

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

FOR

Information:

Decision: X

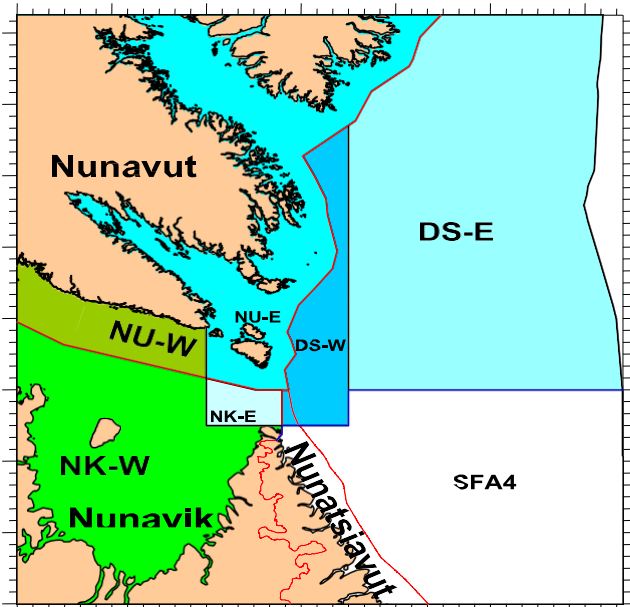
Recommendation: X

Issue: Precautionary Approach Frameworks for Northern (*Pandalus borealis*) and Striped (*P. montagui*) Shrimp in the Western and Eastern Assessment Zones

Map:

Blue areas – Eastern Assessment Zone (EAZ)

Green areas – Western Assessment Zone (WAZ)



Northern shrimp (*Pandalus borealis*)



Striped shrimp (*Pandalus montagui*)

Background

In August 2024, Fisheries and Oceans Canada (DFO) submitted an information note to the Nunavut Wildlife Management Board and Nunavik Marine Region Wildlife Board (the Boards) to provide background and updates on the development of Precautionary Approach (PA) Frameworks that will guide fisheries management for *P. montagui* and *P. borealis* in the Western Assessment Zone (WAZ), and the update of existing PA Frameworks for these species in the Eastern Assessment Zone (EAZ). A map is at Appendix 1.

The primary components of the PA Framework are: **Reference points** to define stock status zones (Healthy, Cautious and Critical) and **Harvest Decision Rules (HDRs)**.

The Limit Reference Point (LRP), which delineates the Cautious and Critical Zones, was developed through a Canadian Science Advisory Secretariat (CSAS) peer review process led by DFO Science in 2020 (Appendix 2). As provided in previous briefings to the Boards, development of the Upper Stock Reference (USR) point and HDR components of the PA Frameworks was undertaken through two channels: the Northern Precautionary Approach Working Group (NPAWG) established in November 2020; and more recently through an industry-led working group of the Northern Shrimp Advisory Committee (NSAC) established in February 2023. A detailed report of the conclusions and recommendations of the industry-led working group was distributed to NSAC in January 2024 (Appendix 3).

Work has concluded and recommended PA Frameworks for *P. borealis* and *P. montagui* in the EAZ and WAZ, respectively, are now available for consideration by the Boards. This briefing note seeks Board decisions and recommendations, as appropriate, to adopt PA Frameworks for these stocks to guide fisheries management decision making, starting in the 2024-25 fishing season.

Upon approval of HDRs for EAZ and WAZ fisheries, DFO will seek decisions and recommendations to amend season bridging provisions for allocations to Nunavut and Nunavik fishing interests in these areas. A review of season bridging protocols is underway and further engagement with Nunavut and Nunavik industry is needed to finalize recommendations. Given that the season bridging pilot project for Nunavut and Nunavik allocations has been in place since 2018, and that some entities have expressed that the current protocol is restrictive, the Department intends to provide some flexibility to carry forward requests in Davis Strait, barring the absence of any conservation concerns. The Department also notes that the *P. borealis* in NU/NKE became part of the season bridging protocol when the bycatch designation was removed in 2020, however no specific amounts for either Nunavut or Nunavik season have been identified.

Recommended Precautionary Approach Framework

NPAWG began its work to develop PA Frameworks for EAZ and WAZ stocks in November 2020. NPAWG membership included Nunavut and Nunavik industry (and/or representatives

thereof), as well as Board staff. In February 2023 an industry-led working group of NSAC was established, chaired by the Nunavut Fisheries Association to further advance this work. Representatives of Nunavut industry were active members in this working group.

Through these efforts, complete PA Frameworks for *P. borealis* and *P. montagui* in the EAZ and WAZ are presented below. *DFO recognizes that the PA Framework(s) serves to guide fisheries management decision making using a precautionary approach, and that Minister and co-management partner discretion would remain in annual decision making (e.g. setting of TAC levels).*

Reference Points

Limit Reference Points (LRPs) – The LRP is based on biological criteria and is the outcome of a CSAS peer review process led by DFO Science. This research outcome does not require management action but generates an information base used to inform future wildlife management.

New LRPs for WAZ stocks and updates to the previous LRPs for EAZ stocks were developed through CSAS peer review in the spring of 2020, at 40% of the geometric mean of female spawning stock biomass (SSB) over a productive period (“40% level”). These calculations are consistent with guidance in the DFO PA Policy. A copy of the Science Advisory Report (2020/053) was provided to the NWMB and NMRWB for December 2020 and March 2021 Board meetings and is at Appendix 2. These LRPs are presented for the respective stocks in Tables 1 and 2.

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

Reference Point	Description	<i>Pandalus borealis</i>	<i>Pandalus montagui</i>
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):	<i>Proposed</i> 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

Table 2. Reference points for *Pandalus borealis* and *Pandalus montagui* in the Western Assessment Zone (WAZ).

Reference Point	Description	<i>Pandalus borealis</i>	<i>Pandalus montagui</i>
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):	<i>Proposed</i> 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

Upper Stock Reference (USRs) Points – The USR is developed by fisheries management in consideration of the most recent science advice and input from stakeholders.

In December 2023, the NSAC industry-led working group recommended to **establish USRs for EAZ and WAZ stocks at the 80% level**. Details of the working group’s deliberations on the USR level are at Appendix 2.

The rationale to establish USRs at the 80% level includes accepting DFO Science proposed levels from the CSAS peer review in 2020 (Tables 1 and 2) and achieving consistency with USRs established for other Shrimp Fishing Areas (SFAs) in the stock complex (SFAs 4-6). Further, USRs at the 80% level would establish a larger Cautious zone than those previously considered (i.e. 70%), allowing more time for reaction to signals of potential stock decline. The working group’s recommendation was contingent upon adoption of a HDR that would smooth responses to annual biomass signals (see HDRs below) to offset potentially negative socio-economic impacts of a USR at the 80% level.

Harvest Decision Rules (HDRs) – HDRs provide details on target harvest (exploitation) rates and possibly other management procedures in each of the Healthy, Cautious and Critical zones. HDRs and management actions vary in relation to the reference points (i.e. LRP and USR), by affecting the target exploitation rate.

In December 2023, the industry-led working group recommended to **adopt the ‘2-Step HDR’ for EAZ, WAZ (and SFAs 4-6) stocks**, beginning in the 2024-25 fishing season. It was also recommended that a review of the HDR’s performance relative to stated objectives be undertaken at minimum, every five years. Details of the working group’s deliberations of this and other candidate HDRs are in Appendix 3.

Supporting rationale for the 2-Step HDR includes its ability to limit (smooth) response to year-to-year survey biomass signals that may be reversed in the following year. The 2-Step HDR provides the timeliest response to (upward and downward) biomass trends which serve socio-economic and conservation objectives, respectively. It was also a priority for industry stakeholders to have a consistent HDR applied across fisheries in the broader stock complex of the EAZ, WAZ and SFAs 4-6. Lastly, this HDR was considered easier to comprehend/communicate than other candidate

HDRs, facilitating greater transparency.

The '2-Step HDR' is described generally herein and summarized at Table 3.

'2-Step HDR': The recommended HDR calculates an initial target TAC by applying a target exploitation rate (ER) (20% in the Healthy zone; sloped ER from 10-20% in the Cautious zone) to the most recent estimate of exploitable (fishable) biomass (FB). Rather than pursue the full magnitude of the change between the initial target TAC and the previous year TAC, the approach directs to pursue only 50% of this change to set the TAC.

The approach considers whether FB is increasing or decreasing to guide actions in years following. In the event of increasing FB, the HDR directs to either finish the remainder of the TAC change to the previous year target (Finish option) or pursue 50% of the change to the current year initial target TAC- whichever yields the higher TAC. In the event of decreasing FB, the HDR directs to either finish the remainder of the TAC change to the previous year target (Finish Option) or pursue 50% of the change to the current year initial target TAC, whichever yields the lower TAC.

Further, the HDR sets maximum ERs for the Healthy and Cautious zones of 1.5 times the target ER. Accordingly the maximum ER in the Healthy zone is 30%, while the maximum ER in the Cautious Zone is 1.5 x the target (slope) ER. If these maximum ERs are not respected, the TAC is set to the maximum ER.

The 2-Step approach would not apply to stocks in the Critical zone, where annual TAC is set to a maximum ER of 10% of the current estimate of FB.

Table 3. Summary of the 2-Step Harvest Decision Rule for *Pandalus borealis* and *Pandalus montagui* in the Eastern and Western Assessment Zones.

Stock Status	Spawning Stock Biomass (SSB)	Harvest Decision Rule	
Healthy	Above the USR	<ul style="list-style-type: none"> The target ER will be 20% of exploitable biomass. The maximum ER will be 1.5x target ER (i.e. 30%). 	<ul style="list-style-type: none"> Pursue 50% of the change between the initial target TAC (i.e. applying the target ER) and the previous year TAC. In subsequent years, either finish the remainder of the TAC change to the previous year target, or pursue 50% of the change to the current year initial target catch. <ul style="list-style-type: none"> Consider whether FB is increasing (select higher TAC) or decreasing (select lower TAC) to guide management action. Ensure maximum ER is respected.
	Between the USR and LRP	<ul style="list-style-type: none"> The target ER will be scaled linearly (slope) from 20% of exploitable biomass at the USR, to 10% ER at the LRP. The maximum ER will be 1.5x target (slope) ER. 	
Critical	At or below the LRP	<ul style="list-style-type: none"> The maximum ER will be 10% of exploitable biomass. 	

Consultation

On February 5, 2024, DFO presented the candidate USRs and HDRs to NPAWG for consideration. A summary of discussion is at Appendix 4. **No concerns were raised by NPAWG, who supported USRs at the 80% level and application of the 2-Step HDR for EAZ and WAZ stocks, beginning in the 2024-25 fishery.**

Subsequently, DFO sought NSAC endorsement of the recommended USRs and HDR in a dedicated Technical Session on February 23, 2024. A summary of discussion is at Appendix 5. **NSAC endorsed establishing USRs at the 80% level and application of the 2-Step HDR for EAZ and WAZ stocks, beginning in the 2024-25 fishery.**

Nunavut and Nunavik industry (and/or representatives thereof) participated in both consultation opportunities. The February 5, 2024, NPAWG meeting was attended by NWMB staff only; NMRWB staff were unavailable. Staff from both the NWMB and NMRWB attended the NSAC Technical session.

NSAC continued to support application of the new 2-step HDR to set 2024-25 TAC levels at the April 3-4, 2024, meeting in St. John's, NL. A request for Board decisions and recommendations on 2024-25 TAC levels for EAZ and WAZ stocks has been submitted under

separate cover, and illustrates application of the 2-step HDR.

Marine Stewardship Council (MSC) Implications

Adoption of PA Frameworks for *P. borealis* and *P. montagui* in the EAZ and WAZ, more specifically, the adoption of reference points, would satisfy an outstanding condition for MSC certification for these fisheries.

Recommendation

DFO recommends that the Boards adopt the PA Frameworks presented herein for *P. borealis* and *P. montagui* in the EAZ and WAZ, respectively. Adoption of these PA Frameworks constitutes an amendment to the integrated fisheries management plan, and would include adoption of reference points as well as HDRs for the respective stocks.

Summary of the Request

DFO is seeking from the NWMB and NMRWB for *P. borealis* and *P. montagui*, respectively:

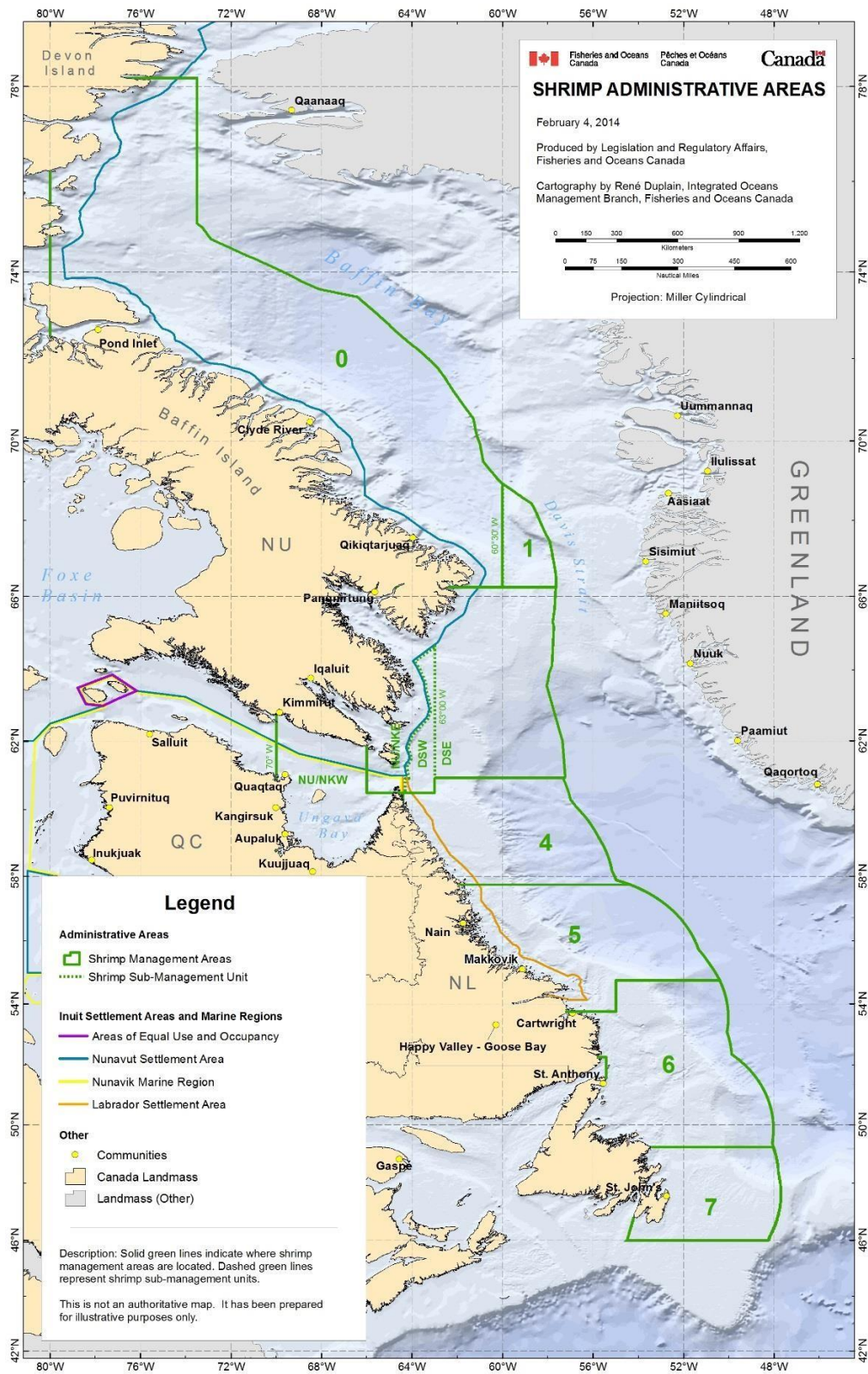
1. Decisions to adopt the PA Frameworks for these stocks in the Nunavut/Nunavik East management units (EAZ). Similarly, decisions to adopt the PA Frameworks for these stocks in the Nunavut/Nunavik West management units (WAZ).
2. Recommendations to adopt the PA Frameworks in the management of these stocks in waters outside the settlement areas in the broader WAZ and EAZ (including the Davis Strait management units).

DFO recognizes that the PA Framework(s) serves to guide fisheries management decision making using a precautionary approach, and that Minister and co-management partner discretion would remain in annual decision making (e.g. setting of TAC levels).

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

Date: April 30, 2024

Appendix 1





SCIENCE ADVICE ON LIMIT REFERENCE POINTS FOR NORTHERN SHRIMP (*PANDALUS BOREALIS*) AND STRIPED SHRIMP (*PANDALUS MONTAGUI*) IN THE EASTERN AND WESTERN ASSESSMENT ZONES



Top: Northern Shrimp (*Pandalus borealis*)
Bottom: Striped Shrimp (*Pandalus montagui*)
Photo: Fisheries Oceans Canada, Newfoundland
and Labrador Region.

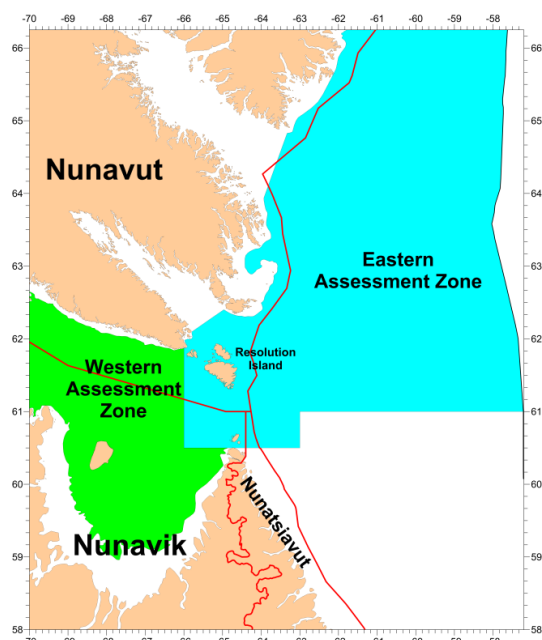


Figure 1. Eastern and Western Assessment Zones for shrimp fisheries in Arctic Region. Boundaries of the Nunavut, Nunavik and Nunatsiavut land claim areas are shown in red.

Context:

Fisheries and Oceans Canada's Fishery Decision-Making Framework Incorporating the Precautionary Approach describes a framework where reference points and harvest decision rules are used to make fisheries management decisions. The limit reference point (LRP) represents the stock status below which serious harm is likely occurring to the stock. The LRP is established based on biological criteria by Fisheries and Oceans Canada (DFO) Science. The Upper Stock Reference (USR) divides the Healthy Zone from the Cautious Zone and is established by DFO Resource Management in consultation with co-management partners, provincial and territorial governments, industry, and DFO Science, to enact harvest decision rules.

Since the reorganization of the Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*) surveys conducted in the Arctic Region in 2014, the joint DFO-Northern Shrimp Research Foundation survey has covered the Western Assessment Zone (WAZ) and Eastern Assessment Zone (EAZ) survey areas annually with the same ship and gear (DFO 2020a). LRPs for the WAZ were developed in 2013, however, the restart of the time series in 2014 means they are no longer valid (DFO 2018a). Data points acquired since the new survey began will therefore be used to establish new reference points for

the WAZ. Reference points will also be updated for the EAZ since the original points were calculated from only three surveys (Siferd 2015), which no longer correspond to the assessment area boundaries (DFO 2019a).

*DFO Resource Management has requested that Science establish LRPs consistent with the Precautionary Approach (PA) framework for Northern Shrimp and Striped Shrimp in order to determine the point below which serious harm may be occurring to the stock (i.e., the Critical Zone), and propose an USR. This Science Advisory Report is from the May 12–13, 2020 Meeting on Science Advice on Limit Reference Points for Northern Shrimp, *Pandalus borealis*, and Striped Shrimp, *Pandalus montagui*, in the Eastern and Western Assessment Zones. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.*

SUMMARY

- The Precautionary Approach (PA) Framework for the Eastern Assessment Zone (EAZ) was established in 2009 on the basis of 3 years of survey data and the results of the *Precautionary Approach Workshop on Canadian Shrimp and Prawn Stocks and Fisheries* (DFO 2009b). The Western Assessment Zone (WAZ) PA Framework was deferred because of changes to the survey design in 2014 that reset the survey time series. The goals of this meeting were to establish the Limit Reference Point (LRP) and propose an Upper Stock Reference point (USR) for the WAZ and update the existing reference points for the EAZ.
- LRPs for Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*) in both the WAZ and EAZ are newly established as 40%, and the proposed USRs as 80%, of the geometric mean of the spawning stock biomass (SSB) index. These calculations are consistent with guidance in the DFO PA Policy.
- In the WAZ, the newly established LRPs for Northern Shrimp (4,100 t) and Striped Shrimp (12,300 t) are based on a 6-year time series (2014–2019). Similarly, a newly proposed USR is provided for each species (8,200 and 24,600 t, respectively).
- In the EAZ, the updated LRP for Northern Shrimp (increase to 15,800 from 6,800 t) and the proposed USR (increase to 31,600 from 18,200 t) are based on an 11-year time series (2009–2019). Re-calculation of the LRP and proposed USR for Striped Shrimp in the EAZ resulted in 3,100 t (increase from 2,300 t) and 6,100 t (no change), respectively.
- The LRPs and proposed USRs are based on the best available scientific information, but do not incorporate environmental or ecosystem factors into their calculations. Information pertaining to these metrics are lacking.
- The PA reference points for the WAZ and EAZ should be re-examined when a population model is developed or relationships between stock productivity and environmental or ecosystem factors are sufficiently developed to inform stock assessments.

BACKGROUND

Canadian Precautionary Approach Framework and Limit Reference Points

In 2009, Fisheries and Oceans Canada (DFO) published the [Sustainable Fisheries Framework](#) that provides the basis for ensuring Canadian fisheries are conducted in a manner which supports conservation and sustainability. The framework is comprised of a number of policies for the conservation and sustainable use of fisheries resources including “[A Fishery Decision-Making Framework Incorporating the Precautionary Approach](#)” (DFO 2009a). The Precautionary

Approach (PA) Policy applies where decisions on harvest strategies or harvest rates for a stock are taken to determine Total Allowable Catch (TAC) or other measures to control harvests. This is the case for Northern Shrimp (*Pandalus borealis*) and Striped Shrimp (*P. montagui*) stocks.

There are three components to the general decision framework for the PA:

1. Reference points and stock status zones;
2. Harvest strategy and harvest decision rules; and,
3. The need to take into account uncertainty and risk when developing reference points and developing and implementing decision rules.

The first component of the PA framework, reference points and status zones, is the subject of this advisory report. The PA is divided into three stock status zones: the Healthy, Cautious and Critical Zones (Figure 2). The Upper Stock Reference (USR) divides the Healthy Zone from the Cautious Zone and the Limit Reference Point (LRP) divides the Cautious Zone from the Critical Zone.

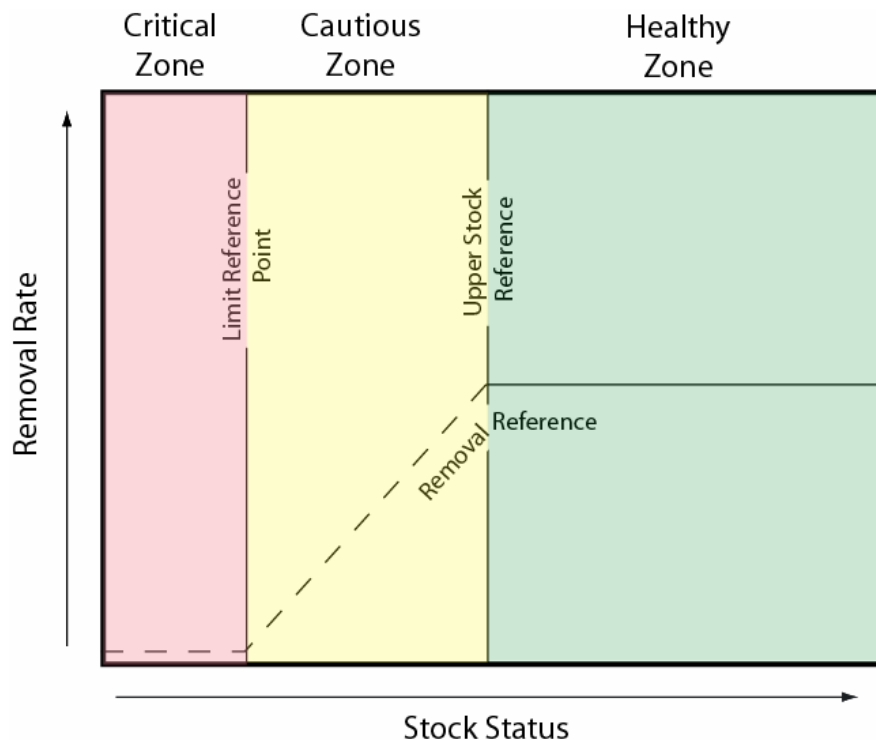


Figure 2. Elements of DFO's PA framework (from DFO 2009a).

The LRP is defined as the stock status *below which serious harm is being done to the stock*. However, a challenge in setting an LRP is identifying the threshold of where and when 'serious harm' occurs to the stock. This threshold is approximated based on the best available information, below which validation is exactly the situation to be avoided. LRP's are based on biological criteria and are established by DFO Science. In the Critical Zone, conservation/biological considerations are meant to be the primary drivers for management decision-making (as opposed to socio-economic factors) and there is to be no tolerance for preventable declines as the primary goal is to rebuild the stock out of the critical zone. Management actions pertaining to this zone are to promote stock growth and removals are to be kept to the lowest possible level regardless of the stock trajectory.

When establishing an LRP, the guidelines advise choosing a stock metric that can account for changing productivity, generally the spawning stock biomass. An LRP should be determined by accounting for periods of high and low productivity over as long a time-series as possible, and based on the best information available on stock biology and fishery characteristics while acknowledging limitations of the data. However, in some cases there may be insufficient information on which to base choices of stock-specific precautionary reference points and harvest rules. In these instances, DFO has a guideline of 40% LRP and 80% USR. The PA Policy states:

“In cases where insufficient stock-specific information is available, these reference points may be considered as the best available guidance for management and for assessing the stock in relation to sustainability. Actual reference points for a stock may use other metrics and be set lower or higher than these references but should be demonstrably appropriate for the stock and be consistent with the intent of the PA.”

Furthermore, while reference points should be reviewed periodically, neither the timeframe nor the triggers for review are specified in the PA Policy. Given that reference points have not been previously proposed for Northern Shrimp and Striped Shrimp in the Western Assessment Zone (WAZ; Figure 1) and that the current reference points in the Eastern Assessment Zone (EAZ) have been in place since 2009 (DFO 2009b), Resource Management has requested a review of the LRPs, and their rationales, to be carried out for these stocks.

Species Biology

Northern Shrimp is found in the Northwest Atlantic from Baffin Bay to the Gulf of Maine, while Striped Shrimp is found from Davis Strait south to the Bay of Fundy.

Both species of shrimp are protandric hermaphrodites. They function as males early in their lives then change sex and reproduce as females for the remainder of their lives. Females usually produce eggs once a year in the late summer-fall and carry them, attached to their abdomen, through the winter until the spring, when they hatch. Newly hatched shrimp spend three to four months as pelagic larvae. At the end of this period they settle at the bottom and take up the life style of the adults.

Recent research by Le Corre (2019, 2020) on the connectivity of management units via shrimp larval drift found that virtually the entire population of Northern Shrimp along the Canadian Atlantic coast (from Baffin Bay to the Scotian Shelf) is connected through larval drift processes with variable retention success in a given management zone. Also, larval drift was found to promote genetic homogeneity in areas with strong currents (Jorde et al. 2015). These findings improved our understanding of recruitment mechanisms and may in the future help to inform management of Canadian shrimp stocks.

Shrimp lifespan is uncertain but shrimp in the north are thought to live five to eight years. Growth rates and maturation are likely slower in the northern populations.

Fishery

The fishery began in the late 1970s in what is known as shrimp fishing area (SFA) 1. Exploratory fishing expanded into what is now the Davis Strait-East management unit (previously known as SFA 2) and then to areas southeast of Resolution Island in Hudson Strait. Quotas in these areas were based on fishery performance and not scientific survey data. In the mid-1990s, the fishery moved southeast of Resolution Island in SFA 2, where the main fishery

remains to date. Implementation of the Nunavut Agreement in 1999 shifted the main fishery east of the Nunavut Settlement Area.

Currently, the fishery in the EAZ and WAZ is managed by a TAC which is divided into individual quotas for 17 offshore licence holders and special allocations for Nunavut and Nunavik fishing interests. Changes to the management of the fishery in what were SFAs 2 and 3 created new SFAs and Management Units beginning with the 2013/14 fishing season (Figure 2). Nunavut Wildlife Management Board (NWMB) and Nunavik Marine Region Wildlife Board (NMRWB) advise on the allocation of quotas to Nunavut and Nunavik fishing interests, respectively. All fishing to date has been conducted by large vessels (> 100' overall length) with 100% At-Sea-Observer coverage.

Fishing gear in the EAZ and WAZ consists of single and, more recently, twin shrimp trawls requiring a minimum codend mesh size of 40 mm and separator grate (maximum 28 mm bar spacing). Since 2003, the management year has been April 1 to March 31. The fishing season is limited by the extent of sea ice, and is conducted between May and December in most years.

Northern Shrimp has been the main commercial species throughout the history of the shrimp fishery in this area. Historically, most of the harvest of Striped Shrimp occurred as by-catch in the directed Northern Shrimp fishery. Directed fishing for Striped Shrimp has become more important especially with quotas available in the Nunavut-West and Nunavik-West management units beginning with the 2013/14 fishing season.

Fishery catch per unit effort (CPUE) data are not considered to reflect stock status. Commercial fishing locations are not broadly distributed; fishing vessels target areas of high density. A mix of two shrimp species are disproportionately caught in the fishery and the composition of the two species in the catch determines which species is designated as directed, which biases CPUE calculations. Throughout the history of the fishery, economic factors (e.g., fuel prices, market price of shrimp) have influenced when and where the species are caught. In the EAZ, commercial vessel performance has changed over the years to target each species to achieve cleaner catches of just one species. Renewed effort in the WAZ is relatively recent. In some years, cleaner catches can be similarly achieved in the WAZ, however that varies in relation to the distribution of the two species.

ASSESSMENT

This is an assessment of LRPs for both Northern Shrimp and Striped Shrimp in the EAZ and WAZ (Figure 1). These two species have overlapping distributions, particularly in the Resolution Island area, resulting in an overlap of their fisheries. The total removal, both directed catch and by-catch, of each species is considered in the assessment.

DFO plans and the Northern Shrimp Research Foundation (NSRF) conducts annual surveys of the EAZ (Resolution Island Study Area; RISA-W, RISA-E and SFA 2EX) and WAZ (SFA 3) survey areas (Figure 3). Both species in the EAZ and WAZ were last assessed in 2019 (DFO 2019a) and updated in 2020 (DFO 2020a). Survey data in the EAZ are available for the period of 2006–2019, however, the first three years are not considered comparable with the rest of the series because of poor trawl performance, incomplete sampling coverage, and inconsistent timing, vessels, and gear (DFO 2018a). Therefore the first three years of data are excluded, and only 2009–2019 data are evaluated for the EAZ.

The WAZ (Figure 1) was surveyed biennially by DFO from 2007–2013. However, results could not be combined with the EAZ survey results because the surveys used different gear and occurred at different times of year. This prevented a comprehensive evaluation of the

distributions of shrimp and a more practical look at broader stock assessment over a larger spatial scale. In 2014, the NSRF was commissioned to take over the survey of the WAZ so that it is sampled in conjunction with the EAZ as a means to maintain consistent methods among management units. This action started a new time series for the WAZ. In 2019, the WAZ was surveyed for the sixth year in the new time series. The advice contained herein marks the first occasion that LRPs have been developed in the WAZ.

Fishable and female spawning stock biomass (SSB) indices from scientific surveys form the basis of this assessment. Fishable biomass is based on male and female shrimp from the surveys with a carapace length greater than 17 mm; this represents shrimp that are large enough to be retained in commercial trawls. SSB is based on all female shrimp from the surveys regardless of size. Fishery data are used to determine the observed exploitation rate index, calculated as catch from the reporting records (Canadian Atlantic Quota Report; CAQR) divided by the fishable biomass index from the same year. The potential exploitation rate index is calculated to represent the exploitation rate if the entire TAC is taken. Bootstrapped 95% confidence intervals are included for each of the indices.

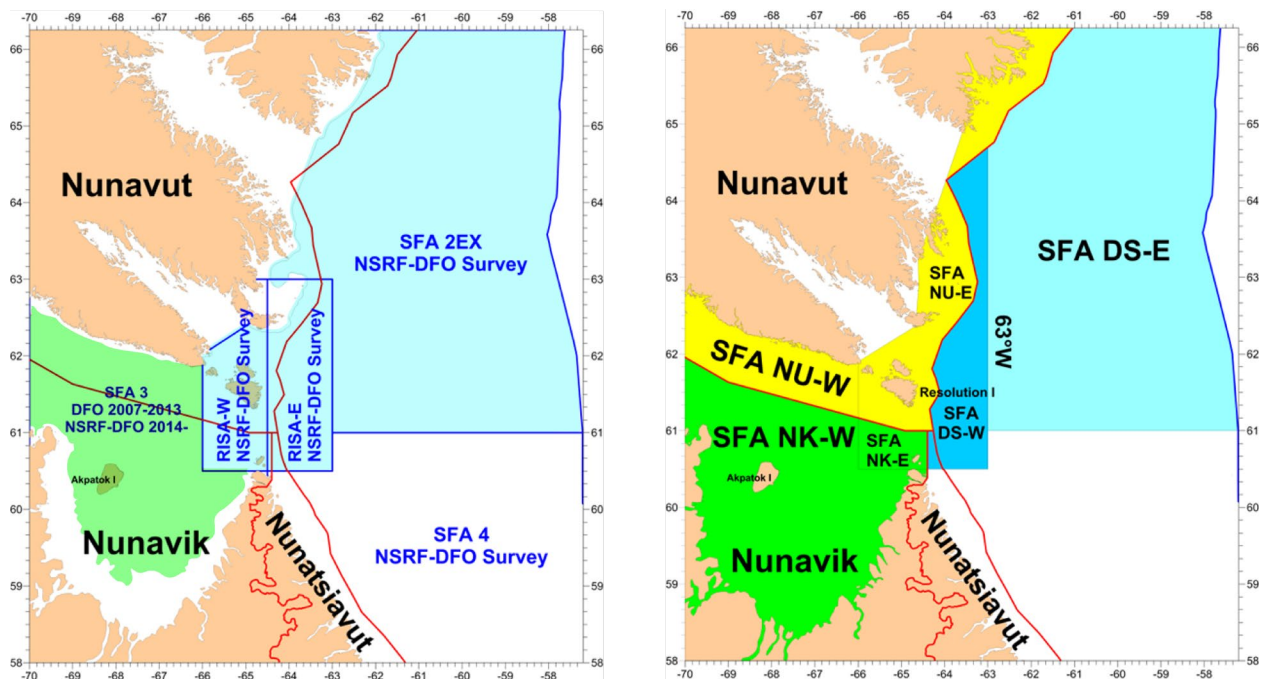


Figure 3. Locations of NSRF survey areas (left panel) within the Eastern (blue) and Western (green) Assessment Zones and the management units (right panel) referred to in this report. Shrimp Fishing Area (SFA), Exploratory (EX), Resolution Island Study Area (RISA), East (E), West (W), Nunavut (NU), Nunavik (NK) and Davis Strait (DS). Red lines show the borders of the Nunavut, Nunatsiavut and Nunavik Land Claims Areas.

For each assessment zone and shrimp fishery an LRP based on 30% and 40% of the SSB index was explored (Walkusz and Atchison 2020). Currently, a 30% LRP is being applied as a reference point by the Northwest Atlantic Fisheries Organization (NAFO) for the Northern Shrimp stock in SFA 1, which is adjacent to the EAZ. This was noted but not considered in-depth during a two-day workshop in 2008 among DFO-Science, DFO-Resource Management, co-management partners and stakeholders in an attempt to establish LRPs in these shrimp fisheries (2009b). Additionally, LRPs and the USRs were adopted at 30% and 80%, respectively, of the geometric mean of female SSB for both Northern and Striped Shrimp in

other southern SFAs. The SSB was deemed to be a suitable proxy for B_{MSY} . The contributing factors leading to the use of 30 and 80% were three years of survey data (2006–2008) in Shrimp Fishing Area 2, and that it was consistent with the approach taken by NAFO. LRPs have since gone unchanged in the EAZ (Siferd 2015).

Adopting a 30% LRP as part of the 2020 process would be consistent with NAFO approach and how shrimp fisheries are managed in the Newfoundland and Labrador Region. However, the use of a 30% LRP is unsubstantiated for the WAZ and EAZ based on the best available scientific information for these particular fisheries (Walkusz and Atchison 2020). Furthermore, an LRP of 40% is suggested in the DFO PA Policy (DFO 2009a) for instances of data deficiency and uncertainty. Establishing LRPs based on 40% average SSB for the WAZ and the EAZ was determined to be the best way forward based on the information available and recent decreases in stock productivity in southern SFAs (e.g., SFAs 4–6, DFO 2019b; SFAs 13–15, DFO 2019c). Uncertainty remains with respect to biomass variability as it relates to environmental conditions (e.g., temperature). Patchy shrimp population distributions have led to occasional large catches and fluctuations and increased variance in biomass estimates for each of the assessment zones in different years. Other SFAs have longer data sets and can justify using 30% LRPs, while the WAZ and EAZ have shorter data sets, large fluctuations in biomass indices and a lack of stock trends. Furthermore, Striped Shrimp in the EAZ appear to have recovered from biomass levels equivalent to an SSB level near the 40% LRP; below this point the ability of the stocks to recover is unknown (DFO 2020b). Similarly, it is not known to what extent Northern Shrimp can recover from below their lowest recorded biomass levels (comparatively higher than Striped Shrimp in the EAZ). When the PA framework for the EAZ was initially established using 30% LRPs, the reference points were based on three years of data, the geographic area of SFA 2 and a different survey range. It was recommended that the initial EAZ PA framework be revised as soon as possible (DFO 2020b). One of the potential options would be to move to a dynamic LRP, which follows the pattern of the stock. Since information on shrimp stocks is limited in the WAZ and EAZ, a fixed LRP is recommended. The PA framework may be revised in the future when more data on variables affecting shrimp stocks in the WAZ and EAZ become available.

The recommended reference points follow DFO's PA Policy (2009a) and include new data to update existing LRPs in the EAZ and establish new LRPs in the WAZ. The geometric mean of SSB was used as a proxy for B_{MSY} . Furthermore, this framework suggests a starting point for calculating USRs. Accordingly, the LRPs and proposed USRs were calculated at 40% and 80%, respectively, of the geometric mean of SSB for both Northern and Striped Shrimp (Figures 4 and 5).

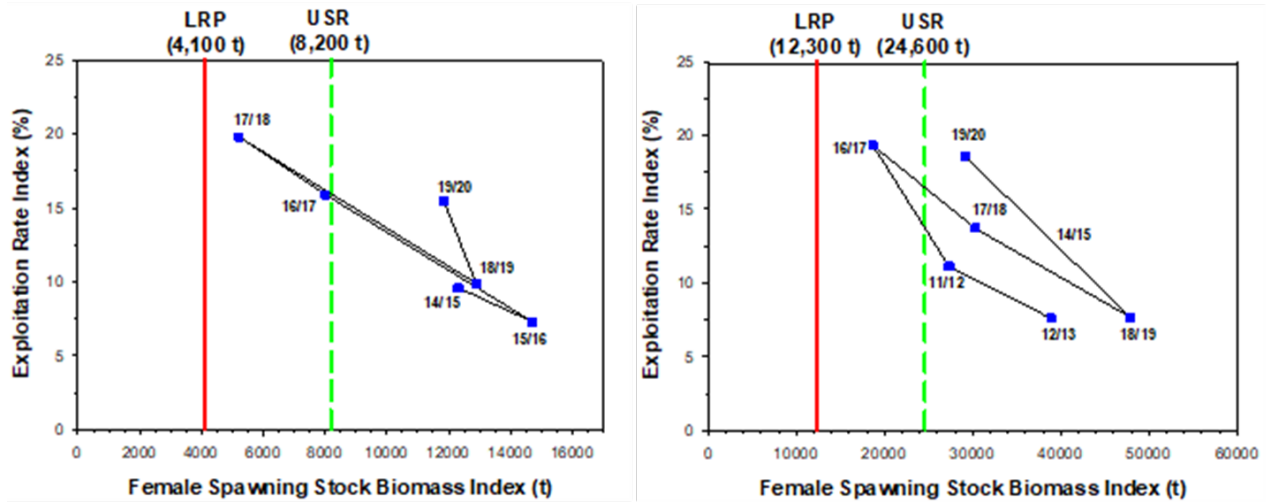


Figure 4. Newly established LRP for Northern Shrimp (left) and Striped Shrimp (right) in the WAZ. The LRP (red line) is calculated as 40% of the geometric mean of the SSB index and the proposed USR (dashed green line) calculated as 80% of the geometric mean of the SSB index. Blue symbols are annual stock status values, numbers indicate the fishing season.

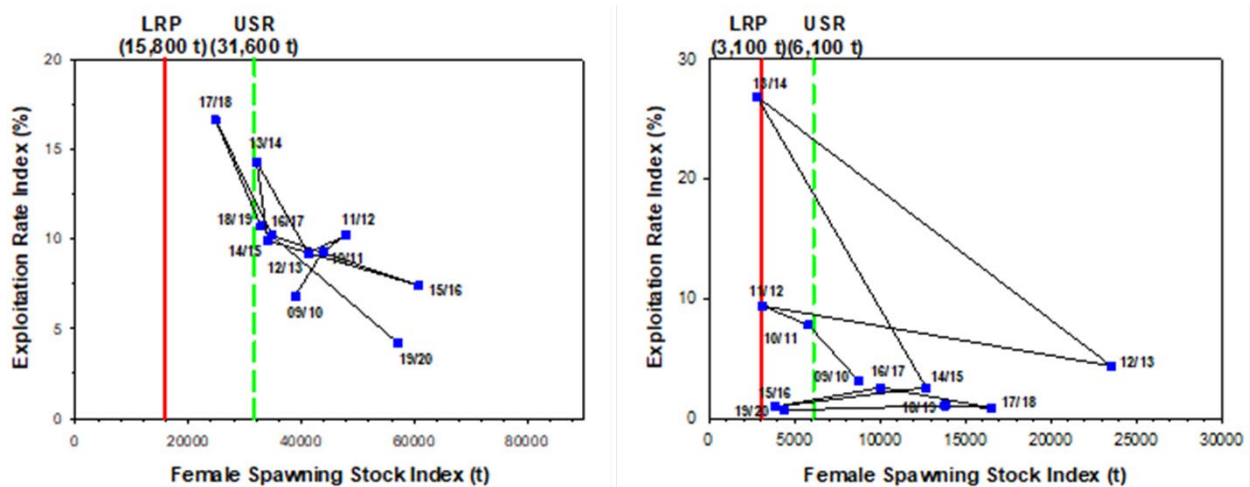


Figure 5. Updated LRP for Northern Shrimp (left) and Striped Shrimp (right) in the EAZ. The LRP (red line) is calculated as 40% of the geometric mean of the SSB index and the proposed USR (dashed green line) calculated as 80% of the geometric mean of the SSB index. Blue symbols are annual stock status values, numbers indicate the fishing season.

Sources of Uncertainty

The sources of uncertainty that were not quantitatively incorporated into the establishment of LRP for Northern and Striped Shrimp stocks in the WAZ and EAZ, include:

- Despite having data on temperature preferences of the two shrimp species, the distribution, availability and dynamics of preferred habitats is lacking. Future efforts should focus on moving towards an Ecosystem Approach to Fisheries Management to address knowledge gaps and drivers of stock variability, such as: larval drift related to the connectivity between management zones (stocks), habitat spatiotemporal variability, and ecosystem linkages

(e.g., predator-prey interactions, oceanographic drivers). The lack of environmental information contributes to uncertainty.

- Given the short time series and the lack of observed trends, it is not feasible to identify periods of high productivity upon which to base reference points (as suggested in the DFO PA Policy).
- 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 data are 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.
- Survey of all stocks is completed in the middle of the fishing season. It is uncertain how much of the TAC has already been taken while the survey is ongoing. Results may be confounded by the timing of the survey and the concurrent level of harvest.
- It is uncertain to what extent these stocks have the capacity to recover from low levels of biomass. High biomass variability exhibited in these stocks can lead to their positioning within the proposed Cautious Zone of this PA framework. A longer time series and a better understanding of the drivers of stock variability may inform recovery potential.
- The stocks' natural mortality, including multi-species linkages, is currently unknown.
- Factors that may cause shrimp productivity to change are poorly understood within the WAZ and EAZ. For example, it is uncertain to what extent larval drift exists between these assessment zones, and to what extent shrimp productivity is impacted by their movements.
- Stocks of both species in both assessment zones exhibit relatively large inter-annual variability in biomass and no trends have been observed. The drivers leading to this variability are poorly understood.
- Northern and Striped Shrimp have populations spanning both assessment zones and their relative distributions are likely to change inter-annually. The stock structure of each species within and between assessment zones is unresolved. For example, it is possible there are multiple populations of the same species within a single assessment zone.
- DFO has recently discovered that a portion of what was previously identified as *P. montagui* from the Gulf and Scotian Shelf (Division 3PS) are in fact *Dichelopandalus leptocerus*. There remains uncertainty about whether this species has recently migrated to this area or may have been misidentified for several years. The same may be true in more northern areas including the WAZ and EAZ.

CONCLUSIONS AND ADVICE

The work described here represents new and updated science advice on reference points for the Northern and Striped Shrimp fisheries in the WAZ and EAZ. The advice is based on a traditional approach of calculating SSB from shrimp trawl surveys, and explores a time series of fishery-independent data. Data used to assess these fisheries are limited and highly variable, and currently no trends in stock status have been observed. Striped Shrimp in the EAZ have demonstrated an ability to recover from 40% of the SSB, the LRP, below which the ability of these stocks to recover is uncertain. Therefore, we recommend a PA consistent with DFO (2009a) that reflects insufficient stock-specific information: 40% LRP and 80% USR, with

respect to the geometric mean SSB index. These reference points represent the best available scientific information and constitute advice to management for assessing the stock in relation to sustainability.

In the WAZ, the newly established LRP and the proposed USR for Northern Shrimp and Striped Shrimp are based on a 6-year time series (2014–2019; Table 1). In the EAZ, the updated LRP and the proposed USR for Northern Shrimp and Striped Shrimp are based on an 11-year time series (2009–2019; Table 1).

Table 1. Established Limit Reference Points (LRPs) and proposed Upper Stock Reference points (USRs) for Northern Shrimp and Striped Shrimp in the Western Assessment Zone and Eastern Assessment Zone. Spawning stock biomass is reported in tonnes. Previous reference points are provided in parentheses.

Species	Western Assessment Zone		Eastern Assessment Zone	
	LRP	USR	LRP	USR
Northern Shrimp (<i>Pandalus borealis</i>)	4,100	8,200	15,800 (from 6,800)	31,600 (from 18,200)
Striped Shrimp (<i>Pandalus montagui</i>)	12,300	24,600	3,100 (from 2,300)	6,100 (no change)

The PA reference points for the WAZ and EAZ should be re-examined when a population model is developed or relationships between stock productivity and environmental or ecosystem factors are sufficiently developed to inform stock assessments.

OTHER CONSIDERATIONS

In general, management of key forage species, such as shrimp, under an ecosystem approach, requires the adoption of a conservative approach with lower fishing mortality reference points and higher biomass reference points than would be considered under a single species management approach.

In cases where insufficient stock-specific information is available, DFO’s PA Policy (2009a) suggests reference points that may be considered as the best available guidance for management and for assessing the stock in relation to sustainability. The 40% LRP and 80% USR provided as guidance are the results of reviews and meta-analyses across a wide variety of fish stocks. However, it is uncertain to what extent this standard can be applied to shrimp fisheries. Here, 40% LRP and 80% USR of the geometric mean SSB index have been used to inform reference points for shrimp fisheries in the WAZ and EAZ without demonstrable validation of stock productivity. Indeed, most larvae released in any management area end up as functioning adults in another management area (in other words, most adults in any management area originated elsewhere; Le Corre et al. 2020). This in and of itself is evidence that the SSB index within an individual management area does not provide a defensible measure of the future health within any individual management area.

The PA reference points in both the WAZ and EAZ are based on the best available scientific information and need to be re-evaluated with new and/or alternative methodologies when data are available to corroborate the advice contained herein. Actual reference points for a stock may use other metrics and be set lower or higher than these references but should be justified for the

stock and consistent with the intent of the PA. Ideally, more robust LRPs and associated PA frameworks should be considered by Science and Resource Management when additional data are available.

LIST OF MEETING PARTICIPANTS

Name	Organization/Affiliation
Christi Friesen	DFO – Fisheries Management, Central and Arctic Region
Courtney D'Aoust	DFO – Resource Management, National Capital Region
Chantelle Sawatzky	DFO – Science, Central and Arctic Region
David Boguski (Chair)	DFO – Science, Central and Arctic Region
Kevin Hedges	DFO – Science, Central and Arctic Region
Chelsey Lumb (Rapporteur)	DFO – Science, Central and Arctic Region
Jessica Mai (Rapporteur)	DFO – Science, Central and Arctic Region
Joclyn Paulic	DFO – Science, Central and Arctic Region
Justin Shead	DFO – Science, Central and Arctic Region
Ross Tallman	DFO – Science, Central and Arctic Region
Wojciech Walkusz	DFO – Science, Central and Arctic Region
Manon Cassista Da-Ros	DFO – Science, Maritimes Region
Brittany Beauchamp	DFO – Science, National Capital Region
Susan Thompson	DFO – Science, National Capital Region
Katherine Skanes	DFO – Science, Newfoundland and Labrador Region
Krista Baker	DFO – Science, Newfoundland and Labrador Region
Hugo Bourdages	DFO – Science, Quebec Region
Eric Pedersen	Concordia University – Biology
Frankie Jean-Gagnon	Nunavik Marine Region Wildlife Board
Amber Giles	Nunavut Wildlife Management Board

SOURCES OF INFORMATION

This Science Advisory Report is from the May 12–13, 2020 Meeting on Science Advice on Limit Reference Points for Northern Shrimp, *Pandalus borealis*, and Striped Shrimp, *Pandalus montagui*, in the Western and Eastern Assessment Zones. Additional publications from this meeting will be posted on the [Fisheries and Oceans Canada \(DFO\) Science Advisory Schedule](#) as they become available.

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Center for Science Advice (CSA)
Ontario and Prairie Region
Fisheries and Oceans Canada
501 University Crescent
Winnipeg, Manitoba R3T 2N6

Telephone: 204-983-5131

E-Mail: xcna-csa-cas@dfo-mpo.gc.ca

Internet address: www.dfo-mpo.gc.ca/csas-sccs/

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Aussi disponible en français :

MPO. 2020. Avis scientifique sur les points de référence limites pour la crevette nordique (Pandalus borealis) et la crevette ésope (Pandalus montagui) dans les zones d'évaluation est et ouest. Secr. can. de consult. sci. du MPO, Avis sci. 2020/053.

Appendix 3

[SUMMARY - Report of Northern Shrimp Advisory Committee (NSAC) Ad Hoc Working Group (Page 3; Page 20)]

[Page 3]

1.0 USRs for *Pandalus borealis* and *P. montagui* in the WAZ and EAZ

Background

In DFO's Precautionary Approach (PA) Framework, the Upper Stock Reference (USR) defines the boundary between the Healthy and Cautious Zones. The decision where to set the USR rests with Fisheries Management, in consultation with industry. Science Branch has recommended setting the USR at 80% of the Bmsy for Northern and Striped shrimp stocks, respectively, in the WAZ and EAZ. The Bmsy proxy is currently based on the geometric mean of the SSB index for the available time series (Science Advisory Report 2020/053).

In 2020, DFO established a PA Working Group (PAWG) representative of fishing interests as well as management boards to advise on the matter of USRs. Industry representatives observed that the USR concept is merely notional for shrimp assessment units that are arbitrary relative to observed stock dynamics, particularly for those in the WAZ and EAZ where the biomass indices fluctuate significantly without trend. On this basis, it is the view of industry that unless there is a declining trend, the USR simply imposes punitive (reduced) harvest rates during years when the SSB drops into the Cautious Zone and returns into the Healthy Zone soon after. Nonetheless, DFO requires this structure as a matter of policy in implementation of a complete PA Framework.

The outcome of discussions through the PAWG was overall support for a USR established at the 70% level in order to lessen the scope of this punitive impact. USRs at the 70% level for Northern and Striped shrimp stocks in the WAZ and EAZ were subsequently recommended for decisions and recommendations to the Nunavut Wildlife Management Board and Nunavik Marine Region Wildlife Board, as appropriate. The wildlife management decisions deferred any decision on USRs until such time as the full suite of PA Framework components could be available for decision.

Discussion

The issue of the 70% USRs in the WAZ and EAZ arose during the ad hoc NSAC Working Group's consideration of candidate HDRs. The consensus of industry representatives was that LRPs and USRs for all the assessment units within the shrimp stock complex should be consistent at 30% and 80% respectively of the Bmsy proxy, pending the development of more appropriate assessment units and a better understanding of stock dynamics in the respective areas. This position was also expressed in the context of the same HDRs being proposed across management units.

Recommendation

It is recommended that NSAC consider endorsement of the USR at the 80% level for *P. borealis* and *P. montagui* in the WAZ and EAZ, contingent upon adoption of the same HDRs for all management units.

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4.0 Harvest Decision Rules (HDRs) for *Pandalus borealis* and *Pandalus montagui* in the WAZ, EAZ and SFAs 4, 5 and 6

Conclusions

Meeting the suite of objectives:

- The Working Group does not support the 1-Step approach because it underperforms other Candidate HDRs relative to the socioeconomic objectives linked to total yield/value and improved interannual stability. Its fast responsiveness to interannual (sometimes false) survey signals may also result in an overreaction, with large 1-year TAC increases likely to contribute to biomass decline, and large 1-year TAC decreases creating socio-economic duress without any offsetting conservation benefit.

Fluctuating biomass without trend:

- The Base TAC approach provides greater stability with higher socio-economic return than the 2-Step approach, with little to no apparent conservation cost.

Responsiveness to biomass trend:

- Where a decreasing trend is apparent, the 2-Step approach provides more timely response than the Base TAC, which better meets conservation objectives.
- Where an increasing trend is apparent, the 2-Step approach provides more timely response than the Base TAC, which better meets the socio-economic objectives.

Miscellaneous:

- The Base-TAC has a maximum ER cap of 1.5*target ER in the Healthy Zone, and 1.25*target ER that is applied after an initial year in the Cautious zone. During the ~10-year retrospective period, the maximum ER would have been used 5 times for (declining) borealis stocks, excluding SFA6 where it was used twice during its dramatic decline (following its dramatic increase) to its relatively stable current level.
- The 2-step method has a maximum ER cap of 1.5*target ER, in both the Healthy and Cautious Zones. In reality, the actual ER is always at or lower than the target ER in an increasing biomass scenario. During the ~10-year retrospective period, the maximum ER would have been used only twice for (declining) borealis stocks, excluding SFA6 where it was used 5 times during its dramatic decline (following its dramatic increase) to its current, relatively stable level.
- Over the retrospective time series, the average ER for the Base-TAC was higher than the 2-Step ER for all borealis stocks except the WAZ where it was virtually identical; the difference ranging from 0.16 percentage points in the EAZ to 1.88 in SFA4. The difference between the 2-Step and 1-Step for all borealis stocks ranged from 0.66 percentage points in SFA4 to 1.54 points in the EAZ.

- The 2-Step method appears to be somewhat easier to comprehend/communicate than the Base-TAC approach, and thus facilitates greater transparency.

Recommendation

It is recommended that NSAC endorse the 2-Step Harvest Decision Rule, for consistent application in SFAs 4, 5, 6, EAZ and WAZ, effective April 1, 2024, to be reviewed by NSAC at least every 5-years at which point its performance would be reviewed relative to the stated objectives, subject to (a) an exceptional circumstance being encountered, or (b) an assessment model(s) being adopted for one or more assessment units.

APPENDIX 4

SUMMARY OF DISCUSSION (FINAL)

NOTE: This is intended to be a high-level summary that identifies key points and areas of discussion. It is not intended to serve as meeting minutes.

Group: Northern Precautionary Approach Working Group (NPAWG) +

Date: February 5, 2024

Location: Virtual_Zoom

Key Topic(s):

- Harvest Decision Rules (HDRs) for *Pandalus borealis* and *P. montagui* in the Eastern and Western Assessment Zones (EAZ & WAZ) and Shrimp Fishing Areas (SFAs) 4, 5 and 6
- Upper Stock Reference Points (USRs) for *P. borealis* and *P. montagui* in the EAZ and WAZ

Participants:

Sherry Glynn, Fish, Food and Allied Workers Union (FFAW)

Bruce Chapman, Canadian Association of Prawn Producers (CAPP)

Angela Burridge, Government of Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (Gov NL)

Alastair O’Rielly, Northern Coalition (NC)

Derek Butler, Nunavut Fisheries Association (NFA)

Brynn Devine, Oceans North

Christopher Mitchelmore, St. Anthony Basin Resources Inc. (SABRI)

Newman Coish, Fogo Island Co-op

Ann-Julie Cote & Rabia Sow, Quebec Ministry of Agriculture, Fisheries and Food (Gov QC)

Leigh Gustafson, Nunavut Wildlife Management Board (NWMB)

Robert Coombs, Nunatukavut Community Council

Tony Wright, Makivvik

Courtney D’Aoust, DFO Resource Management (RM) National Capital Region (NCR)

Leigh Edgar, DFO RM NCR (Chair)

Brian Lester, DFO RM NCR

Dirk Algera, DFO RM NCR

Nicholas Duprey, DFO Science

Susan Thompson, DFO Science

Nicolas LeCorre, DFO Science

Wojciech Walkusz, DFO Science

Samantha Fulton, DFO Science

Martin Henri, DFO RM NL

Christi Friesen, DFO RM Arctic

Jeff Adam, DFO RM Arctic

Meeting Summary:

➤ **Welcome and Opening Remarks**

- A round of introductions occurred and participants were informed that the meeting was being recorded for note-taking purposes.
- The Chair noted invitation to the session had been extended beyond NPAWG members to include southern fleets/interests given implications of HDRs for setting Total Allowable Catch (TAC) in SFAs 4-6.
- Participants were reminded of the *NSAC Industry Working Group Report_Dec 2023* as a key supporting material for the meeting, distributed to the Northern Shrimp Advisory Committee (NSAC) on January 15, 2024.
- A meeting Agenda was outlined with no comment.

➤ **Recall: NPAWG 2020**

- DFO RM recalled the scope and purpose of NPAWG first established in 2020:
 - To develop a **New Precautionary Approach (PA) Framework for P. borealis and P. montagui* in the WAZ, and update a previous PA Framework for these species in the EAZ.
- DFO RM reviewed progress made by NPAWG on USRs for EAZ & WAZ stocks, such that:
 - NPAWG supported USRs at 70% of the geometric mean of the Spawning Stock Biomass (SSB) index for the available time series.
 - USRs were presented to wildlife co-management boards in June 2021 for decisions and recommendations, as appropriate, but were rejected until such a time as the full PA Framework for these stocks, including HDRs, could be available.
- DFO RM recalled an industry-proposed HDR termed “50% or Finish” tabled in early 2022 and establishment of an industry-led working group following the February 2023 NSAC meeting.
 - The working group, among other things, would seek to advance work on USRs and HDRs ahead of the 2024-25 fishery.
 - The working group’s report was submitted to the NSAC Chair in December 2023 (*NSAC Industry Working Group Report_Dec 2023*).

➤ **Upper Stock Reference (USR) Points (EAZ and WAZ)**

- DFO RM revisited rationale for NPAWG support of USRs @70% level from Feb 2021:
 - Participants discussed a lower USR as a means to lessen the socio-economic impact of reduced harvest rates once a stock enters the Cautious zone, especially in cases where stocks experience high interannual fluctuation.
 - CAPP raised that a lower USR would be an important mitigation tool under current HDRs that respond to year-to-year biomass signals.
 - NC recalled that USRs @70% were seen to offset Limit Reference Points (LRPs) developed by DFO Science @ 40% level in 2020.
 - Further, it was important to industry representatives that reference points be consistent across SFAs in the broader stock complex.
- **DFO RM sought NPAWG+ views on the recommendation to establish the USR @ the 80% level (Dec 2023).**
 - Participants acknowledged this would align with DFO Science-recommended USRs from 2020 and achieve consistency in USRs across other SFAs in the stock complex (i.e. SFAs 4-6). Further, this approach would create a wider Cautious zone providing more time to respond to biomass decline signals.
 - CAPP, NC and NFA reiterated support for a higher USR. This was contingent upon adoption of a candidate HDR that would see more smoothed response to annual biomass signals.

Key outcome: No concerns were presented by NPAWG+ in regards to USRs @ 80% level; it was understood that NPAWG+ supported USRs @ 80% level for EAZ and WAZ stocks.

➤ **Harvest Decision Rules (HDRs) (EAZ, WAZ, SFAs 4-6)**

- DFO RM presented 3 candidate HDR that were deliberated and analyzed by the industry working group (as presented in *NSAC Industry Working Group Report_Dec 2023*).
- DFO RM reviewed key objectives adopted by the industry working group to guide their discussions and evaluate candidate HDRs, including but not limited to:

- Compatibility with the PA, mitigation of socio-economic impacts of fluctuating stocks, predictability and ease of comprehension/communication.
 - No additional objectives were suggested or offered by NPAWG+ participants.
- DFO RM reminded participants that HDRs would serve to guide management decisions, but that in all cases Minister discretion would remain.

Option 1: 1-Step

- DFO RM presented the main steps to calculate TAC using Option 1.
 - This option was most similar to current HDRs in Annex I of the Integrated Fisheries Management Plan for Northern shrimp (2018).
- This option was not supported by the industry working group (*NSAC Industry Working Group Report_Dec 2023*).

Option 2: Base-TAC (5 years)

- DFO RM presented the main steps to calculate TAC using Option 2.
- This option was developed in-house by DFO building upon previous NPAWG discussions (2020-22):
 - Base TAC was specifically designed for application the EAZ and WAZ where stocks have been observed to show high interannual fluctuation in biomass indices.
- Participants discussed maximum exploitation rates (ER) proposed for the Cautious zone (1.5 or 1.25x target ER), which consider the number of years in the zone, or equally, a climb from the Critical zone.
- DFO RM clarified that the resulting ER of applying the (dynamic) Base TAC was always considered relative to the most recent science advice (estimate of Fishable Biomass (FB)).
- NPAWG+ discussed that Option 2 provides the greatest stability in cases of high fluctuating biomass signals (EAZ & WAZ).

Option 3: 2-Step

- DFO RM presented the main steps to calculate TAC using Option 3.
 - This option was an evolution of the industry proposal (50% or Finish) tabled in 2022.
- Participants discussed the ability of this approach to limit response to year-to-year survey signals that may be reversed in the following year.
- NPAWG+ discussed that Option 3 provides the most timely response to (upward and downward) biomass trends while still achieving a smoothing effect.

Discussion of (NSAC) Industry Working Group recommendations:

- DFO RM highlighted retrospective analysis conducted on all 3 candidate HDR options, presented in great detail in the *NSAC Industry Working Group Report_Dec 2023*.
 - DFO RM reminded participants that retrospective analysis was not dynamic such that there is no way to measure or demonstrate the potential effect (if any) the candidate HDRs would have had on biomass over time.
 - Further, it would be important to assess the recommended HDR over several years when/if a population model became available.
- NPAWG+ discussed that potential ERs of candidate HDRs were lower than those observed in other cold-water jurisdictions (e.g. North-Pacific and North-Atlantic).
 - DFO Science cautioned against direct comparisons to these ERs; citing different surveys, as well as ecosystem dynamics (i.e. productivity, connectivity) in those systems.

- CAPP pointed to relative values of MSY in the order of magnitude of 35%, and that approaching or exceeding this value on a short term basis could be acceptable.
- **DFO RM sought NPAWG+ views on the industry working group recommendation that Option 3 (2-Step) be applied as a consistent HDR be applied for all SFAs.**
 - CAPP, NC and NFA reiterated support for the 2-Step (50% or Finish) approach beginning in the 2024-25 fishing season, subject to the availability of a population model which could suggest a need to adjust this approach.
 - Members of the industry working group confirmed the expectation that, notwithstanding Minister discretion, the HDR be adopted on a longer-term basis with recommended review in 5 years.
- DFO RM staff stated support for Option 3 (2-Step) in absence of any significant concerns that might be raised through the NSAC technical session; this was echoed by DFO Science staff who had no oppositions to this HDR approach, noting similarities with Option 2 (Base TAC).

Key outcome: No concerns were presented by NPAWG+ in regards to HDR Option 3 (2-Step) and its application to all SFAs, beginning in the 2024-25 fishing season.

➤ **Season Bridging**

- DFO RM briefly linked development of season bridging provisions to HDRs, such that a degree of caution or restraint should be applied (e.g. capping or reducing bridging amounts) as a stock falls below its USR.
- DFO RM acknowledged a number of industry proposals to amend bridging provisions for the offshore fleet, as well as Nunavut and Nunavik special allocations.
 - DFO RM will schedule a dedicated call to further season bridging to further these discussions. Participants encouraged that a call be scheduled as soon as possible.

➤ **Next Steps**

- DFO RM committed to prepare and distribute a Summary of Discussion from February 5 session.
- DFO RM confirmed a technical session of NSAC would be scheduled in the next 3-4 weeks (February 23, 2024)
 - NPAWG+ members were encouraged to participate in this second consultation opportunity on the topics of USRs and HDRs.
- DFO RM clarified that decisions would be sought from wildlife management boards, as appropriate, to establish USRs and adopt HDRs for EAZ and WAZ stocks into 2024.
- **The Chair offered a written feedback period on the two priority topics (USRs and HDRs). This feedback period would conclude February 14, 2024.**
 - *No written feedback was submitted.*

APPENDIX 5

SUMMARY OF DISCUSSION (FINAL)

NOTE: This is intended to be a high-level summary that identifies key points and areas of discussion. It is not intended to serve as meeting minutes.

Group: Northern Shrimp Advisory Committee (NSAC)_Technical Session

Date: February 23, 2024

Location: Virtual_Zoom

Key Topic(s):

- Harvest Decision Rules (HDRs) for *Pandalus borealis* and *P. montagui* in the Eastern and Western Assessment Zones (EAZ & WAZ) and Shrimp Fishing Areas (SFAs) 4, 5 and 6
- Upper Stock Reference Points (USRs) for *P. borealis* and *P. montagui* in the EAZ and WAZ

Meeting Summary:

➤ **Welcome and Opening Remarks**

- Todd Williams, NSAC Chair, informed participants that the meeting was being recorded for note-taking purposes and that on-screen materials would be provided following the meeting.
- The Chair highlighted two key topics for the technical session, namely: USRs (EAZ and WAZ stocks) and HDRs (EAZ, WAZ and SFAs 4-6).
 - Objectives of the technical session would be to seek NSAC views on these elements of the PA Framework, considering working group recommendations.
 - If possible, the Chair sought to achieve NSAC endorsement of these elements to support Minister and co-management partner decision-making.
- Participants were reminded of the *NSAC Industry Working Group Report_Dec 2023* and *Draft Summary of Discussion_Northern PA Working Group+_Feb 5, 2024* as key supporting materials for the meeting, distributed in advance.
- DFO RM confirmed the February 23 technical session would not replace the NSAC full-day meeting scheduled for April 3, 2024, but rather serve to advance more technical discussions.
- A meeting Agenda was outlined with no comment.

➤ **Recall: Working Group Progress**

- DFO RM recalled the scope and purpose of Northern Precautionary Approach Working Group (NPAWG) first established in 2020.
 - To develop a **New Precautionary Approach (PA) Framework for P. borealis and P. montagui* in the WAZ, and update a previous PA Framework for these species in the EAZ.
- DFO RM recalled previous NPAWG support for USRs at 70% of the geometric mean of the Spawning Stock Biomass (SSB) index for the available time series.
 - USRs were presented to wildlife co-management boards in June 2021 for decisions and recommendations, as appropriate, but were rejected until such a time as the full PA Framework for these stocks, including HDRs, could be available.
- DFO RM recalled the industry-proposed HDR termed “50% or Finish” tabled in early 2022 and establishment of an industry-led working group following the February 2023 NSAC meeting.

- The working group, among other things, would seek to advance work on USRs and HDRs ahead of the 2024-25 fishery.
- The working group's report was submitted to the NSAC Chair in December 2023 (*NSAC Industry Working Group Report_Dec 2023*) and distributed to NSAC on January 15, 2024.

Key Outcome: NPAWG+ was reconvened on February 5, 2024, to consider Industry Working Group analysis and recommendations ahead of NSAC.

- **NPAWG+ provided no opposition/concern with respect to the recommended USRs and HDR for these fisheries.**

➤ **Upper Stock Reference (USR) Points (EAZ and WAZ)**

- **DFO RM presented the Industry Working Group recommendation to endorse USRs @ 80% level.** Supporting rationale was discussed to include:
 - Alignment with USRs recommended by DFO Science through the Canadian Science Advisory Secretariat in 2020. Achieve consistency with USRs established for other SFAs in the stock complex (SFAs 4-6)
 - USRs @ 80% level would establish a larger cautious, allowing more time for reaction to signals of potential stock decline.
- DFO RM highlighted that this USR recommendation was contingent upon adoption of a HDR that would see more smoothed response to annual biomass signals.
 - This contingency was emphasized by NC, recalling higher Limit Reference Points (LRP) for EAZ and WAZ stocks (@ 40% level) compared to SFAs 4-6.
- Participants were reminded that USRs for EAZ and WAZ stocks would be presented to co-management partners (NWMB and NMRWB) for decision and recommendation, as appropriate.

Key Outcome: NSAC endorsed the recommendation to establish the USR @ the 80% level for *P. borealis* and *P. montagui* in the EAZ and WAZ.

➤ **Harvest Decision Rules (HDRs) (EAZ, WAZ, SFAs 4-6)**

- **DFO RM presented 3 candidate HDR that were deliberated and analyzed by the industry working group (as presented in *NSAC Industry Working Group Report_Dec 2023*).**
- DFO RM reviewed key objectives adopted by the industry working group to guide their discussions and evaluate candidate HDRs, including but not limited to:
 - Compatibility with the PA, mitigation of socio-economic impacts of fluctuating stocks, predictability and ease of comprehension/communication.
 - No additional objectives were suggested or offered by NSAC participants.
- DFO RM reminded participants that HDRs would serve to guide management decisions, but that in all cases Minister discretion would remain.

Option 1: 1-Step

- DFO RM presented the main steps to calculate TAC using Option 1.
 - This option was most similar to current HDRs in Annex I of the Integrated Fisheries Management Plan for Northern shrimp (2018).
- This option was not supported by the industry working group (*NSAC Industry Working Group Report_Dec 2023*).

Option 2: Base-TAC (5 years)

- DFO RM presented the main steps to calculate TAC using Option 2.
- This option was developed in-house by DFO building upon previous NPAWG discussions (2020-22):
 - Base TAC was specifically designed for application the EAZ and WAZ where stocks have been observed to show high interannual fluctuation in biomass indices.
- DFO RM explained maximum exploitation rates (ER) proposed for the Cautious zone (1.5 or 1.25x target ER), which consider the number of years in the zone, or equally, a climb from the Critical zone.
- DFO RM clarified that the resulting ER of applying the (dynamic) Base TAC was always considered relative to the most recent science advice (estimate of Fishable Biomass (FB)).
- DFO RM highlighted that Option 2 provides the greatest stability in cases of high fluctuating biomass signals (EAZ & WAZ).

Option 3: 2-Step

- DFO RM presented the main steps to calculate TAC using Option 3.
 - This option was an evolution of the industry proposal (50% or Finish) tabled in 2022.
- Participants discussed the ability of this approach to limit response to year-to-year survey signals that may be reversed in the following year.
- DFO RM highlighted that Option 3 provides the most timely response to (upward and downward) biomass trends while still achieving a smoothing effect.

Discussion of (NSAC) Industry Working Group recommendations:

- DFO RM highlighted retrospective analysis conducted on all 3 candidate HDR options, presented in great detail in the *NSAC Industry Working Group Report_Dec 2023*.
 - DFO RM reminded participants that retrospective analysis was not dynamic such that there is no way to measure or demonstrate the potential effect (if any) the candidate HDRs would have had on biomass over time.
Further, it would be important to assess the recommended HDR over several years when/if a population model became available.
- **DFO RM presented the Industry Working Group recommendation that NSAC endorse Option 3 (2-step) as a consistent HDR for all areas (EAZ, WAZ, SFAs 4-6), beginning in the 2024-25 fishery.**
 - CAPP, NC and NFA reiterated their support for this approach.
 - Representatives of Nova Scotia Department of Fisheries and Clearwater Seafoods expressed support for Option 3.
 - DFO RM noted that endorsement of Option 3 would satisfy the Industry Working Group's contingency on adoption of USRs @ 80% level for EAZ and WAZ stocks (see above).
- DFO RM clarified that the 2-Step HDR could be first implemented in 2024, such that:
 - The most recent estimates of FB (*pending CSAS peer-review*) survey would be used to calculate an initial target TAC in the respective SFAs.
 - The 2024-25 TAC would pursue 50% of the change to the initial target from the 2023-24 level.
 - In the subsequent years, decisions to apply the remainder the TAC change ('Finish') or pursue 50% of a *new* initial target TAC would depend on observed increases or decreases in FB.

Key outcome: NSAC endorsed HDR Option 3 (2-Step) and its application to all SFAs (EAZ, WAZ, SFAs 4-6), beginning in the 2024-25 fishing season.

➤ Next Steps

- DFO RM noted that TAC scenarios would apply the endorsed HDR (Option 3) to guide 2024-25 management discussions at the NSAC meeting April 3, 2024.
- CAPP and NFA requested that the Chair seek a Ministerial decision to adopt the HDR ahead of the April NSAC meeting.
 - The Chair confirmed that preliminary signal checks from senior officials would be possible in advance of April 3, but that stand-alone Ministerial approval of HDRs for these fisheries was unlikely given briefing schedules and pending decisions.
- DFO RM confirmed that decisions would be sought from wildlife management boards, as appropriate, to establish USRs and adopt HDRs for EAZ and WAZ stocks into 2024.
- Participants inquired about preparations to release 2024-25 interim quotas and renew licenses ahead of the Easter weekend.
 - DFO RM confirmed intent to release interim quotas at appropriate levels to facilitate fishing by April 1, with the exception of SFA 6.
 - CAPP requested consideration to severe ice conditions that might limit fishing in SFAs 4 and 5 in decisions not to release interim quotas in SFA 6.
- DFO RM committed to prepare and distribute a Summary of Discussion from February 23 technical session.

Participants :

Angela Burrige, Government of Newfoundland and Labrador Department of Fisheries, Forestry and Agriculture (Gov NL)

Claude Pelletier, Government of New-Brunswick Department of Agriculture, Aquaculture and Fisheries (Gov NB)

Ralph Heighton, Government of Nova Scotia Department of Fisheries and Aquaculture (Gov NS)

Ann-Julie Cote, Quebec Ministry of Agriculture, Fisheries and Food (Gov QC)

Bruce Chapman, Canadian Association of Prawn Producers (CAPP)

Alastair O’Rielly, Northern Coalition (NC)

Derek Butler, Nunavut Fisheries Association (NFA)

Brynn Devine, Oceans North

Christopher Mitchelmore, St. Anthony Basin Resources Inc. (SABRI)

Leigh Gustafson, Nunavut Wildlife Management Board (NWMB)

Frankie Jean-Gagnon, Nunavik Marine Region Wildlife Board (NMRWB)

Genevieve Myles & Vincent Dupuis, Association des Capitaines Propriétaires de la Gaspésie (ACPG)

Carey Bonnell, Ocean Choice International

Greg Simpson, Mersey Seafoods

Brent MacNamara, Newfoundland Resources Ltd.

Ben Davis, Torngat joint Fisheries Board

Catherine Boyd, Clearwater Seafoods

Derrick Dalley, Ueushuk Fisheries Ltd.

George Russell, NunatuKavut Community Council

Gilbert Linstead, Labrador Shrimp Co.

Jeff Simms, M.V. Osprey Ltd.

Jim Goudie, Deputy Minister, Land and Natural Resources, Nunatsiavut Government (DM LNR (NG))

Keith Watts & Ron Johnson, Torngat Fish Producers Co-operative Society Ltd.

Mark Quinlan, Newfoundland Resources Ltd. (NRL)

Philip Quinlan, Labrador Fishermen’s Union Shrimp Company Ltd. (LFUSCL)

Renee Butler, Association of Seafood Producers (ASP)

Surendra

Courtney D’Aoust, DFO Resource Management (RM) National Capital Region (NCR)

Todd Williams, DFO RM NCR (Chair)

Leigh Edgar, DFO RM NCR
Brian Lester, DFO RM NCR
Dirk Algera, DFO RM NCR
Elysabeth Theberge, DFO RM NCR
Nicholas Duprey, DFO Science
Nicolas LeCorre, DFO Science

Wojciech Walkusz, DFO Science
Samantha Fulton, DFO Science
Daniel Enright, DFO Science
William Coffey, DFO Science
Martin Henri, DFO RM NL
Jeff Adam, DFO RM Arctic