

Hamlet of Pond Inlet

Response to Golder, Technical Memorandum, Reference No. 1663724-285-TM-Rev1-48000 PRELIMINARY SUMMARY OF 2020 NARWHAL MONITORING PROGRAMS

INTRODUCTION

The Hamlet of Pond Inlet is responding to this Technical Memorandum, given its concern for food security as well as the cultural, social and personal well-being of residents of the community. Given the central role that narwhal play in the life of the community, Mittimatalingmiut culture and well-being - both physical and social - the content of this report is of great importance to the Hamlet.

This Memorandum has been reviewed for us by the Hamlet's Technical Advisor. We agree that there are likely a number of factors contributing to the decline in the number of narwhal. We are submitting this to assist both NIRB and Baffinland in decisions to be made and actions to be taken. At the same time we take issue with some of the conclusions and assumptions made in the document.

The Hamlet acknowledges the work put into this report by Golder, working for Baffinland. We appreciate the way it has been written. It is clearly written, well-organized and helpful to our understanding about what is happening to narwhal and Baffinland's response to the current situation.

The results of the monitoring program undertaken by Baffinland reveal a very serious decline in the number of narwhal found in Milne Inlet and Eclipse Sound during the summer of 2020.

RESULTS OF THE 2020 SURVEY

Data is available for surveys conducted in Eclipse Sound, Milne Inlet and Admiralty Inlet. Table 2 (p.6) shows 2020 'Abundance Estimates for Eclipse Sound and Admiralty Inlet Summer Stocks'.

Table 2: Historical Abundance Estimates for Eclipse Sound and Admiralty Inlet Narwhal Summer Stocks

Stock	Year	Abundance	CV	95% CI	Source
Eclipse Sound	2013	10,489	0.24	6,342–17,347	Doniol-Valcroze et al. 2015
Eclipse Sound	2016	12,039	0.23	7,768–18,660	Marcoux et al. 2019
Eclipse Sound	2019	9,931	0.05	9,009–10,946	Golder 2020
Eclipse Sound	2020	5,018	0.03	4,736 – 5,317	Golder 2021a
Admiralty Inlet	2013	35,043	0.42	14,188-86,553	Doniol-Valcroze et al. 2015
Admiralty Inlet	2019	28,746	0.15	21,545-38,354	Golder 2020
Admiralty Inlet	2020	31,026	0.14	23,406-41,126	Golder 2021a
Eclipse & Admiralty	2013	45,532	0.33	22,440–92,384	Doniol-Valcroze et al. 2015
Eclipse & Admiralty	2019	38,771	0.12	30,667–49,016	Golder 2020
Eclipse & Admiralty	2020	36,044	0.12	28,267–45,961	Golder 2021a

The results show a significant decline in narwhals in Eclipse Sound. The number of narwhals, estimated at 5,018, is a decline of almost 50% from the number recorded in 2019. This is also approximately 42% of the number recorded in 2016.

The number of narwhals in Admiralty Inlet increased slightly by about 7.5% from the numbers recorded in 2019, but the increase does not account for the decline in Eclipse Sound. Displacement from Eclipse Sound to Admiralty Inlet, where numbers increased from 28,746 in 2019, to 31,026 in 2020, accounts for only about 53% of the decline in the Eclipse Sound population. This assumes displacement from Eclipse Sound to Admiralty Inlet.

Estimates of narwhals taken at Bruce Head, Milne Inlet, are consistent with aerial survey results from Eclipse Sound. These are based on the average number observed per hour over observation periods for the years in question (standardized by effort). They show a decline from 126.7 narwhal/hour in 2019, to 47.5 narwhal/hour in 2020 (p.7). This is a decline of 62.5%. In comparison to 2016, when 178.0 narwhal/hour were recorded, this is a decline of 73.3%.

These figures suggest there has been a very significant decline in the narwhal population of Eclipse Sound and Milne Inlet that cannot be accounted for by displacement to Admiralty Inlet. The results are significant given the narrow 95% confidence interval – an estimate of the accuracy of the results – associated with the 2020 aerial survey of narwhals in Eclipse Sound.

Baffinland states that: “These results suggest either potential displacement of a portion of the Eclipse Sound stock to the Admiralty Inlet summering ground during the summer of 2020, a potential displacement of these animals to another area (e.g. Eastern Baffin Bay summering ground), or a potential decrease in the Eclipse Sound summer stock.” The Hamlet agrees with this conclusion.

WHAT MIGHT EXPLAIN THESE RESULTS?

The report done for Baffinland by Golder suggests 5 considerations that might explain these results. These are:

- (1) Ice conditions early in the season, affecting the entry of narwhal into Eclipse Sound.
- (2) Ship noise and ice-breaking by Baffinland.
- (3) Noise generated by pile driving for the dock installation at Pond Inlet.
- (4) An increased number of orca whales in Eclipse Sound and Milne Inlet.
- (5) Effects of climate change.
- (6) Other considerations, including food availability.

In what follows we consider and discuss each of these possibilities.

Ice Conditions

Information provided to Baffinland by Golder (Technical Memorandum p.12) notes that sea ice was more concentrated in the study area in 2020 compared to 2019. This was early in the season when narwhal would normally be entering Eclipse Sound.

Narwhal distribution was different between 2019 and 2020 because of these ice conditions. As a result, and because sea ice was not fragmented as it had been in 2019, narwhal were more concentrated in the ice leads of Eclipse Sound. However, Golder notes that with regard to other areas, "Narwhal distribution in the Baffin Bay and Pond Inlet strata was similar between 2019 and 2020, with narwhal dispersed throughout the open water".

There is nothing in the Technical Memorandum to confirm that ice conditions played a role in diverting narwhal to other locations. This is presented as a possibility. It is noted that the concentration of narwhals in the ice leads of Eclipse Sound was greater than has been the case in previous years. The distribution of narwhals in Baffin Bay and the Pond Inlet strata was similar to 2019. (p.13)

Research, however, suggests that narwhal select their habitats in relation to elements critical to their survival. This suggests that narwhal may be inclined to 'put up' with anthropogenic circumstances that are less than ideal in order to meet immediate and important needs. They will do this, if necessary, in the presence of an activity like ice-breaking that may be stressful and have longer term implications for their health and well-being.

For example, the measurement of ocean depths (bathymetry) in relation to the presence of narwhal reveals that they will congregate in areas and depths at which prey are found, and that this is of greater importance to determining location and habitat than ice concentration or floe size (Kenyon et al., 2018). In other words narwhal are strongly committed to areas where species on which they feed are found (Greenland halibut, for example). It is possible that narwhal stay and return to leads despite an ice breaker passing, as that area has resources critical to their survival.

Research conducted by Kenyon et al (2018) in Admiralty Inlet, suggests that within mobile pack ice, narwhal do not show a preference to sea ice thickness, floe size, and concentration. This suggests that the relationship of narwhal to sea ice and ice-breaking is likely more complex than what is indicated in the Technical Memorandum. As Kenyon et al suggest, climate change and changes in sea ice cover are likely to have implications for narwhal populations.

More information could have been gathered from Elders and hunters as to whether or not being concentrated in ice leads early in the season, might play any role in dispersing narwhal to other summer grounds. (i.e. they give up on entering Eclipse Sound). IQ might also have provided insights into the behaviour of narwhals confined to ice leads in relation to food sources and the presence of killer whales. The decline in the number of narwhals is consistent with observations made by Mittimatalingmiut hunters.

Shipping and Ice-Breaking

Shipping and ice-breaking introduce new sources of under-water anthropogenic noise to the waters of Eclipse Sound and Milne Inlet. The issue is whether these sounds affect narwhal and if so, what is the severity or nature of the effect. Baffinland notes that the results of its 2020 monitoring suggest that recorded sounds from Baffinland icebreaking were 10-20 dB lower than originally modelled and that consequently, the 120 dB exposure durations are 60-90% lower than predicted (Technical Memorandum, p.1). According to Golder, the ice-breaker MSV *Botanica* periodically produces high intensity sound lasting several minutes or less (p.9)

While the current Technical Memorandum focuses on ice-breaking, this activity involved the escort of ore carriers and tugs. The issue is noise levels made by ships. Claims about noise levels made in the Technical Memorandum, and elsewhere, should be examined in relation to the results of a recently released study on vessel noise and impacts that includes attention to Milne Inlet and Eclipse Sound.

This exhaustive study and the results do not deal with ice-breaking, but deal with ship noise and effects on marine mammals, including narwhal. It was published recently in *Marine Policy* by Kochdnowicz et al., "Using western science and Inuit knowledge to model ship-source noise exposure for cetaceans (marine mammals) in Tallurutiup Imanga (Lancaster Sound), Nunavut, Canada" _available online 8 May 2021. The conclusion reached, based on data for the period 1993-2017, was that: "The highest potential behavioural disturbance events for narwhals occurred in Eclipse Sound and Milne Inlet, both in cetacean utilisation distribution areas (identified by western scientific knowledge) and in Inuit-identified cetacean-populated areas (identified by Inuit knowledge)" (p.12).

The Nunavut Impact Review Board might be well-advised to ask a third party to examine the research conducted by Baffinland and conclusions with regard to the impact of ship noise - including both ore carriers and ice-breakers – and the results reported by Kochdnowicz et al, (2021), as a way of reaching an informed conclusion about the likely impact of ship noise on narwhal in Eclipse Sound and Milne Inlet.

As noted below, the Hamlet's concern is not restricted to the direct impact of emitted noise on narwhal, but the indirect effect on narwhal as a result of the impact of sound from ship passage and ice-breaking on the soundscape of the marine environment of Milne Inlet and Eclipse Sound. Introducing these anthropogenic noises changes the soundscape, and could disrupt the behavior and life processes of other marine organisms with systemic implications for narwhal and other species. Duarte et al., (2021), note that while there has been a long-standing recognition of the effects of anthropogenic noise on terrestrial systems, we are only starting to understand the effect of changing ocean soundscapes on marine animals. The Duarte et al (2021) review of the literature on the topic is extensive, with evidence showing that "the impacts of human alterations to ocean soundscapes are pervasive across all ocean areas and detrimentally affect marine life (p.7).

Golder has quantified Baffinland's ice-breaking for 2018, 2019 and 2020 for purposes of comparison. It has noted the lengths of time that ice-breaking took place in heavy ice conditions ($\geq 9/10$ ice cover). In

2018 this took place for 8 days, for 3 days in 2019, and for 6 days in 2020. Ice-breaking in heavy ice took place for twice as many days in 2020 (6 days) as in 2019 (3 days).

Ice-breaking in heavy ice took place for 8 days in 2018. The total hours in 2020 for ice-breaking in heavy ice were twice as many as they had been in 2019, (22 hours versus 11 hours). In 2018, 56 hours were spent ice-breaking in heavy ice conditions. The distance travelled to break heavy ice was also considerably more than in 2019. In 2020, 22 hours were spent breaking heavy ice.

The difference between 2018 and 2019/2020 is explained, in part, by ice-breaking transit restrictions applied after the 2018 shipping season and in response to the observation of hunters on the number of narwhals in Eclipse Sound and Milne Inlet. (Technical Memorandum, p.13)

The Technical Memorandum discusses the relationship between narwhal behaviour and ice-breaking. The text includes observations from ice-breaking for the Nanisivik Mine in Admiralty Inlet (Finlay, 1990), a study by LGL and Greeneridge (1986), and observations by Baffinland in 2019 and 2020.

Golder suggests that the observations made by Finley are of a startle response, given that some narwhals returned to the area in which ice-breaking had occurred, a few days later. How many is unclear. They were reported to have engaged in “normal diving and foraging behaviour” (p.14).

On 21 July, 2020, the ice-breaker *Botnica* escorted two ore carriers and two tugs through a large, consolidated ice field in North Milne/West Eclipse Sound with several narrow ice leads occupied by a large number of narwhals (Technical Memorandum, p.14). The observations made on the effect of these transits on narwhals don't support any particular conclusion on the effects of ice-breaking on narwhal behaviour, or their concentration in leads.

The research and information available on the effects of ice-breaking on narwhals is ‘thin’ at best. The number of variables intersecting with narwhals’ response to ice-breaking is potentially many. These are not discussed. Golder has, as true elsewhere, placed an emphasis on narwhal response to one sensory input – directly received ship noise.

It is possible, with regard to shipping, and in this instance with regard to ice-breaking, that a number of intersecting variables account for what may be highly variable and ‘difficult to predict’ responses. For example, narwhals may not relocate from ice leads when an ice-breaker is approaching or in their vicinity, because of limited options at the time for relocation, and considerations unknown to an observer. Under these circumstances, the effect may not be obvious from any change in behavior, but may be a matter of increased levels of stress and anxiety.

For this reason, a continuation of the study conducted by Watt et al. (2020) to examine cortisol levels in narwhal blubber would contribute to a more holistic understanding of the effect of shipping and ice-breaking on narwhal health. There is reason to believe that the relationship of ship noise to narwhal behavior is more complicated than what is shown by historical research on the topic.

Narwhals may respond, in terms of behaviour or disposition, to other sensory inputs; the movement of surface ice, and movements of surface and subsurface water. Whether or not they return to an area after the passage of an ice-breaker may be related to foraging and a trade-off made between the value of a resource upon which they depend, relative to the level of danger suggested by what they have experienced.

As noted later in the text, it may be that the response of narwhal to ice-breaking and ship passage is an indirect one. Underwater soundscapes can be incredibly noisy, a product of the calls and sounds produced by other mammals and species in any particular environment. These species may be able to detect and react to that which narwhal cannot hear. Changes in the location or calls of other whales or species that narwhal can detect, may affect narwhal behaviour and act as a secondary trigger. In other words, the impact of anthropogenic noise, such as that generated by a ship or ice-breaker, may be indirectly received by narwhals and marine species, responding to the response of, and changes in the behaviour of other species directly affected. Their response may alter the soundscape in a manner detected by narwhal (and other species) and it is this altered soundscape to which they then respond.

Research suggests that marine soundscapes are used by species in all levels of food webs. While marine mammals are often the main focus of noise research in marine environments, lower trophic levels also depend on sound for critical life processes. A meta-analysis of 42 studies and 2,354 data points, “Sound the alarm: A meta-analysis on the effect of aquatic noise on fish behaviour and physiology”, (Cox et al., 2018) lends support to a large number of studies documenting the impact of noise in aquatic environments on fish behaviour. If ship noise has implications for narwhal prey, it obviously has implications for the behaviour, location and distribution of narwhals.

For these reasons, and given the concerns of hunters and elders and opposition by the MHTO to ice-breaking, the Hamlet’s support for the MHTO position on ice-breaking is well-founded. While the Hamlet respects and appreciates the research and observations made by Golder, working for Baffinland, it also recognizes the limitations.

Pile-Driving and the Pond Inlet Wharf

Baffinland has devoted a great deal of its report on narwhals to the results of a monitoring report on a marine infrastructure project, prepared for Fisheries and Oceans Canada by the consulting firm Advisian. The project is the responsibility of the Government of Nunavut and is led by Community and Government Services, with the GN Department of Economic Development and Transportation having responsibility for the wharf when it is completed. The open water season of 2021 will be the last season for construction activity.

The Hamlet of Pond Inlet understands and appreciates the reasons that Baffinland has appended the report by Vancouver-based consultant Advisian, on the 2020 construction season for this project, to its submission to NIRB on narwhal as Attachment 2.

The Hamlet is greatly concerned about the findings and the lack of oversight and enforcement that has apparently accompanied this construction project. The resulting disturbance has complicated the monitoring and observations on narwhals important to the hearing process and the recommendation on Baffinland's Phase 2 proposal by the Nunavut Impact Review Board. The Hamlet acknowledges that this complicates the assessment of Baffinland's ice-breaking and shipping activity on narwhals.

The result has seriously disadvantaged the community and its interests. This is the result of the construction company, Tower Arctic Ltd., failing to follow all of the mitigation measures put in place to minimize project impacts on marine mammals and the marine environment, and taking a rather 'haphazard' and less than professional responsibility for the mitigation measures that were put in place to address potential effects on the marine environment.

The report submitted by Advisian is detailed. What is included here is a brief summary of Baffinland's concerns that pile-driving may have played a role in affecting the presence of narwhals in Eclipse Sound and Milne Inlet in the 2020 season. Baffinland cites research by Tougaard et al., 2009, Brandt et al., 2001, and Madsen et al., 2006, in noting the possibility of the impulsive noise associated with pile-driving being transmitted over long distances and having the potential to disrupt marine mammal behavior.

Underwater noise recordings made for Baffinland during the 2020 early-shoulder and open-water seasons, recorded sounds that are similar to those generated by pile-driving. These corresponded to the time that pile-driving was taking place as part of harbour and wharf construction – from 8 July to 28 August, 2020.

The Technical Memorandum takes note of the following:

- Until August 28, 2020, impact driving methods were used for pile-driving instead of the vibratory methods that had originally been proposed. Vibratory methods generate less noise and have a different impact on marine mammals.
- As a result, underwater noise thresholds were exceeded when pile-driving took place (p.22).
- Proper monitoring of noise thresholds was not done.
- A bubble curtain was supposed to be installed to dampen the transmission and effect of noise. This was not properly installed, and was abandoned as a means of mitigating the effects of sound. A decision to then made to reduce the drop height for doing pile driving by 50% so as to generate less noise. This decision was not implemented.
- When pile-driving is taking place, a 'soft start' can be used to give marine mammals time to move away from the area before full-scale pile-driving that might harm marine mammals is done. A soft-start means that full weight is not brought down on the pile for an appropriate initial period of time. This was not always done (p.23).

Golder suggests that the resulting noise “traveled over distances of tens of kilometers, and that the resulting noise field generated by this activity likely extended across Eclipse Sound during the migratory period and in areas overlapping with established calving/nursing grounds for the Eclipse Sound narwhal stock” (Technical Memorandum p.23). The extent that the sound traveled and decibel levels, are indicated in the map found on page 26 (Figure 13) of the Technical Memorandum. However, the location of established calving/nursing grounds for the Eclipse Sound narwhal stock, are not indicated.

Golder cites literature noting that the impact of pile-driving on seal and behavioral consequences are minimal (Technical Memorandum, p. 27).

Mittimatalingmiut have noted that the construction activity has had a serious impact on the presence of Arctic Char in the vicinity of the community.

Golder notes that no studies have been conducted on the effects of impulse noise on narwhal, but some research has been done on other arctic marine mammal species (Technical Memorandum, p. 27). The Hamlet agrees that the noise generated by pile-driving may have had a role to play in explaining the reduced number of narwhal surveyed during the 2020 open-water season. The observations made by Baffinland are suggestive, while not being conclusive.

The Hamlet is asking DFO and NU Community and Government Services to meet with the Hamlet to:

- (1) Explain how and why the violations of mitigative measures set up to protect the marine environment were allowed to persist over such a long period of time, and why these matters were not addressed in a more effective and timely manner.
- (2) Explain why these difficulties were not clearly communicated to the Hamlet.
- (3) Outline steps to be taken during the final 2021 construction season to ensure that these problems and violations of mitigative measure have been, and will be addressed.

The Presence of Orca (Killer Whales)

Golder also notes the presence of killer whales (*orca*) as a factor that may be contributing to changes in the number of narwhals present in Eclipse Sound and Milne Inlet. Killer whales are a well-known predator of narwhals.

Golder has reviewed the literature on the relationship between killer whales and narwhals (Campbell et al. 1988; Cosens and Dueck 1991; Laidre et al. 2006), and noted its own observations from 2021 (Golder 2021a and Golder 2021b).

Golder reports that more killer whales were present in Milne Inlet and Eclipse sound in 2020 than observed in 2019. Baffinland notes the results of DFO’s community-based killer whale data collection program, and sightings reported in August and September of 2020. The Technical Memorandum also reports on the results of Golder’s aerial surveys in relation to killer whales, including an event on August

27 where over 200 narwhal were chased by about 30 killer whales into Fairweather Bay. Golder reports that at least 4 narwhal were killed (Technical Memorandum, p.28).

Golder also reports that the aerial survey detected an average of 0.0045 killer whales/km flown in 2020, and 0.0010 killer whales/km flown in 2019. Golder acknowledges that the effect this may have had on the presence of narwhals in Milne Inlet and Eclipse Sound is unknown. Golder quotes statements from Inuit hunters that suggest that the presence of an increased number of killer whales is having an effect on the number and distribution of narwhals in Milne Inlet and Eclipse Sound.

Research has yet to detail the impact of changes in ice cover on the presence of killer whales in the Canadian Arctic. But there is good reason, given casual observations about the relationship between ice cover and the presence of killer whales, to believe that climate change and ice cover are affecting the distribution of killer whales. It has been suggested by Higdon and Ferguson (2009) that ice barriers exist which limit the range of killer whales. The removal of these choke points could lead to a drastic shift in the range of killer whales. The most comprehensive review of the ecology of killer whales and Arctic waters that we are familiar with has been published in the Canadian Journal of Zoology in 2020 (Lefort et al. 2020). While this source has not been cited by Golder, a subset of the information reviewed by the authors has been noted (Lefort, Garroway & Ferguson, 2020).

Lefort et al., 2020, note that:

The frequency of killer whale sightings in Canadian Arctic waters has increased in recent years (Higdon et al. 2012; Higdon et al. 2014), likely associated with a climate-linked increase in the extent of ice-free water and duration of the open-water season (Higdon and Ferguson 2009). Increases in abundance or shifts in the distribution of this predator could disrupt the Canadian Arctic marine ecosystem through effects on prey not historically exposed to high levels of killer whale predation (Breed et al. 2017). (p. 245)

There is little reason, knowing the relationship between ice cover and the presence of narwhal and their season migrations in relation to ice cover, to not assume that there are, and are likely to be further changes in the relationship between narwhals and killer whales in Eclipse Sound and Milne Inlet. Inuit hunters note the importance of shallow water to narwhals escaping killer whales. For this reason, access to Koluktoo Bay and other inlets that offer shallow water protection are more important than ever to narwhals in Milne Inlet and Eclipse Sound.

IQ and Other Considerations

In section 4.4 of the Golder Technical Memorandum, reference is made to the effects of climate change on narwhals. These include the relationship between predator/prey dynamics and subsequent effects on narwhal fitness or energy reserves prior to their arrival on summer grounds (p.30).

IQ is cited, noting that: "Hunters think the change in behavior is linked to lack of access to fish at floe edges, and more energy being spent by whales on travelling and hunting for food" (p.30).

Golder has included quotes from Inuit and has referenced Inuit IQ in several places in the Technical Memorandum.

The Hamlet remains concerned about Golder (and Baffinland's) use and understanding of IQ, while it appreciates the effort to incorporate IQ in its research. On a number of occasions, it has been pointed out that Baffinland uses IQ as data. IQ is to be appreciated, understood and used as far more than qualitative data that supports (or does not support) observations and conclusions reached by Baffinland and its consultants.

It appears that the quotes used in the Technical Memorandum have been chosen because they support a claim made by Baffinland, that ship and ice-breaking noise do not appear to have any lasting impact on the use of the waters of Eclipse Sound and Milne Inlet by narwhals. Taken out of a much larger context, these quotes are problematic. They do not reflect, nor have they been interpreted within Inuit Qaujimajatuqangit as a coherent whole that includes, in this case, not only observations on species, but an interpretation of those observations grounded in Inuit world views, laws, rules and 'ways of making sense'.

The quotes suggest that the presence of ships, for narwhal behaviour, is largely inconsequential. Inuit world views and appreciation of animal behaviour (narwhal in this case) do not isolate what is observable behaviour from other things that may be happening with narwhals. This observation originates in a way of looking at animals that challenges western or Qallunaat ways of making sense and suggests the limitations of western science.

Information provided by Inuit hunters should be interpreted in relation to a 'world view' or philosophy; an understanding of animals and who they are in relation to the environments they occupy. Western science tends to treat animals as 'stimulus/response creatures' that develop certain patterns of behavior. Inuit believe that animals have a soul; that they have feelings, they communicate among themselves, they can reason and they make decisions (Karetak, Tester & Tagalik, 2017, p.14).

So while narwhals may flee from a ship, and then return to the area at a later time to continue feeding, nursing or traveling, etc., there are implications for what might be seen as unremarkable behavior that go beyond this one event or observation. It is the 'one event' or observation used apart from the world view or belief in which it is located that is missing when IQ is treated as qualitative data. This leads to interpretations and understandings of the consequences of the behaviour of a species that are limited to the moment or event in question.

For example, the observation that narwhals flee the passing of a ship and return to an area is understood by Inuit as 'making note of what has happened'. It is not intended to, in and of itself, suggest a conclusion. If this movement happens often – and perhaps over a number of months or years – the narwhal in question, and narwhals collectively, may decide that they are tired of this experience. They may decide to migrate elsewhere, where they are no longer subject to something they find annoying. It is both difficult for Qallunaat to absorb and appreciate this way of making sense of animal behaviour, and it also difficult to articulate.

The observation that narwhal are “more scattered and skinnier” can be related to a long list of contributing factors; access to fish at the floe edge and more energy being spent travelling and hunting for food, being among them. Narwhal have feelings. They can be stressed. If they are confined to a lead in the ice and an icebreaker is approaching, their behaviour may indicate no or little effect, given the space to which they are confined. But they may *feel* stressed or threatened. This has implications for their bodily condition and perhaps for future behaviour

Inuit hunters are saying that the combination of increased movement related to avoidance behaviour (ships, ice-breaking, killer whales, etc.), the availability of food in both summer and winter habitats – something that may be related to climate change and offshore over-fishing – as well as the presence or absence, and condition of fish in their summer habitat, all contribute to what hunters are seeing: skinner narwhals. These possibilities inform the work of James Simonee and Dr. Vincent l’Herault; their interest in changes in narwhal body fat and in cortisol levels, research inspired by IQ.

RESPONSE

For reasons already noted, the Hamlet questions Golder’s reliance, in drawing conclusions, on behavioural responses to a disturbance zone area. This is especially the case in relation to ice-breaking and situations where the behaviour of narwhals may be limited by other considerations, including ice conditions and/or the presence of killer whales and the presence of species on which they prey. The desirability of an area (for unknown reasons) may be a factor in the decision by narwhals to return within a short period of time to the area they have left in response to ship passage. Some narwhals may return. Others may decide not to. Inuit grant far more agency to animal species than western science allows.

Confirmation of the first criteria that has to be met to pass the ‘High Risk’ threshold is defined as “the trigger having been observed in at least *two consecutive annual monitoring programs*”. Waiting for a second year to confirm that a high risk threshold has been surpassed may be a problem. This does not allow for the possibility of a catastrophic, dramatic or sudden change taking place – a sudden and considerable drop in population numbers that requires an immediate high level response before it is repeated, or the situation further deteriorates.

It is possible that continuing with operations, while making some changes, and relying on confirmation of observations made in a second year, may result in actions being taken that are too late to mitigate the effect. This was previously noted by the Hamlet as a possibility, comparable to what happened in the case of the Newfoundland cod fishery, dismissed at the time as an inappropriate and improbable analogy.

The decline in a calving rate of 25% and the use of a decrease of 25% in stock size may be acceptable criteria, but this has not been discussed with hunters and elders. The same is true with regard to 25% as criteria in relation to stock size.

The Hamlet accepts the observations made by Baffinland with regard to the possible impact of pile-driving on narwhals and the presence of an unusually high number of killer whales in Eclipse Sound and Milne Inlet. The Hamlet agrees that cumulative effects are most likely having an effect on narwhal numbers and that those effects include *both* ice-breaking and shipping.

The Hamlet appreciates the acknowledgement by Baffinland that “Baffinland icebreaking cannot be ruled out as a contributing cause of the observed decrease in narwhal numbers in 2020” (p.30).

The Hamlet does not believe that drone-based aerial photogrammetry is an adequate way to estimate narwhal body condition. The Hamlet supports the work of James Simonee and Dr. Vince l’Herault, and their intentions to measure both narwhal body fat and cortisol levels in research planned in relation to the forthcoming study of food security in the Hamlet of Pond Inlet.

Elders, hunters and others question Baffinland’s interpretation of narwhal behaviour in relation to shipping and ice-breaking, as noted earlier in the text. The Hamlet, based on discussions with elders, hunters and others, questions Baffinland’s reliance on noise levels and assumptions drawn from the hearing range of bowhead whales - in relation to the hearing range of narwhals. There are very many uncertainties, unexamined alternative hypotheses, and assumptions associated with the science being used in regard to the effects of ship noise and ice-breaking. There are different conclusions about what may be happening, based on Inuit Qaujimajatuqangit.

The Hamlet asks for time to discuss the options presented by Baffinland with regard to ice-breaking going forward. It recognizes and respects the critical role of the MHTO in addressing these options. As noted, Options 1 and 5 presented by Baffinland in the Golder Technical Memorandum correspond most closely to a condition previously put forward by the Hamlet, and reduce the possibility and likely effects of ice-breaking to an absolute minimum.

The Hamlet appreciates and respects Baffinland’s willingness to do a better job of integrating IQ with project monitoring. The Hamlet suggests that Baffinland staff and its consultants need to acquire a more thorough, deeper, and more comprehensive understanding of Inuit Qaujimajatuqangit before addressing the relationship between western science and IQ. This might best be accomplished in a workshop where Baffinland staff, consultants, and others, listen to elders and others from Pond Inlet and elsewhere in Nunavut, talk about IQ; what it is and how it works for Inuit. Unfortunately, the COVID pandemic is a problem in organizing a workshop like this.

The Hamlet is willing to work with Baffinland in refining its current operation and responding to environmental and other problems.

The Hamlet does not support the Phase 2 Proposal for reasons previously stated. The current situation with regard to narwhal, with implications for food security, Mittimatalingmiut culture, social relations, and well-being, is of great concern.

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