

NWRT Final Project Report

1. **NWRT Project Number:** 3-18-16
2. **Project Title:** Ecosystem Approach in Tremblay Sound : Using an Ecosystem Approach to Better
3. **Project Leader:** Dr. Marianne Marcoux, Fisheries and Oceans Canada, Arctic and Aquatic Research Division

4. Summary

Narwhal studies led by Fisheries and Oceans Canada (DFO) in Tremblay Sound began in order to provide information concerning management boundaries between summering whales in Eclipse Sound and Admiralty Inlet. In 2017 the traditional single species study design was expanded to focus on the ecosystem as it relates to narwhal presence and habitat. The ecosystem approach in this case allowed DFO to expand the time and resources necessary to more than double the core data collection relating to narwhal but in addition added fish, sharks, seals, birds and physical parameters to the study design. In 2017, the ecosystem approach achieved 100% of the project goals and results are presently informing processes that will update and modify narwhal management. In 2018 only 4 narwhal, were captured and tagged for study. 2018 activities were hampered by very low narwhal abundance and long periods of sea ice presence/cover. Despite the low abundance of narwhal, the ecosystem approach was successful in collecting valuable data on other species (i.e. fish, seals and sharks) and physical environment parameters that in the long term will help us understand and manage resources like narwhal from a more holistic ecosystem perspective.

5. Objectives

- 1) Attach satellite location and dive tags on 20 narwhals to examine stock mixing, habitat use and possible drivers/disturbance factors.
- 2) Assess fine scale movements of narwhal in Tremblay Sound, habitat use and links to ecological drivers of Arctic cod distribution and movements;
- 3) Establish baseline data of noise and vocalizations of narwhal 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.

6. Methods

- (a) Narwhal are captured in 50-100m long nets set perpendicular from shore.
- (b) Weather permitting, drone surveys will be repeated over areas of greatest narwhal abundance
- (c) Small bottom anchored moorings will be placed within Tremblay Sound in order to record ambient noise and narwhal vocalizations.

7. Results

Our ability to study the focus species, narwhal, was limited in 2018 due to very low animal abundance and long periods of sea ice presence/cover that prevented most marine research activities. Results of shore based observations are presented in Figure 1. Although similar data is not available for years prior to 2017, anecdotally, researchers familiar with the area judged 2017 to be a lower abundance year than typical. This year researchers in the region as well as residents of the nearby community suggested that abundance was low in the broader Eclipse Sound region throughout the typical summer period (mid-July to mid-September). As seen in the figure, 2018 showed substantially lower abundance of narwhal with no observed large movement events (i.e. >100 animals/hour). Given the nature of narwhal capture via a fixed net, it is typical to capture the majority of animals during these larger movement events. A goal of tagging 20 narwhals was set prior to the field season. Goals for live capture tagging are rarely met as weather and animals complicate projects beyond our ability to plan, however the 9 week duration was chosen based on average capture rates from previous studies. As a result of low abundance of narwhal, only 4 whales were captured with 2 of the four tagged, and all 4 released (see Table 1).

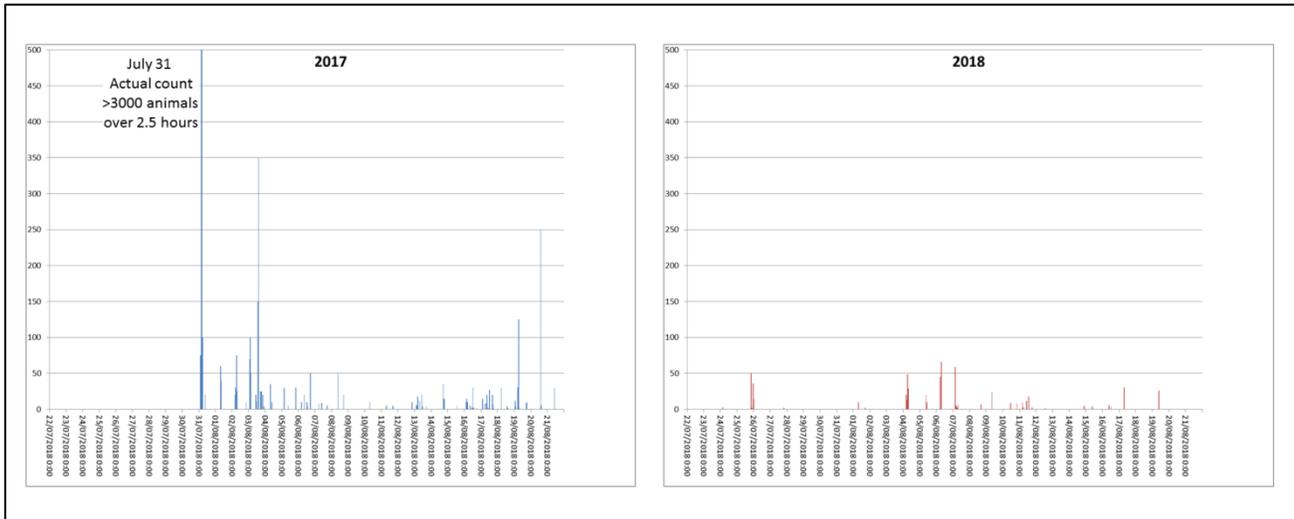


Figure 2: Hourly shore based visual counts of narwhals seen between July 20th and August 21st in 2017 and 2018. Note that observation protocols changed slightly between 2017 and 2018; as a result the 2017 are probably an underestimate.

Table 1: 2018 Narwhal live-capture/releases and associated data.

Release Date/Time	Total Length	Fluke Width	Pec-to-Pec (Girth)	Tusk Length	Acousonde	Backpack Tag	MiniPAT Tag	Last Transmission Date	Coverage
17/08/2018 3:16	360	82	124	0	Yes	174726	176414	09/10/2018 8:44	Eclipse Sound, N. Bilot, ending in Eclipse
17/08/2018 9:48	357	81	114	0	Yes	174728	176415	03/11/2018 17:19	Eclipse, N. Bilot, migration E. Baffin, ending Cape Dyer
17/08/2018 9:49	303	65	99	25	Yes	None	None	NA	
18/08/2018 7:01	382	93	123	0	Yes	None	None	NA	

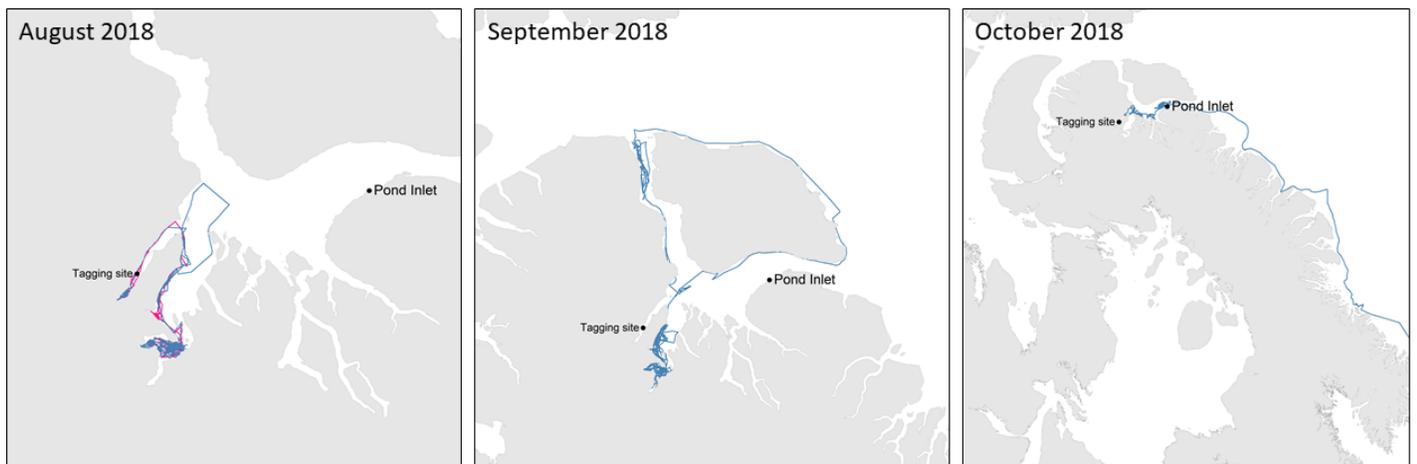


Figure 3: Maps of the movement of the two narwhals equipped with satellite transmitters as part of the Tremblay Sound project.

Tagging of Ringed seal was approached opportunistically in 2018, with nets set in close proximity to narwhal nets when weather and conditions allowed. No specific goal was set on numbers of animals to be tagged given we had no

experience regarding how successful capture via nets would be when in close proximity to a large camp and large narwhal nets and given the location was not chosen for seal capture. Despite these logistical conditions, 3 ringed seals were captured and tagged (see Table 2). Overall, this aspect of the ecosystem approach is considered a great success. Given the unique challenges of 2018 (e.g. sea ice preventing net deployment) and trial basis of this aspect, including reduced deployment times, future goals of 5-10 seals would seem realistic. The less invasive nature of tag application on seals compared to narwhal may make them better suited to collection of certain tag based information (e.g. oceanographic data and as a mobile receiver for fish and shark underwater tags).

Table 2: 2018 Ringed Seal capture and associated data.

Release Date/Time	Total Length	Weight (Kg)	Girth	Shoulder Tag	MiniPAT Tag	Flipper Tag	Last Transmission Date	Coverage
12/08/2018 15:30	111	40	82	159286	176424	168962	14/10/2018 12:51	Navy Board, Ending in Admiralty Inlet
14/08/2018 0:27	112	45	60	159283	176425		04/10/2018 1:38	Navy Board, Prince Regent, ending in Gulf of Boothia
17/08/2018 19:34	100	40	58	159289	176426		CURRENTLY ACTIVE	Eclipse Sound, E. Baffin migration ending Cape Dyer

Greenland Sharks were captured and tagged over the duration of the field season using baited longlines set for 4-8 hours. The mainline consisted of 80 metres of rope with 6-8 baited hooks (seal or char) spaced 10 metres apart. Sharks were tagged with surgically implanted acoustic tags inserted into the peritoneal cavity (V16, 69-Hz, Vemco Ltd, Nova Scotia, Canada) and/or tagged with a pop-off archival tag package that was set to release 24-72 hours later. These packages consisted of a varied combination of accelerometers (Maritime Biologgers; D-tag), hydrophones (D-tag), acoustic receivers (Vemco VMT), CTDs (Star Oddi) and swim speed sensors (Little Leonardo). Overall, 23 of the 34 captured sharks were acoustically tagged and 10 were equipped with pop-off tag packages. Catch per unit (hour) of fishing effort (CPUE) for sharks is shown in Figure 3b. Previous years of shark capture rarely had zero catches during the open water season, likely the high instances of zero catch in 2018 is indicative of very low shark abundance in comparison to past years. Further analysis is required to estimate abundance and relate this to previous years and the abundance of narwhal, but it would appear that there is some direct or indirect ecosystem relationship between sharks and narwhal.

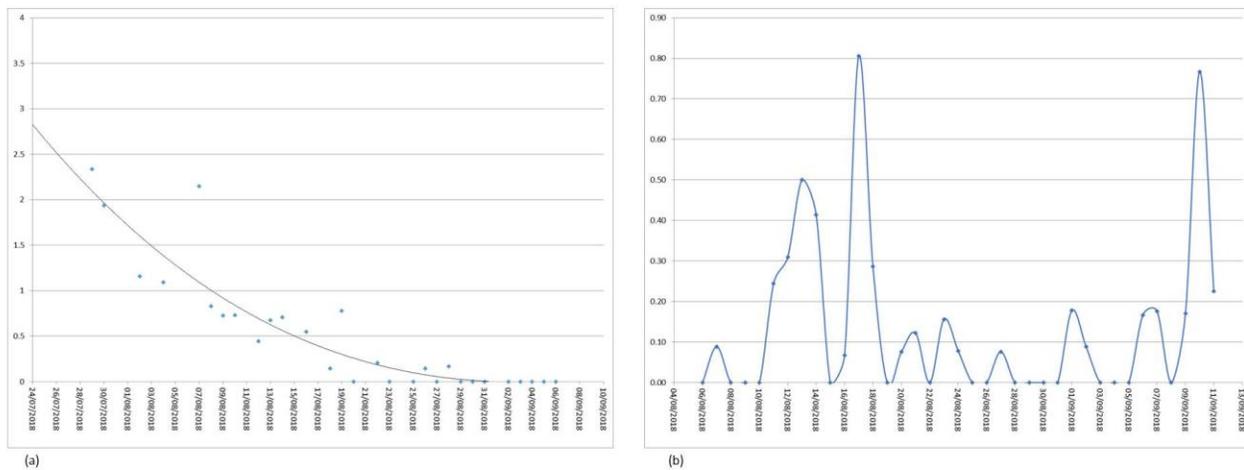


Figure 3: Catch per unit (hour) of effort for Arctic Char (a), and Greenland Shark (b). For aesthetics and ease of interpretation, two days (24/08 and 02/09) of no shark fishing were filled in the plot above with the average of the day before and after.

Arctic Char were captured by gill net (hot picked immediately upon capture), or rod and reel. A total of 81 Arctic Char were caught over the duration of the field season. Analysis is not yet complete but the steady drop in catch per unit effort (CUPE) is likely timed with the abundance of char in the system as they make their run back to freshwater for the winter. 60 Arctic Char were tagged with 69-KHz acoustic tags (Vemco Ltd.). Tagged char from 2017 and 2018 will be tracked via the network of underwater receivers placed in Tremblay Sound. Data recovered in 2019 will add to data collected from 2017/18 and allow researchers to determine fish presence and movement in part to determine the use of the Tremblay ecosystem and role with its foodweb.

Training of experienced researchers is important for the long term future of research and monitoring in this region. All Inuit researchers were given opportunities to gain experience; unfortunately due to low narwhal abundance much of the core training could not be completed. Four new local researchers were part of the research team this year and all gained experience in animal handling, boat-based research activities as well as shore based observations.

8. Discussion and management implications

The movement of narwhals and ringed seals tagged in Tremblay Sound is highly relevant to study the impact of shipping related to the Baffinland Mary River project. The track of the tagged animals will be studied in relation Baffinland shipping and ice breaking activity.

Movement from narwhals tagged in 2018 but also 2017, was used to investigate the connectivity of the Eclipse Sound narwhals stock to the other stocks of the Baffin Bay narwhal population. Data and analysis were presented at a meeting of the National Marine Mammal Peer Review Committee in February 2019 as part of a Canadian Science Advisory Secretariat (CSAS) process, and results are scheduled to be published this year.

9. Report by Inuit participant

There were 6 Inuit participants as part of this project. We did not receive any report but it was not part of the participant role to write a report. One participant was given the opportunity to present at the ArcticNet Annual Scientific Meeting but could not go.

10. Reporting to communities/resource users

We held a face-to-face knowledge exchange meeting with the Pond Inlet HTO on March 8 2019 during which we provided a field update.

Dr. Marcoux participated at the Marine Monitoring and Marine Mitigation Workshop in Pond Inlet for the Mary River Project on May 1-2 2018. She shared some of the information from this project relevant to the Mary River project.

11. References

Marcoux, M., and Watt C. A. In Press. Eclipse sound narwhal (*Monodon monoceros*) movement and hunt composition and its relevance to stock delineation. DFO Can. Sci. Advis. Sec. Res. Doc. 2015/nnn. vi + xx p.

For inquiries regarding this ongoing research please contact:

Marianne Marcoux (Project Lead)
Research Scientist
Central and Arctic Region | Région du Centre et de l'Arctique
Fisheries and Oceans Canada | Pêches et Océans Canada
501 University Crescent, Winnipeg, MB, R3T 2N6
Government of Canada | Gouvernement du Canada
marianne.marcoux@dfo-mpo.gc.ca, 204 983 5023

Robert Hodgson
Marine Biologist
Central and Arctic Region | Région du Centre et de l'Arctique
Fisheries and Oceans Canada | Pêches et Océans Canada
501 University Crescent, Winnipeg, MB, R3T 2N6
Government of Canada | Gouvernement du Canada
Robert.Hodgson@dfo-mpo.gc.ca, 204 983 5003