

## **Environmental Studies Program: Ongoing Studies**

**Study Area(s):** Beaufort Sea, Chukchi Sea

**Administered By:** National Program

**Title:** WALRUS - Walrus Adaptability and Long-term Responses; Using multi-proxy data to project Sustainability (ArcSEES; NT-13-x11)

**BOEM Information Need(s) to be Addressed:** BOEM needs reliable estimation of long-term trends in walrus feeding ecology, foraging location, and population demographics. NSF's Arctic Science, Engineering and Education for Sustainability (ArcSEES) program is a multi-year, interdisciplinary program, supported by an international partnership among BOEM, NSF, USGS, USFWS, EPA, and a consortium of French agencies, that seeks to evaluate the sustainability of the Arctic's human-environmental system and to provide community-relevant sustainability pathways and engineering solutions. BOEM's participation in the ArcSEES program will facilitate a better understanding the complex feedbacks that control the overall evolution of the Arctic system for timescales ranging from a few days to several years. Findings from this and other ArcSEES projects will support NEPA analyses for potential future lease sales, review of EPs, DPPs and other reviews for BOEM decision-making and mitigation.

**BOEM Contribution:** \$200,000  
plus Joint Funding

**Period of Performance:** FY 2013-2019

**Conducting Organization:** NSF, ArcSEES

**BOEM Contact:** [Dr. John Primo](#)

### **Description:**

**Background:** In the last seven years there has been a rapid decline in spatial extent of summer sea-ice in the Arctic Ocean. At the same time, striking changes in Pacific walrus (*Odobenus rosmarus divergens*) foraging and haul-out locations have been observed. Marine mammals are considered sentinels of climate change in the Arctic as they are long-lived, occupy higher trophic levels, and many depend on sea-ice habitat. Walruses are also a significant component of the Alaska Native subsistence way of life, so information exchange based on traditional ecological knowledge (TEK) and scientific findings is pivotal to communities relying on these iconic animals. A substantial threat to walruses is the current warming and associated loss of sea-ice during the summer months, which can result in increased mortality due to decreases in prey within range of coastal haulouts and an increase in disturbance events. Despite impressive data from in-depth studies of Pacific walruses over the last 40-50 years, that timeframe is too short to capture adaptation to large-scale warming and change, making sustainability projections difficult. Management decisions are currently based on numerical population assessments, which can be somewhat unreliable, and instead advocated for decision-making processes based on ecological needs and observed ecological change.

**Objectives:** The goal of this study is to correlate changes in genetic diversity and effective population size (DNA), foraging locations (element analyses) and accessibility (TEK), and changes in overall diet (stable isotope analysis) and health (steroid hormones) of walrus populations in Alaska with known periods of climate change and differing anthropogenic pressures (TEK, published records).

**Methods:** This study will track changes in walrus trophic position, foraging location, and genetic structure and diversity over the past 2500 years using multi-proxy datasets. The researchers will test correlations between these changes and large-scale climate and anthropogenic forces and will develop projections about how walruses would respond to or perceive varied stresses. The project will involve students from high school to graduate levels to promote sustainability education within affected communities. The results will be compiled and disseminated to assist communities currently planning for a sustainable walrus subsistence harvest within the parameters of a rapidly changing Arctic.

**Current Status:** Ongoing

**Publications Completed:**

Clark, C.T., Horstmann, L., and Misarti, N.. "Quantifying variability in stable carbon and nitrogen isotope ratios within the skeletons of marine mammals of the suborder Caniformia.," Journal of Archaeological Science: Reports, 2017.

**Affiliated WWW Sites:** <http://www.boem.gov/akstudies/>  
[http://www.nsf.gov/funding/pgm\\_summ.jsp?pims\\_id=503604](http://www.nsf.gov/funding/pgm_summ.jsp?pims_id=503604)  
[http://www.nsf.gov/awardsearch/showAward?AWD\\_ID=1263848](http://www.nsf.gov/awardsearch/showAward?AWD_ID=1263848)  
<http://ine.uaf.edu/werc/werc-projects/walrus/>  
<https://marinecadastre.gov/epis/#/search/study/100074>

**Revised Date:** August 9, 2018