

Female and young walruses depend on disappearing Arctic sea ice for food sources

August 19 2021



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A new study shows that disappearing sea ice is a significant element of the food web supporting female walrus and their dependent young in the Arctic's Chukchi Sea. Researchers were able to trace biomarkers that are unique to algae growing within sea ice to connect marine mammals with a food source that is rapidly diminishing in the face of climate change.

"This study builds on work we have been doing in the Bering and Chukchi Seas to show that these tracers of ice algae and phytoplankton can be used to monitor the ecosystem response to disappearing sea ice," said lead study author Chelsea Koch of the University of Maryland Center for Environmental Science. "Ongoing monitoring of these sea ice biomarkers in walrus and even other organism tissues in the region will potentially help us to identify how the system is responding to changing food sources at the base of the food web as a result of climate change."

The marine ecosystem of the Pacific Arctic near Alaska is adapted to utilizing fat-rich foods derived from biological production in sea ice. Ice algae blooms lead to a pulse of high-quality food to the sea floor. This in turn supports high abundances of clams and other benthic organisms throughout the Bering and Chukchi Seas—and lots of food for walrus to eat.

However, the loss of seasonal sea ice poses a threat to Pacific walrus,

particularly how they use sea ice for rest and to access and forage on these dense offshore clam beds. With the disappearance of sea ice in many recent years near Alaska, thousands of walruses are coming ashore in the late summer on coastal beaches that are distant from the most productive clam beds. Stampedes are also likely to occur with these massive gatherings, leading to additional mortalities.

Based on the migration patterns of adult females and juveniles moving north with the ice edge each spring, Koch and the research team expected to see higher signatures of ice algae in the walruses harvested from the Chukchi Sea. However, results from the northern Bering Sea revealed a more nuanced finding, aligning with the traditional local knowledge of subsistence hunters on St. Lawrence Island.

Walruses were evaluated for Endangered Species Act listing due to the decline of seasonal sea ice in the Arctic. They are also important in some Alaska Indigenous communities as a source of subsistence food.

"One of the interesting findings was that these sea ice biomarkers were consistently higher in the female walruses in the northern Bering Sea compared to the males. These markers are short-lived in walrus livers, on the order of days or maybe weeks. So we know this elevated sea ice signature in the females is not an accumulation from their previous years' journey into the Chukchi Sea," said Koch. Researchers were able to trace biomarkers using liver tissues from some animals that were harvested as part of subsistence hunting.

This provides supporting evidence that female foraging behavior differs from the males in the winter and spring months while in the Bering Sea.

The work was carried out in coordination with a number of partners in Alaska and also included scientists from Clark University and the Scottish Association for Marine Science. Samples from the Bering Sea

were provided by the University of Alaska's Museum of the North, who in turn received the samples as donations from subsistence hunters. Samples from the Chukchi Sea were collected by the North Slope Borough Department of Wildlife Management (NSB DWM) as part of their harvest and [walrus](#) health harvest monitoring program. Co-author Dr. Raphaela Stimmelmayer of the NSB DWM emphasized that "without the support of the hunters of regional community-based harvest monitoring programs, important studies like this would not be possible."

More information: Chelsea W. Koch et al, Female Pacific walruses (*Odobenus rosmarus divergens*) show greater partitioning of sea ice organic carbon than males: Evidence from ice algae trophic markers, *PLOS ONE* (2021). [DOI: 10.1371/journal.pone.0255686](https://doi.org/10.1371/journal.pone.0255686)

Provided by University of Maryland Center for Environmental Science

Citation: Female and young walruses depend on disappearing Arctic sea ice for food sources (2021, August 19) retrieved 2 June 2023 from <https://phys.org/news/2021-08-female-young-walruses-arctic-sea.html>

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