

Background

For the 2021/22 Northern (*Pandalus borealis*) and Striped (*Pandalus montagui*) Shrimp fisheries in the WAZ and EAZ, Fisheries and Oceans Canada (DFO) has provided the Boards with an initial information and a decision note and addendum for their March meetings, i.e. Total Allowable Catch levels for Northern (*Pandalus borealis*) and Striped (*Pandalus montagui*) Shrimp for the 2021-22 season in the Western and Eastern Assessment Zones. In addition, DFO also subsequently submitted for the June Board meetings a summary of consultations held at the Northern Shrimp Advisory Committee's (NSAC) Indigenous pre-meeting and full meeting, i.e. Consultation Summary: Northern Shrimp Advisory Committee 2021-22 Total Allowable Catches for Northern and Striped Shrimp in the WAZ and EAZ. Within these documents, and as confirmed in the March NWMB Board meeting, DFO outlined several TAC options for each stock but did not make specific TAC recommendations. The Department did make the following recommendations for the respective zones:

Western Assessment Zone – 2020/21 TACs – montagui 11,975 t; borealis 3,163 t:

No Harvest Decision Rules (HDRs) currently exist for stocks in the WAZ. HDRs may be proposed in future, pending outcomes of Northern Precautionary Approach Working Group (NPAWG) discussions.

The Department maintains its view from 2020-21 that the Boards could continue to establish an overall TAC (combined for NU-W and NK-W) with Exploitation Rate (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*.

Eastern Assessment Zone – 2020/21 TACs - montagui 840 t; borealis 10,653 t:

For *P. borealis*, an option could be to increase the TAC by 15% for 2021-22 (ER 14.2%). Where the stock remains in the Healthy Zone, the resulting ER is reasonable. This option considers that significant fluctuations in biomass indices have been observed for this stock. Significant changes in year-to-year TAC may require reductions in future.

For *P. montagui*, an option could be to rollover the TAC at 840t for 2021-22. This option considers that significant fluctuations in biomass continue to be observed for this stock, and that the TAC has been maintained at 840t since 2014.

These recommendations do not take into account possible suggested revisions to EAZ HDRs, pending outcomes of NPAWG discussions.

Based on the DFO submissions to the Boards, discussions at the March NWMB Board meeting, the detailed science presented through the Zonal Review Process (ZRP), the discussions and recommendations reached at the NSAC and Indigenous pre-meetings, and discussions between the industry members from Nunavut and Nunavik, the following pages outline the rationale and recommendations from the current quota holders in Nunavut and Nunavik for consideration by the Boards.

NU/NK Industry Analysis

Stock Status

Any objective assessment of the shrimp stocks in the WAZ and EAZ would conclude that these stocks are in good shape, especially as compared to stocks in more southern SFAs which have in most cases witnessed declines in recent years. As shown in the preliminary Precautionary Approach (PA) framework charts provided in Appendix 1 (from CSAS document 2021/014: ASSESSMENT OF NORTHERN SHRIMP (*PANDALUS BOREALIS*) AND STRIPED SHRIMP (*PANDALUS MONTAGUI*) IN THE EASTERN AND WESTERN ASSESSMENT ZONES, FEBRUARY 2021), all four of the stocks in the WAZ and EAZ are currently in the healthy zone, based on an assumed Upper Stock Reference (USR) of 80%. It is understood from discussions at NPAWG that DFO will be presenting an USR level of 70% for decision by the Boards at the June meetings, indicating that stocks are even more into the healthy zone than indicated in the charts presented in Appendix 1. These charts also serve to demonstrate the low Exploitation Rate (ER) levels that have been utilized for these northern stocks, especially as outlined below in comparison to more southern shrimp stocks.

For each of the stocks under consideration the status is as follows:

- WAZ montagui – Standing Stock Biomass (SSB) of 26,811 t in 2020/21, well above the 21,489 t USR level at 70% of geometric mean. Although SSB and Fishable Biomass (FB) have declined in the last two years, the stock remains in the healthy zone. For the six survey points available for this stock, as shown in Appendix 1, the stock has been in the healthy zone for all but one year (2016/17), where it dipped into the cautious zone but rebounded in the following year;
- WAZ borealis – SSB of 17,555 t in 2020/21, well above the 7,170 t USR level at 70% of geometric mean. SSB and FB increased significantly in 2020/21 over the prior year, reaching their highest level in the time series, putting the stock even higher into the healthy zone. For the six survey points available for this stock, as shown in Appendix 1, the stock has been in the healthy zone for all but one year (2017/18), where it dipped into the cautious zone but rebounded in the following year;
- EAZ montagui – SSB of 14,437 t in 2020/21, well above the 5,351 t USR level at 70% of geometric mean. SSB and FB increased significantly in 2020/21 over the prior year, where the stock was in the cautious zone. Over the 12 survey data points used, this stock has demonstrated the highest degree of variability of the four stocks under consideration, with three years in the cautious zone, one in the critical zone, and the remainder in the healthy zone, as shown in Appendix 1;
- EAZ borealis – SSB of 60,531 t in 2020/21, well above the 27,622 t USR level at 70% of geometric mean. SSB increased slightly over the 2019/20 level, however the FB decreased slightly but remained well above the FB level of 2018/19. Over the 12 survey data points used, this stock has been in the healthy zone for all but one year, where it slipped into the cautious zone for that one year only, as shown in Appendix 1.

HDRs and TAC Considerations

Although DFO has brought forward the recommendations of the NPAWG with respect to the LRP and USRs for stocks in the WAZ and EAZ, this working group has not reached a final recommendation on Harvest Decision Rules (HDRs) for these areas. Discussions have taken place on various HDR approaches that could be utilized and these discussions continue. Working group members are in agreement that stocks in the WAZ and EAZ have shown a greater degree of positive and negative variability than stocks in more southern areas, and industry has expressed concern that any quick reactions to movements into the cautious zone could overly impact on TACs and, as a result, economic impacts of the fishery.

Proposals have been discussed on using multi-year averaging and one-year cautious zone allowances to address and smooth out this risk factor. However, as outlined above, in all but one of the four stocks under consideration (EAZ montagui) these stocks have been in the healthy zone of the preliminary PA Framework for a vast majority of the time.

For all other shrimp stocks under NSAC in southern SFAs, when in the healthy zone the target ER used to establish TACs has been 20%. In the cautious zone, the ERs vary from 10-20% depending on the stock's location in that zone, while when in the critical zone the maximum ER used has been 10%. Over the past several years, when considering TACs in southern SFAs, the general consensus at NSAC has been to utilize two-year averaging of FB multiplied by the appropriate ER (set based on the one year SSB position in PA) to determine the TACs. Using this approach helps to balance the impact of both annual increases and decreases in FB. This has been the approach recommended by the NU and NK industry for the WAZ and EAZ in recent years as well, an approach that has generally been accepted by the Minister to set TACs (other than in SFA 6 where one-year FB has been used at a 10% ER since this stock is in the critical zone).

Based on the fact that NPAWG has not reached a decision on HDRs for 2021/22 and the common use of two-year averaging of FB in the shrimp fishery, the NU and NK industry are proposing to use this approach once again for 2021/22 in its recommendations to the Boards, as outlined in the following section.

NU/NK Recommendations on Overall TACs in the WAZ and EAZ

The following paragraphs outline the joint recommendations of the NU and NK shrimp industry with respect to TACs for 2021/22 in the WAZ and EAZ. Details of the calculations for each stock are provided in Appendix 2. This is followed by industry's recommendations on the sharing of these TACs.

Western Assessment Zone (WAZ) – montagui – 2020/21 TAC of 11,975 t

The WAZ montagui stock is in the healthy zone but has witnessed decreases in FB for the last two years. Being in the healthy zone and given that the PA Framework is nearing completion, an ER of up to 20% would be considered reasonable for this stock. In its submission, DFO has indicated a preference for an "ER that falls within the range where the stock has shown an ability to recover; 8.0% - 19.3% for P. montagui".

Based on the above, industry is presenting two TAC options for consideration by the Boards, a 20% and 19.3% ER, which in using two year averaging of FB would provide the following results:

- **ER at 20% TAC of 11,518 t, a reduction of 457 t** from the 2020/21 TAC; or
- **ER of 19.3% TAC of 11,115 t, a reduction of 860 t** from the 2020/21 TAC.

A 20% ER minimizes the negative impact on industry, but a 19.3% ER would also be in line with DFO's recommendations.

Western Assessment Zone (WAZ) – borealis – 2020/21 TAC of 3,163 t

The WAZ borealis stock is in the healthy zone and the FB biomass increased significantly in 2020/21. Being in the healthy zone and given that the PA Framework is nearing completion, an ER of up to 20% would be considered reasonable for this stock. In its submission, DFO has indicated a preference for an "ER that falls within the range where the stock has shown an ability to recover; 7.3% - 19.8% for P. borealis".

This stock has largely been a bycatch fishery in this area to date, with actual harvests coming in significantly lower than existing TACs. However, given the significant increase in FB for this stock opportunities may exist for future targeting by industry and, as such, the ER used should reflect this potential opportunity. Based on this, industry is recommending the following:

- **ER at 19.8% TAC of 5,268 t, an increase of 2,105 t** from the 2020/21 TAC, consistent with DFO's recommendations on the range of ER's possible and utilizing two-year averaging of FB.

Eastern Assessment Zone (EAZ) – montagui – 2020/21 TAC of 840 t

The EAZ montagui stock is currently back in the healthy zone, rebounding from the cautious zone in 2019/20. As previously mentioned, this is the stock with the most variability and movement from zone to zone, which would support a more cautious approach. In addition, this stock has been a bycatch fishery, which has been maintained at a low TAC level of 840 t for many years. Although actual harvests and ERs for this stock have been very low, industry has expressed concern that with potential significant increases in the EAZ borealis stock and the increase in the EAZ montagui FB, that the level of TAC for this stock be placed at a level that would not negatively impact on its potential to fully harvest its borealis allocations (potential to shut fishery if montagui bycatch is all harvested prior to the borealis quota).

Based on the above points, the NU/NK industry is not recommending having the ER for this stock increased to the 20% level possible for the healthy zone but is recommending an increase to reduce the risk of not having adequate bycatch levels available. Following is the recommendation on TAC:

- **ER at 15% TAC of 2,048 t, an increase of 1,208 t** from the longstanding and low 840 t bycatch level, utilizing two-year averaging of FB. Although the actual ER based on bycatch harvest may come in at a much lower level, if consistent with prior years, this new TAC level will be more reflective of the PA approach and will protect industry from excessive bycatch in the EAZ borealis fishery.

Eastern Assessment Zone (EAZ) – borealis – 2020/21 TAC of 10,653 t

The EAZ borealis stock is well into the healthy zone and although the FB dropped slightly in 2020/21 (less than 10,000 t to 86,211 t), it remains well above the FB from 2018/19 of 46,900 t. For most stocks, this would result in an ER of 20%. However, given the low ERs that have been implemented for these northern stocks, as compared to southern stocks, jumping directly to a 20% ER for this stock would result in an extremely large increase in the TAC. Other options for this area may entail going to lower exploitation rates which would still result in increases and move this stock closer to the ultimate 20% level for healthy stocks. As described further below, the NU/NK industry considered two other ER levels, a 15% ER and a 18.4% ER. Based on these ER options, utilizing two-year FB averaging, the TACs would be as follows:

- ER at 20% TAC of 18,135 t, an increase of 7,482 t
- ER at 18.4% TAC of 16,694 t, an increase of 6,031 t
- ER at 15% TAC of 13,601 t, an increase of 2,948 t

In the EAZ, for borealis the TACs are divided into three sub-areas, Davis Strait West (DSW), Davis Strait East (DSE), and Nunavut/Nunavik East (NU/NK E). Although TACs are included for each of these areas, the DSE area is generally considered non-viable, or in industry terms "paper fish" as although a quota exists it cannot be harvested viably and very little is taken every year. For example, of the 10,653 t in total EAZ quota last year, 2,604 t was in DSE. This means that while the nominal ER for this area may have been 15% (in line with the recommendations NFA made to the Boards last year, see excerpt in Appendix 3), the real fishable ER was more like 11.3% when taking out the unfishable amount in DSE. This 11.3% ER can be considered very low for a stock in the healthy zone, which has recently undergone

a precipitous increase. A more reasonable approach would be, as an intermittent step to a 20% ER, to implement a real ER of at least 15%. For 2021/22, when looking at distributing any increase based on the FB share in each of the three sub-zones (including the non-viable EAZ zone), the nominal ER would amount to 18.4%. As such, for 2021/22, the NU/NK industry is recommending the following TAC:

- **ER at 18.4% (real 15% ER) TAC of 16,694 t, an increase of 6,031 t**

The NU/NK industry believes the TAC recommendations outlined above are reasonable given the healthy status of the stocks and the goal of moving towards ERs which are in line with those used in other SFAs under their PA Framework. Up until now industry has agreed to precautionary ER levels while the PA Frameworks were being developed and to not overly react to precipitous changes, which has impacted on economic opportunities in the WAZ and EAZ shrimp fisheries. These recommendations will not bring levels to the full 20% ER provided for most healthy fisheries but will take a significant step in this direction (as compared to limiting annual increase to 15-20% which would constrain reaching 20% ERs for healthy stocks (and the economic impacts thereof) by several years). As a result of this adjustment for 2021/22, if stocks remain in the healthy zone it should be possible to attain the 20% ER levels with increases in the 15-20% range or less. If this TAC increase is considered excessive, industry may be willing to consider a slightly lower level (ER of 17.5-18%) as a stepped approach to achieving a 20% ER in a reasonable timeframe.

The following section outlines the recommendations of the NU/NK industry on how these TAC levels should be distributed.

Distribution/Sharing of Recommended NU/NK Industry TACs

The following paragraphs present the position of the Nunavut and Nunavik industry on the sharing of the recommended TACs outlined above for 2021/22 only. Both industry groups commit to holding further discussions on future sharing arrangements in these areas, in collaboration with their respective land claims organizations.

Western Assessment Zone (WAZ) – montagui – 2021/22 Recommended TAC of 11,115 t

The WAZ is located fully within the Nunavut and Nunavik settlement areas and, as such, access is limited to the industry players in these Territories. Since the WAZ fishery started the agreement has been to share WAZ TACs between NU and NK on a 50/50 basis. Industry supports a continuation of this practice, which would result in the following distribution:

- **NU – 50% of TAC – 5,557.5 t, a reduction of 430 t from 2020/21;**
- **NK – 50% of TAC – 5,557.5 t, a reduction of 430 t from 2020/21.**

Western Assessment Zone (WAZ) – borealis – 2021/22 Recommended TAC of 5,268 t

A 50/50 split for WAZ borealis is also recommended, as follows:

- **NU – 50% of TAC – 2,634 t, an increase of 1,052.5 t from 2020/21;**
- **NK – 50% of TAC – 2,634 t, an increase of 1,052.5 t from 2020/21.**

Eastern Assessment Zone (EAZ) – montagui – 2021/22 Recommended TAC of 2,048 t

As previously discussed, in the EAZ stocks are subdivided into three areas, DSW, DSE and NU/NK E. At present, the 2020/21 EAZ montagui TAC is distributed with 410 t provided as a bycatch to the offshore sector in DSW/DSE and the remaining 430 t provided to NU and NK in NU/NK E (301 t to NU and 129 t to NK). A logical approach for distributing TACs by sub-area would be to seek to achieve a distribution in line with the distribution of FB between these sub-areas from the stock surveys. Using the same two-year averaging approach for setting the overall TACs, Appendix 4 provides the calculations of overall FB shares by sub-area and what that would mean for the 2021/22 TAC sharing of EAZ montagui (and borealis) TACS.

For EAZ montagui the distribution of FB would be 58.4% in NU/NK E and the remaining 31.6% in DSW/DSE. This would result in the following sharing of TACs:

- **Offshore – DSW/DSE – 852 t, an increase of 442 t**
- **NU/NK – NU/NK E – 1,196 t, an increase of 766 t**
 - **NU – 837 t, an increase of 536 t**
 - **NK – 359 t, an increase of 230 t**

Eastern Assessment Zone (EAZ) – borealis – 2021/22 Recommended TAC of 16,694 t

At present, the 2020/21 EAZ borealis TAC is distributed between the offshore sector, Nunavut and Nunavik, as follows:

- Offshore – 5,250 t in DSW, 1,000 t in DSE, 6,250 t total;
- NU – 1,778 t in DSW, 1,604 t in DSE, 659 t in NU/NK E, 4,041 t total;
- NK – 197 t in DSW, 165 t in NU/NK E, 362 t total.

In 2020/21, NFA recommended to the Boards that a portion of the increase in the TAC be provided to the offshore to increase its DSW total to its historical level of 5,250 t, with the understanding that any further future increases would be distributed solely to northern participants (see 2020/21 submission excerpts in Appendix 3). The 2020/21 TAC decision did include this increase and a portion of the

2020/21 increase was also provided to the offshore in DSE to bring them closer to their historical level of 1,604 t. All of the remaining increase in the 2020/21 TAC was provided to the other access holders, NU and NK based on the established sharing arrangements of 90/10 NU/NK in DSW and 80/20 NU/NK in NU/NK E.

For 2021/22, as with EAZ montagui a logical approach for distributing TACs by sub-area would be to seek to achieve a distribution in line with the distribution of FB between these sub-areas from the stock surveys. Details for borealis are also provided in Appendix 4 and would result in a distribution of the new 16,694 t TAC by sub-area as follows:

- **DSW – 59.5% share – 9,924 t, a 2,699 t increase;**
- **DSE – 18.7% share – 3,117 t, a 513 t increase;**
- **NU/NK E – 21.8% share – 3,643 t, a 2,819 t increase.**

It is recommended that distribution of the sub-area increases be limited to the existing access holders only and in DSW and NU/NK E be provided to NU and NK based on the current sharing arrangement, while the increase in DSE be provided to the existing participants, NU and the offshore, to further bring this sector closer to its historical level in this area. Using these recommendations, the final sharing of the new 16,694 t TAC would be as follows:

- **Offshore – 5,250 t in DSW, 1,300 t in DSE, 6,550 t total – a 300 t increase;**
- **NU – 4,207 t in DSW, 1,817 t in DSE, 2,914 t in NU/NK E, 8,938 t total – a 4,897 t increase;**
- **NK – 467 t in DSW, 729 t in NU/NK E, 1,197 t total – a 834 t increase.**

It should be noted that even with this significant increase for the northern adjacent industry in NU and NK, they would still have a minority share of the shrimp in the primary fishing area in this zone, i.e. DSW.

NU/NK Industry Recommendations on Management Measures

The NU and NK shrimp industries support the continuation of the following management measures:

- **Continuation of the practice whereby both northern and striped shrimp allocations in NU-W and NK-W may be harvested in either management unit, regardless of land claim boundaries; and**
- **Continuation of the practice whereby both northern and striped shrimp allocations in NU-E and NK-E may be harvested in either management unit, regardless of land claim boundaries.**

In addition to continuing the above management measures, the NU/NK industry is also requesting that in view of the large amount of montagui shrimp on the NKW/NKE border, to continue the practice in Ungava Bay of allowing tows to cross a line in Ungava Bay for at least one more year in order to better define stock parameters. Harvests will continue to be reported where the tow begins.

Summary

The above paragraphs have outlined the joint recommendations of the Nunavut and Nunavik shrimp industries with respect to the TACs and sharing in the WAZ and EAZ and the continuation of current management measures. Industry's recommendations with respect to TACs and the sharing of these TACs is summarized in the following table.

Shrimp Stock	TAC Recommendation	Sharing Recommendation
WAZ montagui	11,115 t , a reduction of 860 t	NU – 50% of TAC – 5,557.5 t, a reduction of 430 t NK – 50% of TAC – 5,557.5 t, a reduction of 430 t
WAZ borealis	5,268 t , an increase of 2,105 t	NU – 50% of TAC – 2,634 t, an increase of 1,052.5 t NK – 50% of TAC – 2,634 t, an increase of 1,052.5 t
EAZ montagui	2,048 t , an increase of 1,208 t	Offshore – DSW/DSE – 852 t, an increase of 442 t NU/NK – NU/NK E – 1,196 t, an increase of 766 t <ul style="list-style-type: none">• NU – 837 t, an increase of 536 t• NK – 359 t, an increase of 230 t
EAZ borealis	16,694 t , an increase of 6,031 t	Offshore – 5,250 t in DSW, 1,300 t in DSE, 6,550 t total – a 300 t increase NU – 4,207 t in DSW, 1,817 t in DSE, 2,914 t in NU/NK E, 8,938 t total – a 4,897 t increase NK – 467 t in DSW, 729 t in NU/NK E, 1,197 t total – a 834 t increase

Thank you in advance for the Boards' consideration of these joint NU/NK industry recommendations on these important issues.

Regards,

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cc: Honourable Bernadette Jordan, Minister of Fisheries and Oceans, Government of Canada
Mr. Gabriel Nirlungayuk, Regional Director General, Arctic Region, Fisheries and Oceans Canada
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Ms. Aluki Kotierk, President, Nunavut Tunngavik Incorporated
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Mr. David Alexander, NFA Director, Baffin Fisheries
Mr. Jerry Ward, NFA Director, Qikiqtaaluk Corporation
Mr. Tony Wright, Makivik Corporation

Description of Terms and Acronyms in Submission to the NWMB and NMRWB

- Total Allowable Catch (TAC) – the total amount of shrimp that industry is allowed to harvest from a specific area for the year in question, as established by the Minister of Fisheries and Oceans Canada (DFO) upon the recommendations of the NWMB and NMRWB
- Northern shrimp – *Pandalus borealis* – the main shrimp species harvested by industry in Atlantic Canada and the Arctic
- Striped shrimp – *Pandalus montagui* – a second species of shrimp that is harvested by industry, primarily found in the northern waters near Nunavut and Nunavik
- Shrimp Fishing Areas (SFAs) – the geographic areas established by DFO for commercial shrimp harvesting. The areas off of Nunavut and Nunavik are as follows (see map attached):
 - Western Assessment Zone (WAZ) – shrimp fishing area in Ungava Bay which is fully within the settlement areas of Nunavut and Nunavik. As a result, the TAC for both *montagui* and *borealis* is provided only to Nunavut and Nunavik in this area
 - Eastern Assessment Zone (EAZ) – shrimp fishing area adjacent to Nunavut and Nunavik (mostly Nunavut) which DFO has further sub-divided into three areas or management units:
 - Nunavut-East and Nunavik-East (NU-E and NK-E) – this is the area within the EAZ which falls within the settlement areas of Nunavut and Nunavik, where only Nunavut and Nunavik are provided a share of the TAC
 - Davis Strait West (DSW) – this is the main commercial fishing area in the EAZ where TACs are held by the offshore shrimp license holders, as well as Nunavut and Nunavik. The offshore shrimp licenses consist of 17 total licenses that were provided by DFO to groups throughout Atlantic Canada and the North. Qikiqtaaluk Corporation (QC) and Makivik each have 1.5 of these licenses
 - Davis Strait East (DSE) – this area is East of DSW and although it has a TAC level, industry has not had very much success in harvesting in this area. When an area has TACs which are not financially viable for the industry to harvest, this TAC is often referred to as “paper fish”, i.e. industry has the TAC on paper but it is not viable to harvest
- Northern Shrimp Advisory Committee (NSAC) – a group consisting of industry, federal and provincial and territorial governments, and other stakeholders in the shrimp fishery which meets every year to provide advice to the DFO Minister on the TAC levels and distribution for Canada’s shrimp fishery. This meeting considers all shrimp fishing areas from the south off of Newfoundland (SFA 6) to the north off of Nunavut and Nunavik (EAZ). It does not discuss the WAZ since the decisions on this area are the responsibility of the NWMB and NMRWB. For the past several years, the day before the full NSAC meeting DFO has organized an indigenous pre-meeting where indigenous groups involved in the shrimp fishery received an update on the stock science and were able to discuss the potential TACs and distribution for the coming year
- Harvest Decision Rules (HDRs) – these are rules established to determine how the TACs will be set on an annual basis. These rules are not in place yet for the WAZ and EAZ, we are working on it

- Northern Precautionary Approach Working Group (NPAWG) – this group has been set up by DFO to discuss and come to a recommendation for NSAC on the Reference Points and HDRs for the stocks in the WAZ and EAZ
- Exploitation Rate (ER) – this is the percentage value used to determine the TAC for the coming year, multiplied by the Fishable Biomass (FB) number in the area for that year, eg: if the FB was 50,000 tonnes and the ER was set at 20%, the TAC for the year would be 10,000 t
- Zonal Review Process (ZRP) – these are meetings held between DFO Scientists and industry and other stakeholders in the fishery to present and discuss the science results from the latest surveys that were completed
- Biomass indices – when the stock surveys are completed every year, for each SFA the surveys measure the amount of shrimp harvested in their tows to determine two main factors or indices that are used to determine the health status of the stock and how much fish is available for harvest. These indices are the SSB (spawning stock biomass of female shrimp), which is used to determine if the stock is considered to be in the healthy, cautious or critical zones and the FB (fishable biomass) which is the number used to determine the TAC when multiplied by the chosen ER
- Precautionary Approach (PA) Framework – this is the series of decisions made on stock reference points and HDRs which together are designed to ensure the fish stock is managed properly to ensure it is sustainable for the long term. The NPAWG is working towards trying to recommend these for the WAZ and EAZ
- Stock Reference points:
 - Lower Reference Point (LRP) – this point is set as a percentage of the average (geometric mean) of the SSB for the time period in which survey results are available below which the stock would be considered to be in the critical zone. For the WAZ and EAZ, DFO Science has set the LRP at a level of 40% of the SSB geometric mean;
 - Upper Stock Reference (USR) - this point is also set as a percentage in the same way as the LRP but is the point below which the stock would be considered to be in the cautious zone. In most SFAs this has been set at 80% but NPAWG is recommending to the Boards a level of 70% for the WAZ and EAZ.
- PA zones:
 - Healthy zone – if in the healthy zone the stock's SSB is over the USR level and the stock is considered to be in good shape (healthy). When healthy the ERs can be set at a higher level, generally up to 20%;
 - Cautious zone - the cautious zone is the areas between the critical and healthy zones where there appears to be some pressure on the stock so the ER is usually reduced to be careful of not overexploiting the resource. The ER in this area can range from 10-20% and is usually set based on where the SSB is in the zone, i.e. if it was in the middle the ER would usually be set at around 15%. For the WAZ and EAZ, the cautious zone is going to be the area between 40% of SSB (the LRP) and 70% of SSB (the USR);
 - Critical zone - when a stock falls below the LRP, it is considered to be in the critical zone, where serious concerns exist on the status of the stock and its ability to rebound to higher levels. The ER in this zone does not go above 10% and being in this zone could lead to the closure of the fishery. For the WAZ and EAZ, the critical zone will be anywhere below 40% of the SSB

- Bycatch fishery – A fishery is considered to be a bycatch fishery when industry is trying to focus on catching another species and catches some smaller quantity of the bycatch species, eg: if industry is trying to catch borealis but also catches a quantity of montagui, then the montagui would be considered as the bycatch species. TACs are often set for bycatch species to ensure that industry is able to harvest the targeted species without being concerned that it is catching too much of the other species

Appendix 1

Preliminary PA Framework Charts

(CSAS document 2021/014: ASSESSMENT OF NORTHERN SHRIMP (PANDALUS BOREALIS) AND STRIPED SHRIMP (PANDALUS MONTAGUI) IN THE EASTERN AND WESTERN ASSESSMENT ZONES, FEBRUARY 2021)

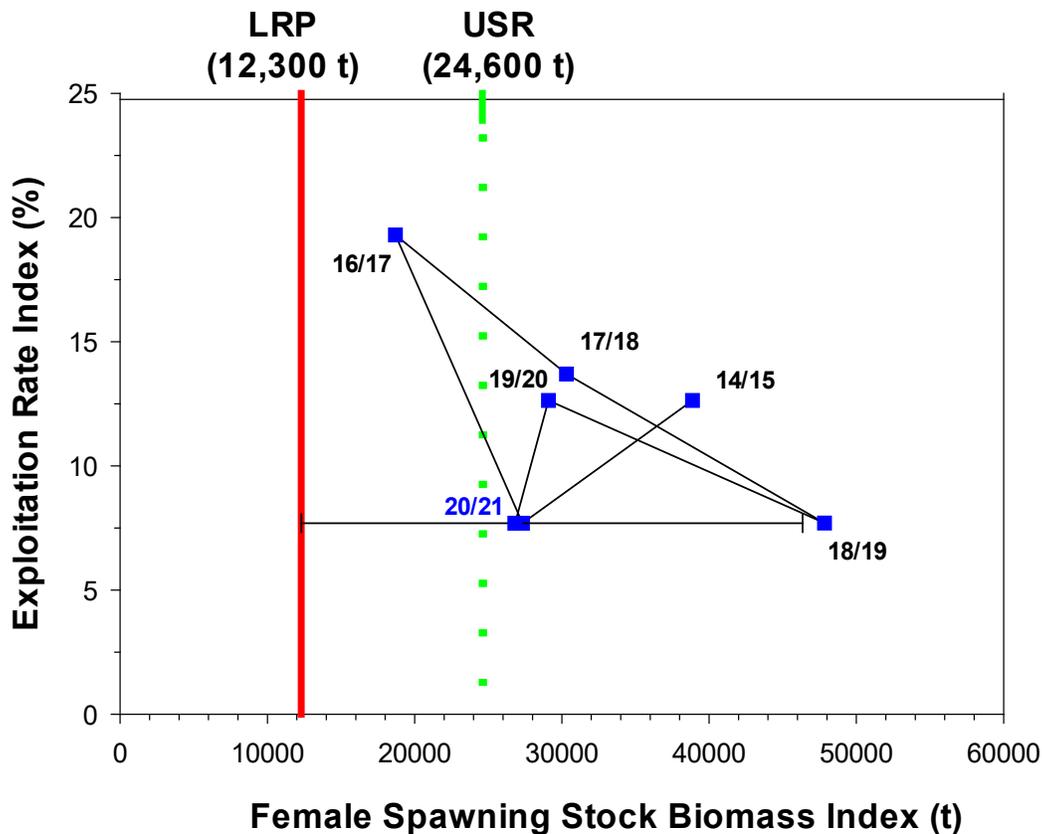


Figure 18. Western Assessment Zone trajectory of *Pandalus montagui* female spawning stock and exploitation rate in reference to Limit Reference Points (LRPs) calculated using the proxy developed in DFO (2020b). Dashed green line indicates the proposed Upper Stock Reference (USR) and the solid red line indicates the LRP, each referring to 80% and 40%, respectively, of the geometric mean of the female spawning stock biomass indices from the 2014–2019 surveys. Since the USR has not been implemented and it is currently being consulted, final location of the dashed line is yet to be determined.

Sources of Uncertainty

Hudson Strait is a highly dynamic system with strong tidal currents and mixing. 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 seen in these areas. 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 at neap tides. 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 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). Exploitation rates are a relative index rather than absolute.

Current Outlook

Pandalus borealis stock in the WAZ is currently well above the established LRP (Figure 14). Although there is currently no established USR, the stock is considered in a healthy state.

Should the USR be established at the proposed level (i.e., 80% of the geometric mean of the SSB; DFO 2020b), the stock in 2020 would be placed well within the Healthy Zone of the PA Framework.

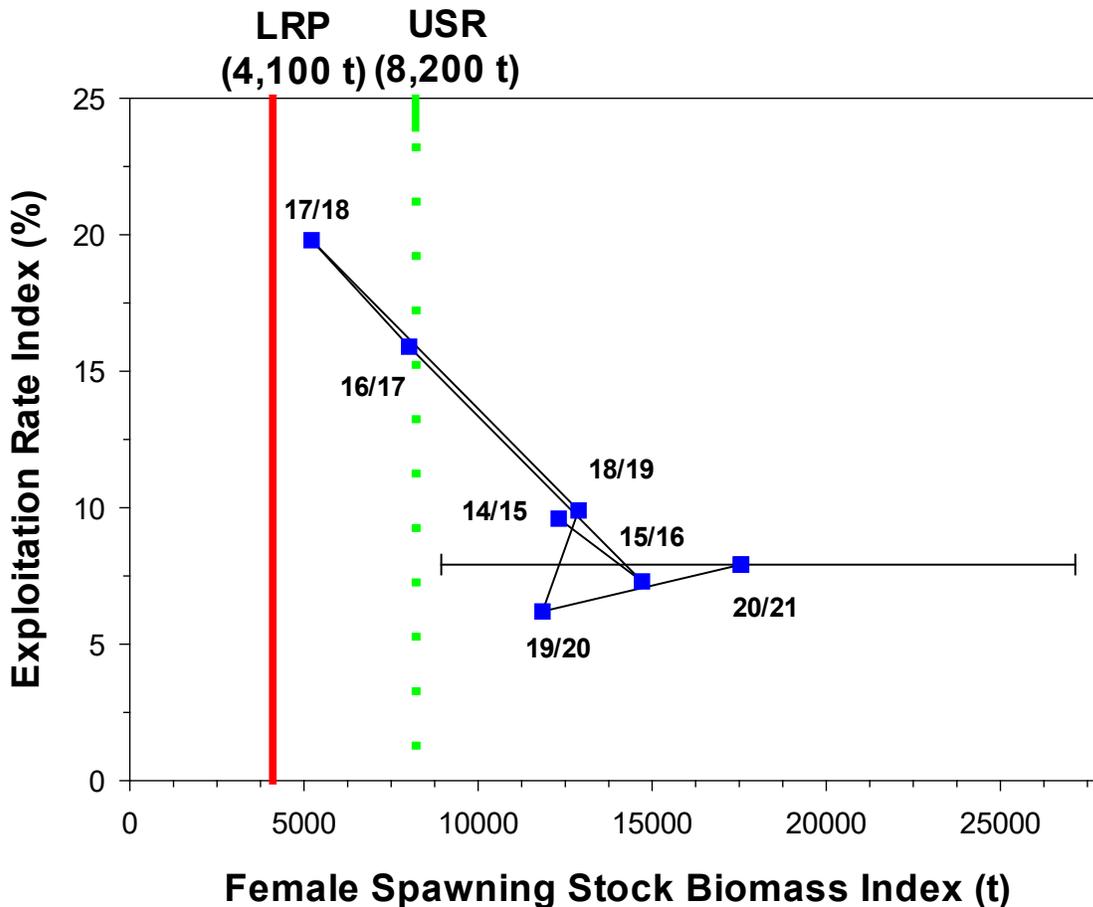


Figure 14. Western Assessment Zone trajectory of *Pandalus borealis* female spawning stock and exploitation rate in reference to Limit Reference Points (LRPs) calculated using the proxy developed in DFO 2020b. Dashed green line indicates the proposed Upper Stock Reference (USR) and the solid red line indicates the LRP, each referring to 80% and 40%, respectively, of the geometric mean of the female spawning stock biomass indices from the 2014–2019 surveys. Since the USR has not been implemented and it is currently being consulted, final location of the dashed line is yet to be determined.

Current Outlook

Pandalus montagui stock in the EAZ is currently well above the established LRP (Figure 10). Although there is currently no established USR and the stock biomass index is subject to considerable interannual variability, the stock is considered in a healthy state.

Should the USR be established at the proposed level (i.e., 80% of the geometric mean of the SSB; DFO 2020b), the stock in 2020 would be placed well within the Healthy Zone of the PA Framework.

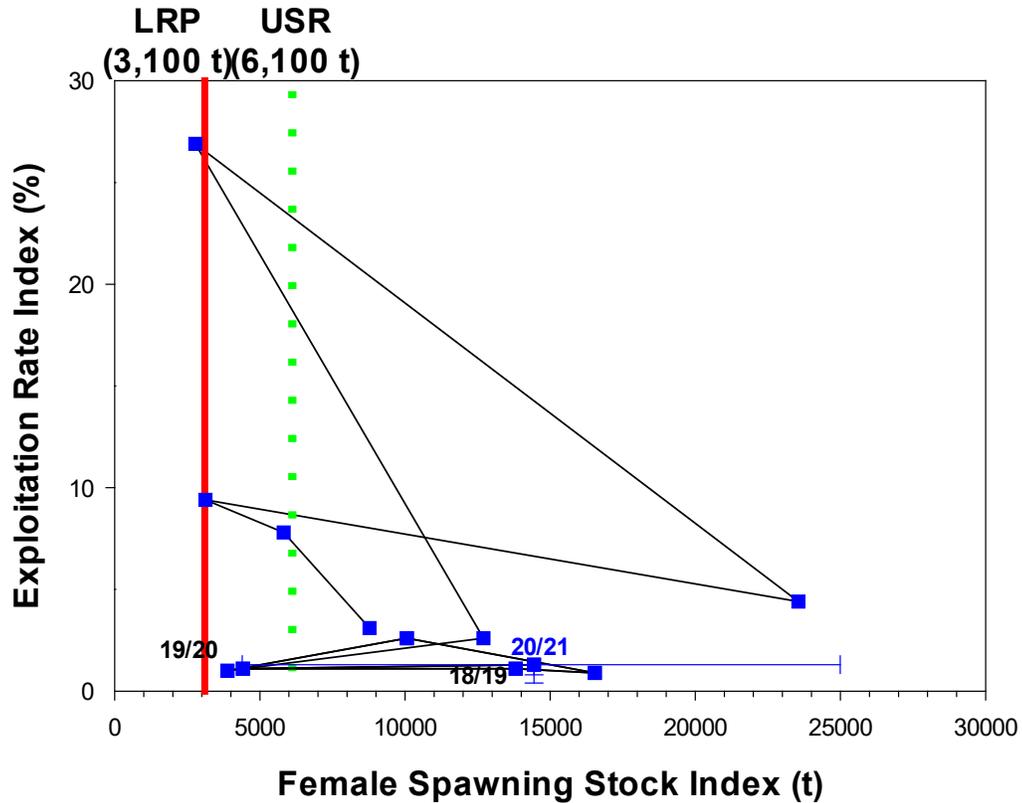


Figure 10. Eastern Assessment Zone trajectory of *Pandalus montagui* female spawning stock and exploitation rate in reference to Limit Reference Points (LRPs) calculated using the proxy developed in DFO 2020b. Dashed green line indicates the proposed Upper Stock Reference (USR) and the solid red line indicates the LRP, each referring to 80% and 40%, respectively, of the geometric mean of the female spawning stock biomass indices from the 2009–2019 surveys. Since the USR has not been implemented and it is currently being consulted, final location of the dashed line is yet to be determined.

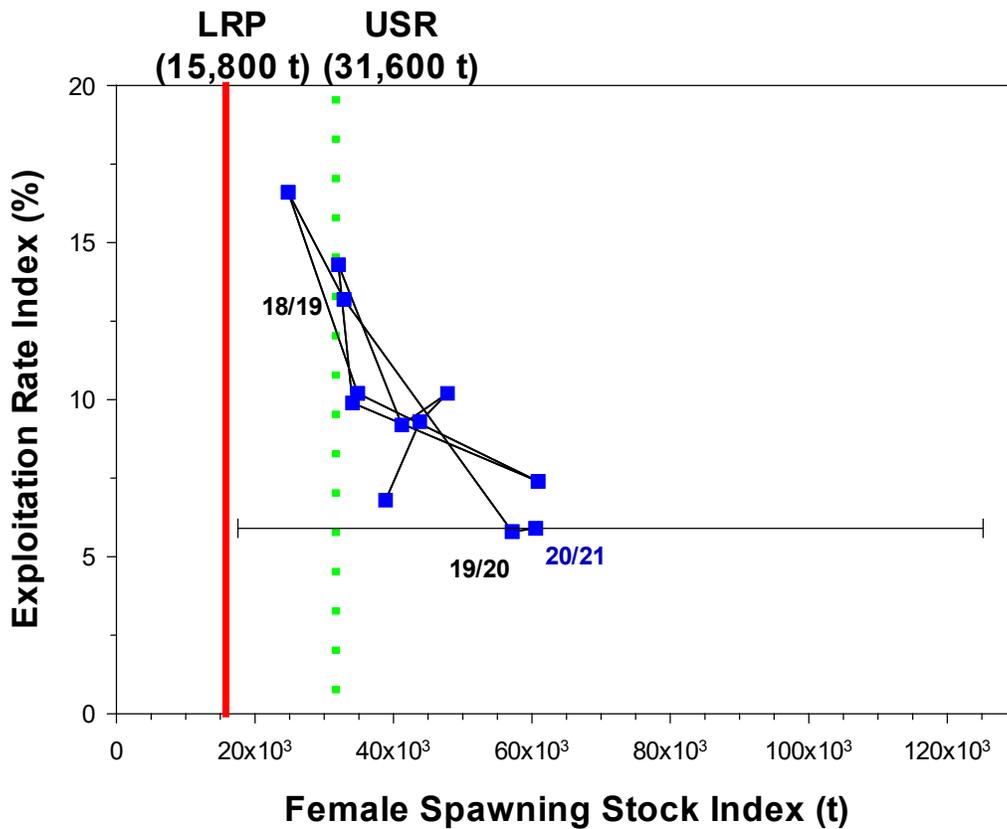


Figure 6. Eastern Assessment Zone trajectory of *Pandalus borealis* female spawning stock and exploitation rate in reference to Limit Reference Points (LRPs) calculated using the proxy developed in DFO (2020b). Dashed green line indicates the proposed Upper Stock Reference (USR) and the solid red line indicates the LRP, each referring to the 80% and 40%, respectively, of the geometric mean of the female spawning stock biomass indices from the 2009–2019 surveys. Since the USR has not been implemented and it is currently being consulted, final location of the dashed line is yet to be determined.

Appendix 2

2021/22 TAC Recommendations of the NU/NK Industry for Stocks in the WAZ and EAZ

2021/22 Shrimp TACs						
NU/NK Industry Recommendations						
SFA/AREA	2020 TAC	Fishable Biomass		Anticipated ER	Two-Year FB Averaging	
		2020 FBI	2019 FBI		TAC	Change
EAZ						
<i>P. borealis</i>	10,653	86,211	95,138	18.4%	16,684	6,031
<i>P. montagui</i>	840	18,803	8,503	15.0%	2,048	1,208
WAZ						
<i>P. borealis</i>	3,163	32,835	20,378	19.8%	5,268	2,105
<i>P. montagui</i>	11,975	50,911	64,268	19.3%	11,115	-860

Appendix 3

Excerpts from NFA Submission to NWMB and NMRWB Boards on 2020/21 Shrimp TACs in the WAZ and EAZ

NFA Recommendations

Eastern Assessment Zone (EAZ) - borealis

- **NFA supports the 15% ER as reasonable, given that the EAZ borealis stocks have in the past demonstrated significant fluctuations in fishable biomass. Future increases in the ER utilized for this area may be supported by NFA if the current high biomass levels continue to be documented through future surveys.**
- **In DSW, as per discussions at NSAC, 513 t of the increase would go to the offshore to bring them up to their long-term position. Once this position is reached the offshore should not participate in any future increases in this area;**
 - **CAPP indicated at NSAC that the long-term allocation for the offshore in this area was at a level of 5,250 t and that they would like to get back to this level when allocations are increased in the DSW;**
 - **In 2019/20, the increase in the DSW was provided to the offshore to return allocations that had been taken from the prior year's decrease. NFA supported this approach to rectify for what may have been a year effect and indicated that it supported the offshore being brought back to its past level in this area. NFA is now aware that the past allocation for the offshore was at a level of 5,250 t for many years and, with a healthy stock, supports the offshore reaching this level;**
 - **As in its 2019/20 position, NFA believes that once the offshore reaches its past level, it should not participate in any future increases, which should be provided to adjacent jurisdictions.**

Appendix 4

2021/22 TAC Sharing Calculations for Stocks in the EAZ

Fishable Biomass Shares by Sub-Area in the EAZ						
EAZ montagui	2019		2020		FB Averages	
	FB	SSB	FB	SSB	2-yr	
DSW	5,224	1,028	6,752	1,933	5,988	35.1%
DSE	2,631	1,361	215	215	1,423	8.4%
NU/NKE	3,768	2,026	15,486	12,487	9,627	56.5%
Total	11,623	4,415	22,453	14,635	17,038	
EAZ borealis	2019		2020		FB Averages	
	FB	SSB	FB	SSB	2-yr	
DSW	56,359	34,607	51,525	39,276	53,942	59.5%
DSE	17,411	9,423	16,480	11,257	16,946	18.7%
NU/NKE	21,368	13,113	18,237	9,998	19,803	21.8%
Total	95,138	57,143	86,242	60,531	90,690	

EAZ borealis Increases for 2021/22 @ 18.4% ER (15% wout DSE)								
	FB 2-yr	%	Share	Increase	NU	NK	Offshore	Distribution
DSW	53,942.0	59.5%	9,924	2,699	2,429	270	0	90/10 NU/NK
DSE	16,945.5	18.7%	3,117	513	213	0	300	
NU/NKE	19,802.5	21.8%	3,643	2,819	2,255	564	0	80/20 NU/NK
Total	90,690.0		16,684	6,031	4,897	834	300	

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**(CSAS በበና⁹ΥL⁹ 2021/014: ⁹PΓ⁹Pσ^{6b} ▷P▷^cC⁹◁Γ P⁹J⁹σ^b (ΓPσ^{6b}σ^b) ◁⁹L
(◁⁹Γσ^{6b}σ^b) β⁹◁◁⁹◁◁σ ◁⁹L σΓ◁σ P^c◁◁▷^cC▷ΥL⁹, Δ⁹◁η 2021,Γ)**

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መጋቢት/መጠኑ	19,802.5	21.8%	3,643	2,819	2,255	564	0	80/20
ከጠቅላይ	90,690.0		16,684	6,031	4,897	834	300	