

Forecasting the Response of Pacific Walrus to Reduced Sea Ice in the Chukchi Sea

The Pacific walrus is one of four marine mammal species managed by the U.S. Department of the Interior (DOI). The U.S. Geological Survey (USGS), as the research arm of DOI, conducts research on walruses to provide information needed by conservation and management agencies and other partners.

Walruses are important to human communities bordering the Chukchi and Bering seas in the United States and Russia, and the status of walrus provides information about the health of these highly productive marine ecosystems. The Pacific walrus is a benthic feeding, ice-associated pinniped that ranges over the continental shelf of the Bering and Chukchi seas. The continental shelf is a shallow region with high biological productivity, supporting abundant marine life within the water column and on the sea floor. Walruses use sea ice as a resting platform between dives to forage for clams and other bottom-dwelling invertebrates.

The loss of sea ice habitat in the Chukchi Sea is believed to be one of the greatest influences on future Pacific walrus population dynamics. In 2015, sea ice over the continental shelf in the northern Chukchi Sea melted entirely. A complete loss of sea ice in this region was first observed in the summer of 2007 and has been observed nearly every



Scientists prepare to radio-tag walruses in the Chukchi sea to track movements as sea ice is reduced in the region. Photograph by U. S. Geological Survey.



Adult female walruses on ice floe with young. Photograph by Sarah Sonsthagen, U.S. Geological Survey.

summer since, with the exceptions of 2008 and 2012. To assess the status of sea ice extent in the Chukchi Sea, the USGS uses near-real-time images and maps derived from satellite data to interpret radio-tag information.

USGS Research on Pacific Walruses

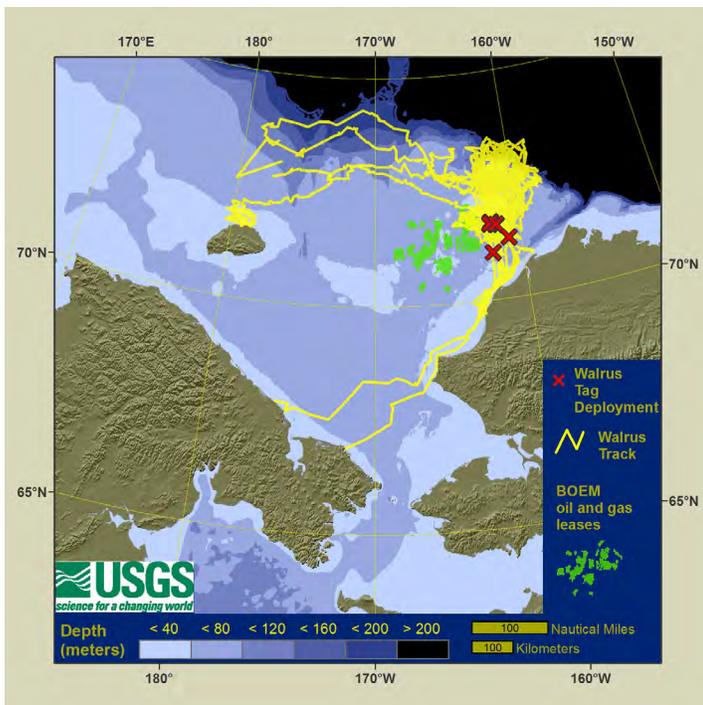
In 2011, the U.S. Fish and Wildlife Service (USFWS) determined that listing of the Pacific walrus as a threatened species under the Endangered Species Act was warranted but precluded by higher priorities. USFWS must review and make a final determination by 2017. The USGS is conducting research to understand how a rapidly changing arctic ecosystem is affecting key biological resources, including the Pacific walrus. As a part of the USGS Changing Arctic Ecosystems Initiative, this research is focused on developing a comprehensive approach for forecasting status of the Pacific walrus population under changing climate scenarios. These studies include tracking studies to understand walrus movements and activity budgets under differing ice conditions; development of a population model and collection of current data on age structure to inform an assessment of trend; and development of an energetic model to link changes in sea ice with changes in activity and ultimately population dynamics.



Satellite-tagged walrus. Red circle shows tag location. Tags are deployed with a crossbow with minimal disturbance to walrus. Photograph by Tyrone Donnelly, U. S. Geological Survey.

Surveys Inform Current Demographics of the Pacific Walrus Population

Since 2013, the USGS Alaska Science Center has led three surveys during spring migration of Pacific walrus into the Chukchi Sea to gather data on age-structure to inform status and trends of the population. These data will also be used to update population dynamic models being developed by the USGS to forecast response of walrus to rapidly declining sea ice (http://alaska.usgs.gov/science/interdisciplinary_science/cae/marine_ecosystem.php#model). Survey information is also quantifying mechanistic linkages between forecasted changes in sea ice, benthic prey and population level consequences for walrus. Other partners



Walrus radio-tracking in the Chukchi Sea, 2015. Walrus tracking is shown with a yellow line. Radio deployment locations are shown with a red X.

in these surveys are the USFWS, the Bureau of Ocean Energy Management (BOEM), and the Alaska Department of Fish and Game.

Satellite Radio-Tags Identify Walrus Foraging Behaviors and Distribution in the eastern Chukchi Sea

Since 2007, USGS researchers have deployed hundreds of satellite radio-tags on Pacific walrus to track their activity and movements. Walrus movement data will be used to quantify the effects of reduced summer sea ice on walrus behavior, distribution, and prey resources and to inform open-water season management decisions by BOEM and the USFWS. The U.S. Navy, U.S. Coast Guard, aviators and other vessel traffic can also use this data to avoid areas used by walrus. Data from previously tagged walrus are summarized and available on the Arctic Environmental Response Management (ERMA) website (<https://erma.noaa.gov/arctic/erma.html#x=-158.52172&y=69.38032&z=5&layers=1+12864+9333+9370+10076+10131>). Near real-time movement data from walrus tagged in 2015 by the USGS are now available online (<http://alaska.usgs.gov/science/biology/walrus/2015animation.html>).

Additional Resources

USGS Alaska Science Center Outreach/ Walrus Media Page (updated 8-19-2015):

http://alaska.usgs.gov/outreach/walrus_media_event_10-1-14.html

USGS Changing Arctic Ecosystems Initiative:

http://alaska.usgs.gov/science/interdisciplinary_science/cae/index.php

Fact Sheets:

- Geiselman, J. A., DeGange, A. R., Oakley, K. L., Derksen, D. V. and Whalen, M. E., 2011, Changing Arctic ecosystems - Research to understand and project changes in marine and terrestrial ecosystems of the Arctic: USGS Fact Sheet 2011-3136, 4 p. <http://pubs.usgs.gov/fs/2011/3136/>
- Oakley, K., Whalen, M., Douglas, D., Udevitz, M., Atwood, T., and Jay, C., 2012, Polar bear and walrus response to the rapid decline in Arctic sea ice: U.S. Geological Survey Fact Sheet 2012-3131, 4 p. <http://pubs.usgs.gov/fs/2012/3131/>
- Jay, C. V. and A. S. Fischbach. 2008. Pacific walrus response to Arctic sea ice losses. USGS Fact Sheet 2008-3041. <http://pubs.usgs.gov/fs/2008/3041/>

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Or visit: USGS Alaska Science Center Outreach/ Walrus Media Page (updated 8-19-2015) - http://alaska.usgs.gov/outreach/walrus_media_event_10-1-14.html