



Suite 301, 5204 50 Ave  
Yellowknife, NT  
X1A 1E2

Your file      Votre référence  
08MN053

July 27, 2020

Our file      Notre référence  
07-HCAA-CA7-00050

Nunavut Impact Review Board (NIRB)  
PO Box 1360  
Cambridge Bay, NU  
X0B 0C0

Dear NIRB,

**Subject: Baffinland Iron Mines Corp. Annual Report 2019 - Mary River Project.**

As requested by the NIRB in their letter dated June 11, 2020, Fisheries and Oceans Canada Fish and Fish Habitat Protection Program (DFO-FFHPP) is providing the following comments with respect to Baffinland Iron Mines Corp.'s (BIM) 2019 Annual Report.

DFO-FFHPP understands that the NIRB would like parties to provide comments regarding:

1) Effects Monitoring

- a) Whether the conclusions reached by Baffinland in the Mary River Project 2019 Annual Monitoring Report are valid; and
- b) Any areas of significance requiring further supporting information.

DFO-FFHPP has reviewed the Annual Report and has the following comments regarding the Proponent's conclusions around effects monitoring:

- i. Icebreaking: In Table 4.30 on page 320 of the 2019 Annual Report, it is indicated that effects to marine mammals from "*habitat changes resulting from icebreaking and/or ice management of landfast ice*" were not monitored as there were "*no project interactions to monitor in 2019*". DFO-FFHPP recognizes that "*Baffinland has not undertaken icebreaking of land-fast ice along the Northern Shipping Route*" (pg. 328, 2019 Annual Report). However, DFO-FFHPP notes that icebreaking of non-land-fast ice occurred in both 2018 and 2019. On page 339 of the Annual Report, it indicates that "*Baffinland procured an icebreaking vessel, the MSV Botnica, in 2019 to facilitate the safe passage of vessels through prevailing ice conditions*". Further, on page 353 of the Annual Report, BIM indicates that "*[n]arwhal occurred in the RSA in similar numbers during the early shoulder season as the open-water season, suggesting that mitigation measures implemented during icebreaking were effective in managing any potential large-scale avoidance or displacement behavior by marine mammals in the RSA.*"

DFO-FFHPP notes that, under the current Project Certificate, BIM has no explicit approval to engage in icebreaking activities, regardless of if land-fast ice is impacted or not. DFO-FFHPP additionally notes that an assessment of potential impacts to marine mammals resulting from icebreaking was only conducted relevant to the Phase 2 Environmental Assessment (EA), not for this current Production Increase Extension Request phase, and is still being evaluated as part of that ongoing EA. DFO-FFHPP acknowledges the mitigation measures that Baffinland has applied to mitigate potential impacts to marine mammals and their habitats resulting from icebreaking activities, however notes that voluntary implementation of these measures does not supersede the requirement to fulsomely assess and evaluate potential impacts nor the requirement to obtain approval of those mitigation measures. DFO continues to express concerns with both the impact assessment relative to icebreaking and the associated mitigations, as documented in our comments on the 2019 draft monitoring reports (see attached).

DFO-FFHPP notes that, on page 15 of their February 3, 2020 submission to the NIRB in regards to BIM's Production Increase Proposal Extension Request, DFO recommended that the amended Project Certificate for the Mary River Project include the following Term and Condition: "*Baffinland shall not conduct icebreaking activities at any point along the Northern Shipping Route until a full assessment of the additional impacts to marine mammals is provided, and the additional activities and associated mitigations are approved and supported by DFO*". On page 18 of Baffinland's February 13, 2020 Response to Comments, BIM recommended modifications to Term and Condition 183 in lieu of a prohibition on icebreaking. DFO-FFHPP notes that on February 24, 2020, DFO sent a letter to NIRB indicating that "*DFO will continue to work with Baffinland and the MEWG to ensure protection of marine mammals and the marine environment. DFO acknowledges that Condition 183 may provide a sufficient mechanism to do so in the interim.*"

This letter does not constitute support or approval of icebreaking activities under the current Production Increase Proposal Extension. Additionally, support and approval of icebreaking and associated mitigations should also come from the Marine Environmental Working Group (MEWG) and the NIRB.

- ii. Marine Mammals: Condition 3.4 of BIM's *Fisheries Act* Authorization for the Milne Inlet Ore Dock under DFO File # 14-HCAA-00525, states "*the Proponent shall provide sufficient marine mammal observer coverage on project vessels to monitor marine mammal interactions with project vessels.*" Additionally, on page 356 of the Annual Report, Term and Condition 106 states "*The Proponent shall ensure that shipboard observers are employed during seasons where shipping occurs...*". On page 339 of the 2019 Annual Report, it states "*Marine wildlife observers[... ]were present on the MSV Botnica during the shoulder shipping seasons from 19 to 29 July 2019 (Leg 1) and again from 5 to 28 October 2019 (leg 2) as part of Baffinland's 2019 Ship-based Observer (SBO) Program to monitor for potential ship strikes on marine mammals...*" DFO notes that while BIM conducted a marine mammal observation program in 2019, it was not conducted throughout the entire shipping season, only during the shoulder seasons. DFO notes that monitoring throughout the entire shipping season is important in order to inform

the conclusions regarding potential effects and interactions of vessels with marine mammals, especially with respect to ship strikes.

On page 335 of the 2019 Annual Report, Baffinland indicates that they are “*not currently planning to conduct marine mammal aerial surveys along the Northern Shipping Route during summer of 2020 as DFO is currently planning a marine mammal aerial survey during summer of 2020 that would include the Northern Shipping Route.*” DFO-FFHPP notes that in email correspondence from June 16, 2020, DFO indicated to BIM that aerial surveys were postponed/cancelled for summer 2020.

DFO recommends that, if possible given the circumstances of the COVID-19 pandemic, BIM continue to conduct marine mammal aerial surveys during summer 2020.

DFO-FFHPP notes that additional comments relative to marine mammal monitoring have been provided to BIM through the MEWG for all the 2019 draft monitoring reports in advance of this Annual Report. We have attached these comments for the NIRB’s records as they remain unresolved and are relevant to this Annual Report.

- iii. Ballast/AIS: DFO notes that on pages 260 and 261 of the Annual Report, it states “*In 2019, total of forty-three (43) zooplankton species were identified during AIS/NIS sampling Milne Port and Ragged Island. Three (3) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns*” and “*A total of 319 benthic invertebrate taxa were identified during AIS sampling in 2019 at Milne Port and Ragged Island. Forty-one (41) of these taxa were not recorded during baseline studies or during previous AIS monitoring campaigns.*” On pages 262 to 263 of the Annual Report, BIM indicates that “*Further investigations into the status of several new species identified during the AIS program are in progress in consultation with DFO and other external experts, with representative specimens sent to a second laboratory for confirmatory taxonomic analysis.*” DFO notes that BIM states “*All taxa were compared against a global invasive species database (Molnar et al. 2008), the National Exotic Marine and Estuarine Species Information System (NEMESIS; Fofonoff et al., 2020), as well as a known invasive species list within the National Risk Assessment for Introduction of Aquatic Nonindigenous Species to Canada by Ballast Water (Casas-Monroy et al. 2014)*” (pg. 289, 2019 Annual Report), but DFO further notes that potentially harmful species may not necessarily exist on these lists. DFO additionally notes that “*At the time of issuing this report, the independent review had not been fully completed for all flagged specimens in 2019, however any relevant findings will be incorporated in the final version of the report and shared with the MEWG*” (pg. 289, 2019 Annual Report).

DFO will continue to work with BIM to ensure the best preventative measures against the spread of aquatic invasive species, and looks forward to reviewing the results of the independent review.

DFO-FFHPP notes that additional comments for the draft 2019 MEEMP and AIS Monitoring Program report were provided to BIM through the MEWG in advance of this

Annual Report. We have attached these comments for the NIRB's records as they remain unresolved and are relevant to this Annual Report

- iv. Freshwater: In table 4.15 on page 105 of the Annual Report, it is indicated that “*ECCC issued a Direction under the Fisheries Act, which Baffinland implemented satisfactorily*” in regards erosion and sedimentation. Although ECCC is the lead department responsible for enforcement of pollution prevention provision of the *Fisheries Act*, DFO has a vested interest in any matters that may impact fish habitat, such as sedimentation.

DFO-FFHPP additionally notes that currently there is no dedicated forum to discuss ongoing freshwater environment impacts and monitoring programs, particularly in regards to the existing Tote Road. On page 8 of the June 20, 2019 TEWG Meeting Minutes in Appendix C of the 2019 Annual Report, a representative from the Government of Nunavut asked BIM if there will be “*a freshwater Working Group moving forward*” in relation to a request regarding fish abundance monitoring along the Tote Road. In response, BIM indicated that they “*have been thinking about how to better incorporate freshwater discussions into the TEWG or how to separate these out*”.

DFO-FFHPP requests that future erosion and sedimentation events be additionally reported to DFO in a timely matter, such that DFO is aware of the situation should any subsequent impacts that may constitute harmful alteration, disruption, or destruction (HADD) of fish habitat occur. DFO-FFHPP notes that DFO is not currently a member of the TEWG, but recommends that freshwater discussions and monitoring be incorporated into the TEWG and that DFO becomes a member of the TEWG to ensure that ongoing impacts and concerns related to the freshwater environment are fulsomely considered and addressed.

- v. Marine Environment Working Group: On page 264 of the Annual Report, it states that “*The [Marine Environment Working Group] receives presentations on the implementation of field programs and the subsequent results in order to prioritize monitoring plans and suggest measures for mitigation where required.*” DFO notes that the objective of the MEWG is to “*provide advice and recommendations to the Proponent in connection with mitigation measures for the protection of the marine environment, monitoring of effects on the marine environment and the consideration of adaptive management plans*” (pg. 264, 2019 Annual Report). Thus far, the MEWG has been an imperfect forum to recommend and discuss potential mitigation measures in response to monitoring results, with the majority of time during meetings spent on reviewing results. DFO-FFHPP acknowledges that the Terms of Reference for the MEWG are in the process of being revised, but is uncertain when these will be finalized and approved by the MEWG.

DFO-FFHPP also notes that this current comment/response format does not provide a timely mechanism for resolution on incorporation and implementation of outstanding issues and proposed mitigation measures. It is important this be resolved as this feedback has the potential to influence BIM's analysis and final reports which, in turn, inform this annual monitoring report. As discussed above, we have attached DFO's MEWG

comments on draft final monitoring reports to this letter, as they remain unresolved and are relevant to this Annual Report.

DFO-FFHPP recommends that presentations and results should be provided at least 14 days in advance of any scheduled MEWG meetings to ensure that MEWG members and observers have sufficient time to review and provide meaningful input, recommendations, and advice, and that an additional day of discussion is scheduled for meetings to ensure any recommendations or questions are addressed in a timely manner. DFO-FFHPP also recommends that BIM work with the NIRB and the MEWG to establish a review and reporting schedule that enables resolution of issues in a meaningful and timely manner.

## 2) Compliance Monitoring

a) Provide a summary of any compliance monitoring and/or site inspections undertaken in association with the Project, including specifically:

- i. Identify the terms and conditions from the Project Certificate which have been incorporated into any permits, certificates, licenses or other approvals issued for the Project, where applicable;

The Proponent currently operates under three *Fisheries Act* Authorizations (18-HCAA-00160, 14-HCAA-00525 and 06-HCAA-CA7-00084). Terms and Conditions # 87, 105, 109, 110 and 121 from the Nunavut Impact Review Board's Project Certificate No.:005 for the Mary River Project are directly incorporated into DFO's *Fisheries Act* Authorization for the Milne Inlet Ore Dock (DFO file no.: 14-HCAA-00525)

DFO notes that additional terms and conditions from the NIRB Project Certificate No.: 005 for the Mary River Project, while not directly incorporated, fall under DFO's mandate and overlap with conditions in Baffinland's existing *Fisheries Act* Authorizations as follows:

- Milne Inlet Tote Road (DFO file no.: 06-HCAA-CA7-00084): Project Certificate 005, Terms and Conditions 19, 26, 45, 47, 48(a) and
- Milne Inlet Ore Dock (DFO file no.: 14-HCAA-00525): Project Certificate 005, Terms and Conditions 45, 76, 88, 99, 101, 106, 113, 115, 123.
- Milne Inlet Freight Dock (DFO file no.: 18-HCAA-00160): Project Certificate 005, Terms and Conditions 14 (a), 45, 76, 88, 99, 101, 113, 115, 123, 128

- ii. A summary of any inspections conducted during the 2019 reporting period, and the results of these inspections;

DFO visited the Mary River Mine Site from June 24-27, 2019. The visit was comprised of three main objectives:

1. Compliance site visit for the Milne Inlet Tote Road: DFO-FFHPP visited a select number of crossing locations along the Milne Inlet Tote Road. Noting time constraints, DFO was unable to visit every crossing along the road. The crossings were chosen based on issues noted in the annual report, some types of crossings DFO

was most interested in and some crossings Baffinland suggested, which displayed good functioning crossings. The crossings visited were: CV-187, CV-186, CV225, CV224, CV-223, CV-001, BG-24, BG-30, CV-217, BG-32, BG-50, CV-104, CV-106, CV-114 & CV-115. Overall DFO noted consistent issues with erosion and sediment control coupled with incorrect sediment fence placement, while also noting that the North Baffin Island landscape is prone to natural erosion, with the added difficulty of vegetation growth constraints. In addition, issues noted with many other crossing locations included: perched culverts/ culverts not being embedded properly, damaged culverts due to ice removal equipment, scour pools and water running through interstitial spacing of placed streambed material rendering the stream impassable. DFO noted that Baffinland and North South Consultants conduct work on the crossings each year to address these issues. DFO provided recommendations, which included: the possibility of replacing culverts in the summer to ensure correct placement and embedded depth; additional communication with DFO to discuss crossing issues and work together to ensure the crossings improve and; hiring a certified sediment and erosion control specialist to assess crossings and provide advice on location and on a regular basis until issues are resolved; or to provide onsite staff with expertise.

2. Compliance site visit for the Milne Inlet Freight Dock: DFO visited Milne Port as a part of the site visit to assess the state of the newly constructed Freight Dock, however, noted Baffinland /HATCH was still constructing the Freight Dock (Freight Dock was initially intended to be completed in winter conditions). HATCH was preparing to dredge, noting that dredging wouldn't be started until the turbidity curtain was in place to mitigate sedimentation. BIM noted delays in the schedule and that the ice went out early. The proposed silt curtain would be weighted, pulled tight at the edges and would be managed hourly. Noted that most of the vibratory piles and some of the impact piles had been installed in the winter already, however, some to still be done. HATCH described some of the dredging to be completed noting 20m out and 1.5m of deep dredging. DFO was unable to walk the entire Freight Dock due to equipment and for safety reasons and therefore was unable to assess the shape of the existing structure, also noting it was not complete yet, as it was. DFO also assessed the crossing to the East of the Freight Dock, which was intended to redirect an unknown stream.
3. First hand observance of methods used to collect baseline freshwater fish habitat data for Phase 2: DFO joined North South Consultants to observe some baseline data collection intended to inform the Phase 2 process and the proposed North Railway. This involved observing NSC taking field measurements at future crossing locations, such as, channel dimensions, electrofishing and velocity measurements.
  - iii. A summary of Baffinland's compliance status with regard to authorizations that have been issued for the Project.

DFO-FFHPP notes that the Proponent is operating under several *Fisheries Act* Authorizations for the Mary River Project. As a general condition of *Fisheries Act* Authorizations, Baffinland

is required to report on their compliance with their issued *Fisheries Act* Authorizations through annual reporting directly to DFO.

However, DFO has the following comments regarding the 2019 Annual Report:

DFO-FFHPP notes that on page 165 of the Annual Report, Condition No. 45 indicates that “[t]he Proponent shall adhere to the No-Net-Loss principle at all phases of the Project to prevent or mitigate direct or indirect fish and fish habitat losses.” Baffinland has determined that the compliance status of this condition is “*In-Compliance*”, however DFO-FFHPP is of the opinion that the compliance status for this condition should be modified to be “*Partial Compliance*” due to the following:

1. Additional Destruction of Marine Fish Habitat: In relation to *Fisheries Act* Authorization # 18-HCAA-00160 for BIM’s Freight Dock, DFO-FFHPP was notified in November 2019 of additional destruction of marine fish habitat that occurred during construction that was not permitted by the Authorization. DFO’s Conservation & Protection Unit is currently reviewing the situation and will determine if further enforcement action is required to remediate impacts to fish habitat.

Although DFO has a regulatory mechanism to manage compliance in regards to authorizations, transparent details of this compliance issue should have been included in the 2019 Annual Report.

2. Fish Passage Obstructions along the Tote Road: As per the DFO *Fisheries Act* Authorization for the Milne Inlet Tote Road (DFO file no.: 06-HCAA-CA7-00084), condition 2.2 states “*Culverts shall be appropriately sized and embedded to maintain upstream and downstream fish passage at each crossing.*” The Proponent submitted its 2019 Annual Fish Habitat Monitoring Report to DFO and identified issues with fish passage at multiple culvert crossings. Specifically, BIM identified nine Tote Road crossings with fish passage/habitat issues in the Annual Report during the 2019 Crossing Survey, including CV-106, CV-111, CV-114, CV-129, CV-216, CV-225, and BG-50. BIM indicated that “*Perching was able to be address in 2019 at five (5) of these water crossings by installing step-pool rocky ramps. However, the installation of step-pool rocky ramps was not feasible at CV-111 and CV-225. Additional efforts are planned in 2020 to address perching concerns at these two (2) remaining crossings*” (pg. 166, 2019 Annual Report).

The following table summarizes the nine identified culverts and associated fish passage and mitigation works.

Table 1. Tote Road Culverts associated with fish passage issues in the 2019 Annual Report

<b>Culvert</b>	<b>Existing issue</b>	<b>Remediation work</b>	<b>Fish passage solved or not</b>
BG-29	Instream road aggregate/rip-rap	Removed obstruction	Yes, revisit to confirm
BG-01	Instream road aggregate/rip-rap	Removed obstruction	Yes, revisit to confirm
CV-129	Small perch (less than 5cm)	Materials placed to create backwater effect. Also added step-pool approach	Yes, revisit to confirm
CV-216	Small perch (less than 5cm)	Materials placed to create backwater effect. Also added step-pool approach	Yes, revisit to confirm
CV-114	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	Yes, revisit to confirm
CV-106	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	The culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.
BG-50	Moderate high perch	Mitigated through installation of step-pool rocky ramps in 2018, which were modified further in 2019.	Work on one culvert was successful. The other culvert was dry in 2019 so must revisit in 2020 to confirm mitigation works were successful.
CV-111	High perch	A new culvert was installed in 2018/2019 to improve fish passage. A rocky ramp was constructed in 2019 but could not eliminate the perch. Additional works to	No. Additional works to be completed in 2020 to provide



		be completed in 2020	access to all classes of Arctic Char.
CV-225	High perches at both culverts. Large deep scour pool downstream of the culvert.	No works completed	Alternative plan to be implemented in 2020

DFO-FFHPP acknowledges the remedial work BIM has completed in order to address fish passage concerns along the Tote Road, and recommends that all crossings with fish passage concerns be targeted for repair in 2020. However, DFO notes that all new workings, activities or undertakings that occur below the high water mark should be submitted to DFO for review prior to construction. DFO notes that construction and infilling below the high water mark may constitute a HADD of fish habitat, which is prohibited under the *Fisheries Act*.

DFO-FFHPP further recommends that BIM engage DFO in advance of the repairs to discuss remedial action of the chronic fish passage issues occurring along the Tote Road to ensure that no additional HADD of fish habitat occurs.

3. Absence of Juvenile Arctic Char: DFO notes that in the 2017 Annual Report, Baffinland identified an unexpected absence of juvenile arctic char downstream of crossing BG-50 and further investigation was to be conducted during 2018 to determine the potential causes. In the 2018 Annual Report, Baffinland noted that “*an absence of fish in BG-50 downstream was observed again in 2018*”. DFO-FFHPP acknowledges that Baffinland did undertake remedial works at crossing BG-50 in 2019, however notes that no update on the presence of juvenile arctic char downstream of crossing BG-50 is provided in the 2019 Annual Report or in the 2019 DFO Tote Road Report. DFO notes that the loss of juvenile char in the downstream area from the BG-50 crossing may be considered a HADD to fish not accounted for in the issued *Fisheries Act* Authorization. DFO reminds Baffinland that there is a *Duty to Notify* DFO when they have caused, or are about to cause, HADD to fish habitat that is not authorized under the Act. Moreover, the *Fisheries Act* imposes duties to take corrective measures and to provide written reports when there are occurrences that may result in HADD to fish habitat. Failure to notify, take corrective measures or report in such situations may result in penalties.

DFO-FFHPP recommends that Baffinland provide an update on the presence of juvenile arctic char at crossing BG-50, and reiterates the 2019 recommendation that Baffinland develop a response plan for absent juvenile arctic char and propose additional measures to ensure that juvenile arctic char return and are able to use the habitat downstream of crossing BG-50. DFO recommends Baffinland discuss any action and response plans with DFO, and that monitoring the presence of juvenile arctic char continue in 2020.

### **Summary of Recommendations:**

- DFO recommends that, if possible given the circumstances of the COVID-19 pandemic, BIM continue to conduct marine mammal aerial surveys during summer 2020.
- DFO-FFHPP requests that future erosion and sedimentation events be additionally reported to DFO in a timely matter, such that DFO is aware of the situation should any subsequent impacts that may constitute harmful alteration, disruption, or destruction (HADD) of fish habitat occur.
- DFO-FFHPP notes that DFO is not currently a member of the TEWG, but recommends that freshwater discussions and monitoring be incorporated into the TEWG and that DFO becomes a member of the TEWG to ensure that ongoing impacts and concerns related to the freshwater environment are fulsomely considered and addressed.
- DFO-FFHPP recommends that presentations and results should be provided at least 14 days in advance of any scheduled MEWG meetings to ensure that MEWG members and observers have sufficient time to review and provide meaningful input, recommendations, and advice, and that an additional day of discussion is scheduled for meetings to ensure any recommendations or questions are addressed in a timely manner.
- DFO-FFHPP recommends that BIM work with the NIRB and the MEWG to establish a review and reporting schedule that enables resolution of issues in a meaningful and timely manner.
- DFO-FFHPP recommends that all crossings with fish passage concerns be targeted for repair in 2020
- DFO-FFHPP recommends that BIM engage DFO in advance of the repairs to discuss remedial action of the chronic fish passage issues occurring along the Tote Road to ensure that no additional HADD of fish habitat occurs.
- DFO-FFHPP recommends that Baffinland provide an update on the presence of juvenile arctic char at crossing BG-50, and reiterates the 2019 recommendation that Baffinland develop a response plan for absent juvenile arctic char and propose additional measures to ensure that juvenile arctic char return and are able to use the habitat downstream of crossing BG-50. DFO recommends Baffinland discuss any action and response plans with DFO, and that monitoring the presence of juvenile arctic char continue in 2020.

If you have any questions, please contact Alexandra Sorckoff ([Alexandra.Sorckoff@dfo-mpo.gc.ca](mailto:Alexandra.Sorckoff@dfo-mpo.gc.ca)) or Gabriel Bernard-Lacaille ([Gabriel.Bernard-Lacaille@dfo-mpo.gc.ca](mailto:Gabriel.Bernard-Lacaille@dfo-mpo.gc.ca)). Please refer to the file number referenced above when corresponding with the Program.

Sincerely,

A handwritten signature in black ink, appearing to read 'A Beattie', with a stylized, cursive script.

Alasdair Beattie  
Team Lead – Mining, Oil & Gas - NORTH  
Fish and Fish Habitat Protection Program  
Fisheries and Oceans Canada

Attachment: DFO 2019 MEWG Comments

cc: Thomas Hoggarth – Fisheries and Oceans Canada  
Alexandra Sorckoff – Fisheries and Oceans Canada  
Gabriel Bernard-Lacaille – Fisheries and Oceans Canada  
Aleksandra Taskova-Vukicevic – Fisheries and Oceans Canada

Name: Alexandra Sorckoff/Marianne Marcoux/Jacque Bastick

---

Agency / Organization: DFO/PCA

---

Date of Comment Submission: Thursday, April 30<sup>th</sup>, 2020

---

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Ship-based Observer Program	2.1	Would it be possible to add detail about the height of the bridge where the observations were performed?	
2	2019 Ship-based Observer Program	2.1	Were the observers able to see the other ships that the MSV Botnica was escorting? Would they be able to make observations in relation to the other ships?	
3	2019 Ship-based Observer Program	2.2.2.1 and 2.2.2.2	Would it be possible to install a camera that would take photographs of the ice in front of the MSV Botnica? It would help to document and describe the ice conditions during ice breaking.	
4	2019 Ship-based Observer Program	2.2.3.1	Observers observed 1,225 seals (unidentified species) in group of up to 560 individuals. They also noted that seals were clustered on large ice pan. This information is interesting because it confirms that seals use the ice for habitat until the ice is completely gone. The ice concentration ranged from 0 to 30% during the observation period.	

#	Document Name	Section Reference	Comment	Baffinland Response
5	2019 Ship-based Observer Program	2.2.3.3	BIM states the closest point of approach (CPA) for sighted marine mammals. When there was enough data, BIM statistically assess if there is a difference in CPA between Leg 1 and Leg 2. We would recommend to refrain from making statistical conclusions on the CPA since these distance were an approximation and might be a biased overestimate.	
6	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	How do the observations of 2018 and 2019 compare to the original SBO Program in 2013 2014 and 2015? It was mentioned that low number of marine mammals were observed in 2014 and 2015. What about 2013? Were the methods comparable?	
7	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	It is stated that no ship strikes were recorded. However, could it be clarified that this only applies to the Botnica and that it was not possible to determine if ship strike occurred on the other project related vessels.	
8	2019 Ship-based Observer Program	4.0 Summary-Marine Mammals	It is mentioned that: <i>“marine mammals in the RSA are likely to demonstrate localized avoidance of Project vessels”</i> . In addition, it is mentioned that: <i>“that the Project is unlikely to result in significant residual adverse effects on marine mammals in the RSA, defined as effects that compromise the integrity of marine mammal populations in the region either through mortality (i.e., ship strikes) or via large-scale displacement or abandonment of the RSA”</i> . It would be important to point out that these results demonstration some level of disturbance by project vessels on marine mammals and	

#	Document Name	Section Reference	Comment	Baffinland Response
			that more work is required to investigate the long term consequences of the project on the marine mammal populations.	
9	2019 Ship-based Observer Program	Bottom of pdf page 4 and top of pdf page 5.	PC: The report appears to only compare 2019 results to 2018 results and, from that, draws the conclusion that 2019 monitoring results support impact predictions etc. and that the Project is unlikely to result in significant adverse residual effects on marine mammals in the RSA. BIM does note the history of this monitoring program stopping and restarting (e.g.: Section 1.1). For the sake of comprehensive monitoring, BIM should make a comment regarding the ability of limitations in comparing 2019 data to all earlier data collected during any time the SBO program existed and to also try to conduct some kind of analysis using their entire suite of SBO data while acknowledging the limitations due to changes in methodology and an interrupted data set.	
10	Ship-based Observer Program	Last paragraph pdf page 4/150 and on pdf page 74/150 in the second full paragraph	PC: Regarding BIM's conclusions, no significant adverse effects as noted in the comment above. BIM notes that the SBO results "lend confidence to existing EA predictions" - however, there is no discussion about the extent and methodology of how the SBO results are incorporated into overall results so as to "lend confidence". It is worth reiterating some sort of general comment about the need for clarity on BIM's overall monitoring framework, as discussed in the marine monitoring section of CSAS Report #3.	

#	Document Name	Section Reference	Comment	Baffinland Response
11	Feb 25 2020 Meeting Minutes	Table 1. Summary of action items update from February 25, 2020 MEWG Meeting – Item # 2, 12	No update. Will continue to work on completing these action items.	

Name: Marianne Marcoux, Jacquie Bastick

---

Agency / Organization: DFO and PCA

---

Date of Comment Submission: June 15<sup>th</sup>, 2020

---

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Passive Acoustic Monitoring Program	General comments	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	
2	2019 Passive Acoustic Monitoring Program	Executive Summary	It should be clearly noted that heavy ice breaking activities did not take place in 2019 and that it was not possible to compare measured levels of noise emitted by the MSV Botnica breaking ice to the predictions of the models provided in the original assessment.	
3	2019 Passive Acoustic Monitoring Program	2.2.3.3. Narwhal-specific Vocalization Detection	Could you provide a description of what knock trains are in the context of this report?	
4	2019 Passive Acoustic Monitoring Program	2.3. Vessel Sound Level Analysis	It would be useful to provide the ice concentrations that relate to each transit/recording in table 4.	



#	Document Name	Section Reference	Comment	Baffinland Response
5	2019 Passive Acoustic Monitoring Program	4.2. Measurement – Model Comparisons	JASCO stated: “The modelled estimates exceed the measured durations shown in Table 11, indicating that the sound propagation calculations incorporated in the model are quite conservative, despite the under-estimation of the radiated noise levels.” Does this statement take into account that the Botnica transited at 8 knot (not 9 knot as modelled)?	
6	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	This is an interesting report. It will be important to continue the Passive Acoustic Monitoring program to capture variation in environmental conditions such as sea ice concentration, especially since recordings made in 2019 did not capture heavy icebreaking conditions.	
7	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	It is not clear if AMAR-R1 and AMAR-B1 will be redeployed in future years. Can you clarify? Are there plans to deploy AMAR in other locations? For example, it would be interesting to compare model predictions to recording levels in Milne Inlet.	
8	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	AMARs were retrieved on September 28-29, 2019. What are the plans to monitor noise levels at the fall shoulder season? Will some of the AMAR be deployed over winter? It is important to monitor noise levels in the fall while narwhals migrate out of the area.	

#	Document Name	Section Reference	Comment	Baffinland Response
9	2019 Passive Acoustic Monitoring Program	4.5. Recommendations	Given that this report indicates that 50% LRR occurs prevalently when the icebreaker was present, the mitigation measures proposed for icebreaking during the shoulder season (as detailed in Assessment of Icebreaking Operations during Shipping Shoulder Seasons on Marine Biophysical Valued Ecosystem Components 1663724-102-R-Rev1-30000) should also apply during the open water season.	

Name: Marianne Marcoux, Jacquie Bastick, Cory Matthews

---

Agency / Organization: DFO, PCA

---

Date of Comment Submission: June 18<sup>th</sup>, 2020

---

#	Document Name	Section Reference	Comment	Baffinland Response
1	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comment	It would be useful that the results from the different monitoring programs related to marine mammals get interpreted and integrated together. The different monitoring programs were designed to complement each other and their results should feed into each other. In addition, they are all part of the same adaptive management and mitigation plan.	
2	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comment	The report provided enough information and detail to be able to assess the data and results. The design, analysis and results seemed appropriate and are in line with previous DFO surveys to estimate abundance of whales.	
3	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	General comments	Would it be possible to add tables with the Mark-recapture distance sampling model considered with their respective AIC values?	

#	Document Name	Section Reference	Comment	Baffinland Response
4	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.3 Narwhal Abundance 3.2.5.3.1 Eclipse Sound Stock	The coefficient of variation (CV) of the Eclipse Sound part of the survey is very low (0.05). This is unusual for a aerial count of whales. The way the CV was calculated seemed correct and the low CV is a result of having most of the narwhals counted in the strata that were fully covered by photos.	
5	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.1 Narwhal Abundance Leg 2 – Open- water Season	“Because narwhal were distributed in a relatively small area (mostly in Milne Inlet and Tremblay Sound where most sightings were captured by photographic surveys), low CVs were achieved in the August surveys which provided the best abundance estimate. Narwhals concentrated in areas where shipping activities were high (Milne Inlet South) rather than moving to areas with low shipping activities. This is a sign that the level of shipping activity is not causing displacement. This is consistent with impact predictions made in the FEIS Addendum for the ERP that the Project was unlikely to result in significant residual adverse effects on narwhal in the RSA (defined as effects that would compromise the integrity of the population either through mortality or via large-scale displacement or abandonment of the RSA).” Your results do show that narwhals were present in Milne Inlet/Koluktoo Bay while shipping is occurring. However, in order to investigate large scale displacement, the densities of narwhals need to be compared to the densities of narwhals before shipping started. It would be informative to compare the current estimates with estimates from	

#	Document Name	Section Reference	Comment	Baffinland Response
			before project-related shipping started. In addition, it would be interesting to link these comments to the results of the Integrated Narwhals Tagging Study where small scale displacements were documented.	
6	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.2 Narwhal Distribution Leg 2 – Open-water Season	Golder states that killer whales had not been observed in southern Milne Inlet area by the Bruce Head study team during 2013 to 2017 and that killer whales had not been observed by Baffinland aerial survey study teams in 2013–2015. DFO notes that there were reports of killer whales in the area during those years, with prolonged period in 2017.	
7	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.1 Visual Survey	For the survey of Milne Inlet South during the surveys 2 and 4 of Leg 1, the design of this strata does not meet the standard for distance sampling analysis. It seems like the intent for this strata design was to use surface density modelling. How was this strata analysed?	
8	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.1.1 Distance Analysis Table 2	Golder used published data for the availability bias correction factors. Did you consider using the data from the 2017-2018 tagging program? Given environmental changes that occurred since 2012, it is recommended to use the most recent data possible. Another approach would be to update the published correction factor with the more recent tag data.	
9	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.2.1 Narwhal	How was the 2 m depth determined? How did the photo trainer determine that some narwhals were below 2 m depth?	

#	Document Name	Section Reference	Comment	Baffinland Response
10	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	2.5.2.1 Narwhal	The availability correction factor usually takes into account water clarity (or murkiness) and the correction factor can be adjusted according to the depth at which narwhals can be seen. How was the information about the murkiness integrated into the abundance estimates?	
11	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.1 Visual Survey Data Characteristics - Narwhal	<p>Golder combined sightings from early shoulder season survey (Leg 1) and the open-water season survey (Leg 2) were used for estimating the detection function and mark-recapture detection probabilities for narwhal in Eclipse Sound. Golder's justification for combining the two was because of low sample size for the open-water period. Were the same observers present during the two sets of surveys? Do you have evidence to suggest that the detection function should be the same during the two legs of the survey? Could you use color coding on figure 27 to illustrate the sightings from the different legs?</p> <p>In Buckland et al 2001, p.14 section 1.5.1, it is suggested that a sample size of 60-80 should be sufficient to determine the detection function.</p> <p>Buckland, S.T., Anderson, D.R., Burnham, K.P., Laake, J.L., Borchers, D.L., and Thomas, L. 2001. Introduction to distance sampling: estimating abundance of biological populations. Oxford University Press, USA, Oxford</p>	

#	Document Name	Section Reference	Comment	Baffinland Response
12	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	3.2.5.2 Photographic Survey Data Characteristics Figure 40-41	Have you tried to fit linear detection function to the photographic data? The default function in distance sampling assume a shoulder at the track line but it might not be the case for oblique photos.	
13	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	4.1 Narwhal Abundance	<p>For their stock assessment, DFO aims at conducting the aerial survey between Aug 1 and 24 (Watt et al. 2015). Narwhals tend to start migrating around August 25 when they tend to make more extensive movement and change their dive behaviour (Dietz et al. 2001, Heide-Jørgensen et al. 2002, Heide-Jørgensen et al. 2003, Dietz et al. 2008,). It should be noted that it is possible that the abundance estimate from Aug 25-27 include narwhals from other stocks that have started their fall migration.</p> <p>Watt, C.A., Marcoux, M., Asselin, N.C., Orr, J.R., and Ferguson, S.H. 2015. Instantaneous availability bias correction for calculating aerial survey abundance estimates for narwhal (<i>Monodon monoceros</i>) in the Canadian High Arctic. Canadian Science Advisory Secretariat Res. Doc. 2015/044.</p>	
14	REPORT 2019 Marine Mammal Aerial Survey Mary River Project	Appendix C. Power analysis 1.0 POWER ANALYSIS - METHODS	This analysis assumes that the coefficient of variation (CV) of future surveys will be similar to the CV of this current survey. As noted above, the 0.05 CV for Eclipse Sound in this current survey is very low and future surveys will likely have a higher CV. It would be helpful to run the power analysis with different values for CV.	

Name: Marianne Marcoux, Jacquie Bastick

---

Agency / Organization: DFO/PCA

---

Date of Comment Submission: June 19<sup>th</sup>, 2020

---

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 Bruce Head Shore-based Monitoring Program	General comment	It would be useful to see results integrated with those from other Baffinland marine monitoring programs. For example, how do the responses of tagged narwhals compare with received sound levels from the PAM data? How do observations from Bruce Head compare to observations of narwhals tagged in the 2017-18 integrated tagging study? Or with CPA and behavioural data from the SBO program?	
2	2019 Bruce Head Shore-based Monitoring Program	Executive Summary- Relative Abundance and Distribution And 7.0 SUMMARY OF KEY FINDINGS Relative Abundance and Distribution	It is suggested that the year 2014 is used as a reference. However, according to table 5-2, there were 13 one-way transits recorded in 2014 during the study period. It might be more helpful to compare the number before any project related shipping occurred. In addition, given the variability in narwhal densities between years, it might be helpful to use an average as baseline instead of data from a single year.	
3	2019 Bruce Head Shore-based Monitoring Program	4.4.1.2. Automatic Identification System (AIS) data	BIM has changed the distance of “potential vessel effects” from 15 km to 10 km based on the <i>2017-2018 Integrated Narwhal Tagging Study - Technical Data Report data report</i> . However, in the tagging report, there is no test for the 15 km threshold. It might be worth investigating different distance thresholds.	



#	Document Name	Section Reference	Comment	Baffinland Response
4	2019 Bruce Head Shore-based Monitoring Program	4.4.1.8 Data Filtering	It is mentioned that cases with 200 or more narwhal within substratum (3 cases) and cases where group size was <20 narwhal (18 cases) were removed. Do you believe these data points are accurate or are they the result of observer error? If they are real, would it be possible to use a different distribution (data transformation) in your models to accommodate for large data points?	
	2019 Bruce Head Shore-based Monitoring Program	4.4.2.3 Relative Abundance and Distribution	Can you provide more detail about the spatial auto-correlation structure?	
	2019 Bruce Head Shore-based Monitoring Program	5.2.1 Baffinland Vessels and Other Large/Medium-Sized Vessels Table 5-2	50% of the 1-way vessel transits were recorded by observers during the Bruce Head survey period. Would it be possible to increase the percentage of transits observed? It would be beneficial to observe during the entire shipping season to see if there are different impacts at the beginning and end of the season (e.g.: during icebreaking) than only during open-water season.	
	2019 Bruce Head Shore-based Monitoring Program	7.0 SUMMARY OF KEY FINDINGS	As mentioned in the comment below, it would be helpful to include some information about the power analysis here to help interpret non-significant results.	
	2019 Bruce Head Shore-based Monitoring Program	Appendix E. Power Analysis	The power analyses are helpful to put the results in perspective. For example, with the current data, it is very difficult to detect changes in narwhal abundance related to the change in number of vessels from one to more than one. For some analyses, the data was not sufficient to detect any effect. Tables 1 and 2 are great tools to understand and interpret the analysis. We encourage BIM to produce these types of power analysis in the future. In addition, it would be helpful to include Tables 1 and 2 in the main document.	

Name: Kim Howland, Sarah Bailey, Jacquie Bastick, Chantal Vis, Alexandra Sorckoff

Agency / Organization: DFO/PCA

Date of Comment Submission: June 21, 2020

#	Document Name	Section Reference	Comment	Baffinland Response
1	2019 MEEMP and AIS Monitoring Program	3.1.7.2 Fish Surveys  4.1.7.1 Catch Data	<p>Sampling in 2019 was largely completed at the end of July and the end of August, with limited sampling occurring between these events (pgs 28-32). DFO notes that in the 2018 MEEMP Report, sampling occurred more frequently between the end of July and the end of August (2018 MEEMP AIS Report, Section 3.1.5.2, pgs 23-25). As demonstrated in Table 4-23 of the 2019 MEEMP, the total number of fish caught and the total number of fish species caught was lower in 2019 than in 2018.</p> <p>What factors influenced the frequency and timing of fish sampling in 2019? Consistency in sampling methodology and frequency each year will better allow for any potential effects to fish community structure from the construction and operation of Milne Port to be detected, and will allow for better comparison of data.</p>	
2	2019 MEEMP and AIS Monitoring Program	General Comments	Baseline is not well established (they often compare to data when the project had already started or only one year of baseline data), and to use CCME guidelines (where available) as baseline or level to stay below and conclude no significant effects is something that should be discussed; these guidelines are set for southern areas, already influenced by many decades of industrialization/pollution, not for pristine Arctic environments.	
3	2019 MEEMP and AIS Monitoring Program	Pdf p 5/1149 and pdf pp 117-118/1149 (Marine Water Quality section)	For marine water quality, the conclusion that there has been no increase in iron is based on the result that iron concentrations in 2019 were no different from those in 2015-2018 (years in which the mine was already operational). As the mine was operational during those years, this cannot serve as a baseline. The comparison might be made with other areas for which water quality data is available.	
4	2019 MEEMP and AIS Monitoring Program	General Comments	Results - Are there any visuals (graphs or charts) that illustrate trend over time of the various parameters for the MEEMP? While there is lots of textual description and comparison to CCME guidelines, it may be beneficial to also see the actual trends so it is clear what is decreasing/increasing/staying the same compared to the actual baseline conditions. This could then be followed by all the textual discussion and comparison of actuals to guidelines etc.	
5	2019 MEEMP and AIS Monitoring Program	Pdf p 198 /1149 (first bullet, water quality)	It is indicated that measured concentrations were “generally consistent” with previous years and CCME guidelines. However, this is not the same as “entirely consistent”. Were there significant differences? If so, in what and to what degree and why?	
6	2019 MEEMP and AIS Monitoring Program	Pdf p 188/1149 (section 5.2.6)	It is stated that diving on a ship’s hull to conduct specimen collection can be severely hazardous in an active port. Diving may be done elsewhere in Canadian ports. Can those safety protocols be adopted?	
7	2019 MEEMP and AIS Monitoring Program	Pdf p 185/1149 (section 5.2.2)	This section identifies 5 examples of potentially A/NIS and flags them for further review. Do we have a sense of how rapidly this review will occur as, if there is delay in this, there may be a danger of the species becoming established if indeed it is invasive. Is this where there should be a better link to a rapid response program?	
8	2019 MEEMP and AIS Monitoring Program	AIS Monitoring Program  3.2	<p>Multiple references that Casas-Monroy et al. (2014) was used as a definitive list of invasive species in Canada (e.g. Executive Summary, AIS Zooplankton section).</p> <p>Please note that the Casas-Monroy list is a subset of Molnar et al. 2008 data, limited to those species listed by Molnar from ecoregions connected to Canada by ship traffic during the period of study, with some species removed when recognized as being native to Canada. This reference is not an exhaustive list of existing or potential species considered invasive to Canada. As the reference is a subset of Molnar et al, it may be best to retain only the references to the Molnar study and remove the citations to Casas-Monroy completely to avoid misunderstanding.</p> <p>While using global AIS lists such as Molnar can be informative, they are not exhaustive, and quickly become outdated. Criteria used to determine status of a species as nonindigenous and/or invasive should follow that of Goldsmit et al 2014 and Dispas 2019 who used a process of cross referencing with comprehensive historical native species occurrence data to identify species that are new to a given ecoregion or to the Canadian Arctic more generally. All NIS should be treated as having potential to become invasive given the uncertainty as to how they may spread once introduced to a new region.</p>	

#	Document Name	Section Reference	Comment	Baffinland Response
9	2019 MEEMP and AIS Monitoring Program	3.2.6 Ship Hull Monitoring Methods	<p>It is not clear how the ships were selected for hull monitoring. Recommend that ships are selected based on age of anti-fouling paint/time since last dry-dock aiming to survey ships that have not recently been painted or cleaned. Together with the above factors, greater time spent in previous ports of call, and greater number of regions visited since last cleaning have also been shown to be associated with increased extent of fouling and could be used to select vessels for monitoring (e.g. see Sylvester eta l. 2011).</p> <p>DFO recommends identification of factors influencing biofouling risk of vessels calling on Milne Port through a validated risk assessment, however this would require initial sampling from a subset of vessels to assess of percent cover and physical collection of organisms in a representative, standardized and comprehensive manner (including both hull and niche areas) that will allow for identification of non-native species that may be transported through project shipping (DFO 2020).</p>	
10	2019 MEEMP and AIS Monitoring Program	3.2.6 Ship Hull Monitoring Methods	The methods for the surveys are insufficient to understand what was surveyed on each ship. A standardized, stratified survey design should be implemented for consistency, such as used by Sylvester & MacIsaac (2010) Diversity & Distributions 16(1).	
11	2019 MEEMP and AIS Monitoring Program	4.2 accumulation curves  3.2.1	<p>The use of accumulation curves is good, but given that the curves are based on samples collected over 3 days, they may underestimate seasonal diversity. Caution should be used in the interpretation of the asymptote for curves based on a ‘single’ point in time. i.e. sampling may have been sufficient for that point in time, but underestimate of annual diversity over multiple seasons of the year.</p> <p>Plankton are well known to exhibit high seasonal variability in both abundance and species richness (e.g., McKinstry and Campbell 2018 and references therein). This has been well demonstrated in surveys of other Canadian Arctic ports where variability in density and species richness across months was found to greatly exceed variability among sites at a given port (Dispas 2019). Sampling at regular intervals over a 3 month period versus overs a two week window resulted in a 40% increase in species richness (Dispas 2019). Collection of more frequent plankton samples (at least once/month during open water season when plankton are blooming) is recommended to improve baseline coverage of species that may be present.</p> <p>We note that some of the oblique tows are being done with a 64um net and have concerns that there may be a bow wave created with such a small mesh size which could bias results. This method is best suited to larger mesh nets for capturing larger faster swimming zooplankton and ichthyoplankton. Overall densities of plankton in the oblique hauls are unusually low (suggesting there may be a problem in the way the net is being towed an or bow wave effects.</p>	
12	2019 MEEMP and AIS Monitoring Program	4.2.6	113 minutes of video footage across five ships is very small and may be inadequate to assess fouling coverage adequately, noting that previous studies have taken between 1-3 h per ship (e.g. Sylvester & MacIsaac (2010)).	
13	2019 MEEMP and AIS Monitoring Program	4.2.6 Table 4-46	While the methods section 3.2.6 indicated that much effort was focused on niche areas where biofouling was most likely to occur, this table shows only stern sections and one bow section were surveyed. Combined with the minutes of video footage, it appears the ROV surveys were insufficient to determine biofouling extent on any vessel.	
14	2019 MEEMP and AIS Monitoring Program	5.2.6	Identifications were insufficient due to use of video footage only. Addition of a biologist at the time the ROV is being operated is unlikely to improve the ability to acquire species-level identifications as normally a specimen would be required. ROV technology is currently suitable only for assessing % coverage. Divers in the water are needed to obtain specimens for species level identifications. A combination approach could be used in the future to acquire specimens while minimizing diver time in the water.	
15	2019 MEEMP and AIS Monitoring Program	Executive Summary, Ship Hull Monitoring	The statement that <i>No NIS or AIS taxa were identified among biofouling species observed in ship hull surveys</i> is inappropriate for the executive summary considering the limited survey effort (minute of video footage) and the lack of specimen collection and species-level identifications. Similarly, the statement that most of ships’ surfaces were found free of biofouling may be an overreach, depending on the extent of hull surface actually surveyed.	
16	2019 MEEMP and AIS Monitoring Program	Executive summary MEEMP  2.2.1	DFO supports the 2019 modifications of extra sampling intensity for benthos and including sculpin in fish tissue sampling, however we would like to know rationale for why the 3 subsamples at each station were combined for a composite sample. It is unclear if this was only done for the Van Veen or the Ponar Grabs as well and unclear why 2 different grab methods were used. If subsampling is used there must be care that the sample is being split evenly from top to bottom so as to not bias results since the distribution of biota from the source to deeper sediments will vary.	
17	2019 MEEMP and AIS Monitoring Program	3.5.1	“Species from several major taxa groups were excluded from the dataset before data analysis because these are meiofauna and not reliably retained on 500 um mesh, or not strictly invertebrates”. Although removing these for the MEEP analyses seems reasonable, these species should be retained for the AIS program. Could BIM provide confirmation if this was done.	

#	Document Name	Section Reference	Comment	Baffinland Response
18	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Zooplankton  4.2.1	<p>It is reassuring to see that BIMs annual monitoring is able to pick up new species, demonstrating the benefits of regular monitoring, something which is not feasible in most areas of the Arctic. The specimen of <i>Obelia</i> from the zooplankton samples is of particular interest. This genus is rare in the Canadian Arctic, however, <i>Obelia longissima</i> is relatively common in the Eurasian Arctic and north Sea (Europe) – for example, of 1400 records in the GBIF biodiversity database, there are only 2 historical reports of specimens from the Canadian Arctic, one of which is at Canadian Museum of Nature; DFO has requested confirmation of the identity of this specimen. Based on NEMESIS database (<a href="http://invasions.si.edu/nemesis/jtmd/SpeciesSummary.jsp?taxon=Obelia%20longissima">http://invasions.si.edu/nemesis/jtmd/SpeciesSummary.jsp?taxon=Obelia%20longissima</a>), the species is thought to be spread via biofouling and considered exotic/cryptogenic in north pacific to Alaska and also listed as non-native to temperate northern Atlantic, however, references in NEMESIS should be checked carefully to confirm this. Type locality for species in Black Sea and Ireland suggesting possible origin in this region. Given the limited reports in Canadian Arctic and possibilities of introductions of this species from other northern locations, the specimen (s) found by BIM should be examined to see if the species can be confirmed and background on the species should be examined more carefully to evaluate if this species would be considered an NIS to the region. We note that recent specimens of <i>Obelia</i> spp. were also detected in port of Churchill (Dispas 2019) and Deception Bay (Goldsmid 2016). At least one of these collections has been preserved in ethanol which may allow for further examination of genetic affinities with populations elsewhere. Likewise records of <i>Hybocodon prolifer</i> in the Canadian Arctic are limited to a handful of specimens previously found in the port of Iqaluit, but there more frequent detections in northern Europe and the Bering Sea (GBIF, OBIS), suggesting this species should be examined more carefully and museum specimens from the Canadian Arctic verified to confirm previous identifications – there do not, however, appear to reports of the species being invasive or introduced elsewhere. In contrast to these two species, <i>Onisimus glacialis</i>, although not common, has been historically reported in a number of areas across the Canadian Arctic through multiple studies, providing better confidence that it is native to the region. Given the above comments, it may be misleading or premature to state that “<b>No NIS taxa were identified in zooplankton samples...</b>”. A statement that “<b>Further review of natural ranges and vectors of introduction are required to confirm NIS status</b>” similar to the statement regarding benthic infauna would be more appropriate.</p>	
19	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Benthic Infauna  3.2.2	<p>There is mention that benthic specimens identified as potentially non-indigenous were sent to Philippe Archambault’s lab for identification. Could Baffinland please provide a list of which species?</p>	
20	2019 MEEMP and AIS Monitoring Program	Executive summary AIS Benthic Infauna  4.2.2 4.2.2.1.1 4.2.2.1.2	<p>The identification of <i>Marenzelleria viridis</i> is interesting as this was a species identified as having potential risk for invasion to the Arctic and has been assessed and ranked in two a recent screening level risk assessments (Vizilli et al. submitted; Goldsmid et al. in prep). Although the Bim report suggests multiple specimens have been collected in the 80’s and 80’s, we found this species has had limited historical reports from the Canadian Arctic: one from an Imperial Oil consultant report (the same record noted in this MEEMP AIS report originally from Conover and Stewart 1978) near Baffin Island and 5 specimens (under the original synonym of <i>Scolecoplepides viridis</i>) from the Beaufort Sea area in 1980’s by Hopcroft (2016). The species was also reported in a recent survey at the community of Gjoa Haven (Brown et al. 2011). However, it should be noted that the genus <i>Marenzelleria</i> consists of five species, which are very difficult to discriminate by morphological characters alone (Blank et al 2008). This species (particularly older records) could be confused for <i>Marenzelleria arctica</i> which has recently been found in other locations in the Arctic so it is possible these isolated reports represent misidentifications of this closely related species (C. Conlon, Canadian Museum of Nature, pers. comm). We would suggest reexamination of specimens by a Polychaeta expert to verify if specimens found at Milne Inlet are indeed <i>M. viridis</i>, a species which has successfully invaded California, Scotland, the North Sea, and the Baltic Sea where it has reached high densities in its, and replaced native infauna/ altered sediment characteristics in some locations (NEMESIS; <a href="https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=-47">https://invasions.si.edu/nemesis/browseDB/SpeciesSummary.jsp?TSN=-47</a>). While formalin allows for better preservation of specimens, situations such as this point to the benefits of good preservation in ethanol which would allow for genetic barcoding as a potential option for verifying identity of morphologically challenging species such as this.</p> <p>While it is helpful to see descriptions of distributions for new species, Table 4-41 would be much more informative if the specific references associated with previously known distributions of <u>each</u> new species were given as another column. This would allow the reader to check references associated with individual species to better assess the quality of baseline data upon which a species designation is based. We request that the table be updated with this information in a similar fashion to how it is presented in supplementary tables of Goldsmid et al. (2014). Once this is done, we would like the opportunity to review each species in light of information contained in supporting references and any additional information that may be relevant. Likewise species found in previous years at the port and not included in 4-41 should also have clearly linked references to support their designations as native, invasive or cryptogenic, so as to have a cumulative list covering the life of the monitoring program.</p>	



#	Document Name	Section Reference	Comment	Baffinland Response
			<p>We would also like to know which of the species in 4-41 were validate in Philippe Archambault’s lab – we suggest this be included in the table or tracked somewhere in the document and associated database. Will specimens that could not be identified to species also be sent to experts either from the Archambault lab or to another lab with expertise in the respective taxonomic groups? We recommend this be done as specimens in 2018 that were not identified to species by Biologica, were in some cases be identified by another lab (Archambault’s lab).</p> <p>We checked distributions for <i>Lineas</i> and could not find evidence of the genus occurring anywhere in the Arctic aside from one record in Alaska. The genus appears widespread elsewhere, particularly in northern Europe, suggesting it could be a potential NIS. We suggest having this specimen verified, examining potential vectors and checking its known distribution carefully to evaluate status.</p> <p>We are pleased to see there will be further work to validate specimens of Moocrophium by a third lab given uncertainties and the potential for this species to be non-indigenous. We would be interested to know which sites this species was found at in 2019 and whether it appears to have spread from the original site near the ore dock. Are there any plans for response to manage/contain this species?</p>	
21	2019 MEEMP and AIS Monitoring Program	Executive summary AIS macroflora and benthic epifauna  4.2.3	<p>Given the difficulty in identifying taxa to species level with video surveys the that <b>“No NIS or AIS tax were identified...”</b> is misleading. Rather there should be acknowledgement that these methods are not suitable for identifying most taxa at the level needed for proper assessment of their status as native or introduced and that improvements are needed. We recognize that BIM is working toward improving methods for sampling of epifauna to include more specimen-based collection and encourage them to continue these efforts.</p> <p>Further we note that of the following taxa identified to species may be NIS based on known distributions:</p> <p><i>Pecten albicans</i> was not mentioned, but a search of global data bases (ARMS, GBIF, OBIS) shows that this species only occurs in Japan. There should be verification of footage to determine if this species identification is correct as it would be considered an NIS with potential to compete with other scallop species in the area.</p> <p><i>Polycarpa pomeria</i> is a species with a strictly European distribution and other species of <i>Pomaria</i>, while more widely distributed have not been documented anywhere in the Arctic with the exception of northern Europe suggesting this species may be an established NIS given that it was previously observed in benthic infauna samples (2018). Video footage as well as specimens should be verified by a tunicate expert to validate if these identifications are correct.</p>	
22	2019 MEEMP and AIS Monitoring Program	Executive summary AIS encrusting epifauna  4.2.4	<p><i>Circeis americana</i> is not listed in either of the sources mentioned to have been used as references supporting a known Arctic distribution for this species. A quick search in global databases (OBIS, GBIF) shows it has only been reported on one occasion recently (2008) in Churchill, the area of highest shipping in the Canadian Arctic at that time. It is interesting to see it reported in Milne inlet for the first time and should be investigated more carefully to better understand it distribution and to confirm identity of specimens found on settlement baskets.</p> <p><i>Patinella verrucaria</i> was only found in the ARMS database reference that is cited in the report (Sirenko etal. 2020), but distribution is shown to be on the Atlantic coasts of north America and Europe, not the Canadian Arctic or elsewhere in the Arctic. A search of global databases (GBIF, OBIS) show this (and the synonym <i>Lichenopora verrucaria</i>) to have been found elsewhere in the Canadian Arctic in a range of locations, although the species does not appear to be commonly reported.</p> <p><i>Gonothyraea</i> was not found in any of the cited references, however a search of OBIS and GBIF showed it to be found in a few locations within the Arctic with generally limited distribution information globally.</p> <p>We suggest updating the references to only include those that support statements in the text.</p> <p>We would like to confirm if unidentified species (those only identified to genus) will be given to other experts to try and identify these to the species level.</p> <p>Further, given the above notes, it may be misleading or premature to state that <b>“No NIS taxa were identified in encrusting epifauna samples...”</b> in the executive summary until <i>Circeis americana</i> is investigated further. A statement that <b>“Further review of natural ranges and vectors of introduction are are required to confirm NIS status”</b> similar to the statement regarding benthic infauna would be more appropriate.</p>	

- McKinstry, C.A.E., and R.W. Campbell. 2018. Seasonal variation of zooplankton abundance and community structure in Prince William Sound, Alaska, 2009–2016. *Deep Sea Research Part II* 147:69-78
- Blank, A. LAINE, K. JUSS, AND R. BASTROP. 2008. Molecular identification key based on PCR/RFLP for three polychaete sibling species of the genus *Marenzelleria*, and the species' current distribution in the Baltic Sea. *Helgol. Mar. Res.* 62: 129–141.
- Conover & Stewart. 1978. Marine benthic invertebrates of the Southern Davis Strait and Ungava Bay. Arctic petroleum operators association projects, Report for Imperial Oil Ltd, Aquitaine Co. Of Canada Ltd. And Canada cities services Ltd.
- DFO. 2020. Science Review of Additional Documents submitted October 8, 2019 – January 8, 2020 for the Final Environmental Impact Statement Addendum for the Baffinland Mary River Project Phase 2. DFO Can. Sci. Advis. Sec. Sci. Resp. 2020/018.
- Dispas, A. 2019. Étude de référence sur la biodiversité du mésozooplancton dans quatre ports de l'arctique canadien en vue d'une augmentation de l'activité maritime, de l'exploitation des ressources et du réchauffement climatique. MSc. Thesis, Université du Québec À Rimouski. 146 p.
- Goldsmith, J., Howland, K. L. and Archambault, P. 2014. Establishing a baseline for early detection of non-indigenous species in ports of the Canadian Arctic. *Aquatic Invasions* 9: 327-342.
- Hopcroft R (2016). Macrobenthos and Meiobenthos Tuktoyaktuk Harbor and Mason Bay 1985-1988 NOGAP. Conservation of Arctic Flora and Fauna. Occurrence dataset <https://doi.org/10.15468/9wnx7f> accessed via GBIF.org on 2020-06-20.
- Sylvester, F. & MacIsaac, H. 2010. Is vessel hull fouling an invasion threat to the Great Lakes? *Diversity and Distributions*, 16, 132– 143.
- Sylvester F, Kalaci O, Leung B, Lacoursière-Roussel A, Clarke Murray C, Choi FM, Bravo MA, Therriault TW, MacIsaac HJ. 2011. Hull fouling as an invasion vector: can simple models explain a complex problem? *J Appl Ecol* 48:415–423.