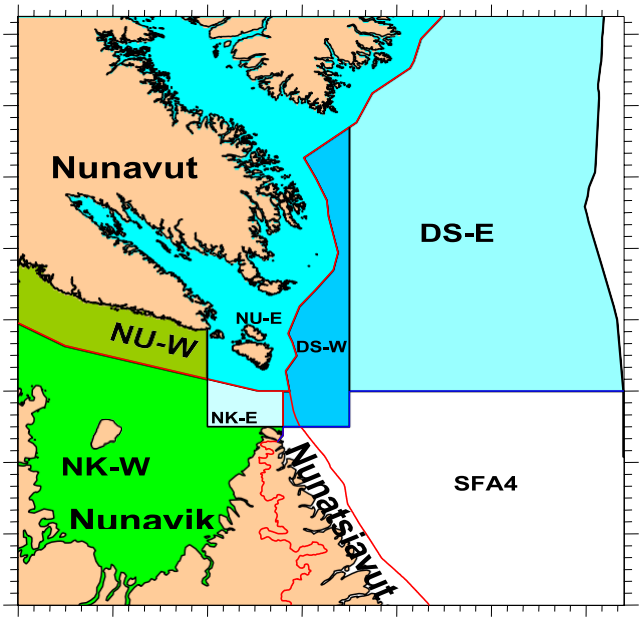
SUBMISSION TO THE
NUNAVUT WILDLIFE MANAGEMENT BOARD
AND NUNAVIK MARINE REGION WILDLIFE BOARD

FOR

Information: **Decision: X** **Recommendation: X**

Issue: Total Allowable Catch levels for Northern (*Pandalus borealis*) and Striped (*Pandalus montagui*) Shrimp for the 2024-25 season in the Western and Eastern Assessment Zones

Map:
Blue areas – Eastern Assessment Zone
Green areas – Western Assessment Zone



Northern shrimp (*Pandalus borealis*)

Striped shrimp (*Pandalus montagui*)

Background

Fisheries and Oceans Canada (DFO) submitted a briefing note to the Nunavut Wildlife Management Board (NWMB) and the Nunavik Marine Region Wildlife Board (NMRWB) (the Boards) *For Information* in March 2024 to mark an upcoming request for their decisions and recommendations on: *Total Allowable Catch levels for Northern (Pandalus borealis) and Striped (Pandalus montagui) Shrimp in the Western and Eastern Assessment Zones for the 2024-25 season.*

This briefing note presents the Boards with the information necessary to provide decisions and recommendations to the Minister of Fisheries and Oceans Canada for 2024-25 fisheries in the WAZ and EAZ. Science results from the 2023 DFO-Northern Shrimp Research Foundation multi-species survey are now available with science advice from the Canadian Science Advisory Secretariat (CSAS) peer review process from the week of February 6, 2024, provided at Appendix 1.

A meeting of the Northern Shrimp Advisory Committee (NSAC) occurred on April 3-4, 2024. A summary of these consultations is provided at Appendix 6.

New Precautionary Approach (PA) Frameworks for Northern and Striped shrimp in the WAZ and an update to the current PA Frameworks in the EAZ have been recently developed. These PA Frameworks have been submitted to the NWMB and NMRWB for decision and recommendation, as appropriate, under separate cover. This briefing note presents the status of Northern and Striped shrimp stocks and TAC scenarios in the context of the recommended Frameworks and illustrates application of the recommended Harvest Decision Rules (HDRs).

Recognizing that fishing may begin in the EAZ and WAZ as early as May, decisions and recommendations are requested as soon as possible. In keeping with past practice, DFO expects to release interim allocations within the settlement areas at levels previously approved by the NWMB, NMRWB and the Minister in 2019, to support fishing as soon as conditions permit.

WESTERN ASSESMENT ZONE (WAZ)

Fishery Profile

The fishery for *P. borealis* and *P. montagui* in the WAZ operates April 1 – March 31. Harvesting activity commences as early as June, subject to ice conditions. Both are directed stocks in the WAZ.

The WAZ is divided into two management units, Nunavut West (NU-W) and Nunavik West (NK-W) (see map). These management units are located entirely within the Nunavut Settlement Area (NSA) and Nunavik Marine Region (NMR), respectively. The NWMB and NMRWB make decisions on management measures within their respective land claim areas and may make recommendations for adjacent management units.

P. borealis and *P. montagui* allocations in the NU-W management unit have been allocated to Nunavut fishing interests. Similarly, allocations in the NK-W management unit have been allocated to Nunavik fishing interests. Although no formal sharing arrangement exists, harvest level decisions in NU-W and NK-W have historically resulted in equal distribution of the overall TAC for each stock. A standing joint decision made by the NWMB and NMRWB on July 13, 2022, supports harvesting of these species in either management unit, regardless of land claim boundaries.

A historical quota profile for the WAZ is provided at Appendix 4.

Science Advice

Ten years of data are now available in the time series for the WAZ (2014-2023). A summary of the CSAS peer review process to update the status of the stocks that occurred in February 2024 is at Appendix 1. Stock status indicators for *P. borealis* and *P. montagui* in the WAZ for the past four years (2020-2023) are at Appendix 2.

P. borealis and *P. montagui* stocks have shown signs of high volatility, with no clear indication of mechanisms driving year-to-year fluctuations in biomass. Currently, DFO Science cannot detect trends for either stock.

For ***P. borealis***, the 2023 survey indicates a Fishable Biomass (FB) decrease of 25.1% from the 2022 survey. The Spawning Stock Biomass (SSB) was similar (-1.2% change) to the previous year's survey. *[FB 17,919t; SSB 15,713t]*

For ***P. montagui***, the 2023 survey indicates a FB decrease of 35.6% from the 2022 survey. The SSB also decreased by 34.9% from the previous year's survey. *[FB 67,425t; SSB 39,745t]*

2024-25 Management Considerations

For ***P. borealis***, the current SSB is in the Healthy Zone, at 192% of the recommended USR.

The 2023-24 TAC was 4,788t. A rollover of the TAC in 2024-25 would result in a potential ER of 26.7%. Application of the recently developed 2-Step HDR would yield a TAC of 4,186t (-12.6%) with a potential ER of 23.4% (see calculation at Appendix 5). Maintaining the 20% ER from last year would result in a TAC of 3,584t, a 25.1% decrease in TAC. No HDRs are established yet in the WAZ. Scenarios are illustrated below, for consideration.

Scenario *(P. borealis)*	TAC	ER	% change in TAC from previous year
Rollover TAC	4,788t	26.7%	0%
Proposed 2-Step HDR *(recommended)*	4,186t	23.4%	-12.6%
Maintain ER	3,584t	20.0%	-25.1%
Current HDR	*No HDRs established for WAZ.*		

For ***P. montagui***, the current SSB is in the Healthy Zone, at 162% of the recommended USR.

The 2023-24 TAC was 17,282t. A rollover of the TAC in 2024-25 would result in a potential ER of 25.6%. Application of the recently developed 2-Step HDR would yield a TAC of 15,384t (-11%), with a potential ER of 22.8% (see calculation at Appendix 5). Maintaining the 16.5% potential ER from last year would result in a TAC of 11,125t, a 35.6% decrease in TAC. No HDRs are established yet in the WAZ. Scenarios are illustrated below, for consideration.

Scenario *(P. montagui)*	TAC	ER	% change in TAC from previous year
Rollover TAC	17,282t	25.6%	0%
Proposed 2-Step HDR *(recommended)*	15,384t	22.8%	-11.0%
Maintain ER	11,125t	16.5%	-35.6%
Current HDR	*No HDRs established for WAZ.*		

Recommendation: It is recommended that the Boards apply the proposed 2-Step HDR to set the overall TAC (combined for NU-W and NK-W) for *P. borealis* and *P. montagui*, respectively. Details of this HDR and calculation method are presented under separate cover.

The 2-Step HDR was endorsed by NSAC, which supports its consistent application throughout the fishery, including in the WAZ for the 2024-25 fishing season. Application of this HDR reflects a step-wise approach in response to the observed decline in biomass for both species, while yielding ERs that are considered appropriate for Healthy Zone stocks (23.4% and 22.8%, respectively). Further, the proposed ERs would be below the maximum 30% ER for the healthy zone, in accordance with the 2-Step HDR.

Other key considerations in setting the TAC may include historic catch levels for the respective stocks, and industry's capacity to prosecute the full extent of substantial TAC increases.

Summary of Request

Western Assessment Zone:

1. Decisions on harvest levels for *P. borealis* and *P. montagui* in the NU-W (within the NSA) and NK-W (within the NMR) management units, respectively.

2. Recommendations on the overall TAC for *P. borealis* and *P. montagui* in the WAZ.

Summary of requested decisions and recommendations, WAZ.

Area (Management Unit)	***P. borealis***	***P. montagui***
NSA (NU W)	Harvest level decision NWMB *(Recommendation NMRWB)*	Harvest level decision NWMB *(Recommendation NMRWB)*
NMR (NK W)	Harvest level decision NMRWB *(Recommendation NWMB)*	Harvest level decision NMRWB *(Recommendation NWMB)*
TOTAL (WAZ)	*TAC recommendation (combined total of decisions) NWMB and NMRWB*	*TAC recommendation (combined total of decisions) NWMB and NMRWB*

EASTERN ASSESMENT ZONE (EAZ)

Fishery Profile

The fishery for *P. borealis* and *P. montagui* in the EAZ operates April 1 – March 31. Harvesting activity typically commences in May/June, subject to ice conditions.

The EAZ is divided into four management units, Nunavut East (NU-E), Nunavik East (NK-E), and the offshore Davis Strait West (DSW) and Davis Strait East (DSE) areas (see map). These management units are located partially within and adjacent to the NSA and NMR. The NWMB and NMRWB make decisions on management measures within their respective land claims areas and may make recommendations for the adjacent Davis Strait management units. *P. borealis* is a directed species in the EAZ (all management units). *P montagui* is a directed species in NU/NK-E and utilized by the offshore fleet as bycatch in the Davis Strait.

P. borealis and *P. montagui* allocations in the NU-E management unit have been allocated to Nunavut fishing interests. Similarly, allocations in the NK-E management unit have been allocated to Nunavik fishing interests. Although no formal sharing arrangement exists, DFO observes a long-standing distribution of allocations between NU-E and NK-E management units at 80-20 per cent for *P. borealis*; and approximately 70-30 per cent for *P. montagui*. A standing joint decision made by the NWMB and NMRWB on July 13, 2022, supports harvesting of these species in either management unit, regardless of land claim boundaries.

P. borealis allocations in the Davis Strait management units have been to the offshore fleet with special access to Nunavut fishing interests. Nunavik fishing interests have special access in Davis Strait West only.

There are no pre-existing arrangements for the distribution of quota between management units in the EAZ. However, allocation of quotas between the settlement areas (NU/NK-E) and the offshore Davis Strait areas must distribute fishing effort throughout the Zone and avoid concentrated effort in a single productive area (e.g. Resolution Island).

A historical quota profile for the WAZ is provided at Appendix 4.

Science Advice

Fifteen years of data are now available in the time series for the EAZ (2009-2023). A summary of the CSAS peer review process to update the status of the stocks that occurred in February 2024 is at Appendix 1. Stock status indicators for *P. borealis* and *P. montagui* in the EAZ for the past four years (2020-2023) are at Appendix 3.

P. borealis and *P. montagui* stocks have shown signs of high volatility, with no clear indication of mechanisms driving year-to-year fluctuations in biomass. DFO Science cannot detect trends for either stock at this time.

For ***P. borealis***, the 2023 survey indicates a FB increase of 30.6% from the 2022 survey. The SSB also increased by 37.4% from the previous year's survey. *[FB 48,216t; SSB 32,659t]*

For ***P. montagui***, the 2023 survey indicates the FB was similar (-1.3% change) to the 2022 survey. The SSB decreased by 34.5% from the previous year's survey. *[FB 14,137t; SSB 6,829t]*

2024-25 Management Considerations

For ***P. borealis***, the current SSB is in the Healthy Zone, at 103% of the recommended USR.

The 2023-24 TAC was 7,383t. A rollover of the current TAC in 2024-25 would result in a potential ER of 15.3%. Application of the recently developed 2-Step HDR would yield a TAC of 8,513t with a potential ER of 17.7% (see calculation at Appendix 5). Maintaining the target 20% ER from last year would result in a TAC of 9,643t, a 30.6% increase in TAC. The current HDR would generally suggest a 15% TAC increase to 8,490t (potential ER 17.6%). Scenarios are illustrated below, for consideration.

Scenario *(P. borealis)*	TAC	ER	% change in TAC from previous year
Rollover TAC	7,383t	15.3%	0%
Proposed 2-Step HDR	8,513t	17.7%	+15.3%
Maintain ER	9,643t	20.0%	+30.6%
Current HDR	8,490t	17.6%	+15.0%

For ***P. montagui***, although there was a decline in SSB, the current SSB is in the Healthy Zone, at 112% of the recommended USR. FB remained similar to the previous year.

The TAC was set at 840t from 2014 to 2020, with a series of increases towards 2,100t in 2023-24. A rollover of the current TAC in 2024-25 would result in a potential ER of 14.9%. Application of the recently developed 2-Step HDR would yield a TAC of 2,464t with a potential ER of 17.4% (see calculation at Appendix 5). Maintaining the 14.7% ER from last year would result in a slight TAC decrease to 2,078t. The current HDR would generally suggest a 15% TAC increase to 2,415t (potential ER 17.1%). Scenarios are illustrated below, for consideration.

Scenario *(P. montagui)*	TAC	ER	% change in TAC from previous year
Rollover TAC	2,100t	14.9%	0%
Proposed 2-Step HDR	2,464t	17.4%	+17.3%
Maintain ER	2,078t	14.7%	-1.0%
Current HDR	2,415t	17.1%	+15.0%

For the Boards' consideration: At the Northern Shrimp Advisory Committee Meeting in April, 2024, in discussing TACs and quotas for *P. Montagui* in the EAZ, the offshore fleet noted that in Davis Strait (where they hold a bycatch designation for *P. Montagui*) they require 920t in order to be able to prosecute their *P. borealis* allocations.

Recommendation: It is recommended that the Boards apply the proposed 2-Step HDR to set the overall TAC (combined for Davis Strait East/West, NU-E and NK-E) for *P. borealis* and *P. montagui*, respectively. Details of this HDR and calculation method are presented under separate cover.

Application of the 2-Step HDR would reflect a step-wise approach in response to the observed increase in biomass for *P. borealis*, and partially pursue a target 20% ER for *P. montagui*. This HDR was endorsed by NSAC, which supports its application in the EAZ for the 2024-25 fishing season. Applying this HDR would yield ERs that are considered conservative for Healthy Zone stocks (17.7% and 17.4%, respectively). Further, the proposed ERs would be below the maximum 30% ER for the healthy zone, in accordance with the 2-Step HDR.

Summary of Request

Eastern Assessment Zone:

1. Decisions on harvest levels for *P. borealis* and *P. montagui* in the NU E (within the NSA) and NK E (within the NMR) management units, respectively.

2. Recommendations on the distribution of the TAC for *P. borealis* between the Davis Strait management units (DS W and DS E). Recommendations on *P. borealis* allocations in Davis Strait management units.

3. Recommendations on the overall TAC for *P. borealis* and *P. montagui* in the EAZ, respectively.

Summary of requested decisions and recommendations, EAZ.

Area (Management Unit)	***P. borealis***	***P. montagui***
NSA (NU E)	Harvest level decision NWMB *(Recommendation NMRWB)*	Harvest level decision NWMB *(Recommendation NMRWB)*
NMR (NK E)	Harvest level decision NMRWB *(Recommendation NWMB)*	Harvest level decision NMRWB *(Recommendation NWMB)*
DS E	TAC distribution and allocation recommendation NWMB & NMRWB	TAC recommendation NWMB & NMRWB
DS W	TAC distribution and allocation recommendation NWMB & NMRWB	
TOTAL (EAZ)	*TAC Recommendation NWMB & NMRWB*	*TAC Recommendation NWMB & NMRWB*

Prepared by: Leigh Edgar, Fisheries Resource Management, Fisheries and Oceans Canada

Date: April 26, 2024

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Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Arctic Region
Ontario and Prairie Region

Canadian Science Advisory Secretariat
Science Response 2024/017

UPDATE OF STOCK STATUS INDICATORS FOR NORTHERN SHRIMP, *PANDALUS BOREALIS*, AND STRIPED SHRIMP, *PANDALUS MONTAGUI*, IN THE EASTERN ASSESSMENT ZONE, FEBRUARY 2024

CONTEXT

Fisheries and Oceans Canada (DFO) Resource Management (RM) has requested Science advice on the status of the two species of shrimp, Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*Pandalus montagui*) in the waters adjacent to Nunavut and Nunavik. Both species in the Eastern Assessment Zone (EAZ) were last fully assessed in 2023 (DFO 2023). Full assessments are carried out every two years with stock status updates in the intervening years. The next full assessment is scheduled for 2025. This assessment follows the framework developed in 2007 for Northern Shrimp off Labrador and the northeastern coast of Newfoundland (DFO 2007). The Limit Reference Point (LRP) was updated and an updated Upper Stock Reference point (USR) was proposed in 2020 (DFO 2020). A series of fishery-independent surveys and fishery data formed the basis of the current assessment.

This Science Response Report results from the regional peer review of February 6, 2024 on the Stock Update of Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*) in the Eastern Assessment Zone and Western Assessment Zone, February 2024. (IFMP). Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- The *P. borealis* stock in the Eastern Assessment Zone (EAZ) is currently above the established LRP (15,800 t). Based on the proposed USR of 31,600 t, the stock would be in the Healthy zone of the Precautionary Approach (PA) Framework with a 58.8% probability.
- The *P. montagui* stock in the EAZ is currently above the established LRP (3,100 t). Based on the proposed USR of 6,100 t, the stock would be in the Healthy zone of the PA Framework with a 66.7% probability.

Trends

- Fishable biomass and spawning stock biomass indices varied without trend from 2009–2023 for both *P. borealis* and *P. montagui* in the EAZ.

Ecosystem and Climate Change Considerations

- Environmental and climate change considerations were not updated or reviewed during this Science Response Report.

- Fluctuations in the Northwest Atlantic ocean climate have potential impacts on the availability of optimal Pandalid habitat and/or predator-prey interactions in the EAZ. These potential impacts on Pandalid shrimp productivity have not yet been quantified for shrimp stocks in the EAZ or incorporated into the assessment (DFO 2023).
- *Pandalus borealis* and *P. montagui* are distributed broadly over the Northwest Atlantic Ocean. The associated assessment areas, including the EAZ, Western Assessment Zone (WAZ), and Shrimp Fishing Areas (SFAs) 4–7, are connected through larval dispersal, but rates of exchange of adults are less understood. The strong linkages between EAZ, WAZ, and SFA 4 need to be considered to interpret fluctuations in biomass within and among assessment areas, even within the same year (DFO 2023).

Stock Advice

- The assessment framework for *P. borealis* and *P. montagui* stocks in the EAZ does not provide forward-looking advice. A full stock assessment is planned in 2025.
- The spawning stock biomass index for *P. borealis* in the EAZ moved out of the Cautious zone into the proposed Healthy zone in 2023 and is currently considered to be in a healthy state.
- The spawning stock biomass index for *P. montagui* in the EAZ remained in the proposed Healthy zone in 2023 and is currently considered to be in a healthy state.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

This assessment follows the framework developed in 2007 for Northern Shrimp off Labrador and the northeastern coast of Newfoundland (DFO 2007).

Assessment Type

Interim Year Update

Most Recent Assessment Date

1. Last Full Assessment: February 2023 (DFO 2023)
2. Last Interim Year Update: January 2022 (DFO 2022)

Assessment Approach

1. Broad category: Index-based
2. Specific category: Index-based (Fishery-independent indices)

The assessment follows the framework established by DFO (2007); catch data from scientific surveys are spatially expanded to produce an abundance index for the 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. A detailed description of the survey history, survey design, and biomass calculations can be found in Fulton et al. (2024).

Stock Structure Assumption

Stock overview information: For both *P. borealis* and *P. montagui*, the EAZ is a management-based stock unit and does not represent a biological unit.

Reference Points

Reference points are presented in Table 1.

Table 1. Reference points for Pandalus borealis *and* Pandalus montagui *in the Eastern Assessment Zone.*

Reference Point	Description	*Pandalus borealis*	*Pandalus montagui*
Limit Reference Point (LRP):	40% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2009–2019) for EAZ, a proxy for BMSY, DFO (2020).	15,800 t	3,100 t
Upper Stock Reference (USR):	Proposed at 80% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2009–2019) for EAZ, a proxy for BMSY, DFO (2020).	31,600 t	6,100 t
Removal Reference (RR):	N/A	-	-
Target (TRP):	N/A	-	-

Data

- Northern Shrimp Research Foundation (NSRF) annual trawl survey (2009–2023)
- Commercial catches from Atlantic Quota Monitoring System (AQMS)

Data changes:

- Commercial catch data for 2023 is considered incomplete as the season is not officially closed until March 31, 2024. Data were pulled on January 24, 2024.
- Commercial catch data for 2022 were updated on January 24, 2024.

ASSESSMENT

Historical and Recent Stock Trajectory and Trends – *P. borealis*

Fishery

Catch has varied without trend around 6,000 t from 1997 through 2023/24 (Figure 1a, Table 2). The total reported catch for 2023/24, based on the AQMS, as of January 24, 2024, was 6,188 t; 83.8% of the 7,383 t TAC.

Biomass

Both the FB and SSB indices varied without trend from 2009–2023. The FB in 2023 (48,216 t; Figure 2a) increased (30.6%) relative to the 2022 value but remained below both the long term mean (2009–2022; 61,213 t) and reference period mean (2009–2019; 62,849 t). The SSB in 2023 (32,659 t; Figure 1b) also increased (37.4%) relative to the 2022 value but remained below both the long term mean (2009–2022; 38,875 t) and reference period mean (2009–2019; 39,459 t).

Exploitation

Both the reported and potential exploitation rates were at or above the long term mean (2009–2022). As of January 24, 2024, the reported exploitation rate index for 2023/24 was 12.8% with 83.8% of the total allowable catch (TAC) taken (Figure 2b). Should the entire 2023/24 TAC of 7,383 t be taken, the exploitation rate index would be 15.3%.

Current Outlook

The *P. borealis* stock in the EAZ is currently above the established LRP (15,800 t) and proposed USR (Figure 2c). Should the USR be established at the proposed level of 31,600 t suggested by Fisheries and Oceans Canada's (DFO's) Science sector (i.e., 80% of the geometric mean of the SSB index; DFO 2020), the stock in 2023 would be in the Healthy zone of the PA Framework with a 58.8% probability

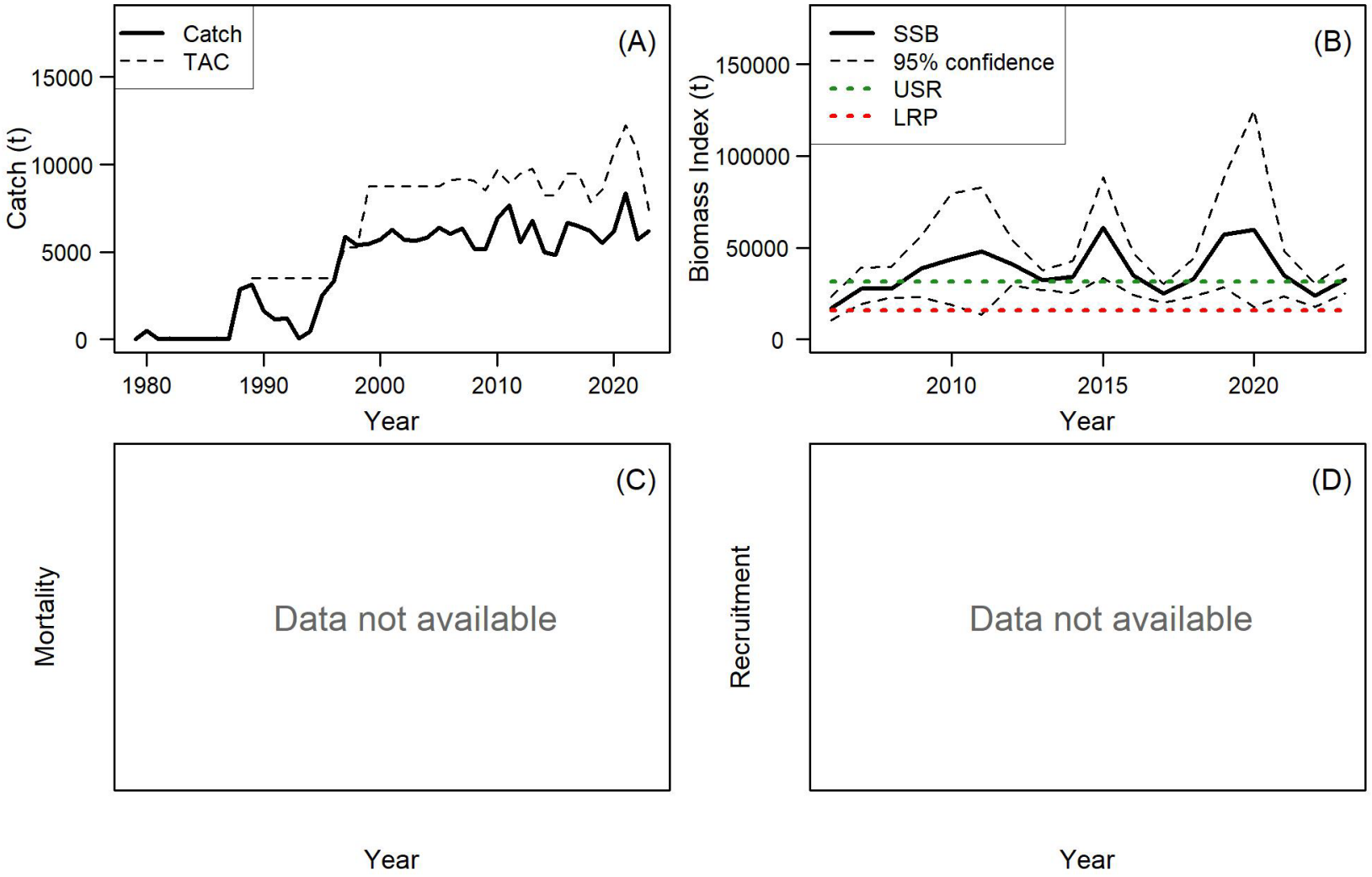

Figure 1. Pandalus borealis *in the Eastern Assessment Zone. (A; top left) Catch (as of January 24, 2024) and Total Allowable Catch (TAC), (B; top right) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 15,800 t) and (proposed) Upper Stock Reference (USR; 31,600 t), (C; bottom left) Fishing Mortality, (D; bottom right) Recruitment.*

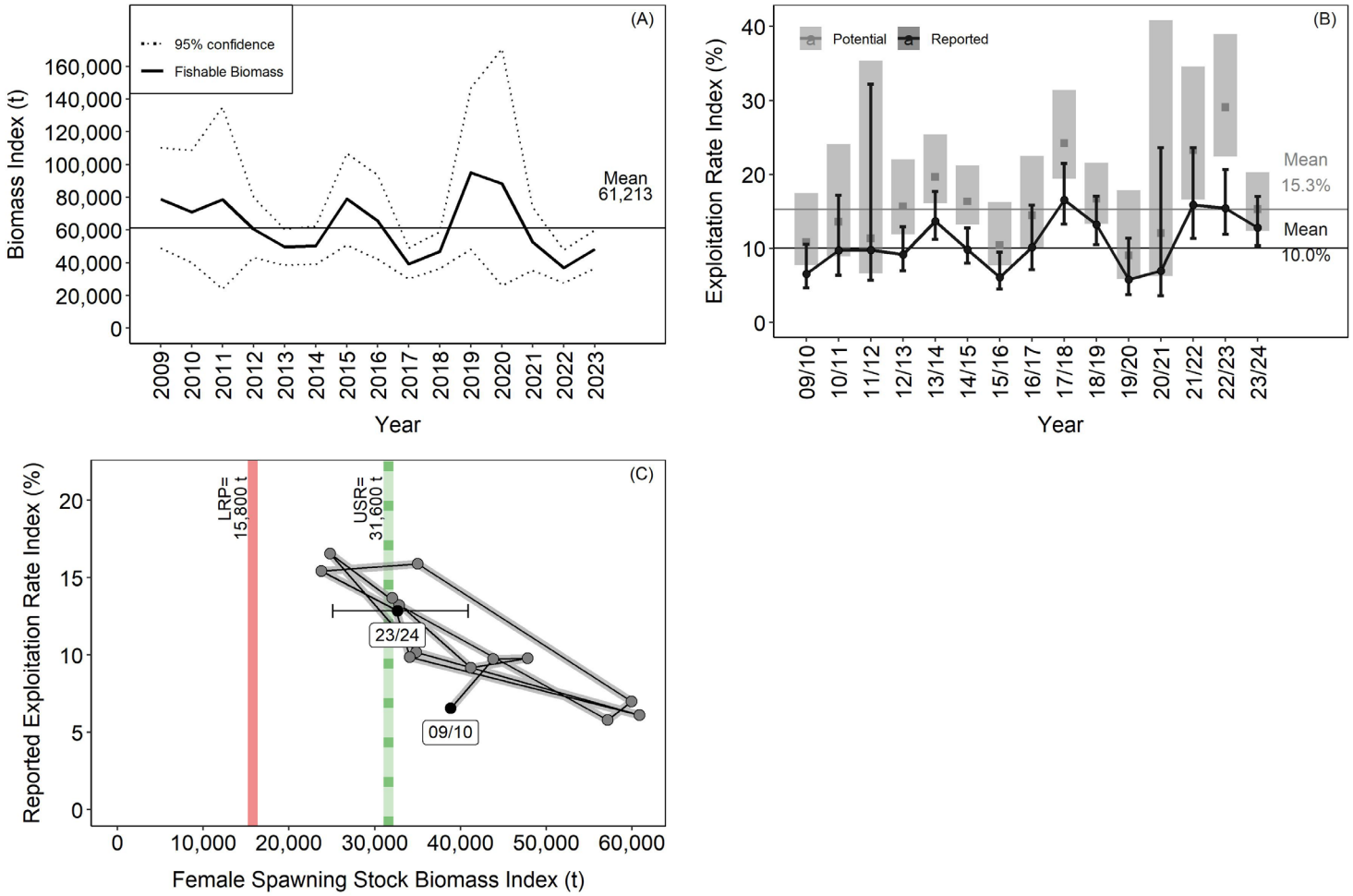

Figure 2. Pandalus borealis *in the Eastern Assessment Zone. (A; top left) Fishable Biomass Index, horizontal lines are long-term (2009–2022) geometric means. (B; top right) Exploitation rate indices for management years 2009/10–2023/24 at the reported rate based on the total catch (solid black line) and at the potential rate if the TAC was fully harvested (grey shading) as of January 24, 2024. Error bars based on bootstrapped 95% confidence ranges of the fishable biomass and horizontal lines are long-term (2009–2022) geometric means. (C: bottom left) Female spawning stock biomass (SSB) and reported exploitation rate in relation to the Limit Reference Point (LRP; 15,800 t) and (proposed) Upper Stock Reference (USR; 31,600 t).*

Historical and Recent Stock Trajectory and Trends – *P. montagui*

Biomass

Both the FB and SSB indices varied without trend from 2009–2023. The FB in 2023 (14,137 t; Figure 4a) was similar (-1.3% change) to the 2022 value and remained above both the long term mean (2009–2022; 12,525 t) and reference period mean (2009–2019; 11,715 t). The SSB in 2023 (6,829 t; Figure 3b) declined (-34.5%) relative to the 2022 value and fell below both the long term mean (2009–2022; 8,405 t) and reference period mean (2009–2019; 7,644 t).

Fishery

Total catch in 2023/24 was 173 t, 8.24% of the 2,100 t TAC (Figure 3a). Catch statistics in 2023/24 are preliminary and based on the AQMS data as of January 24, 2024.

Exploitation

As of January 24, 2024, the reported exploitation rate index for 2023/24 was 1.22% with only 8.24% of the total allowable catch (TAC) taken (Figure 4b). Should the entire 2023/24 TAC of 2,100 t be taken, the exploitation rate index would be 14.9%.

Current Outlook

Despite a decline in SSB, the *P. montagui* stock in the EAZ is currently above both the established LRP (3,100 t) and the proposed USR (6,100 t; Figure 4c). Should the USR be established at the proposed level of 6,100 t (i.e., 80% of the geometric mean of the SSB; DFO 2020), the stock in 2023 would be in the Healthy zone of the PA Framework with a 66.7% probability.

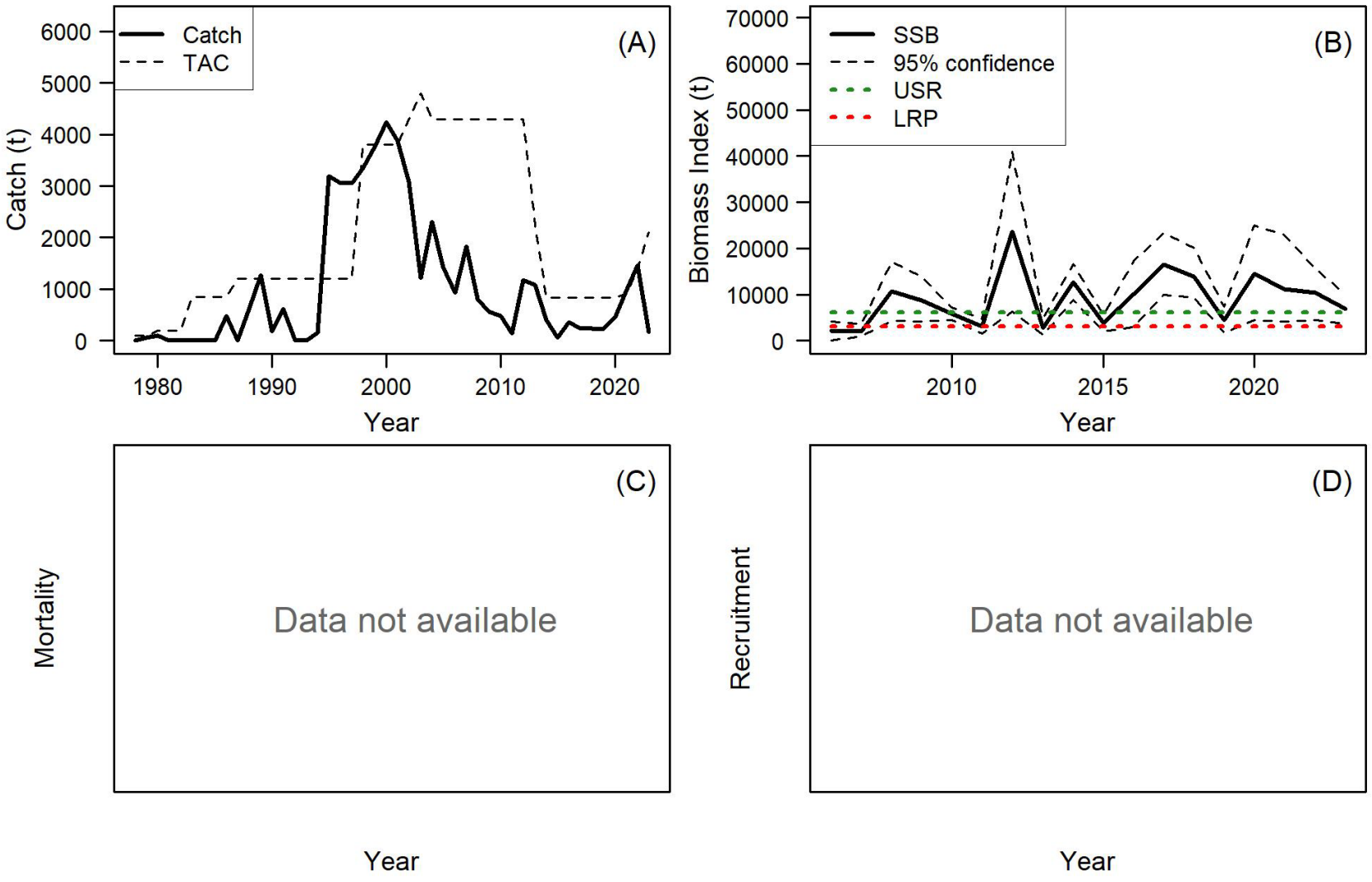

Figure 3. Pandalus montagui *in the Eastern Assessment Zone. (A; top left) Catch (as of January 24, 2024) and Total Allowable Catch (TAC), (B; top right) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 3,100 t) and (proposed) Upper Stock Reference (USR; 6,100 t), (C; bottom left) Fishing Mortality, (D; bottom right) Recruitment.*

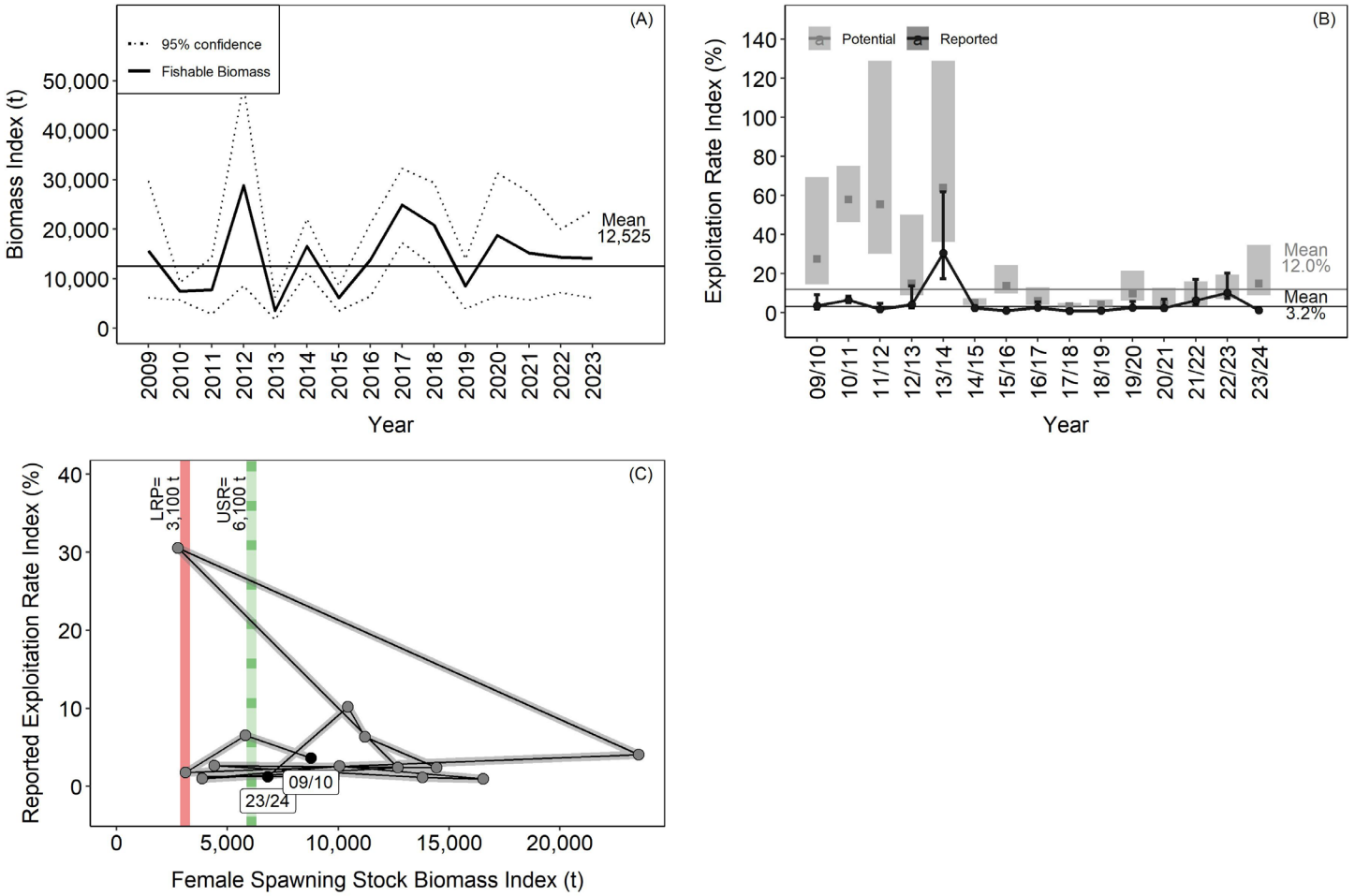

Figure 4. Pandalus montagui *in the Eastern Assessment Zone. (A: top left) Fishable Biomass Index, horizontal lines are long-term (2009–2022) geometric means. (B: top right) Exploitation rate indices for management years 2009/10–2023/24 at the reported rate based on the total catch (solid black line) and at the potential rate if the TAC was fully harvested (grey shading) as of January 24, 2024. Error bars based on bootstrapped 95% confidence ranges of the fishable biomass and horizontal lines are long-term (2009–2022) geometric means. (C: bottom left) Female spawning stock biomass (SSB) and reported exploitation rate in relation to the Limit Reference Point (LRP; 3,100 t) and (proposed) Upper Stock Reference (USR; 6,100 t).*

History of Landings

Table 2. Nominal reported catches (t) for the Eastern Assessment Zone for Pandalus borealis *and* Pandalus montagui*. Catch based on AQMS as of January 24, 2024. Catches for 2023/24 are considered preliminary.*

Year	Eastern Assessment Zone	
	P. borealis	***P. montagui***
2023/24	6,188	173
2022/23	5,691	1,460
2021/22	8,359	965
2020/21	6,165	447
2019/20	5,508	225
2018/19	6,198	234
2017/18	6,488	233
2016/17	6,667	358
2015/16	4,816	59
2014/15	4,972	401
2013/14	6,793	1,075
2012/13	5,555	1,173
2011/12	7,687	135
2010/11	6,908	483
2009/10	5,159	564
2008/09	5,184	808
2007/08	6,359	1,832
2006/07	6,028	925
2005/06	6,387	1,427
2004/05	5,842	2,301
2003/04	5,617	1,217
2002/03	5,695	3,081
2001/02	6,275	3,867
2000/01	5,718	4,238
Avg 1995–99	4,533	3,288
Avg 1990–94	904	190
Avg 1985–89	1,211	470
Avg 1979–84	93	28

Projections

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

Ecosystem and Climate Change Considerations

Environmental and climate change considerations were not updated or reviewed during this Science Response Report. The following information is a summary taken from the last full assessment (Fulton et al. 2024).

It is believed that the habitat available to shrimp is shaped, to a great extent, by the oceanographic conditions present in the area. Fluctuations in the Northwest Atlantic ocean climate have potential impacts on the availability of optimal Pandalid habitat and/or predator-prey interactions in the EAZ. These potential impacts on Pandalid shrimp productivity have not yet been quantified for shrimp stocks in the EAZ or incorporated into the assessment.

Shrimp are known to be an important food source for a number of predator species, e.g., Greenland Halibut (*Reinhardtius hippoglossoides*), American Plaice (*Hippoglossoides platessoides*), Atlantic Cod (*Gadus morhua*), skates (Rajidae) and redfish (*Sebastes* spp.). The amount of shrimp consumed by these predators varies in response to predator stock size and movement within and between assessment areas. Work is ongoing to quantify the impact of these predators on the shrimp stocks in the EAZ to determine the importance of predator-prey dynamics on shrimp biomass variability over the years.

Pandalid shrimp can disperse through various mechanisms but larval dispersion with currents may be a main driver for shrimp movement (Le Corre et al. 2020). It is also known that adult shrimp can move in the water column (particularly males) and be carried away with the currents, thus this mechanism also contributes to shrimp dispersal. The two assessment areas, EAZ and WAZ, along with SFA 4 farther south and SFA 0 and SFA 1 to the north, have no physical boundaries between them and are considered interconnected. The extent of shrimp exported/imported between these areas remains unknown for both larval and adult stages, however, it could be one of the important drivers of year-to-year variability observed in any particular assessment area over time.

SOURCES OF UNCERTAINTY

Typically survey trawl length (i.e., bottom contact) is calculated using trawl sensor data to determine when each trawl starts and stops fishing. In 2023 the primary trawl sensor data were unavailable for 2/3 of the survey trawls, therefore bottom contact time was estimated for the missing trawls (52 of 173 trawls in the EAZ had their data estimated). This estimation was calculated using a regression between bottom contact times measured by CTD (Conductivity, Temperature, Depth sensor) and the primary trawl sensor for the trawls where both were measured. Although this calculation deviates from the typical approach, it is not expected to impact the outcome of the assessment.

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.

Experimental work done by DFO in 2007 in the Resolution Island area suggests that survey results may be affected by the tidal cycle. In order to reduce the impact of the tidal currents, the surveys were conducted near neap tides as much as possible. However, the survey is conducted around the clock, so strong tidal currents would still be present and may result in either an over- or underestimate of biomass.

Trawls used in the survey are known to have a catchability coefficient less than one but the exact value is unknown. Therefore, the survey is an index of biomass and not an absolute estimate of the total biomass. Catch is known; however, the total fishery-induced mortality is

unknown (landed catch plus incidental mortality from trawling). Thus, exploitation rates are a relative index rather than absolute.

Four research vessels (Cape Ballard, Aqviq, Kinguk, Katsheshuk II) have been used throughout the time series in the EAZ. Expert opinion was that, given the similarity in the ships' dimensions and use of standardized gear, the relative catchability would be consistent among vessels. However, this assumption has not been empirically tested.

LIST OF MEETING PARTICIPANTS

Name	Organization/Affiliation
Sheila Atchison (Chair)	DFO – Science, Ontario and Prairie Region
Samantha Fulton (Science Lead)	DFO – Science, Ontario and Prairie Region
Wojciech Walkusz	DFO – Science, Ontario and Prairie Region
Daniel Enright	DFO – Science, Ontario and Prairie Region
Krista Baker	DFO – Science, Newfoundland and Labrador Region
William Coffey	DFO – Science, Newfoundland and Labrador Region
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Susan Thompson	DFO – Science, National Capital Region
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Dirk Algera	DFO – Resource Management, National Capital Region
Chantelle Sawatzky	DFO – Science, Ontario and Prairie Region
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Aussi disponible en français :

*MPO. 2024. Mise à jour des indicateurs de l'état des stocks de crevettes nordiques (*Pandalus borealis*) et de crevettes ésopes (*Pandalus montagui*) dans la zone d'évaluation Est, février 2024. Sec. can. des avis sci. du MPO. Rép. des sci. 2024/017.*

Fisheries and Oceans Canada | Pêches et Océans Canada
Ecosystems and Oceans Science | Sciences des écosystèmes et des océans

Arctic Region
Ontario and Prairie Region

Canadian Science Advisory Secretariat
Science Response 2024/016

UPDATE OF STOCK STATUS INDICATORS FOR NORTHERN SHRIMP*, PANDALUS BOREALIS*, AND STRIPED SHRIMP, *PANDALUS MONTAGUI*, IN THE WESTERN ASSESSMENT ZONE, FEBRUARY 2024

CONTEXT

Fisheries and Oceans Canada (DFO) Resource Management (RM) has requested Science advice on the status of the two species of shrimp, Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*Pandalus montagui*) in the waters adjacent to Nunavut and Nunavik. Both species in the Western Assessment Zone (WAZ) were last fully assessed in 2023 (DFO 2023). Full assessments are carried out every two years with stock status updates in the intervening years. The next full assessment is scheduled for 2025. This assessment follows the framework developed in 2007 for Northern Shrimp off Labrador and the northeastern coast of Newfoundland (DFO 2007). A new Limit Reference Point (LRP) was established and a new Upper Stock Reference point (USR) was proposed in 2020 (DFO 2020). A series of fishery-independent surveys and fishery data formed the basis of the current assessment.

This Science Response Report is from the February 6, 2024 regional peer review on the Stock Update of Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*) in the Eastern Assessment Zone and Western Assessment Zone, February 2024. (IFMP). Additional publications from this meeting will be posted on the Fisheries and Oceans Canada (DFO) Science Advisory Schedule as they become available.

SCIENCE ADVICE

Status

- The *P. borealis* stock in the Western Assessment Zone (WAZ) is currently above the established limit reference point (LRP; 4,100 t). Based on the proposed upper stock reference (USR) of 8,200 t, the stock would be in the Healthy zone of the Precautionary Approach (PA) Framework with a 99.3% probability.
- The *P. montagui* stock in the WAZ is currently above the established LRP (12,300 t). Based on the proposed USR of 24,600 t, the stock would be in the Healthy zone of the PA Framework with a 98.4% probability.

Trends

- Fishable biomass and spawning stock biomass indices varied without trend from 2014–2023 for both *P. borealis* and *P. montagui* in the WAZ.

Ecosystem and Climate Change Considerations

- Environmental and climate change considerations were not updated or reviewed during this Science Response Report.
- Fluctuations in the Northwest Atlantic ocean climate have potential impacts on the availability of optimal Pandalid habitat and/or predator-prey interactions in the WAZ. These potential impacts on Pandalid shrimp productivity have not yet been quantified for shrimp stocks in the WAZ or incorporated into the assessment (DFO 2023).
- *Pandalus borealis* and *P. montagui* are distributed broadly over the Northwest Atlantic Ocean. The associated assessment areas, including the Eastern Assessment Zone (EAZ), WAZ, and Shrimp Fishing Areas (SFAs) 4–7, are connected through larval dispersal, but rates of exchange of adults are less understood. The strong linkages between EAZ, WAZ, and SFA 4 need to be considered to interpret fluctuations in biomass within and among assessment areas, even within the same year (DFO 2023).

Stock Advice

- The assessment framework for *P. borealis* and *P. montagui* stocks in the WAZ does not provide forward-looking advice. A full stock assessment is planned in 2025.
- The spawning stock biomass index for *P. borealis* in the WAZ remained in the proposed Healthy zone in 2023 and is currently considered to be in a healthy state.
- The spawning stock biomass index for *P. montagui* in the WAZ remained in the proposed Healthy zone in 2023 and is currently considered to be in a healthy state.

BASIS FOR ASSESSMENT

Assessment Details

Year Assessment Approach was Approved

This assessment follows the framework developed in 2007 for Northern Shrimp off Labrador and the northeastern coast of Newfoundland (DFO 2007).

Assessment Type

Interim Year Update

Most Recent Assessment Date

1. Last Full Assessment: February 2023 (DFO 2023)
2. Last Interim Year Update: January 2022 (DFO 2022)

Assessment Approach

1. Broad category**:** Index-based
2. Specific category: Index-based (Fishery-independent indices)

The assessment follows the framework established by DFO (2007); catch data from scientific surveys are spatially expanded to produce an abundance index for the 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. A detailed description of the survey history, survey design, and biomass calculations can be found in Fulton et al. (2024).

Stock Structure Assumption

Stock overview information: For both *P. borealis* and *P. montagui*, the WAZ is a management-based stock unit and does not represent a biological unit.

Reference Points

Reference points are presented in Table 1.

Table 1. Reference points for Pandalus borealis *and* Pandalus montagui *in the Western Assessment Zone.*

Reference Point	Description	*Pandalus borealis*	*Pandalus montagui*
Limit Reference Point (LRP):	40% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2014–2019) for WAZ, a proxy for BMSY, DFO (2020).	4,100 t	12,300 t
Upper Stock Reference (USR):	Proposed at 80% of the geometric mean of female spawning stock biomass (SSB) over the productive period (2014–2019) for WAZ, a proxy for BMSY, DFO (2020).	8,200 t	24,600 t
Removal Reference (RR):	N/A	-	-
Target (TRP):	N/A	-	-

Data

- Northern Shrimp Research Foundation (NSRF) annual trawl survey (2014–2023)
- Commercial catches from Atlantic Quota Monitoring System (AQMS)

Data changes:

- Commercial catch data for 2023 is considered incomplete as the season is not officially closed until March 31, 2024. Data were pulled on January 24, 2024.
- Commercial catch data for 2022 were updated on January 24, 2024.

ASSESSMENT

Historical and Recent Stock Trajectory and Trends – *P. borealis*

Fishery

Total catch in 2023/24 was the highest in the current time series at 2,080 t, 43.4% of the 4,788 t TAC (Figure 1a). Catch statistics in 2023/24 are preliminary and based on the AQMS data as of January 24, 2024.

Biomass

Due to a change in survey methodology, the 2014 survey began a new time series. Thus, the 2023 survey was the tenth survey in the new time series. Since the start of the new series, both the FB and SSB indices varied without trend. The FB in 2023 (17,919 t; Figure 2a) decreased (-25.1%) relative to the 2022 value falling below both the long term mean (2014–2022; 20,398 t) and reference period mean (2014–2019; 18,223 t). The SSB in 2023 (15,713 t; Figure 1b) remained very similar (-1.2% change) to the 2022 value and was above both the long term mean (2014–2022; 11,831 t) and reference period mean (2014–2019; 10,243 t).

Exploitation

Both the reported and potential exploitation rates were the highest observed in the time series. As of January 24, 2024, the reported exploitation rate index for 2023/24 was 11.6% with 43.4% of the total allowable catch (TAC) taken (Figure 2b). Should the entire 2023/24 TAC of 4,788 t be taken, the exploitation rate index would be 26.7%.

Current Outlook

The *P. borealis* stock in the WAZ is currently above the established LRP (4,100 t) and proposed USR (Figure 2c). Should the USR be established at the proposed level of 8,200 t suggested by Fisheries and Oceans Canada's (DFO's) Science sector (i.e., 80% of the geometric mean of the SSB index; DFO 2020), the stock in 2023 would be in the Healthy zone of the PA Framework with a 99.3% probability.

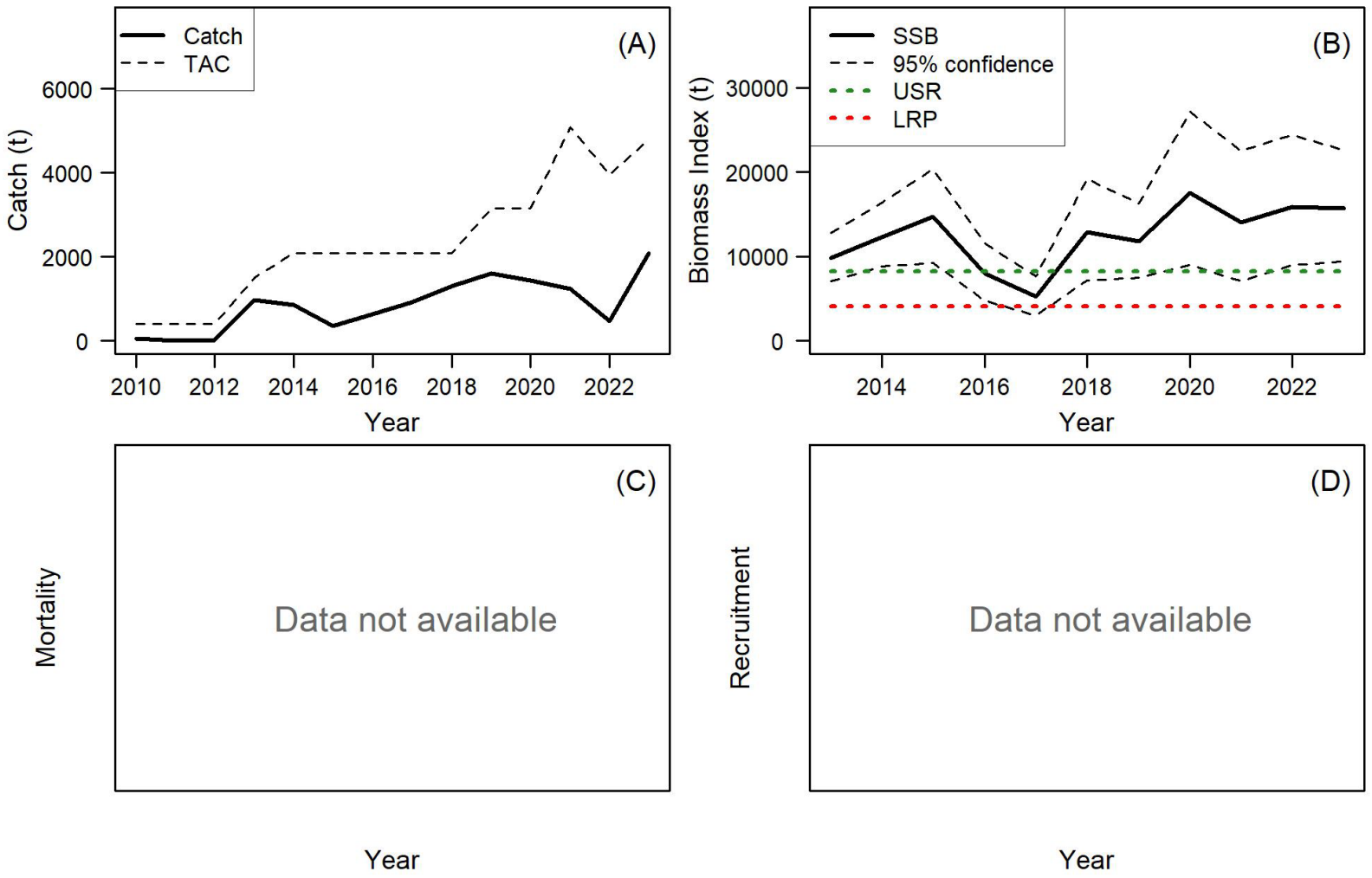

Figure 1. Pandalus borealis *in the Western Assessment Zone. (A; top left) Catch (as of January 24, 2024) and Total Allowable Catch (TAC), (B; top right) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 4,100 t) and (proposed) Upper Stock Reference (USR; 8,200 t), (C; bottom left) Fishing Mortality, (D; bottom right) Recruitment.*

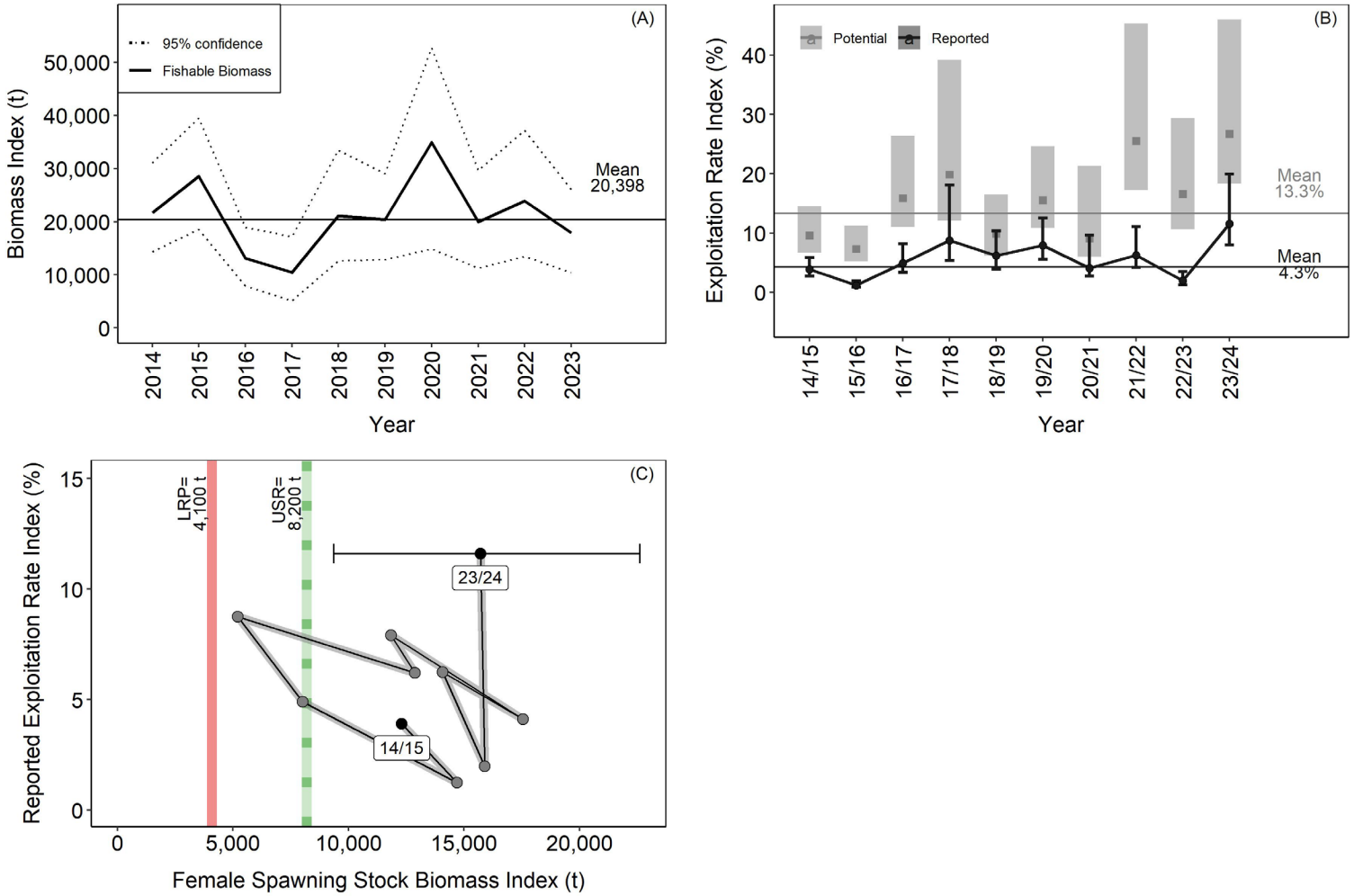

Figure 2. Pandalus borealis *in the Western Assessment Zone. (A; top left) Fishable Biomass Index, horizontal lines are long-term (2014–2022) geometric means. (B: top right) Exploitation rate indices for management years 2014/15–2023/24 at the reported rate based on the total catch (solid black line) and at the potential rate if the TAC was fully harvested (grey shading) as of January 24, 2024. Error bars based on bootstrapped 95% confidence ranges of the fishable biomass and horizontal lines are long-term (2014–2022) geometric means. (C: bottom left) Female spawning stock biomass (SSB) and reported exploitation rate in relation to the Limit Reference Point (LRP; 4,100 t) and (proposed) Upper Stock Reference (USR; 8,100 t).*

Historical and Recent Stock Trajectory and Trends – *P. montagui*

Fishery

Total catch in 2023/24 was 7,194 t, 41.6% of the 17,282 t TAC (Figure 3a). Catch statistics in 2023/24 are preliminary and based on the AQMS data as of January 24, 2024.

Biomass

Both the FB and SSB indices varied without trend from 2014–2023. The FB in 2023 (67,425 t; Figure 4a) decreased (-35.6%) relative to the 2022 value but remained above both the long term mean (2014–2022; 60,454 t) and reference period mean (2014–2019; 56,079 t). The SSB in 2023 (39,745 t; Figure 3b) also declined (-34.9%) relative to the 2022 value but remained above both the long term mean (2014–2022; 33,365 t) and reference period mean (2014–2019; 30,698 t).

Exploitation

As of January 24, 2024, the reported exploitation rate index for 2023/24 was 10.7% with 41.6% of the total allowable catch (TAC) taken (Figure 4b). Should the entire 2023/24 TAC of 17,282 t be taken, the exploitation rate index would be 25.6%.

Current Outlook

Despite a large decline in SSB, the *P. montagui* stock in the WAZ is currently above both the established LRP (12,300 t) and proposed USR (24,600 t; Figure 4c). Should the USR be established at the proposed level of 24,600 t (i.e., 80% of the geometric mean of the SSB; DFO 2020), the stock in 2023 would be in the Healthy zone of the PA Framework with a 98.4% probability.

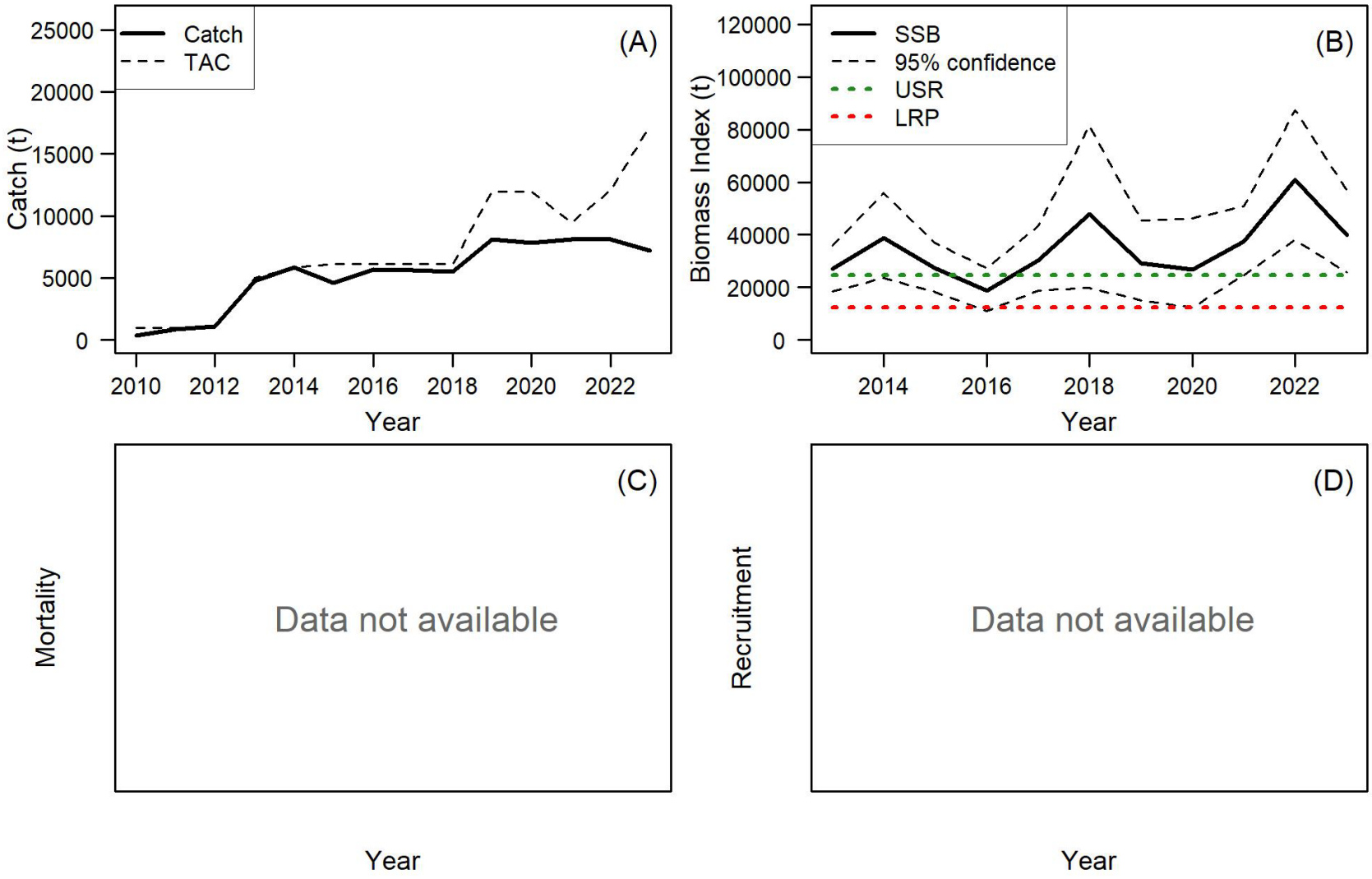

Figure 3. Pandalus montagui *in the Western Assessment Zone. (A; top left) Catch (as of January 24, 2024) and Total Allowable Catch (TAC), (B; top right) Spawning Stock Biomass (SSB) in relation to the Limit Reference Point (LRP; 12,300 t) and (proposed) Upper Stock Reference (USR; 24,600 t), (C; bottom left) Fishing Mortality, (D; bottom right) Recruitment.*

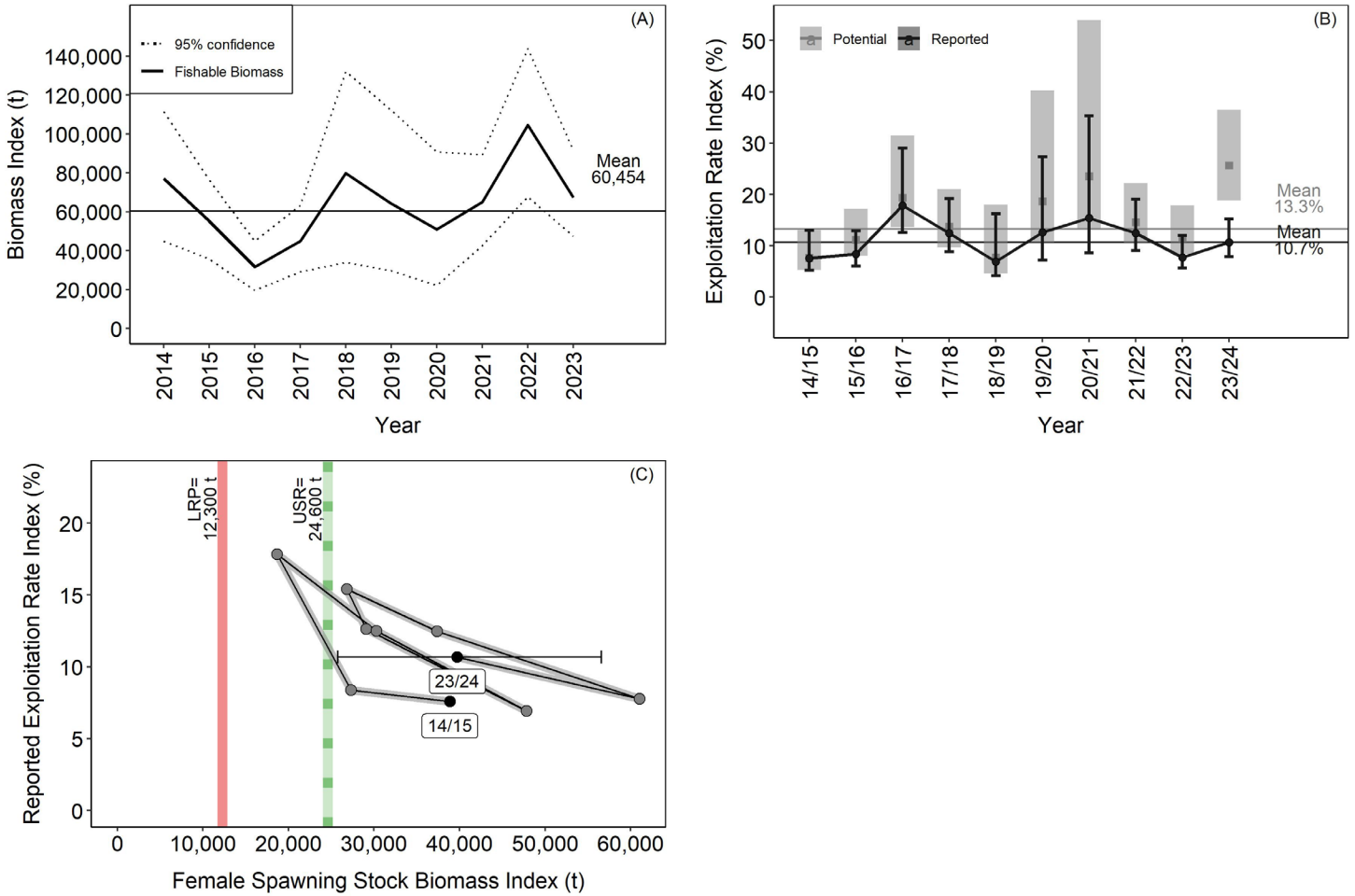

Figure 4. Pandalus montagui *in the Western Assessment Zone. (A: top left) Fishable Biomass Index, horizontal lines are long-term (2014–2022) geometric means. (B: top right) Exploitation rate indices for management years 2014/15–2023/24 at the reported rate based on the total catch (solid black line) and at the potential rate if the TAC was fully harvested (grey shading) as of January 24, 2024. Error bars based on bootstrapped 95% confidence ranges of the fishable biomass and horizontal lines are long-term (2014–2022) geometric means. (C: bottom left) Female spawning stock biomass (SSB) and reported exploitation rate in relation to the Limit Reference Point (LRP; 12,300 t) and (proposed) Upper Stock Reference (USR; 24,600 t)*

History of Landings

Table 2. Nominal reported catches (t) for the Western Assessment Zone for Pandalus borealis *and* Pandalus montagui*. Catch based on AQMS as of January 24, 2024. Catches for 2023/24 are considered preliminary.*

Year	Western Assessment Zone	
	P. borealis	***P. montagui***
2023/24	2,080	7,194
2022/23	475	8,128
2021/22	1,245	8,106
2020/21	1,438	7,841
2019/20	1,612	8,114
2018/19	1,307	5,531
2017/18	918	5,609
2016/17	643	5,660
2015/16	353	4,616
2014/15	847	5,836
2013/14	973	4,775
2012/13	13	1,105
2011/12	0	857
2010/11	57	345
2009/10	0	0
2008/09	0	0
2007/08	0	0
2006/07	0	0
2005/06	-	0
2004/05	-	0
2003/04	-	0
2002/03	-	0
2001/02	-	0
2000/01	-	0
Avg 1995–99	-	0
Avg 1990–94	-	1
Avg 1985–89	-	5
Avg 1979–84	-	5

Projections

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

Ecosystem and Climate Change Considerations

Environmental and climate change considerations were not updated or reviewed during this Science Response Report. The following information is a summary taken from the last full assessment (Fulton et al. 2024).

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*MPO. 2024. Mise à jour des indicateurs de l'état des stocks de crevettes nordiques (*Pandalus borealis*) et de crevettes ésopes (*Pandalus montagui*) dans la zone d'évaluation Ouest, février 2024. Sec. can. des avis sci. du MPO. Rép. des sci. 2024/016.*

APPENDIX 2

Table 1. Stock status indicators and total allowable catch for *P. borealis* and *P. montagui* in the WAZ (2021-22 to 2024-25).

	2021-22	**2022-23**	**2023-24**	**2024-25**
Total Allowable Catch (TAC) (t)	5,090	3,958	4,788	*TBD*
% Change TAC	60.9	-22.2	21.0	*TBD*
Fishable Biomass (FB)*	34,929[1]	19,967[1]	23,939	17,919
Spawning Stock Biomass (SSB)*	17,555	14,083	15,899	15,713
Potential Exploitation Rate	14.6	19.8	20.0	*TBD*
% Change FB	71.4	-42.8	19.9	-25.1
% Change SSB	48.2	-19.8	12.9	-1.2

	2021-22	**2022-23**	**2023-24**	**2024-25**
Total Allowable Catch (t)	9,470	12,096	17,282	*TBD*
% Change TAC	-20.9	27.7	42.9	*TBD*
FB*	50,911	65,026	104,737	67,425
SSB*	26,811	37,398	61,058	39,745
Potential Exploitation Rate	18.6	18.6	16.5	*TBD*
% Change FB*	-20.8	27.7	61.1	-35.6
% Change SSB*	-7.8	39.5	63.3	-34.9

**Biomass indices reflect the prior year's survey (e.g. 2024-25 indices are reflective of the Fall 2023 survey).*

[1] FB value updated 2023, affects associated potential ER.

APPENDIX 3

Table 1. Stock status indicators and total allowable catch for *P. borealis* and *P. montagui* in the EAZ (2021-22 to 2024-25).

	2021-22	**2022-23**	**2023-24**	**2024-25**
Total Allowable Catch (TAC) (t)	12,251	10,732	7,383	*TBD*
% Change TAC	15.0	-12.4	-31.2	*TBD*
Fishable Biomass (FB)*	88,361	52,617[1]	36,911	48,216
Spawning Stock Biomass (SSB)*	59,935	35,000	23,771	32,659
Potential Exploitation Rate	13.9	20.4	20.0	*TBD*
% Change FB	-7.1	-40.5	-29.8	30.6
% Change SSB	4.9	-41.6	-32.1	37.4

	2021-22	**2022-23**	**2023-24**	**2024-25**
Total Allowable Catch (t)	965	1,400	2,100	*TBD*
% Change TAC	14.9	45.1	50.0	*TBD*
FB*	18,802	15,225	14,325	14,137
SSB*	14,437	11,200	10,428	6,829
Potential Exploitation Rate	5.1	9.2	14.7	*TBD*
% Change FB*	121.1	-19.0	-5.9	-1.3
% Change SSB*	227.0	-22.4	-6.9	-34.5

**Biomass indices reflect the prior year's survey (e.g. 2024-25 indices are reflective of the Fall 2023 survey).*

[1] FB value updated 2023, affects associated potential ER.

APPENDIX 4

Species	Management unit_Fleet/Interest	2020/21 Quota	2021/22 Quota	2022/23 Quota	2023/24 Quota
P. borealis	DSW_Offshore	5,250	5,250	4,884	3,360
	DSE_Offshore	1,000	1,150	1,008	693
	DSE_Nunavut	1,604	1,845	1,616	1,112
	DSW_Nunavut	1,778	2,753	2,155	1,483
	DSW_Nunavik	197	305	239	165
	NU-E_Nunavut	659	758	664	456
	NK- E_Nunavik	165	190	166	114
	TOTAL	***10,653***	***12,251***	***10,732***	***7,383***
P. montagui	NU-E_Nunavut	301	346	574	820
	NK-E_Nunavik	129	148	252	360
	DS E/W_Offshore (bycatch)	410	471.5	574	920
	TOTAL	***840***	***965.5***	***1,400***	***2,100***
P. borealis	NU-W_Nunavut	1,582	2,545	1,976	2,394
	NK-W_Nunavik	1,582	2,545	1,976	2,394
	TOTAL	***3,163***	***5,090***	***3,958***	***4,788***
P. montagui	NU-W_Nunavut	5,988	4,735	6,048	8,641
	NK-W_Nunavik	5,988	4,735	6,048	8,641
	TOTAL	***11,975***	***9,470***	***12,096***	***17,282***

APPENDIX 5

The following table shows application of the proposed 2-Step HDR, for each respective stock.

EAZ Borealis									
SSB	**FB**	**Initial target ER (based on Zone) Healthy: 20%**	**Initial target TAC**	**Previous Year TAC**	**Difference (2023 TAC to 2024 Initial target TAC)**	**50% of the Change in TAC (Tonnage)**	**Calculated 2024-25 TAC**	**2024-25 Potential ER**	**Does this exceed Max 1.5* Target ER? (Y/N)**
32,659	48,216	20%	9,643.2	7,383	2,260.2	1,130.1	8,513.1	17.7%	No

EAZ Montagui									
SSB	**FB**	**Initial target ER (based on Zone) Healthy: 20%**	**Initial target TAC**	**Previous Year TAC**	**Difference (2023 TAC to 2024 Initial target TAC)**	**50% of the Change in TAC (Tonnage)**	**Calculated 2024-25 TAC**	**2024-25 Potential ER**	**Does this exceed Max 1.5* Target ER? (Y/N)**
6,829	14,137	20%	2,827.4	2100	727.4	363.7	2,463.7	17.4%	No

WAZ Borealis									
SSB	**FB**	**Initial target ER (based on Zone) Healthy: 20%**	**Initial target TAC**	**Previous Year TAC**	**Difference (2023 TAC to 2024 Initial target TAC)**	**50% of the Change in TAC (Tonnage)**	**Calculated 2024-25 TAC**	**2024-25 Potential ER**	**Does this exceed Max 1.5* Target ER? (Y/N)**
15,713	17,919	20%	3,583.8	4,788	-1,204.2	-602.1	4,185.9	23.4%	No

WAZ Montagui									
SSB	**FB**	**Initial target ER (based on Zone) Healthy: 20%**	**Initial target TAC**	**Previous Year TAC**	**Difference (2023 TAC to 2024 Initial target TAC)**	**50% of the Change in TAC (Tonnage)**	**Calculated 2024-25 TAC**	**2024-25 Potential ER**	**Does this exceed Max 1.5* Target ER? (Y/N)**
39,745	67,425	20%	13,485	17,282	-3,797	-1,898.5	15,383.5	22.8%	No

APPENDIX 6

Consultation Summary: Northern Shrimp Advisory Committee (April 3-4, 2024)
2024-25 Total Allowable Catches for Northern and Striped Shrimp in the WAZ and EAZ

A meeting of the Northern Shrimp Advisory Committee (NSAC) took place on April 3, 2024. The Department held a post-meeting with Indigenous participants on April 4, 2024. Meetings were well attended by groups that have direct interests in the WAZ and EAZ, namely:

- Nunavut Wildlife Management Board (NWMB)
- Nunavik Marine Region Wildlife Board (NMRWB)
- Nunavut Fisheries Association (NFA)
- Torngat Fish Producers Co-Op
- Qikiqtaaluk Corporation (QC)
- Northern Coalition (NC)
- NunatuKavut Community Council (NCC)
- Innu Nation
- Torngat Joint Fisheries Board (TJFB)
- Nunatsiavut Government (NG)
- Baffin Fisheries Coalition (BFC)
- Makivvik Corporation
- Labrador Fishermen's Union Shrimp Company

Other participants at NSAC included representatives of the offshore and inshore fleet, individual licence holders, provincial government representatives, and Oceans North (non-governmental organization).

The Department sought views on Total Allowable Catches (TACs) for *Pandalus borealis* and *P. montagui* in the EAZ at the main NSAC table, with discussions on WAZ TACs reserved for the Indigenous post-meeting. DFO reminded NSAC participants of the NWMB and NMRWB's (the Boards') decision-making role in WAZ, and decision and recommendation role in the EAZ.

The Department encouraged Nunavut and Nunavik industry to make their views on TACs known to their respective Boards as part of the decision making process on 2024-25 TACs for Northern and Striped shrimp in the WAZ and EAZ.

2024-25 Total Allowable Catches:

During discussions on the EAZ and WAZ at the NSAC meeting, there was support for the application of the 2-step HDR to calculate 2024-25 TACs for *P. borealis* and *P. montagui*, in both the EAZ and WAZ.

- ***Eastern Assessment Zone:*** DFO presented an illustrative 2024-25 TAC of 8,513 for *P. borealis* and 2,464t for *P. montagui*.

- ***Western Assessment Zone:*** DFO presented an illustrative 2024-25 TAC of 4,186t for *P. borealis* and 15,384t for *P. montagui*.

Management Measures:

Discussion of NK-E and NK-W (EAZ-WAZ) boundary

- Makivvik Corporation revisited a request to amend the management unit lines between NK-E and NK-W, or another means to address challenges in accessing large shrimp aggregations situated on the management line.
  - DFO underlined the implications of changing a management unit that also defines distinct stock assessment areas (i.e. divides EAZ and WAZ).
  - Such a change would present a need for re-calculation of biomass over the time series, with implications on survey design for both species.
  - Further, DFO Science noted that the aggregation of the resource around the management unit/stock assessment boundary may not reflect a permanent tendency of the stock and it remains unclear whether this issue will persist as the stock fluctuates.
  - The group discussed the appropriateness of a working group to address this issue, with mixed support. Northern Coalition pointed to an ongoing process to review the appropriateness of current assessment units and to gain a better understanding of stock dynamics in the respective areas, which could contribute to and inform further discussion on this matter.

Discussion of EAZ-SFA 4 boundary

- TJFB proposed the formation of an industry-led working group to undertake a comprehensive ("10-year") review and reflection on the implications of the boundary lines dividing the EAZ (DSW) with the northern boundary of Shrimp Fishing Area (SFA 4), and changes made in 2013.
  - TJFB called for meaningful engagement in such a working group from access holders, DFO Science and Resource Management.
  - Torngat Fish Producers Co-Op supported such a working group and review, noting no access to the EAZ for Nunatsiavut interest as a longstanding concern.
  - Other representatives did not support the establishment of a working group, noting this issue may not be appropriate for a full working group given the scope is limited to certain proponents.
  - The NSAC Chair noted potential limitations to internal DFO resources to engage in such a working group given additional priorities for this fishery over the coming year (e.g. model development, potential for Management Strategy Evaluation). The NSAC Chair committed to preparing a document to serve as a historical summary of this boundary issue to establish a common understanding. This draft would be circulated to the Committee for information.

<u>Access and Allocations:</u>

EAZ *P. montagui*

- CAPP supported applying the proposed 2-step HDR to set the overall TAC to help reduce fluctuations from the erratic nature of the fishery.
- Further, CAPP indicated the offshore fleet requires an allocation of 920t in the Davis Strait East/West (DSE/W) management units, and offered this could be implemented as a bycatch 'allowance'.
    - It was proposed that this allowance represent a 'soft limit' that could be exceeded without implication to the directed *P. borealis* fishery in these areas. The allowance would be static to promote year-to-year stability.
    - CAPP added that the allowance request has been made for 3 years in a row now such that the risk of reaching a hard limit and unduly affecting the direct fishery remains.
    - CAPP confirmed that it would be willing to forgo an increase in the offshore bycatch quota in DSE/W that could be available under a higher TAC in 2024-25 (and future seasons) should DFO and co-management partners support conversion from a quota to an allowance.
    - CAPP suggested that where additional *P. montagui* quota was available beyond 920t for the broader EAZ, the remainder of the TAC could be allocated in NU/NK E, but that the opposite would also be true, in that when the TAC goes down, the reduction would come from the NU/NKE management units.
    - DFO recalled that co-management boards have authority to set harvest levels inside the NU/NK-E management units; establishing a bycatch allowance 'off-the-top' of the overall TAC for the EAZ would involve subsequent decisions from the Boards on the remaining quota.

- Northern Coalition, Makivvik Corporation and NFA suggested a need to consult more on the concept of a bycatch allowance for the offshore fleet in DSE/W, but were in principal supportive of the idea. The group indicated its interest in pursuing this discussion further with the offshore fleet.

Season bridging:

Season bridging was not raised at the NSAC table on April 3 due to time constraints, but was raised at the Indigenous meeting on April 4. DFO outlined that season bridging is currently available for the directed *P. borealis* quota in the EAZ and the *P. montagui* quota in the WAZ.

- DFO reminded the group that the Nunavut and Nunavik Boards make decisions inside settlement areas and that those decisions are needed to be able to modify the Integrated Fisheries Management Plan (IFMP) season bridging provisions that are applicable in the settlement areas.
- DFO noted that considering the timing of the next NWMB and NRWMB meetings, implementing any changes to the season bridging protocol for EAZ and WAZ is not expected to occur this year.
- DFO indicated since the pilot project was implemented for NU and NK entities in 2018, there have been calls from NU and NK industry to revisit various aspects of the protocol. The Department has committed to the Boards that it would complete the PA Framework for *P. borealis* stocks, including harvest decisions rules, before addressing season bridging. Given that a decision to modify season bridging is unlikely for this year, and

that *P. borealis* in the EAZ is in the healthy zone, the Department will be flexible in its assessment of any season bridging requests in Davis Strait. It was noted that Baffin Fisheries Coalition is disadvantaged in its ability to carry forward uncaught quota in Davis Strait compared to the other entities, which have additional bridging flexibility accrued via their offshore licences. The Department will maintain communication with Boards' staff on any requests and outcomes. DFO will continue discussions with Nunavut and Nunavik entities, as well as the offshore fleet .

- It was recommended to inform the Boards in the season bridging update that the current season bridging protocol for NU and NK is restrictive and to provide some interim allowances to be somewhat consistent with the southern areas.
- The Department will work generally with the offshore fleet and Nunavut and Nunavik industry to develop a season bridging protocol that respects and responds conservation and socio-economic considerations, and specifically with Nunavut and Nunavik entities for season bridging for NU and NK allocations. Issues to be addressed include amounts for carry forward and bridging for when the stock is in the Healthy, Cautious or Critical zones, deadlines, and applicable stocks.