Integration of Indigenous Knowledge & western science to understand ice-seal movement and habitat use

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Introduction

As the climate warms, Native peoples in the Arctic face changes in access to culturally and nutritionally important subsistence species—potentially impacting community health. Indigenous Knowledge (IK) contains a wealth of information gained by Native peoples over generations through daily interactions with and observations of animals and their habitats. Though wildlife management agencies are starting to require that IK be considered alongside western science in the decision making process, it has been a challenge to meaningfully integrate these two systems of knowledge.

This project fills an important gap in efforts to better understand animal movements, habitat use, and behavior, and lends itself toward application to other animal and plant species throughout Alaska and globally. By seeking to improve the information on which management decisions are made—such as including IK in a meaningful way—this work acknowledges the practical value of the information held by Native users of the resource.

Overall Goal

Develop a Bayesian analytical framework that combines IK (as informed priors) with western science to improve characterizations of animal behavior and habitat use. As a case-study, both IK obtained from interviews and satellite tracking data, each covering ice seals in Alaskan waters, will be used within the modeling framework. Ultimately, we seek to improve the understanding of ice seal biology and to demonstrate the value of integrating IK with western science. Specific steps to reaching this goal include:

1. Document IK on ringed, bearded, and spotted seal movements, habitat use, and behavior.
2. Use Bayesian statistics to combine IK with western science into more fully informed biological models.
3. Assess how well this new approach works based on feedback from IK holders.

Methods

Indigenous knowledge from active seal hunters[1] was solicited. Two meetings were planned for interviews. In the preliminary meeting, the IK holders were interviewed using a semi-directed format in a conversational style that focused on seal behavior and habitat use—often involving sketches and labels on maps (Fig. 1). To capture a broad range of variation in seal movements and behavior along with the associated differences in IK, hunters from multiple villages were interviewed.

Figure 1. Active seal hunter Michael Tuzroyluk (Point Hope) is interviewed by Rowenna Gryba about ice-seal behavior and habitat use.

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[1] All hunter participants received a $200 gas card as an honorarium.

Upon completion of the preliminary interviews the information documented from each region is pooled and synthesized into a document that generalized ice seal spatial ecology from the hunters' perspective. To assess whether the investigators correctly understood what the hunters had explained, a second set of meetings with the same hunters was conducted, the objective of which, was to assess the accuracy of the synthesized IK data. The validation meetings included an individual hunter and the project PIs. Though conversational in approach, the meeting topics were more directed to summaries of the results as depicted in a series of figures (Fig. 2). The information in the figures represents the synthesis of the hunter TEK into the informed priors that would be used in the Bayesian models. As such, it is critical to our modeling approach to ensure that these functions are accurate. This was accomplished through a careful recap of the results with the hunters to verify the accuracy and correct any mistakes.
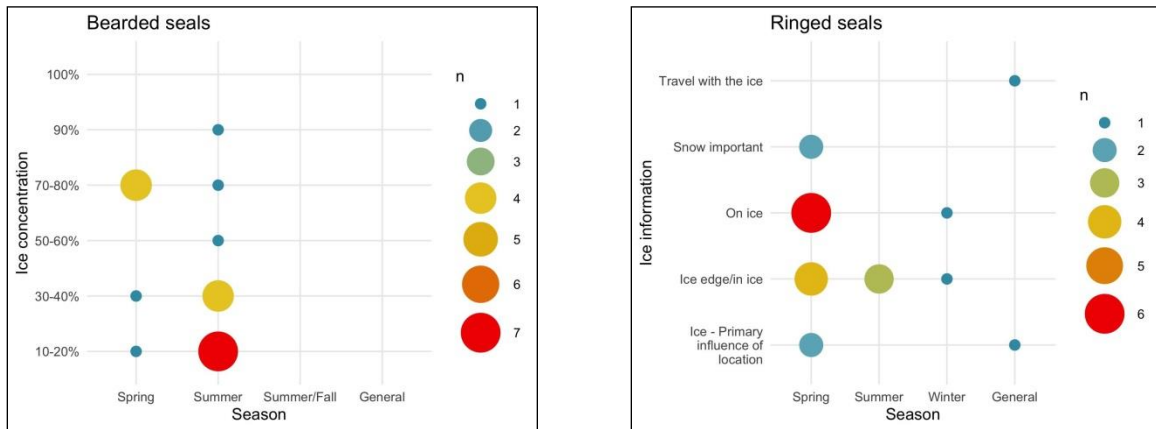

Figure 2 – Examples of synthesized TEK data. A set of these diagrams were used to discuss the initial findings with Native Alaskan seal hunters in order to ensure that the investigators' IK syntheses were correct. These figures graphically depict what will eventually become the informed prior distributions used to inform the Bayesian habitat and behavior models.

Progress
To date, interviews have occurred in Utqiaġvik ($n = 9$), Point Hope ($n = 7$); and Kotzebue ($n = 9$). The second set of validation interviews has occurred in Utqiaġvik. Based on these interviews, it appears that the synthesis of the IK shared by the hunters was mostly accurate, with the only a few corrections and clarifications being necessary. These follow-up meetings also provided opportunities to answer questions from the hunter participants. The IK from the interviews in Point Hope and Kotzebue is still being

Next steps
Further verification will be sought in a second round of meetings with IK holders in Point Hope and Kotzebue. IK will be used to generate informed priors for Bayesian models. Prototype models will be developed and refined prior to larger scale models.

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