SUMMARY UPDATE

North Slope Borough
Fish & Game Management Committee

Ice Seal & Polar Bear Research & Management
2020-21

North Slope Borough Department of Wildlife Management

November 19, 2021
Utqiaġvik AK

Update prepared by:
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INTRODUCTION

The North Slope Borough Department of Wildlife Management (NSB-DWM) conducts research on wildlife species that are important as subsistence resources to North Slope communities. The information generated by this research informs decision-makers on how best to manage these species and their habitat in support of sustainable subsistence harvest. This update summarizes ongoing research & management activities relating to ice seals (ringed, bearded, and spotted seals) and polar bears carried out by the North Slope Borough Department of Wildlife Management (NSB-DWM) and its partners in 2020-21.

The work summarized here would not be possible without the help and guidance of the people that we work for…specifically, local hunters, community members, and leaders—to whom we are grateful for generously sharing their knowledge and skills.

1. Ice Seal Satellite Spatial Ecology

Objective: Document ice seal movements, habitat use, and behavior (e.g., diving, foraging, and hauling out) over time.

Methods: Capture ice seals in a net and instrument them with satellite trackers[1].

The pandemic has been disruptive to the NSB-DWM's ice seal research, particularly in 2020, when only 2 days of field effort occurred. During this time, two seals were captured and instrumented with satellite trackers. Tracking data (Fig. 1) provided useful information about their spatial ecology. This information will fill knowledge gaps and can be built upon to improve understanding about ice seal biology and ecology. It is also useful to managers tasked with ensuring that healthy and abundant populations remain available for subsistence. Several publications have been generated from this research (see *Publications* section).

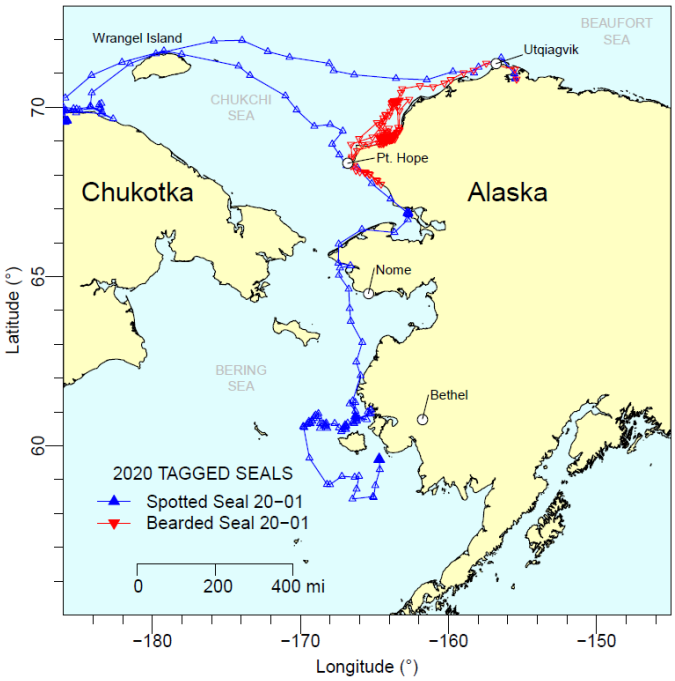

Figure 1 – 2020 Seal Movements.
The spotted seal (blue) was a sub-adult male and the bearded seal (red) was a sub-adult female. The hollow triangles show daily locations and the solid triangles show the final location.

[1] Satellite trackers are glued to the fur on a seal's back and will drop off the following spring when the seal molts (i.e., sheds its fur). Often, a second satellite tracker is permanently mounted to the webbing of a seal's hind flipper.

In 2021 we were able to spend more time in the field. Despite somewhat marginal weather conditions, we were able to capture and instrument six ice seals, including one ringed seal (Fig. 2) and five spotted seals (Fig. 3). As in previous years, their tracking data has been mapped and sent out to a long list of community members and interested parties. These maps are also available on the NSB-DWM webpage[2].

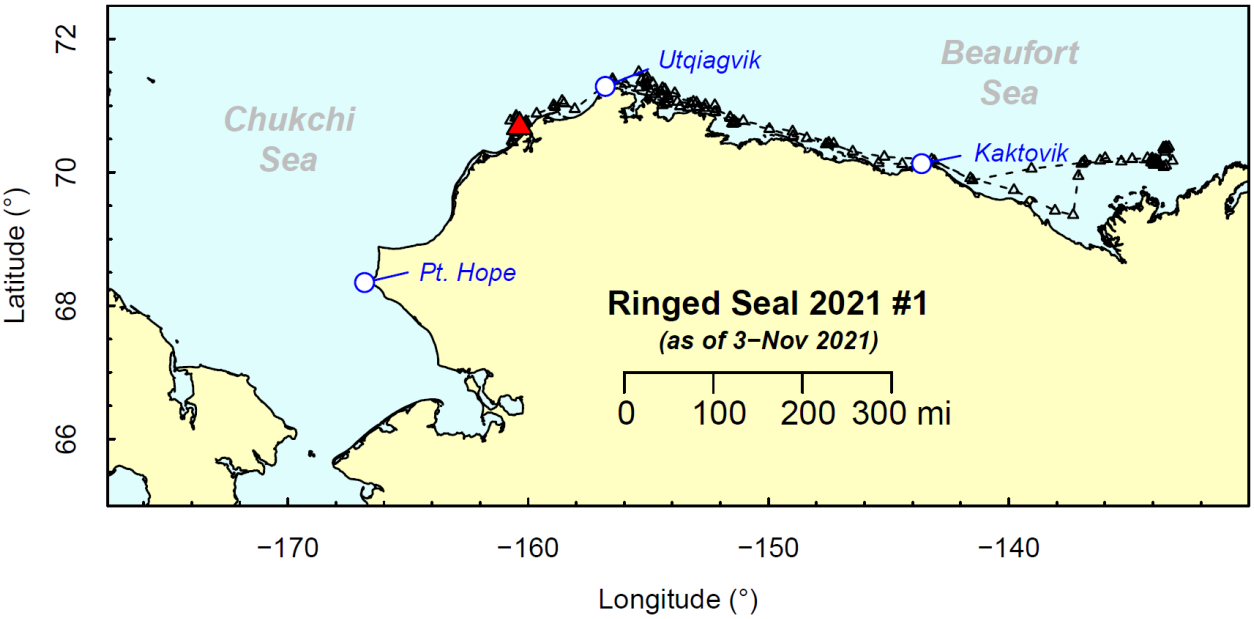

Figure 2 – Spring 2021 ringed seal capture.
On 10-Jul 2021 an adult male ringed seal was captured and instrumented with a satellite tracker. (top) The NSB-DWM team deploys a long net in the lead. Special thanks go out to Bobby Sarren for his help with setting the net using his personal kayak. (bottom) Latest tracking map sent out with the total movements of this seal as of 3-Nov 2021. The hollow triangles show daily location, and the red triangle shows the latest location.
(Photo: M. Frantz, NSB)

[2] http://www.north-slope.org/departments/wildlife-management/studies-and-research-projects/ice-seals

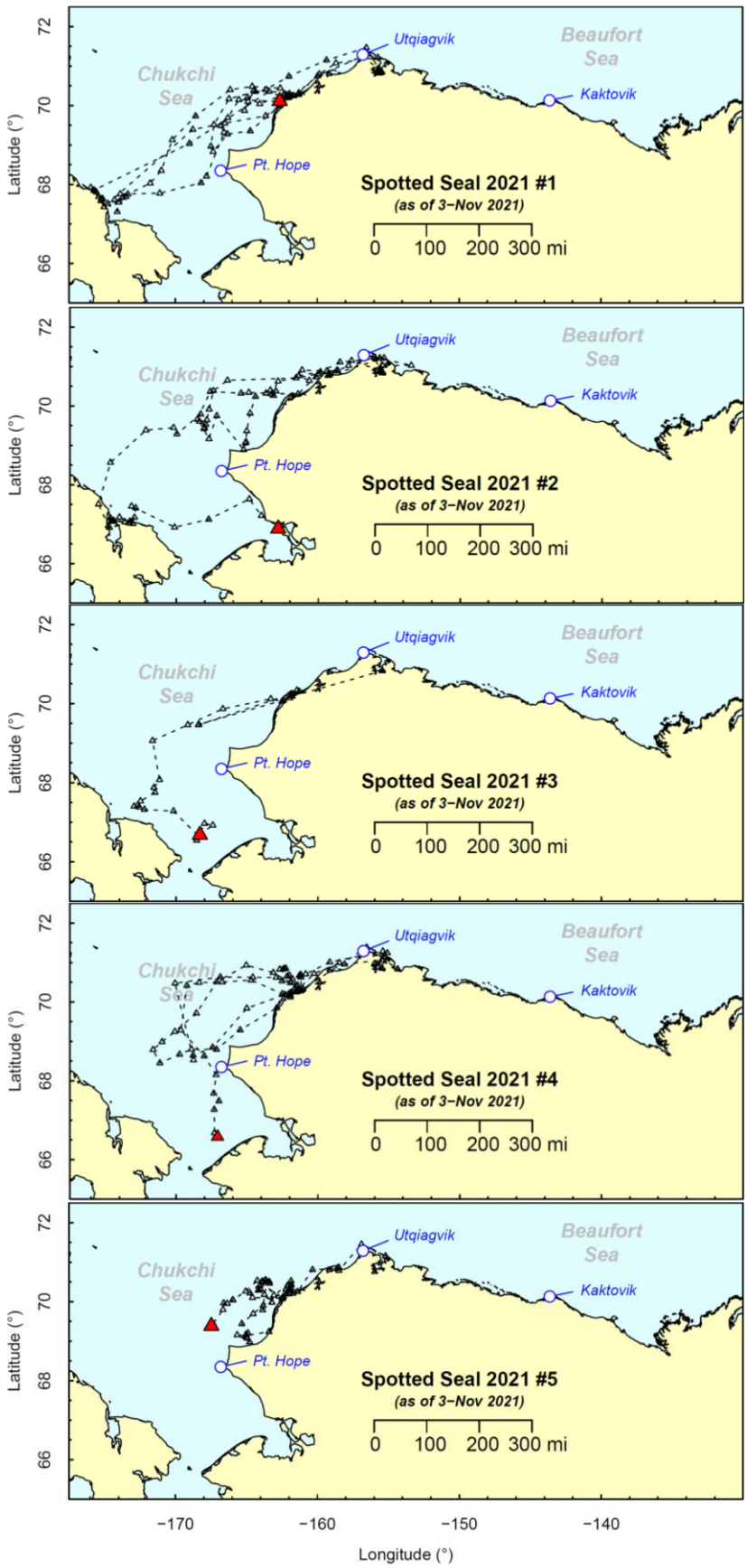

Figure 3 – 2021 Spotted seal movements. The latest tracking maps sent out with the total movements of the five spotted seals as of 3-Nov 2021. The hollow triangles show daily locations, and the red triangle shows the latest location. Spotted seals #1 and #5 are subadult males, all others are adult males.

2. Ice Seal Haul-outs in the NPR-A

Objective: Document the characteristics of spotted seal terrestrial haul-outs in the NPR-A. Also document timing and conditions when haul-outs are used.

Methods: Deploy trail cameras, acoustic recorders, and weather monitoring stations at three known spotted seal haul-outs in the NPR-A.

This is a collaborative project with Dr. Donna Hauser of the University of Alaska Fairbanks. Work commenced in 2020 with the deployment of gear at Oarlock Island and Smith Bay (Pisuq River). In 2021, gear was also deployed at the mouth of the Topagoruk River, and at Peard Bay (Illuqsiñaq Point). Note that in 2021, during a long stretch of bad weather, the camera setup at Oarlock Island washed away along with the sand spit on which it was deployed (Fig. 4). A new location for the camera/acoustic gear was established at the mouth of the Topagoruk River. As of October 2021, all gear has been retrieved from the field sites.

Figure 4 – Typical gear deployment. (main photo) Two T-posts with cameras were deployed at each study site. This post has one camera and one acoustic recorder. This photo from 2021 shows that the spit has almost completely washed away. Eventually, the entire spit disappeared including this post. Note the NSB Search and Rescue (SAR) helicopter on Oarlock Island. We are very grateful to SAR for their support for this project.
(inset photo) Andy Von Duyke sets up a weather monitoring station on Oarlock Island in 2020. The sandy spit is visible in the background. The two posts can also be seen.
(main photo: A. Von Duyke, NSB; inset photo: K. Scheimreif, NSB)

This project is in the beginning stages of data entry and data analysis. Specifically, trail camera images, weather data, and acoustic data will be analyzed to characterize the timing and conditions associated with spotted seal haul-out behavior (Fig. 5). This project was also facilitated through a partnership with the Alaska Arctic Observatory & Knowledge Hub (AAOKH). More information on this project will be published in the AAOKH newsletter[3]. Look for preliminary results to be presented in the next year.

Figure 5 – Spotted seals hauled out Oarlock Island. This photo was taken on 22-Aug 2020 at Oarlock Island. There are at least 25 spotted seals hauled out at the end of the sandy spit. Note that the striped stick was set at the water line when the cameras were deployed, and so it is evident that the water level is lower in this photo.
(Photo: A. Von Duyke)

[3] https://arctic-aok.org/about/education-outreach/

3. Integration of Indigenous Knowledge and Scientific Knowledge

Objective: Develop better explanatory models of ice seal spatial ecology by drawing upon the wealth of Indigenous Knowledge (IK) shared by Iñupiaq hunters and integrating it with Scientific Knowledge (SK) into a comprehensive framework for a more complete understanding of ice seal biology.

Methods: Using Bayesian statistical methods, SK (satellite tagging data) and IK (hunter interviews) will be combined into models that explain ice seal movements, habitat use, and behavior.

This work is funded by the North Pacific Research Board (NPRB) and is a collaboration between the NSB-DWM, the University of British Columbia[4], and Huntington Consulting[5]. The villages of Kotzebue, Point Hope, and Utqiaġvik were selected as study sites in order to interview hunters (Fig. 6) in three distinctly different settings and to capture a diversity of seal behavior across their range. Interviews were conducted in 2019 in all three villages, with a follow-up interviews[6] occurring in Utqiaġvik only. COVID-19 travel restrictions have so far prevented follow-up interviews in Kotzebue and Point Hope, but with time and the easing of travel restrictions, it is hoped that the research team can return to the remaining villages to ensure the accuracy of how the IK was documented and interpreted. In the meantime, the model framework is being developed and tested in preparation of combining both systems of knowledge. So far, one paper on the IK from Utqiaġvik has been published (Gryba et al. 2021).

Figure 6 – IK interview in Utqiaġvik. Qaiyaan Harcharek sketches on a map to explain ice seal behavior to Henry Huntington. Note that both Qaiyaan and Henry are co-authors—as are several other hunters—on the most recent publication (Gryba et al. 2021).
(Photo: A. Von Duyke; NSB)

[4] Rowenna Gryba and Dr. Marie Auger-Méthé
[5] Dr. Henry Huntington
[6] Following the initial interviews, the information was compiled into a single and summary document that upon which model structure is bases. Getting this information correct is critical to the project and so this document was presented to the original IK holders to check for accuracy.

4. Ringed Seal Population Analysis

Objective: Assess the trajectory of Alaska's ringed seal population in comparison to the results generated in a model by Reimer et al. (2019)[7].

Methods: A population model will be built that is similar in structure to that already published by Reimer et al. (2019), but which incorporates density-dependence and draws upon locally relevant biological data on ringed seals.

The model by Reimer et al. (2019) suggested that ringed seals will experience a 50-90% decline in western Canada within the next century. In a collaboration with the Alaska Department of Fish & Game[8] (ADF&G) and the University of Washington[9], a new population model is being developed to replicate the approach used by Reimer et al. (2019), but using assumptions and data that are more relevant to Alaska. A report was produced, which demonstrated important differences in model outcomes when density-dependence and assumptions/data more closely aligned with local ringed seal biological observations are used. This report is now being prepared for publication in a peer-reviewed scientific journal.

[7] Reimer JR, Caswell H, Derocher AE, and Lewis MA (2019) Ringed seal demography in a changing climate. Ecological Applications 29(3). e01855. https://doi.org/10.1002/eap.1855

[8] Lori Quakenbush and Dr. John Citta (now with NSB-DWM)

[9] Dr. Eric Regehr

5. Ice Seal Committee (ISC)

Objective: From the ISC By-Laws, *"the purpose of the Ice Seal Committee shall be to preserve and enhance the marine resources of ice seals including the habitat; to protect and enhance Alaska Native culture, traditions, and especially activities associated with subsistence uses of ice seals; to undertake education and research related to ice seals."*

NSB-DWM manages the ISC's section 119 grant (MMPA) covering operational expenses. Because of the ongoing pandemic, the ISC's last face-to-face meeting took place in January of 2020. The most recent annual meeting in January of 2021 and a scheduled interim meeting were both virtual and took place on Zoom. It remains to be determined whether the next annual meeting will once again be face-to-face. If COVID-19 travel restrictions are sufficiently relaxed and if participants are vaccinated, then this may be possible. For those who remain concerned over risk of exposure to COVID-19, a virtual remote participation option will most likely be available. Details will be made available on the ISC's new website (Fig. 7).

Figure 7 - New ISC website (www.iceseals.org). The Ice Seal Committee new website has been live since 2020. It is meant to be a clearinghouse for information pertinent to co-management of ice seals in Alaska. New information and updates relevant to management (e.g., critical habitat) are constantly being added, so please check back often. Of course, helpful suggestions are always welcome.

6. Non-invasive genetic sampling – Hair DNA

Objective: Collect genetic samples from polar bears for use in identification and abundance estimation.

Methods: Baited hair-snags deployed on the sea ice (Fig. 8). Trail cameras are also deployed at each station to provide additional information about any bears that visits a site.

This work has been reported upon previously. In 2020 no sampling took place due to the pandemic. In 2021, in partnership with ADF&G, polar bears were sampled on the spring sea ice before whaling. Sampling locations included Wainwright, Utqiaġvik, and Kaktovik. The timing of the sampling effort was coordinated with the concurrent helicopter-based genetic sampling by USGS. The samples collected using the hair-snags were shared with the joint US-Canada team[10] that is currently using genetics to estimate the abundance of the southern Beaufort Sea population of polar bears. This effort effectively doubled the sample size available for analysis.

Figure 8 – Hair-snag deployed on the sea ice. (left) Smelly lure is smeared on the flag and inside the box. (center) The lure attracts bears that investigate the box. (right) Lining the box are stiff wire brushes that pluck hairs from the bear. The follicle on each hair contains a small amount of tissue from which a bear's DNA can be sampled.

(photos: P. Detwiler; NSB)

[10] The team consists of the US Geological Survey, the government of Nunavut, and the government of the Yukon Territory – with support and guidance from the Inuvialuit-Iñupiat Polar Bear Commission.

7. Environmental DNA (eDNA) from bear tracks

Objective: Refine methods for sampling polar bear eDNA left behind in their snow tracks.

Methods: Scoop snow from bear tracks (Fig. 9), melt it, filter it, and genotype the bear to document its identity and sex.

This is an ongoing project that also been reported upon previously. In 2020 no sampling took place due to the pandemic. In 2021 samples were collected concurrently with the hair-DNA project. Two different labs are currently being evaluated, and methods are being refined. Though this method is simple in concept, it is complicated in the detailed approach required to ensure that the samples are not contaminated. Additional funding has come through and so it is anticipated that progress in working out this method will continue. Look for results to be reported next year.

Figure 9 – Collecting snow from polar bear tracks for eDNA analysis.
Peter Detwiler is shown scraping the top layer from fresh polar bear tracks. Multiple tracks are collected for each sample. Factors such as the number of tracks per sample, the age of the tracks, and environmental variables are also recorded to help establish best practices for this new method.

(photo: A. Von Duyke; NSB)

8. <u>Harvest risk assessment for setting sustainable polar bear harvest</u>

Objective: Develop a tool to help managers set sustainable harvest goals for polar bears.

Methods: Within a population modeling framework, forecast polar bear population trends and the likelihood that harvest will be sustainable.

Recently a paper was published (Regehr et al. 2021) describing a new tool to assist managers with setting sustainable polar bear harvest objectives. This tool combines a reliable abundance estimate[11], a population growth model, and assessments of numbers and causes of polar bear mortality to forecast polar bear population trends under varying harvest scenarios. It also provides guidance to managers on the frequency and accuracy of population monitoring in order to avoid inadvertent overharvest (i.e., failure to detect and respond to overharvest).

Ecological Applications, 0(0), 2021, e02461

Demographic risk assessment for a harvested species threatened by climate change: polar bears in the Chukchi Sea

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Abstract. Climate change threatens global biodiversity. Many species vulnerable to climate change are important to humans for nutritional, cultural, and economic reasons. Polar bears *Ursus maritimus* are threatened by sea-ice loss and represent a subsistence resource for Indigenous people. We applied a novel population modeling-management framework that is based on species life history and accounts for habitat loss to evaluate subsistence harvest for the Chukchi Sea (CS) polar bear subpopulation. Harvest strategies followed a state-dependent approach under which new data were used to update the harvest on a predetermined management interval. We found that a harvest strategy with a starting total harvest rate of 2.7% (~85 bears/yr at current abundance), a 2:1 male-to-female ratio, and a 10-yr management interval would likely maintain subpopulation abundance above maximum net productivity level for the next 35 yr (approximately three polar bear generations), our primary criterion for sustainability. Plausible bounds on starting total harvest rate were 1.7–3.9%, where the range reflects uncertainty due to sampling variation, environmental variation, model selection, and differing levels of risk tolerance. The risk of undesired demographic outcomes (e.g., overharvest) was positively related to harvest rate, management interval, and projected declines in environmental carrying capacity; and negatively related to precision in population data. Results reflect several lines of evidence that the CS subpopulation has been productive in recent years, although it is uncertain how long this will last as sea-ice loss continues. Our methods provide a template for balancing trade-offs among protection, use, research investment, and other factors. Demographic risk assessment and state-dependent management will become increasingly important for harvested species, like polar bears, that exhibit spatiotemporal variation in their response to climate change.

Key words: climate change; density dependence; habitat loss; harvest; polar bear; risk assessment; state-dependent management; subsistence; sustainability; Ursus maritimus.

[11] Regehr EV, Hostetter NJ, Wilson RR, Rode KD, St. Martin M, Converse SJ (2018) Integrated Population Modeling Provides the First Empirical Estimates of Vital Rates and Abundance for Polar Bears in the Chukchi Sea. Scientific Reports 8:16780. https://doi.org/10.1038/s41598-018-34824-7

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