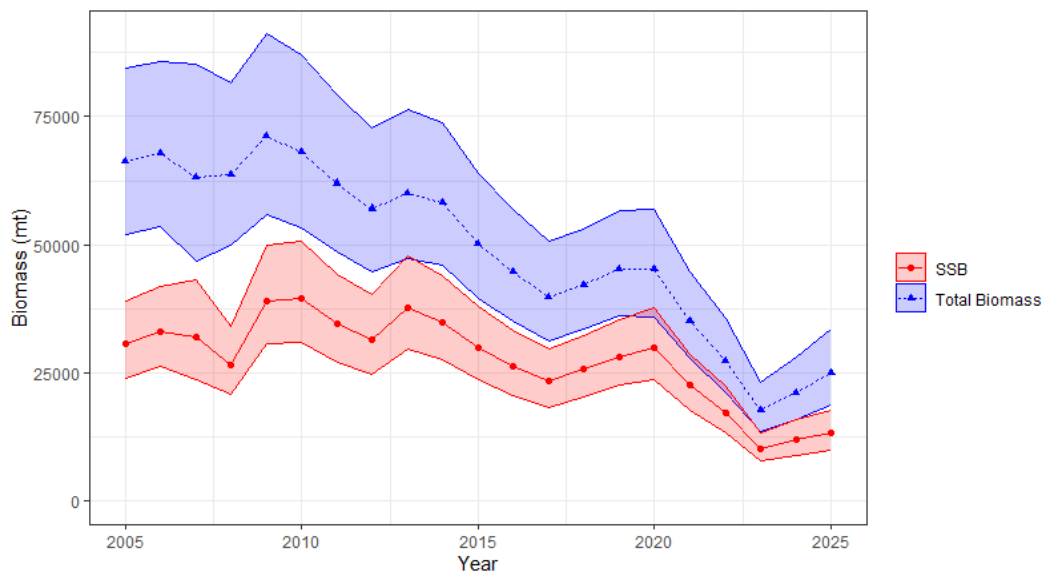


Figure 21. Model-estimated total biomass (blue) and spawning stock biomass (SSB) (red) in metric tonnes (mt) for all Shrimp Fishing Areas combined between 2005 and 2025. Band represents 95% confidence interval.

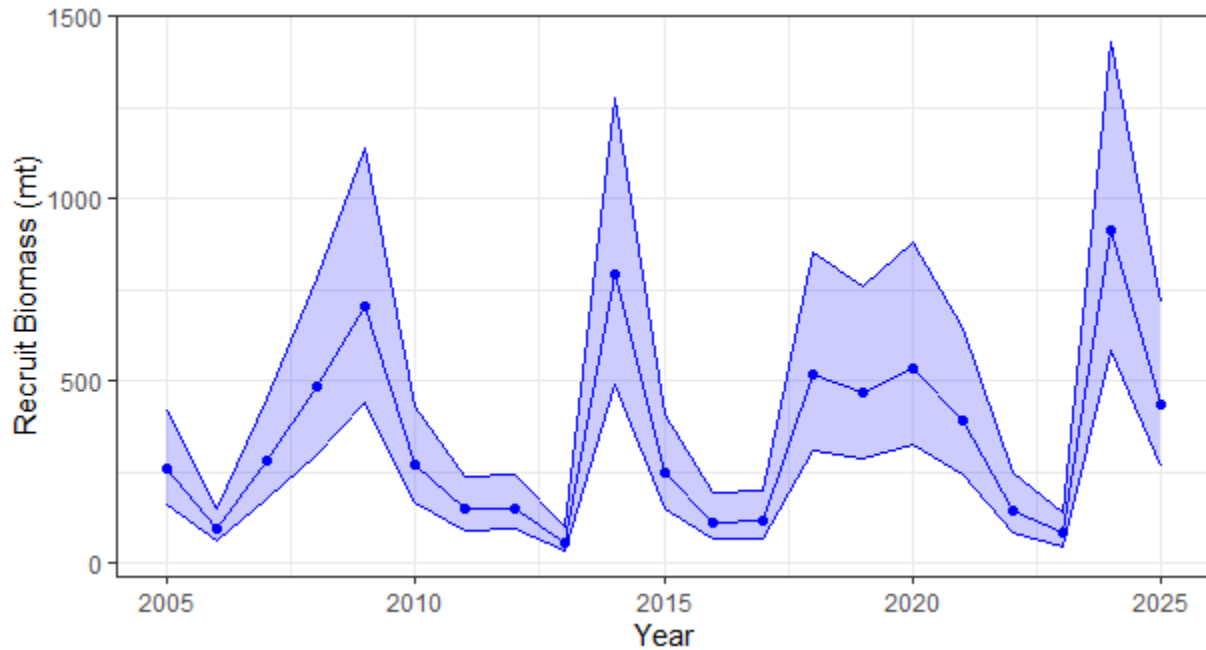


Figure 22. Model-estimated total recruitment in metric tonnes (mt) for all Shrimp Fishing Areas combined between 2005 and 2025. Band represents 95% confidence interval.

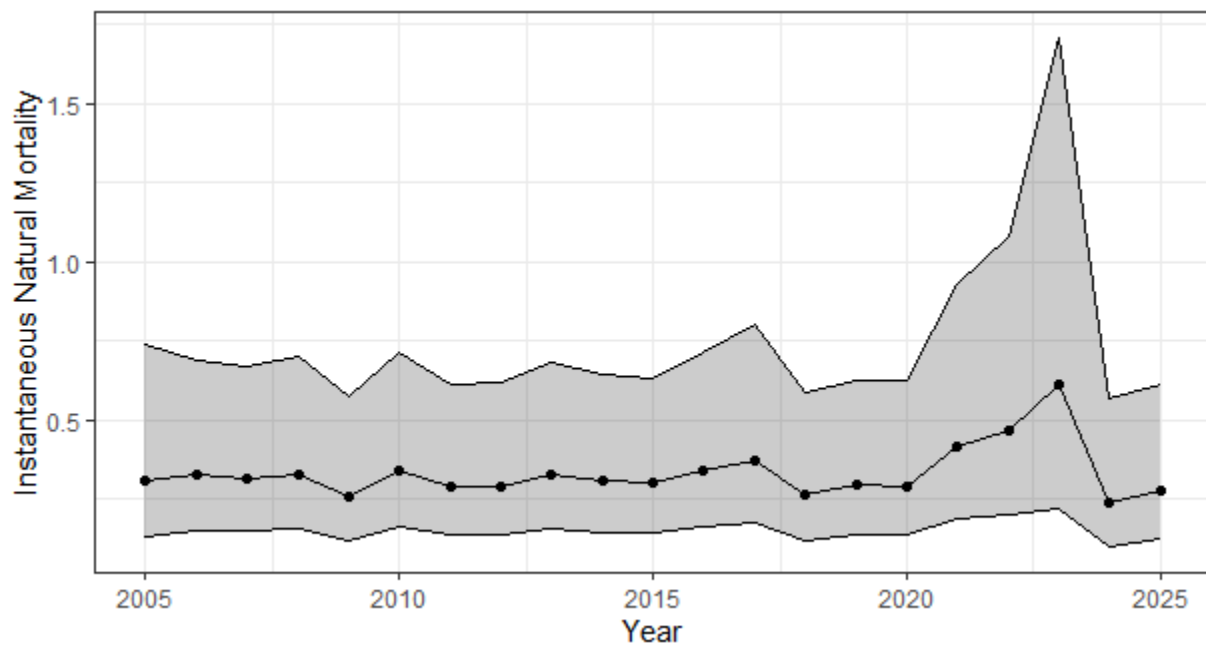


Figure 23. Instantaneous natural mortality for all Shrimp Fishing Areas combined between 2005 and 2025. Band represents 95% confidence interval.

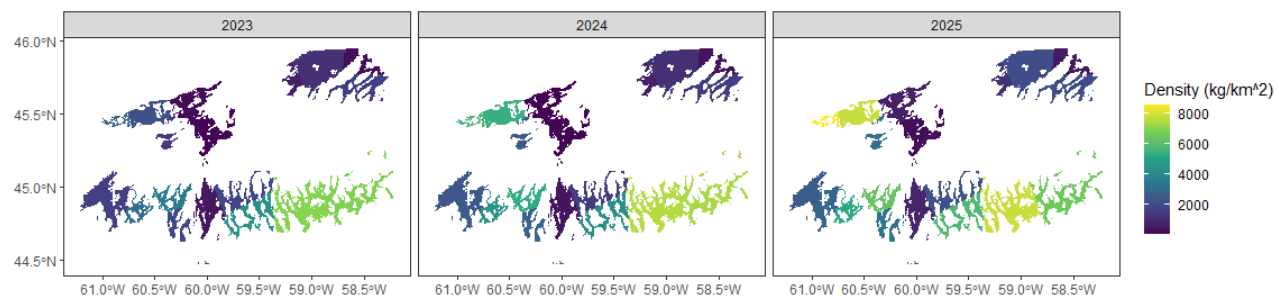


Figure 24. Model-estimated biomass densities in kilograms per square kilometer ( $\text{kg}/\text{km}^2$ ) in each knot between 2023 and 2025.

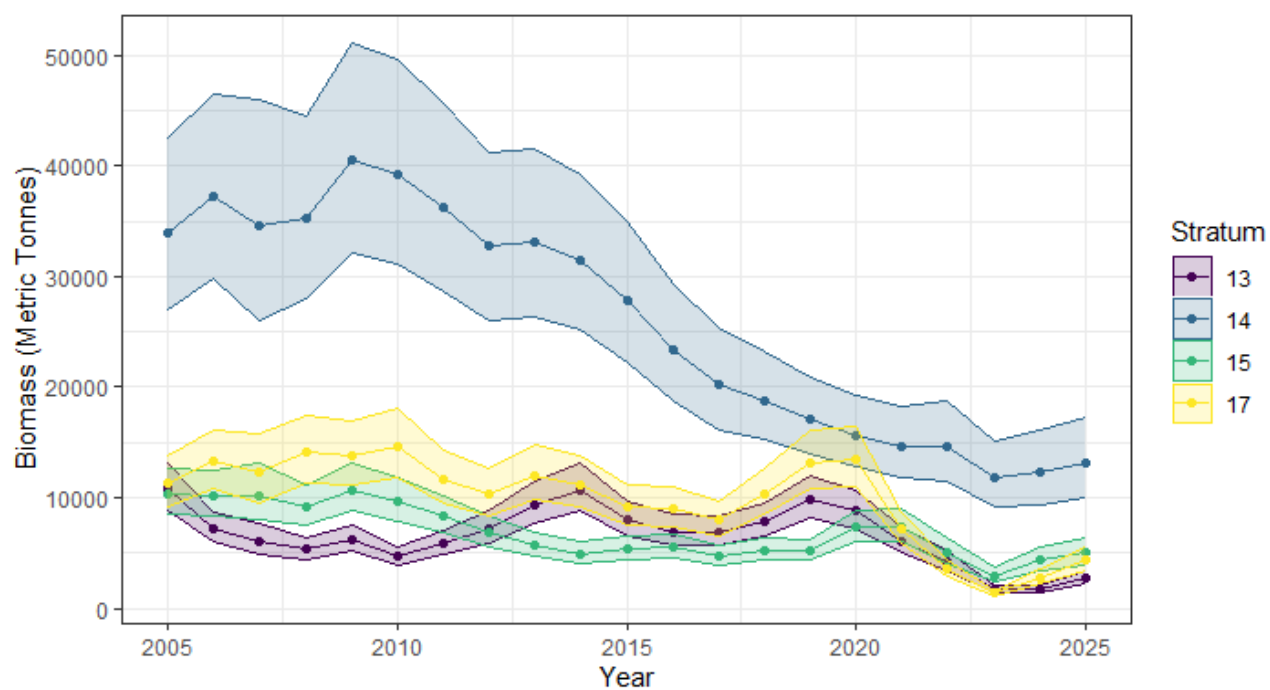


Figure 25. Strata-specific model-estimated total biomasses between 2005 and 2025.

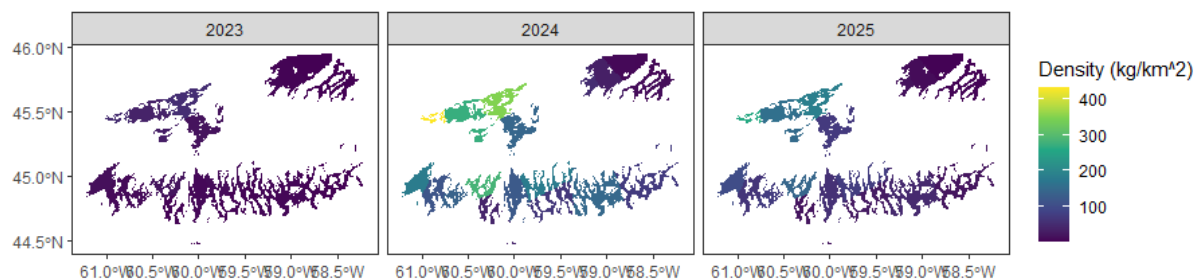


Figure 26. Model-estimated recruit biomass densities in kilograms per square kilometer ( $\text{kg}/\text{km}^2$ ) in each knot between 2023 and 2025.

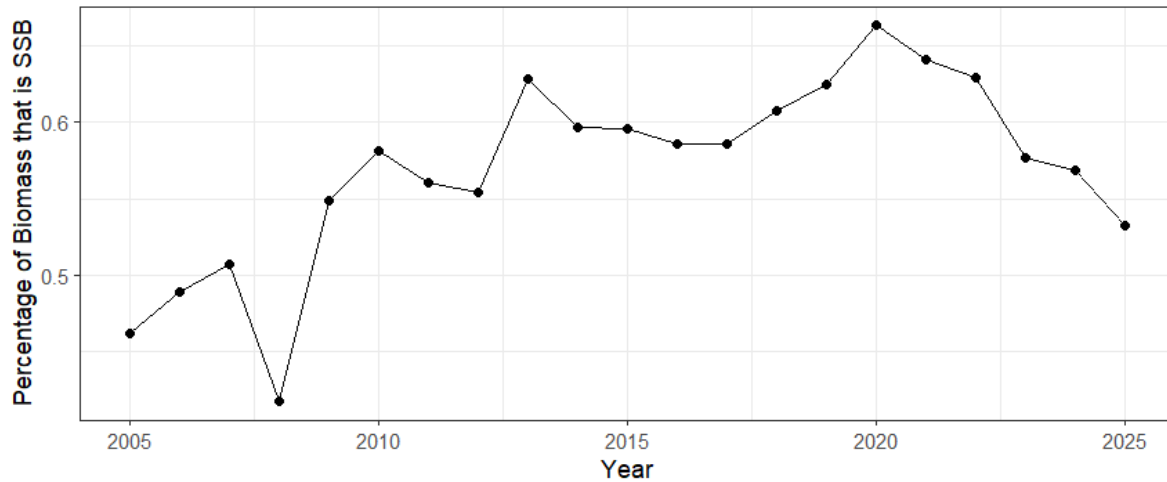


Figure 27. Proportion of biomass that is spawning stock biomass (SSB) between 2005 and 2025 for all Shrimp Fishing Areas combined.

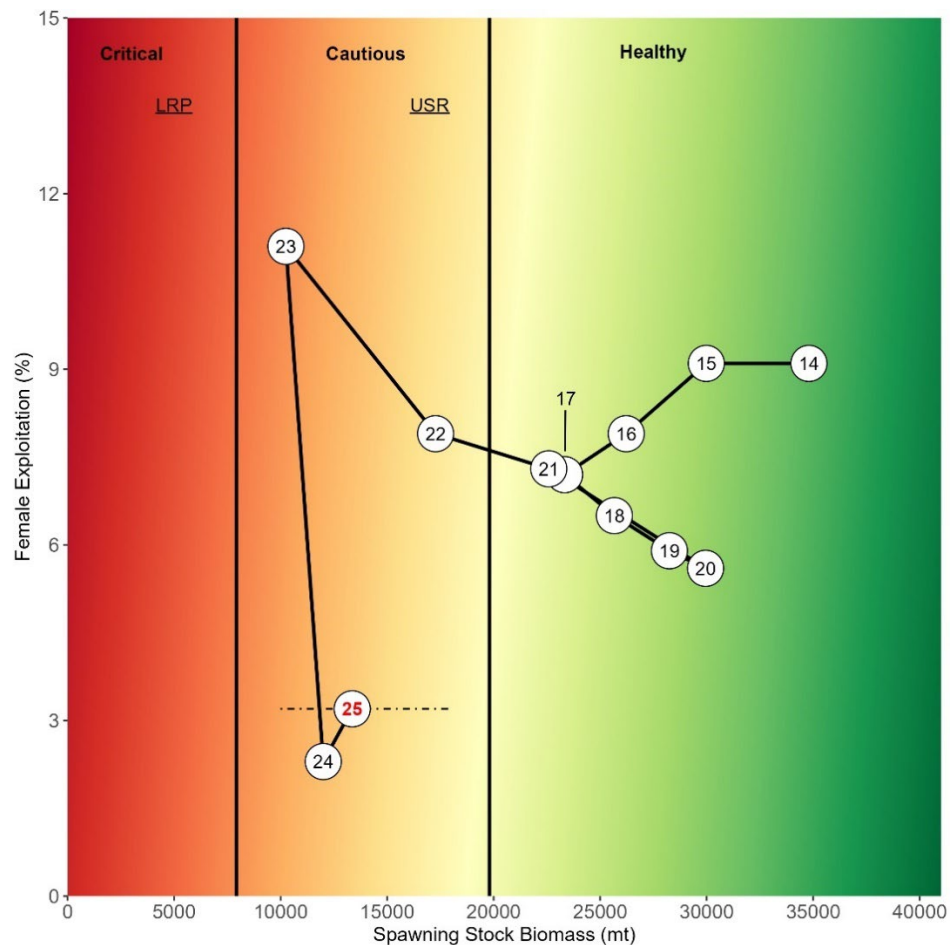


Figure 28. Female exploitation rate in percent (%) versus spawning stock biomass (SSB) in metric tonnes (mt) between 2014 and 2025, with the 2025 confidence interval for SSB denoted by dashed lines and the color gradient representing the healthy zone (green), separated by the upper stock reference (USR) from the cautious zone (yellow), separated by the limit reference point (LRP) from the critical zone (red).

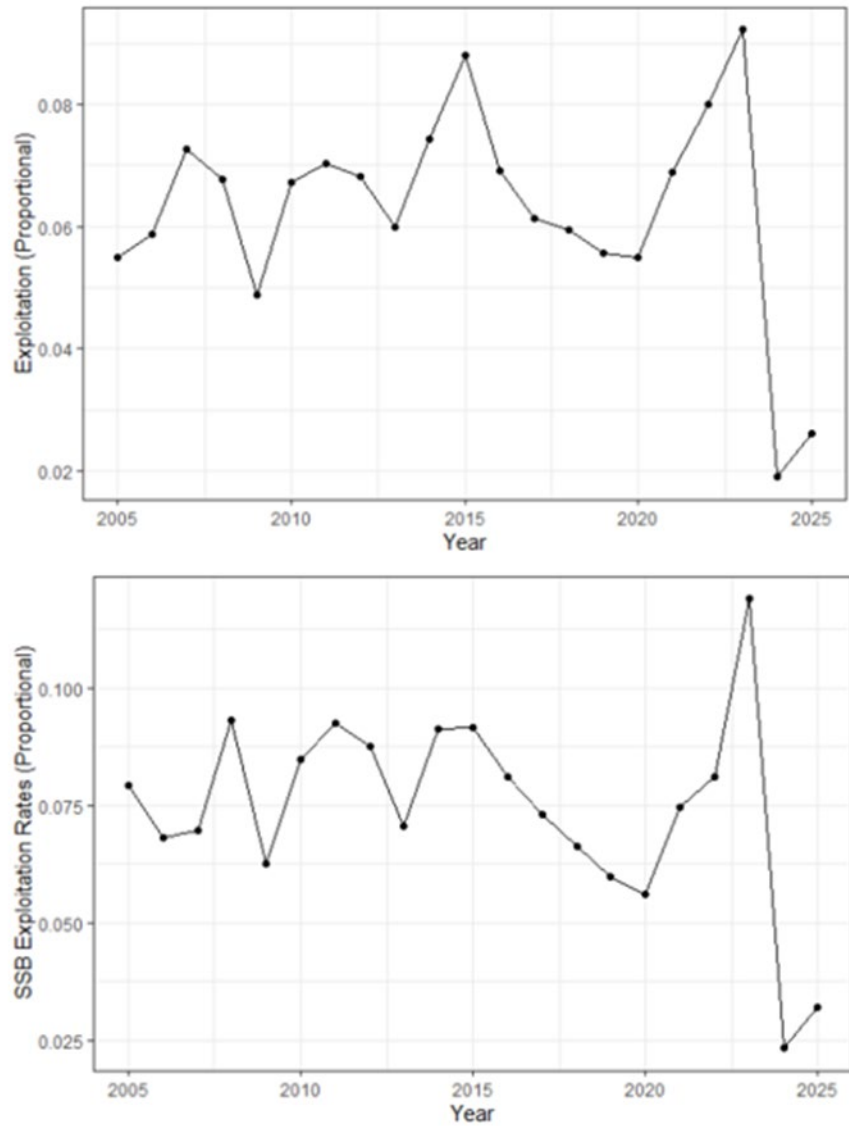


Figure 29. Proportional model-estimated total biomass exploitation rates (top panel) and spawning stock biomass (SSB) exploitation rates (bottom panel) between 2005 and 2025.

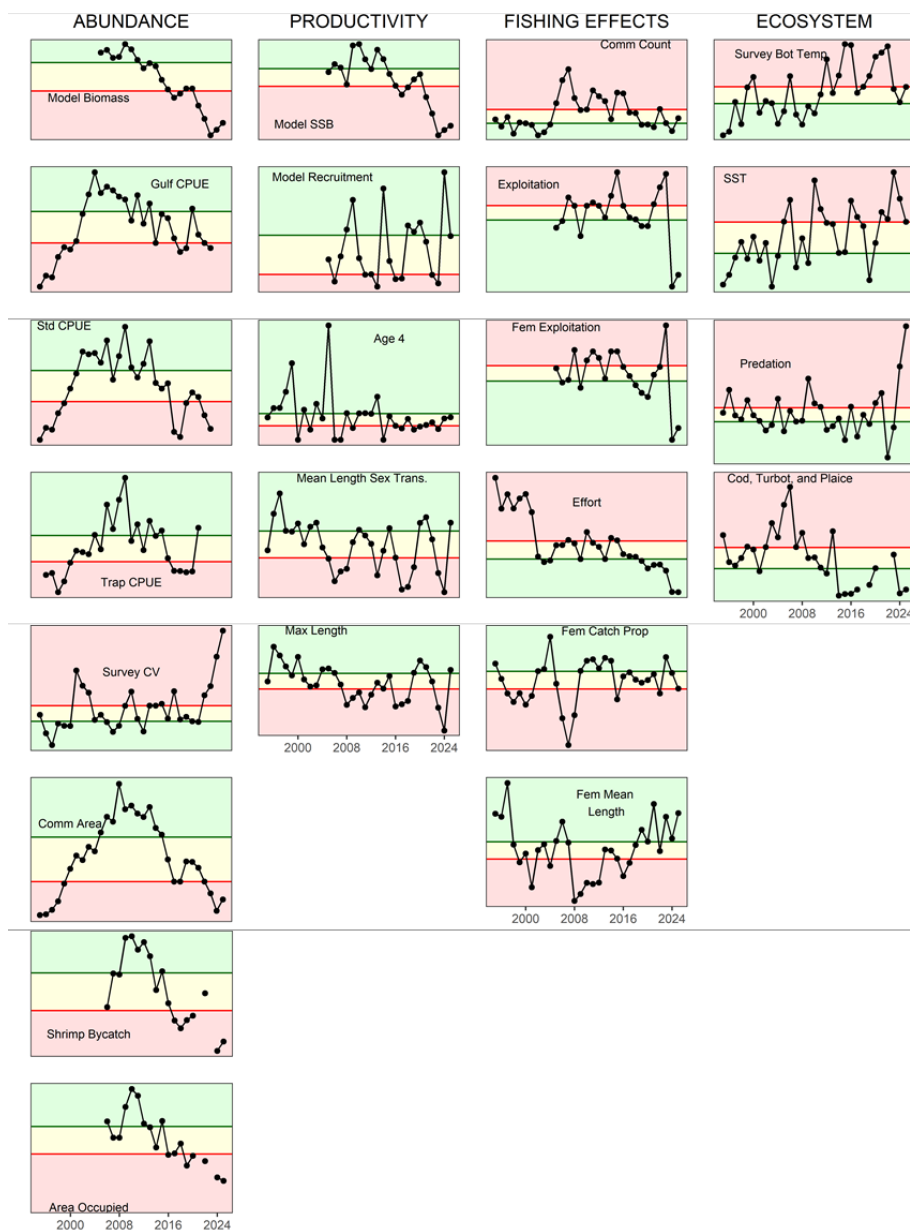


Figure 30. Time series of individual Eastern Scotian Shelf Northern Shrimp indicators updated with 2025 values. Due to the number of active licences and guidelines associated with public reporting pursuant to the Privacy Act, the three commercial catch per unit effort (CPUE) indicators (i.e., Gulf CPUE, Std CPUE, and Trap CPUE) have not been updated in 2025, rather an alternative Joint Commercial CPUE is shown for the Gulf and Std CPUE. SST represents Sea Surface Temperature; Std CPUE represents Maritimes mobile fleet standardized CPUE; Comm count represents commercial counts of shrimp per pound.

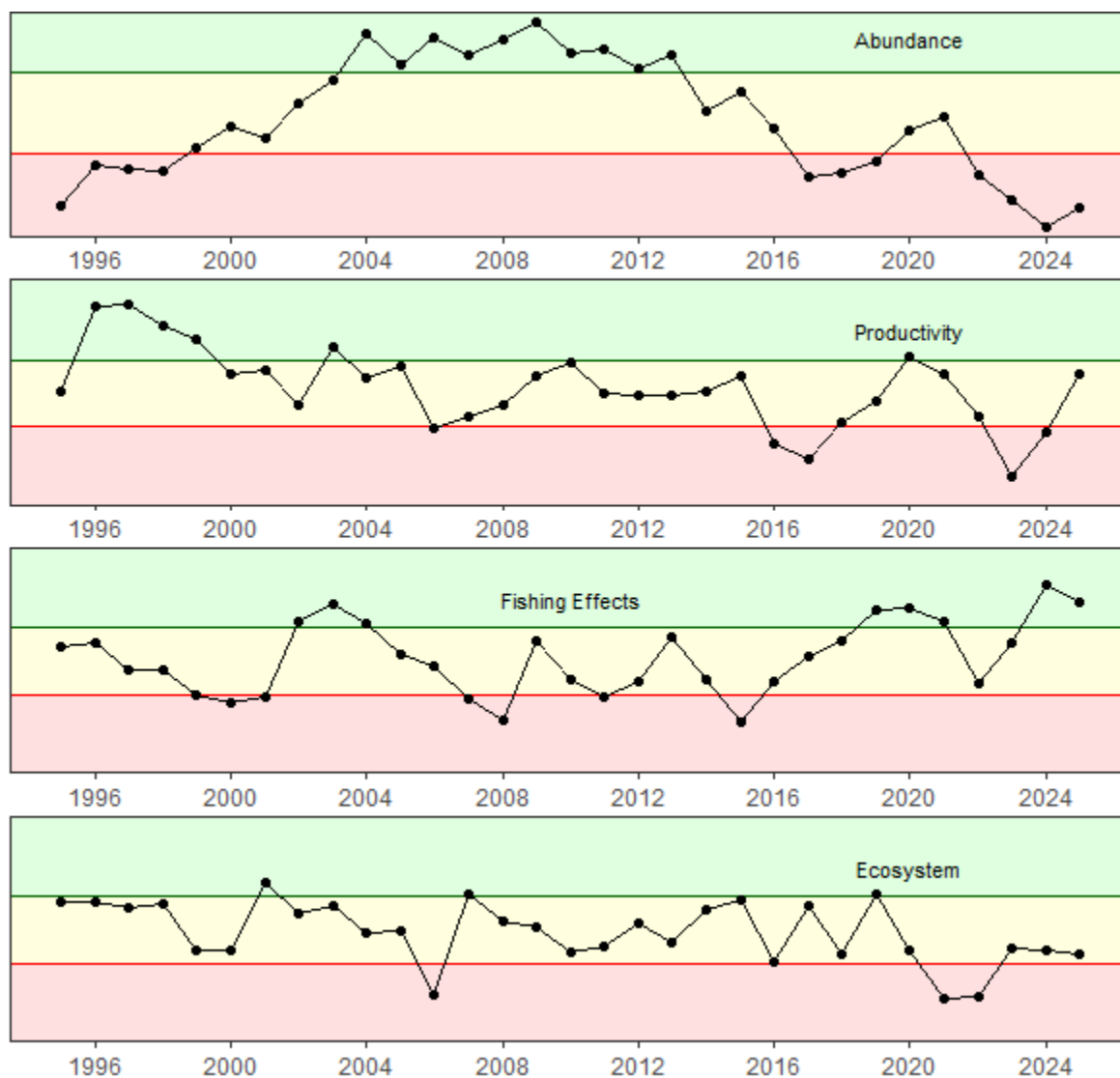


Figure 31. Time series of Eastern Scotian Shelf Northern shrimp indicators grouped into four characteristics between 1995 and 2025. Thresholds between red, yellow, and green are at the 33<sup>rd</sup> and 66<sup>th</sup> percentile of the 1995–2024 data series for each indicator. See McDonald et al. (2025) for detailed description of indicators.

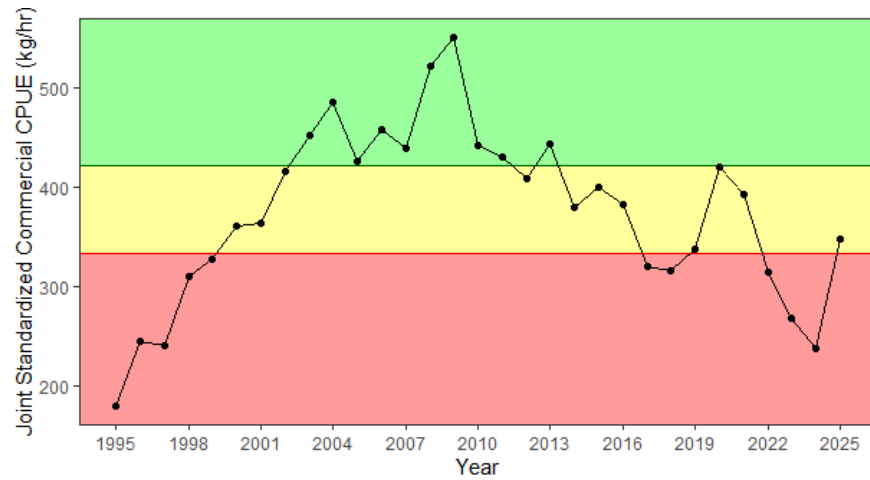


Figure 32. Joint (i.e., Gulf and Nova Scotia fleets) Standardized Commercial catch per unit effort (CPUE) indicator in kilograms per hour (kg/hr) associated with the Abundance characteristic presented in replacement of the Gulf and Standardized CPUE indicators. Refer to McDonald et al. (2025) for a detailed description of the indicator.

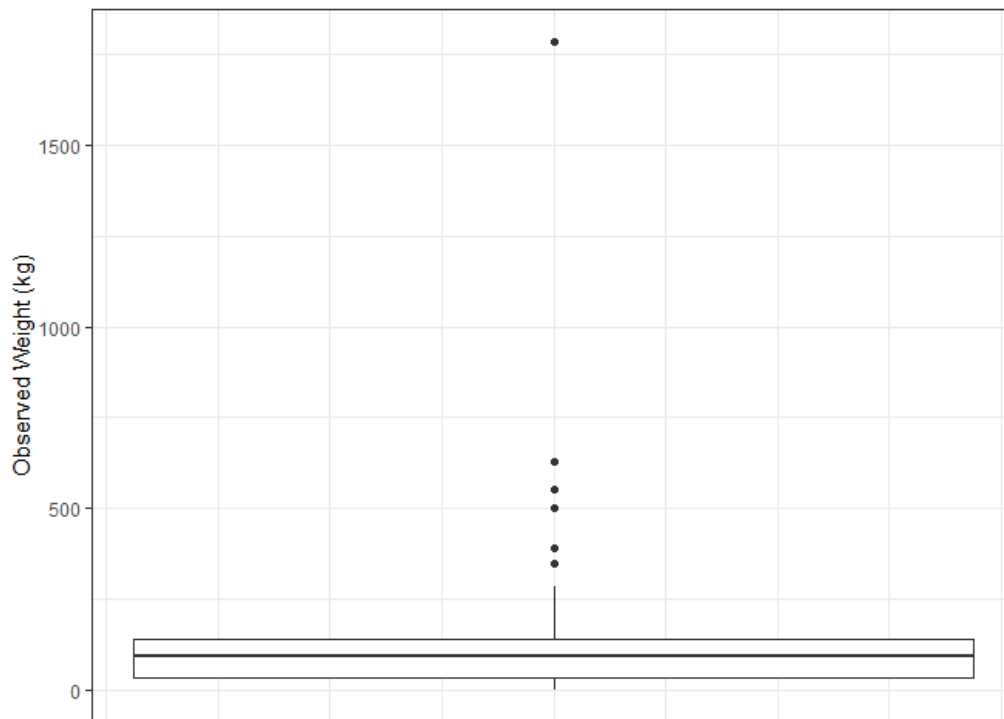


Figure 33. Boxplot of observed weights in kilograms (kg) in the 2025 survey at the 60 stations.

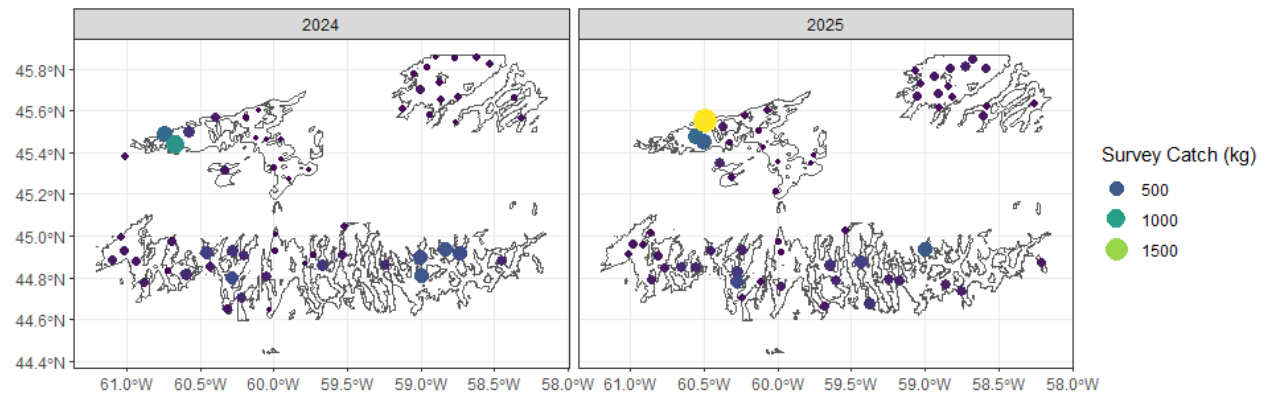


*Figure 34. Image of observed weights in kilograms (kg) in 2024–25 to show the three large tows in 17.*