

# Effects of Changing Sea Ice on Marine Mammals and Subsistence Hunters in Northern Alaska

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## Overview

Marine mammals are important sources of food for indigenous residents of northern Alaska. Changing sea ice extent and thickness affect the behavior of animals and thus the success of hunters. Documenting the traditional knowledge of Iñupiaq and Yup'ik hunters concerning marine mammals and sea ice makes a wide range of information and insight relevant to ecology, conservation, and human activity. We interviewed hunters in villages from the northern Bering Sea to the Beaufort Sea about bowhead whales, walrus, and ice seals, (ringed, bearded, spotted, and ribbon). Traditional knowledge is the product of careful, systematic observation of the environment, confirmed by repeated observation or comparison with the observations of others. This knowledge is shared among hunters through stories and conversation, and treated with care and attention, including attributing the observations and interpretations to the individuals who made them (Noongwook et al. 2007). We documented observations of the migratory and local movements of marine mammals, feeding and reproductive behavior, predation, habitat use, response to disturbance including human activity, and other aspects of the life history and ecology of these animals.

## Methods

- We used the semi-directive interview method to collect traditional knowledge from subsistence hunters and community members (Huntington 1998).
- We interviewed people from 8 communities between 2007 and 2015 (Table 1).
- After the interviews, we prepared a draft report that was reviewed and approved by all the participants.
- The final report was prepared after all the comments had been addressed.

Table 1. Summary of interviews.

Community	Year	Species Focus	No. of Participants
Kaktovik	2007	Bowhead whales	6
Barrow	2007	Bowhead whales	6
Wainwright	2008	Bowhead whales	7
Point Lay	2011	Walrus	5
Wainwright	2011	Walrus	13
Point Hope	2013	Walrus	8
Barrow	2015	Walrus and ice seals	10
Elim	2015	Ice seals and walrus	8
St. Michael & Stebbins	2015	Ice seals and walrus	8
Total 8 communities	5 years	6 species	71 participants

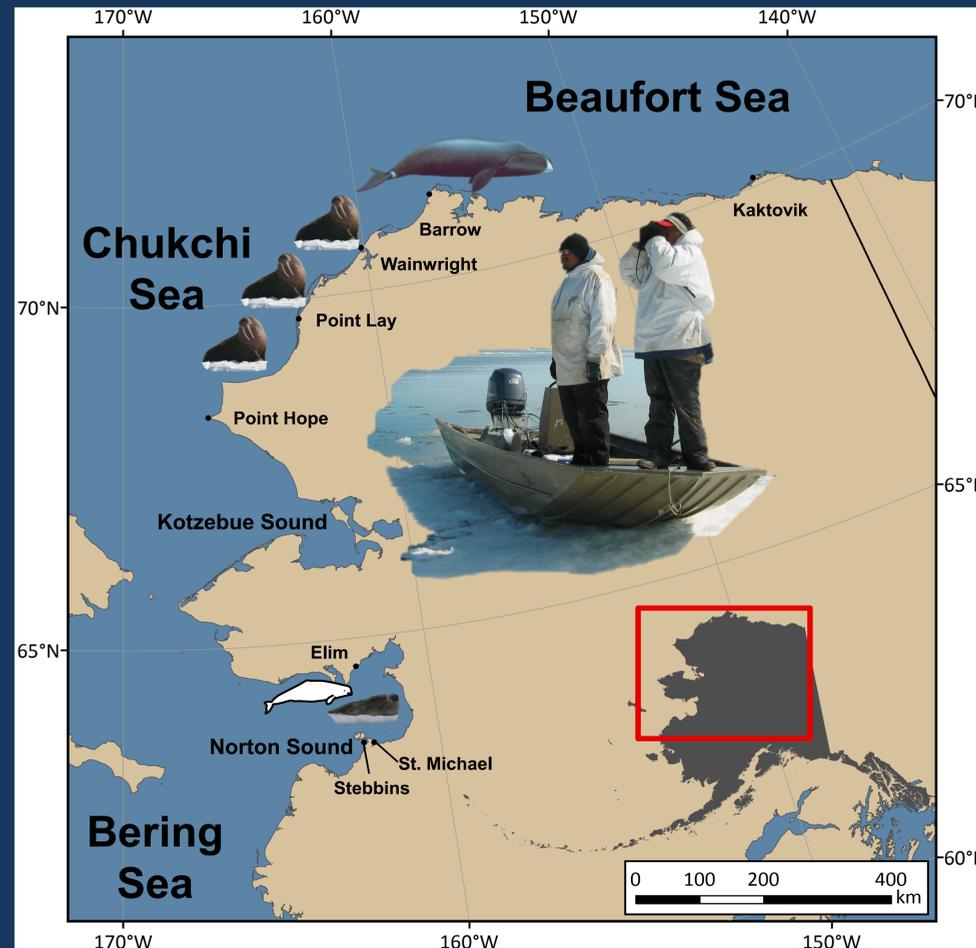


Figure 1. Map of study area and participating communities. Icons correspond to detailed observations about walrus, ice seals, and beluga and bowhead whales.

## General Observations

(Recorded in many communities)

- Ice seals are available for a shorter period of time.
- In the past, pack ice came and went all summer, but now retreats from shore and does not return until freeze-up.
- Because of thinner sea ice, it is harder to find a place to haul a bowhead whale onto ice for butchering.
- Hunting and traveling is more dangerous because of thinner ice in winter and spring.
- More efficient boat motors enable hunters to travel farther to retreating ice.
- Less sea ice and bigger storms reduce the number of good hunting days.
- Increased oil and gas activity and greater shipping traffic are concerns; impacts to subsistence are still unknown but potentially large.
- Hunters have adjusted for changing sea ice by hunting earlier in the spring and later into the fall and winter to get what they need.

## Specific Observations

(Recorded in one or two communities)



Beluga whales (*Delphinapterus leucas*) and killer whales (*Orcinus orca*) were seen near Elim in Norton Bay in January 2015, when ice was unusually late in forming (Figure 1).



Walrus are hauling out on land near Point Lay in the tens of thousands. Walrus hauled out on land many times in the past century but in smaller groups.



There is less snow on the sea ice in Norton Bay, reducing the habitat available for seal dens; however, there are still many breathing holes in the ice in spring.



Thinner shorefast ice off of Barrow has shifted spring feeding areas and the distribution of bowhead whales, so that few are now seen along the ice edge to the southwest of the community, which used to be a good hunting area.



Snowmachine noise near Barrow may be changing migration patterns away from shorefast ice.

## Conclusions

Our findings are consistent with other recent studies of traditional knowledge and marine mammals in the region (e.g., Noongwook et al. 2007, Galginaitis 2013, Huntington et al. 2013, Kawerak 2013, Voorhees et al. 2014), which note both the responses of marine mammals to changing conditions and the innovations of hunters to shifts in timing, distribution, and behavior of the animals they seek. In these studies and in ours, hunters emphasized that the impacts to animals and people are a result of the interactions among many factors rather than to changing sea ice acting alone.

## Acknowledgements

We appreciate the skill, expertise, and generosity of the 71 hunters who participated in the interviews, and the communities and Tribal Councils of Kaktovik, Barrow, Wainwright, Point Lay, Point Hope, Elim, Stebbins, and St. Michael that facilitated this work. We also thank the Alaska Eskimo Whaling Commission, the Eskimo Walrus Commission, and the Ice Seal Committee for their support and guidance. We are grateful to the Bureau of Ocean Energy Management, the Minerals Management Service, ConocoPhillips, and the Coastal Marine Institute for funding.

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