

From: [Marcoux, Marianne](#)
To: [Tester, Frank J.](#)
Cc: [Joshua Arreak](#)
Subject: RE: Baffinland Phase 2 Proposal and Impacts on Narwhal
Date: Friday, January 8, 2021 9:29:13 AM

Dear Frank,

Please find below some information related to your email. I have also attached the relevant documents to this email. Please let me know if you have any further questions or require additional information.

I hope this is helpful,

Marianne

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Baseline data

Fisheries and Oceans (DFO) has conducted 3 aerial surveys to estimate the size of the Eclipse Sound population in the last 20 years. I have attached the relevant documents to this email. The first survey was done in 2004 and the estimate was about 20,200 with a 95% confidence interval of 9,500 - 37,100 (Richard et al 2010). The second survey was done in 2013 and the estimate was 10,500 with a 95% confidence interval of 6,600 - 16,700 (Doniol-Valcroze et al. 2015). The last one was done in 2016 and the estimate was 12,000 with a 95% confidence interval of 7,800 - 18,700 (Marcoux et al 2019). We were planning to conduct a survey last summer but it got postponed because of the pandemic. We consider that the three surveys are reliable and were conducted using comparable methods. We also note that there was a decrease in Eclipse narwhals from 2004 to 2013. This decrease is not statistically significant because the confidence intervals from the 2013 are overlap with the confidence intervals for the 2004. The 2013 survey happened before BIM started its official operation in 2015 but it coincided with an increase in shipping activity in the area in 2013 related to the beginning of construction for the mine. Therefore, it is debatable if the baseline number should be from the 2004 or the 2013 survey.

Energy budget

I don't know of any work that has put together a detailed energy budget for narwhals. The closest work was done by Laidre and colleagues (2004) where they estimated how much Greenland halibut narwhals were eating during the winter in Baffin Bay. They provided a very rough estimate of the daily requirement of narwhal by using a general equation of basal energy requirement developed on much smaller land mammals. The problem with using this equation is that we don't know how well it extrapolates for much larger marine mammals. Using this equation, they estimated that an average narwhal required between 42,000 to 48,000 kcal per day.

Movement

In 2016, 2017 and 2018, DFO lead field work to tag narwhals in Eclipse Sound. The main objective of the tagging for DFO was to look at summer aggregation fidelity and movement between the Eclipse Sound and Admiralty Inlet summer grounds. Golder partnered with us for the tagging program in 2017 and 2018 to fulfill some of their

monitoring commitment for BIM. The data generated by this program is owned by both DFO and Golder. We have not analyzed the impact of shipping on the movement of narwhals in details yet. It is very complex and requires a careful interpretation.

Feeding

There are a few western science papers that report that narwhals feed intensely during the winter and much less during the summer (see Finley and Gibb 1982, Laidre and Heide-Jørgensen 2005 attached). These studies are based on stomach content analysis of hunted narwhals. Stomach content analysis can be biased against food that get digested quickly. It is also possible that hunted narwhals empty their stomachs as they get hunted. The two studies found that the stomach of most narwhals were empty during the summer. A study based on telemetry data of narwhals tagged from 2010 and 2011 done by DFO showed that narwhals performed deep dives in the summer in the Eclipse Sound/Milne Inlet area (Watt et al 2017). These dives suggest that narwhals might feed in the area during the summer. Lastly, in the summer of 2016, we captured drone footage of narwhals feeding on fish using their tusks to stun the fish at the surface of water. This footage provides evidence that at least, narwhals do some feeding during the summer and also that narwhals can feed at the surface.

REFERENCE (attached to email)

Doniol-Valcroze, T., Gosselin, J.-F., Pike, D., Lawson, J.W., Asselin, N.C., Hedges, K.J., and Ferguson, S. 2015. Abundance estimates of Baffin Bay narwhal stocks in Canadian waters based on the 2013 High Arctic Cetacean Survey. Canadian Science Advisory Secretariat, Research Document Research Document 2015/060.

Finley, K.J., and Gibb, E.J. 1982. Summer diet of the narwhal (*Monodon monoceros*) in Pond Inlet, northern Baffin Island. Canadian Journal of Zoology-*Revue Canadienne de Zoologie* 60(12): 3353–3363.

Laidre, K.L., Heide-Jørgensen, M.P., Jørgensen, O.A., and Treble, M.A. 2004. Deep-ocean predation by a high Arctic cetacean. *Ices Journal of Marine Science* 61(3): 430–440.

Laidre, K.L., and Heide-Jørgensen, M.P. 2005. Winter feeding intensity of narwhals (*Monodon monoceros*). *Marine Mammal Science* 21(1): 45–57.

Marcoux, M., Montsion, L.M., Dunn, J.B., Ferguson, S.H., and Matthews, C.J. 2019. Estimate of the abundance of the Eclipse Sound narwhal (*Monodon Monoceros*) summer stock from the 2016 photographic aerial survey. Canadian Science Advisory Secretariat Research Document 2019/028: iv + 17 p.

Richard, P.R., Laake, J.L., Hobbs, R.C., Heide-Jørgensen, M.P., Asselin, N.C., and Cleator, H. 2010. Baffin Bay narwhal population distribution and numbers: aerial surveys in the Canadian High Arctic, 2002-2004. *Arctic* 63(1): 85–99.

Watt, C.A., Orr, J.R., and Ferguson, S.H. 2017. Spatial distribution of narwhal (*Monodon monoceros*) diving for Canadian populations helps identify important seasonal foraging areas. *Canadian Journal of Zoology* 95(1): 41–50. doi:10.1139/cjz-2016-0178.