

## PROJECT STATUS UPDATE 2019-20

### Brief Introduction

Bearded and ringed seals are culturally, nutritionally, and ecologically important to Alaska Native communities in the Arctic. The loss of summer sea ice reduces Arctic seal breeding habitat and opens the region for commercial development and industrial activities. As a result, ice seal breeding habitats grow smaller and noisier. Bearded seals and ringed seals mate underwater and rely on sea ice for resting, pupping, and nursing between spring and early summer. They produce underwater vocalizations near the ice edge to attract mates, defend territories, and facilitate social interactions. The combination of industrialization and man-made noise coupled with the loss of critical ice seal breeding habitat may have a significant impact on seal populations essential to Alaska Native communities.

Additionally, as sea ice retreats earlier and ice habitats shrink, ice seals will be in greater competition for breeding space over shorter time periods. This will likely result in the same number of individuals vocalizing underwater in smaller and smaller breeding regions and earlier in the year. Because ice seals call often and loudly during the breeding season, it is likely that in addition to being exposed to noise from humans, ice seals will also experience an increase in noise from other calling seals. Overall, the underwater soundscape may become too loud (from both overlapping seal calls, and man-made noise) for individuals to find a locate one another to facilitate successful mating. Changes in timing of breeding may be particularly important to ringed seals, who, in the past, bred earlier than bearded seals in some regions. If bearded seals begin calling earlier in response to ice break up, then ringed seals may be overwhelmed by both the sound of bearded seals and man-made noise.

Because the under-ice environment is naturally filled with sounds (ice creaking, whales calling, wind, rain, fish etc.) seals have likely developed some strategies for dealing with changing noise conditions, but if or how ice seals adapt their calling behavior is unknown. One of our goals is to identify if there is a “noise threshold” or a “noise type”, that ice seals cannot adapt to. Identifying the conditions under which seals are impacted will be important for managing industrial and commercial activities in the reduced-ice Arctic.

### Research Priority

We proposed to investigate if and how bearded and ringed seals adjust the timing of breeding, and advertisement behavior in response to loss of habitat and increases in man-made sound. This research directly addresses Ice Seal Conservation Goal I sections A.i and A.ii of the ISC Management Plan:

*“Identify and protect areas that are important for pupping, migrating, feeding, and other biological processes” and “Identify important habitat concentration areas and suggest ways to mitigate impacts from industrial and commercial activities.”*

This research also directly addresses Ice Seal Research Goal VI section A.v of the ISC Management Plan *“Determine effects of man-made disturbance and noise”*.

## **Objectives Addressed**

Using Cornell acoustic data previously collected in collaboration with the North Slope Borough, we analyzed data from the 2010 and 2011 bearded seal breeding season in support of the following objectives:

1. Does the timing of ice seal breeding seasons shift in response to ice break up?
2. Do ice seals adjust their call louder to compensate for noise from other seals?
3. Is there a threshold beyond which seals cannot compensate for natural noise?

**Additionally:** A complete acoustic record of recordings made in collaboration with the North Slope Borough was aggregated and sent to Utqiagvik, along with an archival drive to ensure data longevity.

## **Preliminary Results:**

1. Bearded seals delayed the onset of their breeding season in low ice years (2010) compared to higher ice years (2011)
2. Bearded seals increased their call loudness as natural sounds increased, but there was a limit to how loud they were willing/able to call
3. When ambient noise reached a specific threshold ( $\sim 103$  dB<sub>RMS</sub> 100-900 Hz band) bearded seals were no longer willing/able to call louder to compensate for high noise

## **Significance of Results:**

1. Shifts in timing of the breeding season may impact annual hunts, may shorten breeding seasons, and may reduce pup survival or fitness
2. Bearded seals exhibit some resilience to natural noises, but may be negatively impacted by ambient noise above the observed threshold
3. Manmade noise (particularly vessel noise) that falls above the 103 dB threshold may negative impact breeding behavior

## **Next Steps:**

Continue analyzing existing data to answer the questions below, and potentially deploy a small hydrophone array in Smith Bay, to document breeding behavior (timing and calling behavior) of ice seals (bearded and ringed).

1. Do ringed seals similarly adjust their calling behavior (call louder, call more often) to compensate for man-made noise (vessels, oil and gas)?
2. Is there a threshold beyond which ringed seals cannot compensate for man-made noise?
3. Do ringed seals exhibit the same resilience to noise as bearded seals?
  - a. Data collected through oil and gas contracts already exists to answer these questions.  
No fieldwork necessary
4. Are ice seals in Smith Bay vulnerable to anthropogenic impacts associated with noise and sea ice loss? (NPRB grant application)
  - a. Fieldwork would be brief, would occur prior to the spring hunting season, and would not require any direct interaction with the animals.

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