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Newfoundland and Labrador Region
Arctic Region

Canadian Science Advisory Secretariat
Science Advisory Report 2025/041

STOCK ASSESSMENT FOR STRIPED SHRIMP (*PANDALUS MONTAGUI*) IN SHRIMP FISHING AREA 4, THE EASTERN ASSESSMENT ZONE, AND WESTERN ASSESSMENT ZONE FOR THE 2025–26 FISHING SEASON

CONTEXT

Fisheries and Oceans Canada (DFO) Fisheries Resource Management has requested an assessment of Striped Shrimp (*Pandalus montagui*) stocks in Shrimp Fishing Area 4 (SFA 4), the Eastern Assessment Zone (EAZ), and Western Assessment Zone (WAZ) as the basis for harvest advice for the 2025–26 fishing season.

This Science Advisory Report is from the March 10–11, 2025 multi-regional peer review meeting on Stock Assessment for Striped Shrimp (*Pandalus montagui*) in Shrimp Fishing Area 4, the Eastern Assessment Zone, and the Western Assessment Zone for the 2025-26 Fishing Season. Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- **SFA 4:** In 2024, Striped Shrimp fishable biomass (FB_{pop}) was estimated to be 2.8 times the LRP for SFA 4. The population-wide potential predator index is at a time-series high in 2024, but other indices of stock health showed no cause for concern. Striped Shrimp in SFA 4 is considered in a healthy state.
- **EAZ:** In 2024, Striped Shrimp was estimated to be in the Healthy Zone of the PA Framework, above the USR with a 91.5% probability.
- **WAZ:** In 2024, Striped Shrimp was estimated to be in the Healthy Zone of the PA Framework, above the USR with a 98.0% probability.

Trends

- **SFA 4:** In 2024, the SSB index increased by 6% (to 25,000 t) since 2023, and is slightly above the long-term mean (2005–23). The SFA 4-specific FB index has decreased by 26% (to 28,600 t) since 2023, and is slightly below the long-term mean (29,600 t).
- **EAZ:** The female SSB and FB indices in the EAZ have increased since 2023, by 97.5% (to 13,488 t) and 11.2% (to 15,724 t), respectively. These indices are above the long-term mean (2009–23) and reference period mean (2009–19).
- **WAZ:** The female SSB and FB indices in the WAZ have increased since 2023, by 65.3% (to 65,704 t) and 7.7% (to 72,644 t), respectively. These indices are above the long-term mean (2014–23) and reference period mean (2014–19).

Ecosystem and Climate Change Considerations

- In SFA 4, the EAZ, and WAZ, summer ocean bottom temperatures for 2024 were close to average to slightly warmer.
- The potential predator index representing the assessment area has increased in recent years to a time-series high in 2024.

Stock Advice

- **SFA 4:** The preliminary ERI for 2024/2025 was 10.4%, with 74% of the bycatch limit taken. If the full bycatch limit is taken in 2024/2025, the ERI will be 14.1%.
- **EAZ:** The preliminary ERI for 2024/2025 in the EAZ was 1.6%, with 11.1% of the TAC taken. If the full TAC is taken in 2024/2025, the ERI will be 14.1%.
- **WAZ:** The preliminary ERI for 2024/2025 in the WAZ was 6.0%, with 28% of the TAC taken. If the full TAC is taken in 2024/2025, the ERI will be 21.2%.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

The assessment for the EAZ and WAZ follows the reference points developed in 2020 for the Precautionary Approach (PA) framework for Striped Shrimp (DFO 2020). The assessment for SFA 4 follows the assessment framework developed in 2023 (Baker et al. 2024).

Assessment Type

Full Assessment

Most Recent Assessment Date

1. Last Full Assessment: 2023 (Fulton et al. 2024, Le Corre et al. 2024, DFO 2024a)
2. Last Interim-Year Update: January (SFA 4) and February (EAZ and WAZ) 2024 (DFO 2024b, DFO 2024c, DFO 2024d).

Stock Assessment Approach

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

In the EAZ and WAZ, the assessment follows the framework established by DFO (2020); catch data from scientific surveys are spatially expanded to produce an abundance index for fishable biomass (FB) and female spawning stock biomass (SSB). Both male and female shrimp with a carapace length greater than 17 mm are considered in the calculation of the FB index, while female shrimp of any size form the basis of the SSB index.

The assessment of SFA 4 uses a spatiotemporal model to estimate fishable biomass for the Striped Shrimp population as a whole (i.e., EAZ, WAZ, and SFA 4 combined) (Baker et al. 2024). In addition, the framework for SFA 4 examines a potential predator index, total egg production, and a SFA 4-specific FB index calculated using Ogive Mapping methodology.

Ecosystem and Climate Change Assessment Approach

Ocean bottom temperature and trends were considered. Biomass of key predators is integrated into the SFA 4 assessment framework and examined for the whole assessment area.

Stock Structure Assumption

SFA 4, EAZ, and WAZ are management-based stock units. Striped Shrimp stocks in these units are biologically connected through larval dispersal (Le Corre et al. 2020).

Reference Points

Table 1. Reference points for Striped Shrimp in the Eastern Assessment Zone (EAZ) and Western Assessment Zone (WAZ). B_{MSY} is the biomass at maximum sustainable yield.

Reference Point	Description	EAZ	WAZ
Limit Reference Point (LRP):	40% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2009–19 for EAZ, 2014–19 for WAZ), a proxy for B_{MSY}, DFO (2020).	3,100 t	12,300 t
Upper Stock Reference (USR):	80% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2009–19 for EAZ, 2014–19 for WAZ), a proxy for B_{MSY}, DFO (2020).	6,100 t	24,600 t
Removal Reference (RR):	N/A	-	-
Target (TRP):	N/A	-	-

In SFA 4, an LRP for Striped Shrimp based on the combined survey data time series (2005–22) of SFA 4, EAZ, and WAZ was developed from a spatiotemporal model that created a new FB index (FB_{pop}) to determine the stock status. The LRP for Striped Shrimp in SFA 4 is the average of the following metrics:

- the lowest FB_{pop} at which the stock increased and remained above the geometric mean for a period of at least three years,
- the lowest observed FB_{pop} between 2005 and 2022, and
- 40% of the geometric mean of the FB_{pop} index from 2005 to 2022.

In addition to reporting on the status of the stock in relation to the LRP, three additional indicators of stock health are reported during each assessment: potential predator index, total egg production index, and SFA 4-specific fishable biomass index. There is no USR for SFA 4.

Data

- Northern Shrimp Research Foundation (NSRF) – DFO collaborative annual trawl survey (2005–24): 2005–24 for SFA 4, 2009–24 for EAZ, 2014–24 for WAZ.
- Atlantic Quota Monitoring System (AQMS – formerly known as the Canadian Atlantic Quota Report [CAQR]; 2010–2024/2025).

- Reported commercial catch data (1979–2009).
- At-sea observer program (1979–2025).

Data changes:

- Commercial catch data for 2024/2025 are considered incomplete as the season is not officially closed until March 31, 2025. AQMS data for SFA 4 were pulled on February 2, 2025. AQMS data for EAZ and WAZ were pulled on January 15, 2025.

ASSESSMENT

Historical and Recent Stock Trajectory and Trends – Shrimp Fishing Area 4

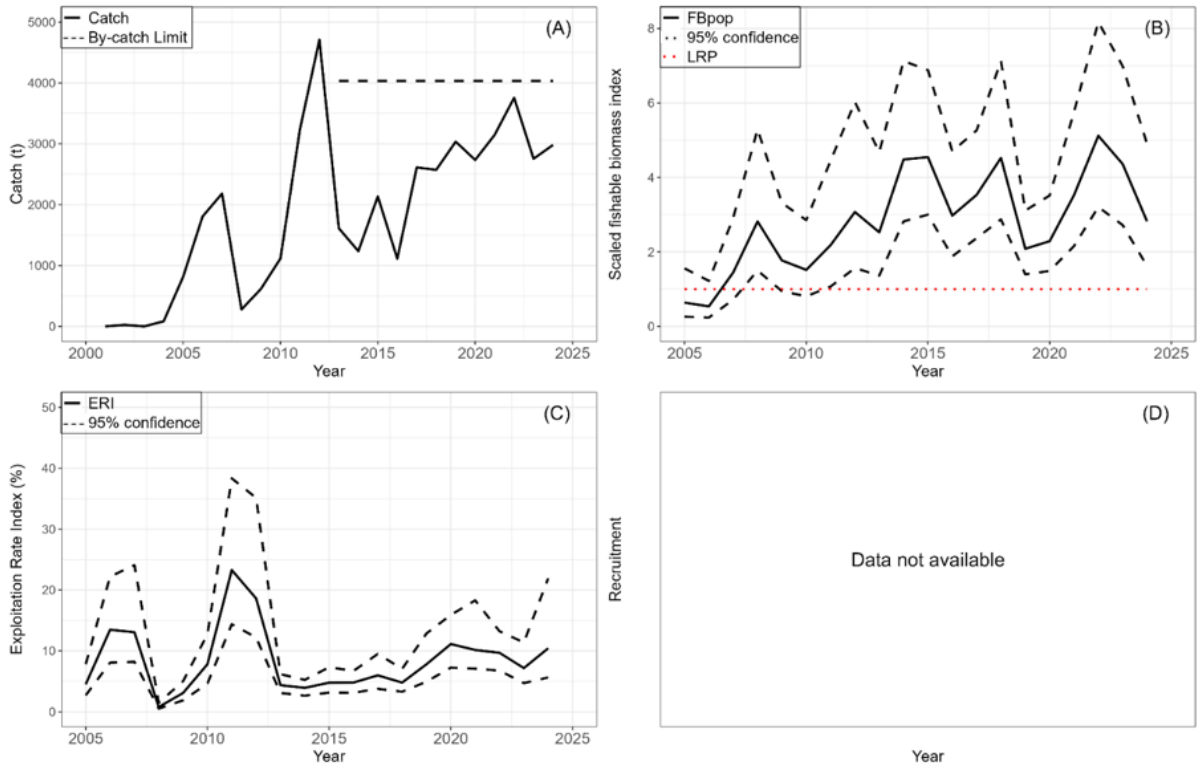

Figure 1. Shrimp Fishing Area (SFA) 4 stock trends: (A) Catch and By-catch Limit, (B) Fishable Biomass (FB_{pop}) in relation to the Limit Reference Point (LRP), (C) Exploitation Rate Index (ERI) (Fisheries catch relative to SFA 4-specific fishable biomass), D) Recruitment (data not available).

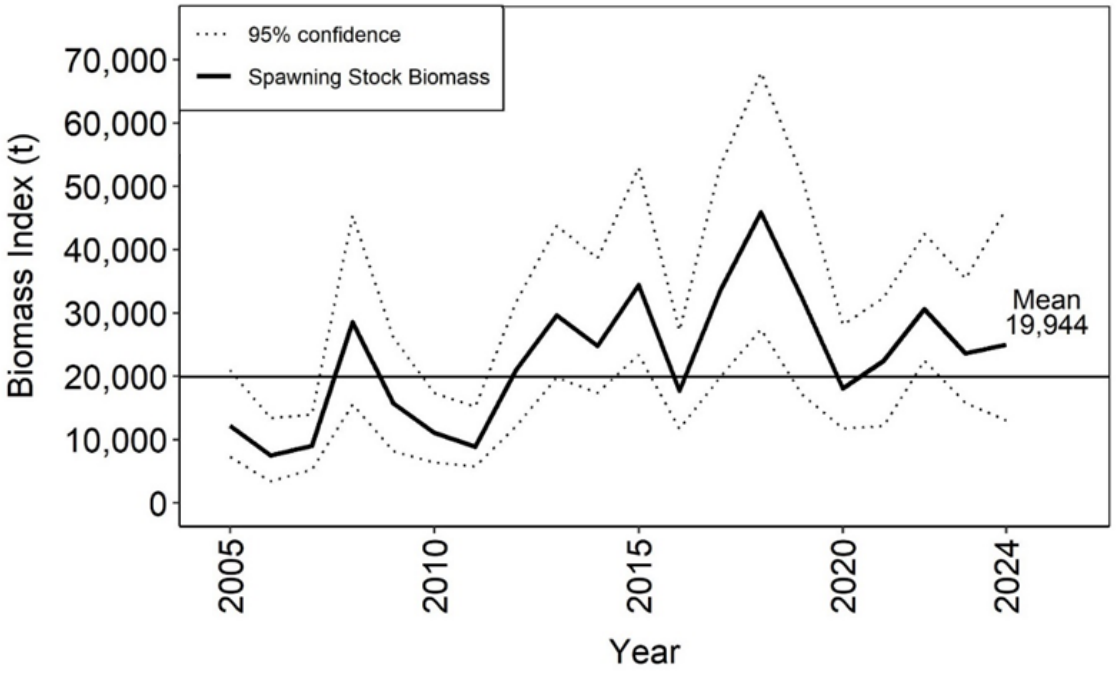

Figure 2. Shrimp Fishing Area 4 spawning stock biomass with 95% confidence interval from 2005 to 2024. The solid horizontal line represents the geometric mean from 2005 to 2023.

Biomass

FB and SSB indices varied without trend in recent years. There was a 26% decline in FB from 2023 to 2024 (2023: 38,400 t; 2024: 28,600 t), and a 6% increase in SSB (to 25,000 t) in 2024 (Figure 2). However, there was a 68% decline in male biomass (to 6,100 t), the second lowest value in the timeseries.

Fishery

Catch in SFA 4 has varied without trend around 3,000 t annually from 2017–24 (Figure 1a, Table 2). The preliminary catch in 2024/2025, as of February 2, 2025, was 2,981 t (74% of the bycatch quota of 4,033 t).

Exploitation

The exploitation rate index (ERI) ranged between 0.8% and 23.3% from 2005/06 to 2023/24 and the preliminary ERI was 10.4% in 2024/25 (Figure 1c). If the full bycatch limit is taken in 2024/25, the ERI will be 14.1%.

Current Status

The Striped Shrimp stock in SFA 4 is currently 2.8 times the established LRP. The population-wide potential predator index increased by 62% from 2023, and was at a time-series high in 2024. Other indices of stock health, including population-wide total egg production index and SFA 4-specific FB index showed no cause for concern. Although there is no USR for this stock, Striped Shrimp in SFA 4 is considered in a healthy state.

Historical and Recent Stock Trajectory and Trends – Eastern Assessment Zone

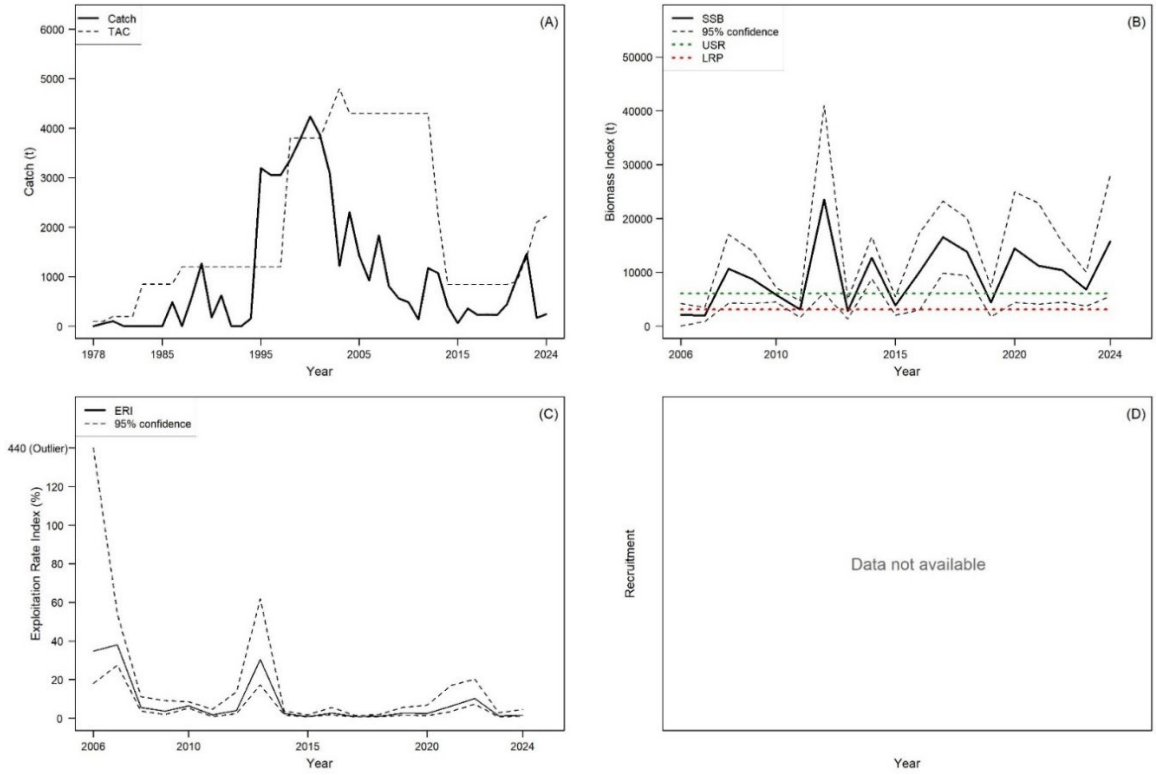

Figure 3. Eastern Assessment Zone stock trends: (A) Catch and Total Allowable Catch (TAC), (B) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 3,100 t) and Upper Stock Reference (USR; 6,100 t), (C) Exploitation Rate Index (ERI) (fisheries catch relative to fishable biomass), D) Recruitment (data not available).

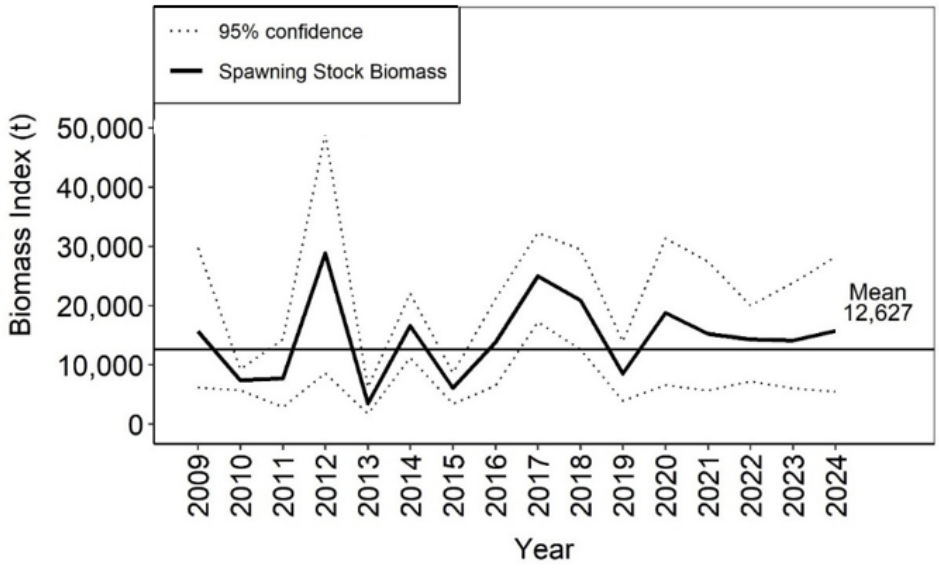

Figure 4. Eastern Assessment Zone fishable biomass index with 95% confidence interval from 2009 to 2024. The displayed mean is the geometric mean from 2009 to 2023.

Biomass

Both the FB and SSB indices varied without trend in recent years. The FB in 2024 (15,724 t) was above the long term geometric mean and increased 11.2% from 2023 (Figure 4). The SSB in 2024 (13,488 t) increased 97.5% from 2023 (Figure 3b).

Biological Indicators

Mean female and male carapace length have demonstrated high variability in recent years and declined steeply in 2024 compared to 2023 to some of the lowest values in the time-series. Similarly, in 2024, the length at 50% male-to-female transition declined to below the previous time-series low. If these trends continue this could have negative impacts on stock productivity.

Fishery

Catch in the EAZ has varied without trend, but has remained under 1,000 t most years since the beginning of the current time series of 2009–24 (Figure 3a, Table 2). The preliminary catch in 2024/2025, as of January 15, 2025, was 247 t (11.1% of the TAC of 2,216 t).

Exploitation

The preliminary exploitation rate index in 2024/25 was 1.6% (Figure 3c), with a potential exploitation rate of 14.1% should the entire 2024/25 TAC of 2,216 t be taken.

Current Status

The Striped Shrimp stock in the EAZ is currently above the USR with 91.5% probability. The stock is in the Healthy Zone of the PA Framework.

Historical and Recent Stock Trajectory and Trends – Western Assessment Zone

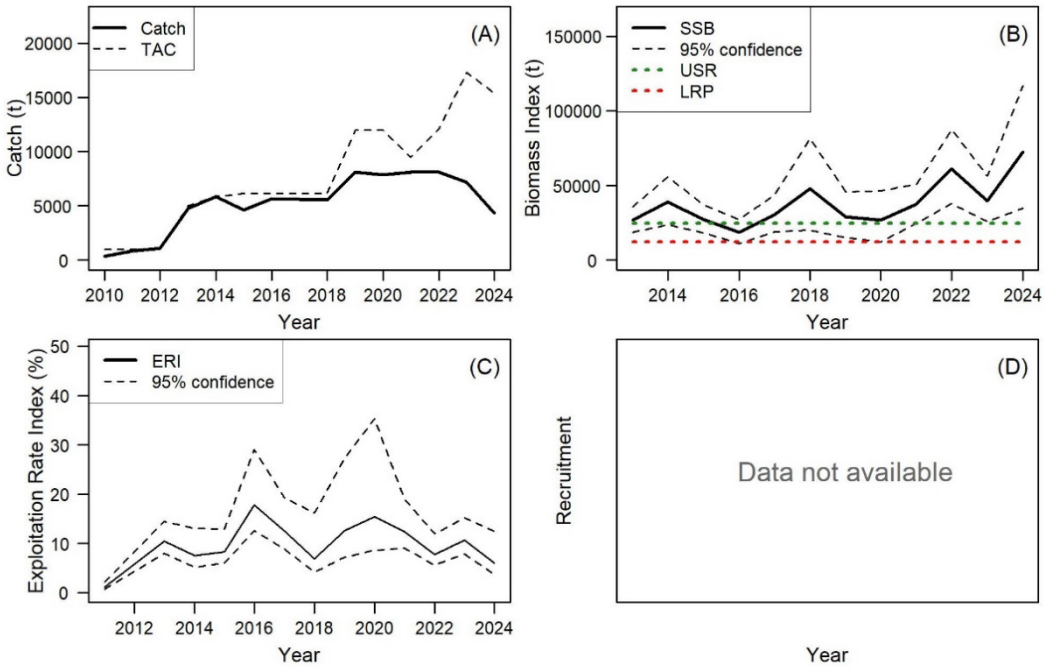

Figure 5. Western Assessment Zone stock trends: (A) Catch and Total Allowable Catch (TAC), (B) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 12,300 t) and Upper Stock Reference (USR; 24,600 t), (C) Exploitation Rate Index (ERI) (fisheries catch relative to fishable biomass), D) Recruitment (data not available).

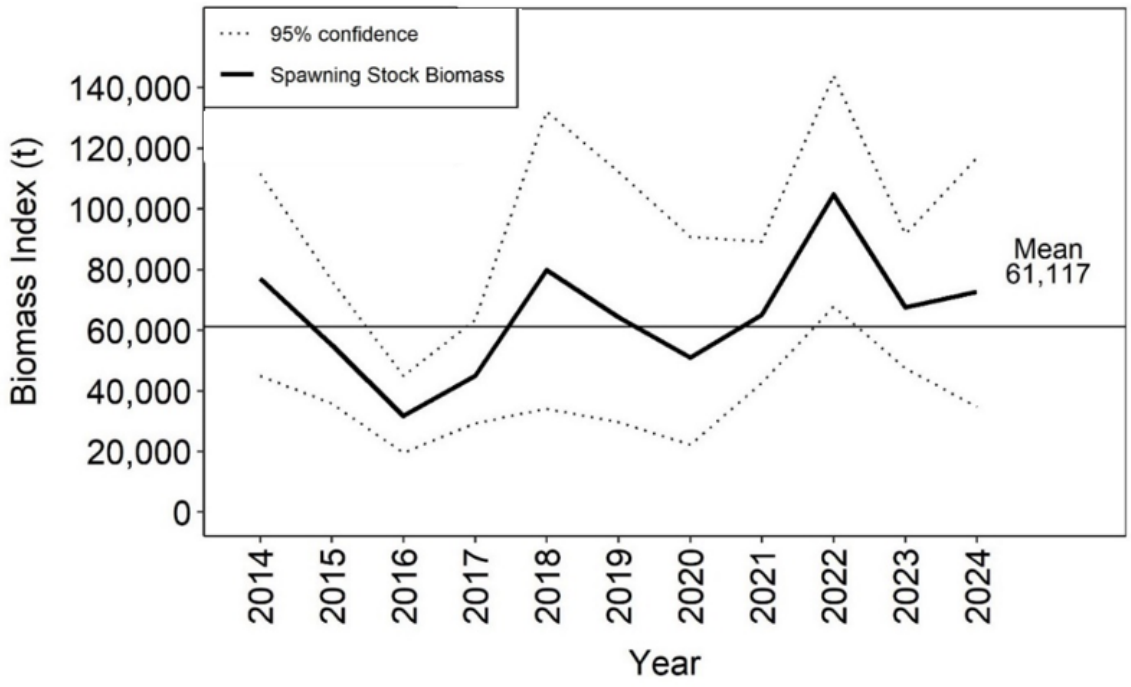

Figure 6. Western Assessment Zone fishable biomass index with 95% confidence interval from 2014 to 2024. The displayed mean is the geometric mean from 2014 to 2023.

Biomass

Both the FB and SSB indices were on a slight upward growth trend in recent years. The FB in 2024 (72,644 t) was above the long-term geometric mean and increased 7.7% from 2023 (Figure 6). The SSB in 2024 (65,704 t) increased 65.3% from 2023 (Figure 5b).

Biological Indicators

Mean female and male carapace length have demonstrated high variability in recent years and declined steeply in 2024 compared to 2023 to some of the lowest values in the time-series. Similarly, in 2024, the length at 50% male-to-female transition declined substantially to below the previous time-series low. If these trends continue this could have negative impacts on stock productivity.

Fishery

Catch in the WAZ has varied over time. From 2015 to 2018, catch varied without trend around 5,000 t. From 2019 to 2023, catch increased to around 8,000 t per year (Figure 5a, Table 2). The preliminary catch in 2024/2025, as of January 15, 2025, was 4,353 t (28.3% of the TAC of 15,384 t).

Exploitation

The preliminary exploitation rate index in 2024/25 was 6.0% (Figure 5c), with a potential exploitation rate of 21.2% should the entire 2024/25 TAC of 15,384 t be taken.

Current Status

The Striped Shrimp stock in the WAZ is currently above the USR with 98.0% probability. The stock is in the Healthy Zone of the PA Framework.

History of Landings

*Table 2. Nominal reported catches and quotas (in tonnes) for the Eastern Assessment Zone (EAZ), Western Assessment Zone (WAZ), and Shrimp Fishing Area (SFA) 4 for Striped Shrimp from the 2014/2015 fishing season to the 2024/2025 fishing season. *Catch based on Atlantic Quota Monitoring System as of January 15, 2025 for EAZ and WAZ, and February 2, 2025 for SFA 4. Since the fishery is still open the catch is preliminary for 2024/2025. TAC is the total allowable catch, measured in tonnes.*

Fishery Year	EAZ		WAZ		SFA 4	
	Catch (t)	TAC (t)	Catch (t)	TAC (t)	Catch (t)	Quota (t)
2024/2025*	247	2,216	4,353	15,384	2,981	4,033
2023/2024	173	2,100	7,194	17,282	2,753	4,033
2022/2023	1,460	1,400	8,128	12,096	3,755	4,033
2021/2022	965	902	8,106	9,470	3,146	4,033
2020/2021	447	840	7,841	11,975	2,734	4,033
2019/2020	225	840	8,114	11,975	3,034	4,033
2018/2019	234	840	5,531	6,138	2,571	4,033
2017/2018	233	840	5,609	6,138	2,611	4,033
2016/2017	358	840	5,660	6,138	1,112	4,033
2015/2016	59	840	4,616	6,138	2,134	4,033
2014/2015	401	840	5,836	5,860	1,235	4,033

Ecosystem and Climate Change Considerations

Ocean bottom temperatures across the assessment area in 2024 were close to average to slightly warmer. Pandalid shrimp are known to be important prey for a variety of fishes, e.g., Greenland Halibut (*Reinhardtius hippoglossoides*), Roughhead Grenadier (*Macrourus berglax*), skates (*Rajidae* spp.) and redfish (*Sebastes* spp.). Such predators can be significant drivers of biomass and population dynamics in their prey. The amount of shrimp consumed by these predators varies in response to predator stock size, spatial overlap, and alternative prey options. The predator index across the assessment area has increased in recent years.

Stock Advice

Projections or simulations have not been developed for this assessment as it is index-based and data driven.

PROCEDURE FOR INTERIM-YEAR UPDATES

These stocks are assessed every two years, with an interim-year update in the alternating years.

SOURCES OF UNCERTAINTY

Hudson Strait is a highly dynamic system with strong tidal currents and mixing. With speeds up to five knots, the strong currents could result in quick shifts in shrimp distribution and catchability. Shrimp could be transported great distances in a relatively short period of time in and out of the WAZ, EAZ, and SFA 4 to the south. This is most likely the cause of the wide fluctuations in biomass observed within and among assessment areas, even within the same

year. Assessing only a subset of a larger population is a source of uncertainty in determining the true status of a resource.

The relative catchabilities for the four research vessels (*Cape Ballard*, *Aqviq*, *Kinguk*, and *Katsheshuk II*) that have been used throughout the time series of the NSRF-DFO collaborative survey and the relative catchability between the vessels is unknown.

Research Recommendations

Given the recognition that SFA 4, EAZ, and WAZ likely do not represent separate populations, assessment units for these stocks should be reevaluated.

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SOURCES OF INFORMATION

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ISSN 1919-5087
ISBN 978-0-660-78341-3 Cat. No. Fs70-6/2025-041E-PDF
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Correct Citation for this Publication:

DFO. 2025. Stock Assessment for Striped Shrimp (*Pandalus montagui*) in Shrimp Fishing Area 4, the Eastern Assessment Zone, and Western Assessment Zone for the 2025–26 Fishing Season. DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2025/041.

Aussi disponible en français :

*MPO. 2025. Évaluation des stocks de crevette ésope (*Pandalus montagui*) de la zone de pêche de la crevette 4, la zone d'évaluation est et la zone d'évaluation ouest pour la saison de pêche 2025-2026. Secr. can. des avis sci. du MPO. Avis sci. 2025/041.*