

(ADDENDUM) SUBMISSION TO THE
NUNAVUT WILDLIFE MANAGEMENT BOARD AND
NUNAVIK MARINE REGION WILDLIFE BOARD

FOR

Information:

Decision: X

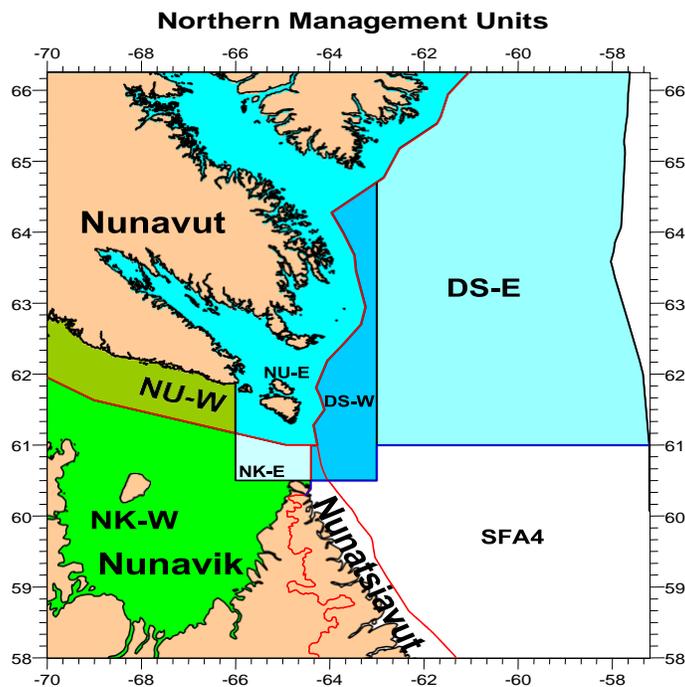
Recommendation: X

Issue: Total Allowable Catch levels for Northern (*Pandalus borealis*) and Striped (*Pandalus montagui*) Shrimp for the 2022-23 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) in February 2022 as a placeholder for their joint decisions and recommendations on 2022-23 Total Allowable Catch (TAC) and harvest levels for two species of shrimp in the Western Assessment Zone (WAZ) and Eastern Assessment Zone (EAZ).

Science results from the 2020 DFO-Northern Shrimp Research Foundation multi species survey that would inform decision making were not available at the time of submission. Results of the Canadian Science Advisory Secretariat (CSAS) peer review from the week of January 28, 2022, are now available and are being submitted through this addendum (Appendix 1).

This addendum presents the Boards with the information needed to provide advice to the Minister of Fisheries and Oceans Canada for the 2022-23 fishery in the WAZ and EAZ. Recognizing that fishing may begin in these areas as early as May 2022, advice is requested as soon as possible.

A meeting of the Northern Shrimp Advisory Committee occurred on March 3, 2022. A summary of these consultations, included as they relate to the EAZ, will be provided to Board staff within the coming weeks

WESTERN ASSESMENT ZONE (WAZ)

Fishery Profile

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

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 claims areas and may make recommendations for adjacent management units. Notably, decisions have been given priority over recommendations in the event they are not aligned.

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 species.

A quota and catch history profile for the fishery in the WAZ is provided at Appendix 4.

Precautionary Approach Framework

Work continues on the development of a draft Precautionary Approach (PA) framework for *P. borealis* and *P. montagui* in the WAZ.

Through a Canadian Science Advisory Secretariat (CSAS) peer-review process in May 2020, DFO Science established a Limit Reference Points (LRP) for each stock at 40% of the geometric mean of the Spawning Stock Biomass (SSB) index for the available time series, an increase from 30%. DFO Science also proposed an Upper Stock Reference (USR) point for each stock at 80% of the geometric mean of the SSB index. Through a series of working group sessions from November 2020 to February 2021, the Northern Precautionary Approach Working Group (NPAWG) has since considered a potential USR at 70% of the geometric mean of the SSB index for each stock¹.

¹ LRPs are considered established and are not subject to Board decisions or recommendations. USRs require Board decisions and recommendations (as appropriate) prior to being established. Use of the USR is for illustrative purposes for consideration in 2022-23 TAC decisions.

Relative to the established LRP and USR considered by the NPAWG, both *P. borealis* and *P. montagui* stocks would be situated in the Healthy Zone of a draft PA Framework.

Harvest Decision Rules (HDRs) that could prescribe harvest rates and other management procedures in each the Healthy, Cautious and Critical Zones are currently under development by the NPAWG. HDRs in the context of a PA Framework are not yet available.

Science Advice

Eight data points are now available in a new time series for the WAZ that began in 2014. *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 at this time.

For *P. borealis*, the 2021 survey indicates a Fishable Biomass (FB) decrease of 39.7% from the 2020. The Spawning Stock Biomass (SSB) decreased by 19.8% from the previous year's survey (Appendix 1).

For *P. montagui*, the 2021 survey indicates a FB increase of 27.7% from the 2020 survey. The SSB increased by 39.5% from the previous year's survey (Appendix 1; Appendix 2).

2022-23 Management Considerations

Although a PA Framework has not been fully established, both stocks would be situated in the Healthy Zone relative to the established LRPs and USRs recommended by DFO Science.

For *P. borealis*, a rollover of the current TAC in 2022-23 would result in an ER of 25.7%. Maintaining the 15.5% ER from 2021-22 would result in a 2022-23 TAC of 2,968t (an decrease of approximately 42%). Scenarios are illustrated below (notably some scenarios present ERs outside the range of past ERs observed for this stock).

Scenario	TAC	ER	% change in TAC from previous year
Rollover TAC	5,090t	25.7%	0%
Maintain ER	2,968t	15.5%	-42%
15% TAC decrease	4,327t	21.9%	-15%

For *P. montagui*, a rollover the current TAC in 2022-23 would result in an ER of 14.6% (notably, outside the range of past ERs observed for this stock). Maintaining the 18.6% ER from 2021-22 would result in a 2022-23 TAC of 12,095t (a increase of 2,526t or approximately 28%). Scenarios are illustrated below.

Scenario	TAC	ER	% change in TAC from previous year
Rollover TAC	9,470t	14.6%	0%
Maintain ER	12,095t	18.6%	28%
15% TAC increase	10,891t	16.7%	15%

Recommendation: No HDRs currently exist for stocks in the WAZ. HDRs may be proposed in future, pending outcomes of NPAWG discussions.

The Department maintains its view from 2021-22 that the Boards could continue to establish an overall TAC (combined for NU-W and NK-W) with ER that falls within the range where the stock has shown an ability to recover; 7.3% - 19.8% for *P. borealis*; 8.0% - 19.3% for *P. montagui*.

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

Table 2. Summary of requested decisions and recommendations, WAZ.

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

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), Davis Strait West (DSW) and Davis Strait East (DSE) (see map). These management units are located partially within and adjacent to the NSA and NMR, respectively. 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. Notably, decisions have been given priority over recommendations in the event they are not aligned.

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. No formal sharing arrangement exists to prescribe distribution of allocations between NU-E and NK-E.

Allocations in the Davis Strait management units have been allocated to Nunavut and Nunavik fishing interests, as well as to the offshore fleet. *P. montagui* is a bycatch species in Davis Strait. A quota and catch history profile for the fishery in the EAZ is provided at Appendix 4.

Precautionary Approach Framework

A PA Framework currently exists for *P. borealis* and *P. montagui* in the EAZ and work is underway to update this framework. In May 2020, DFO Science analysed the available longer data series and updated the LRP for each stock to 40% of the geometric mean of the SSB index for the available time series, an increase from 30%. DFO Science also proposed an updated USR for each stocks at 80% of the geometric mean of the SSB index.²

² LRPs are considered established and are not subject to Board decisions or recommendations. USRs require Board decisions and recommendations (as appropriate) prior to being established. Use of the USR is for illustrative purposes for consideration in 2022-23 TAC decisions.

Relative to the updated LRP and USR recommended by DFO Science, both *P. borealis* and *P. montagui* stocks would be situated in the Healthy Zone of an updated PA Framework.

HDRs are currently available to inform 2021-22 TAC decisions within the existing PA Framework for EAZ stocks. However, these HDRs are currently being reviewed and potential updates being developed by the NPAWG.

Science Advice

Twelve data points are now available in the time series for the EAZ. *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 2021 survey indicates a FB decrease of 37.8% from the 2020 survey. The SSB decreased by 40.9% from the previous year’s survey (Appendix 1).

For *P. montagui*, the 2021 survey indicates a FB decrease of 19% from the 2020 survey. The SSB decreased by 22.4% from the previous year’s survey (Appendix 1). The FB of *P. montagui* has fluctuated precipitously every year since 2012, and the status of this resource is uncertain.

2022-23 Management Considerations

Both *P. borealis* and *P. montagui* stocks would be situated in the Healthy Zone relative to established LRPs and USRs recommended by DFO Science. Existing HDRs for stocks in the Healthy Zone prescribe ERs well above the base target ER of 15%, and changes in the TAC should generally not exceed 15% of the previous TAC.

For *P. borealis*, the 2021-22 TAC was 12,251.75t. A rollover of the current TAC in 2022-23 would result in an 2022-23 potential ER of 22.8%. Maintaining the 14.2% ER from 2021-22 would result in a 2022-23 TAC of 7,619.4t. A 15% decrease would result in a TAC of 10,414t. Scenarios are illustrated below.

Scenario	TAC	ER	% change in TAC from previous year
Rollover TAC	12,251.75	22.8%	0%
Maintain ER	7,619t	14.2%	-37.8%
15% TAC decrease	10,414t	19.4%	-15%

The TAC for *P. montagui* was set at 840t from 2014 to 2020 with an increase to 965.5t in 2021. A rollover the current TAC of 965.5t would result in a potential ER of 6.3% in 2022-23. Maintaining the 5.1% ER would result in a 2022-23 TAC of 776.5t. A decrease of 15% would result in a TAC of 821t. Scenarios are illustrated below.

Scenario	TAC	ER	% change in TAC from previous year
Rollover TAC	965.5	6.3%	0%
Maintain ER	776.5	5.1%	-19%
15% TAC decrease	821t	5.2%	-15%
15% TAC increase	1110t	7.3%	+15%

Recommendation:

For *P. borealis*, an option could be to decrease the TAC by 15% for 2022-23 (ER 19.4%). Where the stock remains in the Healthy Zone, the resulting exploitation rate is reasonable and within the range of past ERs applied in similar circumstances.

For *P. montagui*, options could be to maintain the TAC at 965.5t for 2022-23 (ER 6.3%) or increase the TAC by 15% to 1110t (ER 7.3%) given the relatively conservative ERs currently being applied in this fishery.

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.

Table 3. Summary of requested decisions and recommendations, EAZ.

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

Prepared by: Kailey Noonan and Derek Mahoney, Fisheries Resource Management,
Fisheries and Oceans Canada

Date: March 9, 2022

SUMMARY: Assessment of Northern Shrimp, *Pandalus borealis*, and Striped Shrimp, *Pandalus montagui*, in the Eastern and Western Assessment Zones, February 2022

Resource status in the EAZ and WAZ is evaluated within a Precautionary Approach (PA) Framework that was established in 2020 (DFO 2020). For both species of shrimp, the Limit Reference Point (LRP) was set at 40% of the geometric mean of the female spawning stock biomass (SSB) index and the preliminary (not yet finalized) Upper Stock Reference (USR) was proposed at 80% of the geometric mean of the female SSB index over a recent productive period. For the EAZ, the recent productive period used to calculate the geometric mean is 2009–2019. For the WAZ, the geometric mean is based on the 2014–2019 period given the previously mentioned change to the survey protocol prior to 2014.

Eastern Assessment Zone – *Pandalus borealis*

Fishery

- The preliminary total 2021/22 catch of *P. borealis* in the EAZ was 8,359 t, which is 74% of the TAC

Biomass

- The fishable biomass index decreased for the second year in a row, by 37.8% from 2020 to 2021, and is now at 53,658 t The female SSB index showed a second consecutive annual decrease, by 40.9% from 2020 to 2021, and is now at 35,792 t
- Both indices fell below their respective long-term means in 2021.

Exploitation

- The reported ER index for 2021/22 was 15.6% (Figure B4a). If the entire TAC were taken this fishing season the potential ER index for 2021/22 would be 21.1% (Figure B4b), which is above the long-term mean (14.7%).

Current Outlook

- Despite the decline in the SSB index, based on the proposed USR, *P. borealis* in the EAZ still remains within the Healthy Zone of the PA Framework. Note, there is a possibility of transgressing into the Cautious Zone based on the confidence interval crossing the proposed USR

Eastern Assessment Zone – *Pandalus montagui*

Fishery

- The preliminary total 2021/22 catch of *P. montagui* in the EAZ was 582 t, which is 65% of the TAC

Biomass

- The fishable biomass index decreased by 19.0% from 2020 to 2021, and is now at 15,225 t. The female SSB index showed a decrease, by 22.4 % from 2020 to 2021, and is now at 11,200 t. Both indices were close to their respective long-term means in 2021.

Exploitation

- The reported ER index for 2021/22 was 3.8%. If the entire TAC were taken this fishing season the potential ER index for 2021/22 would be 5.9% which is below the long-term mean (28.6%).

Current Outlook

- Despite the decline in the SSB index, based on the proposed USR, *P. montagui* in the EAZ still remains within the Healthy Zone of the PA Framework. Note, there is a

possibility of transgressing into the Cautious Zone based on the confidence interval crossing the proposed USR

Western Assessment Zone – *Pandalus borealis*

Fishery

- The preliminary total 2021/22 catch of *P. borealis* in the WAZ was 1,248 t, which is 24% of the TAC.

Biomass

- The fishable biomass index decreased by 39.7% from 2020 to 2021, and is now at 19,784 t. The female SSB index showed a decrease, by 19.8% from 2020 to 2021, and is now at 14,082 t. Both indices were near their respective long-term means with the fishable biomass being slightly below the long-term mean and the female SSB being slightly above the long-term mean.

Exploitation

- The reported ER index for 2021/22 was 6.3%. As a consequence of the decline in the fishable biomass in 2021, if the entire TAC were taken this fishing season the potential ER index for 2021/22 would be 25.7% which is above the long-term mean (12.5%).

Current Outlook

- Despite the decline in the SSB index, based on the proposed USR, *P. borealis* in the WAZ still remains within the Healthy Zone of the PA Framework. Note there is a possibility of transgressing into the Cautious Zone based on the confidence interval crossing the proposed USR.

-

Western Assessment Zone – *Pandalus montagui*

Fishery

- The preliminary total 2021/22 catch of *P. montagui* in the WAZ was 8,106 t, which is 86% of the TAC.

Biomass

- The fishable biomass index increased by 27.7% from 2020 to 2021, and is now at 65,026 t. The female SSB index showed an increase, by 39.5% from 2020 to 2021, and is now at 37,398 t. Both indices are above their respective long-term means in 2021.

Exploitation

- The reported ER index for 2021/22 was 12.5%. If the entire TAC were taken this fishing season the potential ER index for 2021/22 would be 14.6%, which is near the long-term mean (14.5%).

Current Outlook

- Based on the proposed USR, *P. montagui* in the WAZ is within the Healthy Zone of the PA Framework. Transgressing into the Cautious Zone is very unlikely based on the confidence interval not crossing the proposed U

Table 1. Stock status indicators for *P. borealis* and *P. montagui* in the WAZ (2019-2022).

WAZ <i>P. borealis</i>				
	2022-23	2021-22	2020-21	2019-20
Total Allowable Catch (TAC) (t)	<i>TBD</i>	5090	3,163	3,163
% Change TAC	<i>TBD</i>	61%	0.0%	52.1%
Fishable Biomass (FB)*	19,784	32,835	20,378	21,088
Spawning Stock Biomass (SSB)*	14,082	17,555	11,845	12,884
Potential Exploitation Rate	<i>TBD</i>	15.5%	15.5%	15.0%
% Change FB	-39.7	61.1%	-3.4%	101.1%
% Change SSB	-19.8	48.2%	-8.1%	147.0%

WAZ <i>P. montagui</i>				
	2022-23	2021-22	2020-21	2019-20
Total Allowable Catch (t)	<i>TBD</i>	9,470	11,975	11,975
% Change TAC	<i>TBD</i>	-21%	0.0%	95.1%
FB*	65,026	50,911	64,268	79,835
SSB*	37,398	26,811	29,079	47,834
Potential Exploitation Rate	<i>TBD</i>	18.6%	18.6%	15.0%
% Change FB*	27.7%	-20.8%	-19.5%	77.7%
% Change SSB*	39.5%	-7.8%	-39.2%	57.8%

*Biomass indices reflect the prior year's survey (e.g. 2021-22 indices are reflective of the Fall 2020 survey).

Table 2. Stock status indicators for *P. borealis* and *P. montagui* in the EAZ (2019-2022).

EAZ <i>P. borealis</i>				
	2022-23	2021-22	2020-21	2019-20
Total Allowable Catch (TAC) (t)	<i>TBD</i>	12,251	10,653	8,610
% Change TAC	<i>TBD</i>	15%	23.7%	9.8%
Fishable Biomass (FB)*	53,658	86,211	95,138	46,900
Spawning Stock Biomass (SSB)*	35,792	60,531	57,143	32,842
Potential Exploitation Rate	<i>TBD</i>	14.2	11.2%	18.4%
% Change FB	-37.8%	-9.4%	102.9%	19.6%
% Change SSB	-40.9%	5.9%	74.0%	32.4%

EAZ <i>P. montagui</i>				
	2022-23	2021-22	2020-21	2019-20
Total Allowable Catch (t)	<i>TBD</i>	965.5	840	840
% Change TAC	<i>TBD</i>	15%	0.0%	0.0%
FB*	15,225	18,803	8,503	20,895
SSB*	11,200	14,437	4,415	13,806
Potential Exploitation Rate	<i>TBD</i>	5.1%	9.9%	4.0%
% Change FB*	-19%	121.1%	-59.3%	-16.3%
% Change SSB*	-22.4%	227.0%	-68.0%	-16.5%

*Biomass indices reflect the prior year's survey (e.g. 2021-22 indices are reflective of the F

Table 3. Summary of Northern Shrimp quota and catches 2017-22

Species	Management unit_Fleet/Interest	2017/18		2018/19		2019/20		2020/21		2021/22	
		Quota	Catches	Quota	Catches	Quota	Catches	Quota	Catches	Quota	Catches (Preliminary)
<i>P. borealis</i>	DSW_Offshore	4,813	5,009	4,013	4,576	4,737	4,511	5,250	4,980	5,250	4,066
	DSE_Offshore	1,604	530	802	352	802	4	1,000	11	1,150	5
	DSE_Nunavut	1,604	884	1,604	215	1,604	0	1,604	35	1,845	0
	DSW_Nunavut	1,084	928	1,084	1,055	1,084	976	1,778	1,185	2,753	2,673
	DSW_Nunavik	120	0	120	0	120	0	197	0	305	0
	NU-E_Nunavut	210	67	174	45	210	4	659	420	758	355
	NK- E_Nunavik	53	66	43	94	53	13	165	167	190	259
	TOTAL	9,488	7,483	7,840	6,337	8,610	5,508	10,653	6,648	12,251	7,358
<i>P. montagui</i>	NU-E_Nunavut	301	92	301	0	301	76	301	168	346	116
	NK-E_Nunavik	129	140	129	3	129	0	129	178	148	128
	DS E/W_Offshore (bycatch)	410	71	410	141	410	150	410	96	471.5	310
	TOTAL	840	304	840	143	840	225	840	348	965.5	554
<i>P. borealis</i>	NU-W_Nunavut	1,040	466	1,040	485	1,582	1,236	1,582	785	2,545	617
	NK-W_Nunavik	1,040	452	1,040	822	1,582	375	1,582	652	2,545	614
	TOTAL	2,080	918	2,080	1,307	3,163	1,612	3,163	1,366	5090	1,231
<i>P. montagui</i>	NU-W_Nunavut	3,069	2,505	3,069	1,879	5,988	4,131	5,988	3,871	4,735	2,996
	NK-W_Nunavik	3,069	3,104	3,069	3,638	5,988	3,983	5,988	3,970	4,735	4,743
	TOTAL	6,138	5,609	6,138	5,517	11,975	8,114	11,975	6,567	9,470	7,739