

Final Project Report

1. NWRT Project Number: 3-19-02

2. Project Title: Ecosystem Monitoring in Tremblay Sound (EMT 2019): The ecosystem approach to better understand Narwhal movements and the potential for impacts of shipping was conducted in 2017 and 2018; 2019 is a regroup year but baseline monitoring and research must continue for context and variability.

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4. Summary: Narwhal focused studies in Tremblay Sound evolved into an ecosystem approach in 2017 to better address multiple questions regarding narwhal management. 2017 research (EAT2017) provided evidence suggesting stock definitions and management may need to be updated. In addition, new technologies used in 2017 are helping to inform our understanding of the impacts of ship traffic on narwhal movements and behavior. EAT2018 set out to repeat EAT2017, however narwhal were not present in typical numbers for reasons seemingly connected to the conditions prior to whales establishing their summering areas (i.e. spring/early summer conditions, that may have included increased noise from ships and early presence of killer whales). Although this low abundance of narwhal meant less narwhal specific data was collected, it provided greater appreciation of the variability within this type of ecosystem and the complexity of drivers that impact narwhal habitat use and selection. Given this high variability, increasing pressures (including shipping and killer whale predation), and continuing review of narwhal management, it is obvious more research is needed. However, after two intensive years of ecosystem research time is needed to fully process and report results as well as properly plan future ecosystem research. Given more research is needed and will be proposed for future years, it is important to maintain Inuit research participation, baseline monitoring and the infrastructure of equipment currently operational in Tremblay Sound.

This project therefore focuses on 1) Narwhal observations using underwater hydrophone recorders, surface observations and UAV imagery, 2) continued research to understand fish and their role in the Tremblay ecosystem, and 3) characterization of the physical environment (i.e. sea ice melt, river inputs, ocean salinity and temperature regimes) that influence fish and mammal habitat. Field activities over approximately 3 weeks will maintain and/or re-establish passive monitoring equipment such as recording hydrophones and fish tracking receivers, setup and calibrate land based narwhal observation systems (i.e. time-lapse equipment calibrated to human observations of narwhal movement and abundance), and UAV mini-surveys for estimating relative abundance of narwhal, their group composition and behaviour.

5. Project Objectives:

1- Monitor noise, physical parameters (water salinity and temperature profiles), and other species abundance in Tremblay Sound.

- 2- Examine timing and numbers of narwhals entering and using Tremblay Sound using drone-surveys, and obtain details on group sizes, animal condition and mother-calf pairs.
- 3- Establish baseline data of noise and vocalizations of narwhals while in their critical summer habitat in Tremblay Sound and relate these data to narwhal movement and behaviour. This will then inform discussion on the potential impacts of shipping within this context.
- 4- Monitor ecosystem productivity and activity in order to better understand ecosystem function and variability and the role of ecosystem components in driving narwhal habitat selection.

6. Materials and Methods:

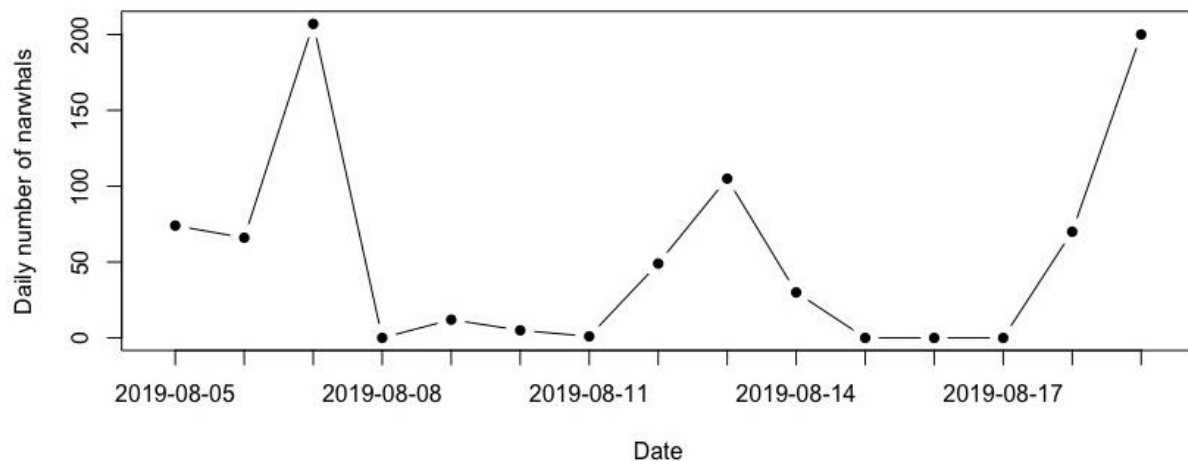
We used small drone to monitor the presence and behaviour of narwhals in Tremblay Sound. Weather permitting, drone surveys were repeated over areas of greatest narwhal abundance (as seen from plane-based surveys in previous years, and/or adjusted based on real-time observations). Special operations permits will be obtained from transport Canada. We installed a time-lapse camera on a high vantage point to take photographs of narwhals the travelled to Tremblay Sound. The camera was programmed to take photos every 5 seconds. This data will help to develop an index of narwhal presence in Tremblay Sound.

We placed small bottom anchored moorings placed within Tremblay Sound to record ambient noise and narwhal vocalizations. When possible (based on equipment availability), sensors to record water temperature and salinity were placed on these moorings. We also deployed instruments to detect fish movements and measures biomass of lower tropic level species (i.e. zooplankton and small fish). These moorings have been in place since June 2017 and have produced very informative data. Moorings must be retrieved and redeployed in order to access 2018 data and continue to collect data through to July 2020.

We hired 6 Nunavut Beneficiaries to take part of this research program. All Inuit researchers took part in the research and were trained in the different aspects of the program. For example, Inuit researchers have been trained to deploy and retrieve the mooring and they mostly lead this part of the work.

7. Results

Visual and behavioural observations of narwhals were made from August 5 to 19 2019. The number of narwhals observed per day is shown below. These numbers are similar to the number of narwhals observed in 2017 and are higher than the number of narwhals observed in 2018.



An automatic time-lapse camera system was installed on a high vantage point providing a continuous recording of narwhals entering and exiting the system. A total of 207,316 photos were taken between the August 2 and 20 2019. We were able to detect narwhal groups in the photos. Generally, using a 5-second interval seems enough to capture at least one individual of each group observed in a given photo and determine the direction of travel of the group.

A systematic drone survey was conducted at a fixed elevation of 120 m from point of launch. Due to limited battery, two transect lines were surveyed at each flight. The aim for the systematic surveys was to establish and test the feasibility of the survey protocol to assess changes in the abundance of the Eclipse Sound stock. We also obtained several hours of opportunistic drone video recordings for behavioural study, and captured a wide diversity of narwhal groups and activities, as well as bowhead whales.

8. Discussion/Management implications: With the current operation of the Mary River Baffinland mine and the proposed expansion, it is important to keep monitoring the different areas around Eclipse Sound. Tremblay Sound provide an area of low disturbance where narwhal can be observed. We experimented with different methods to get a general index of narwhal presence and to get a ratio of the number of narwhal calf. The time laps camera seem a promising way to get narwhals presence by our current set-up needs improvement to allow for a higher vantage point. Drone videography is a promising ways to get a ratio of calf in the population.

9. Report by Inuit participants: There were 6 Inuit participants as part of this project. We did not received any formal written from them report but it was not part of the participant role to write a report. However, during the field program, Inuit participants had several occasions to provide informal input about the project.

10. Reporting to communities/resource users:

We had a face-to-face meeting with the Mittimatalik HTO in March 2019 for consultation for the project. We were in communication by email and phone with the Mittimatalik HTO before the start of the field

season. We meet with the Mittimatalik HTO after our field work in August 2019. We had planned a face-to-face meeting with the Mittimatalik in March 2020 to present some of the results and present a field report. However, we have not been able to travel to Pond Inlet because of travel restrictions due to the pandemic.