

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Region: Alaska

Planning Area(s): Chukchi Sea, Bering Sea

Title: Biogeochemical Assessment of the OCS Arctic Waters: Current Status and Vulnerability to Climate Change (AK-08-12-03)

BOEM Information Need(s) to be Addressed: This study would provide an assessment of the current status of the ecosystem and its vulnerability to acidification or other aspects of climate change to use in evaluation of potential local and regional impacts from offshore exploration and development activities that may occur in Federal waters. The study was initiated for NEPA analysis and documentation for the North Aleutian Basin, but has shifted emphasis north into the Chukchi Sea.

Total Cost: \$756,704 plus Joint Funding

Period of Performance: FY 2008-2014

Conducting Organization: CMI, UAF

BOEM Contact: [Nancy Deschu](#)

Description:

Background: This study initially emphasized the North Aleutian Basin in the southeastern Bering Sea, one of the most productive marine ecosystems in the world. The scope of the study has expanded to include measurements first in the northern Bering Sea and now in the Chukchi Sea. Over the last decade, the character of the ecosystem productivity in the southeastern Bering Sea has undergone dramatic changes due to variability in hydrographic and climate forcing. In recent years, the system has changed from one dominated by cold-water, Arctic species to organisms more indicative of temperate zones with the historically rich fishing areas shifting northward. Available data suggest decreased coupling of benthic and pelagic production. The National Science Foundation's multi-component Bering Sea Ecosystem Study (BEST) is examining these changes. This BOEM-sponsored Alaska Coastal Marine Institute (CMI) Task Order is being conducted in conjunction with BEST and also with the Bering Sea Integrated Ecosystem Research Program (BSIERP). This CMI study was extended to December 2013, to allow time for inclusion of additional samples and analyses from the Chukchi Sea.

Objectives:

- Quantify upper ocean net ecosystem production (NEP) and its fate in North Aleutian Basin.
- Assess the effect of ocean acidification on the marine environment of the Bering Sea and Chukchi Sea.

Methods: The CMI Task participates in multiple cruises in Bering and Chukchi Sea, including samples during the COMIDA CAB study. Dissolved organic and inorganic nutrients and carbon, total alkalinity, particulate organic matter, and pCO₂ measurements are used to calculate net

ecosystem production and acidification. The seasonal changes in stocks of inorganic C and N are a measure of NEP. The fraction of NEP accumulating in the dissolved organic matter, suspended particulate matter, and sinking particulate matter pools will be estimated.

Current Status: Ongoing

Final Report Due: December 2013

Publications Completed:

- Fabry, V. J., J. B. McClintock, J. T. Mathis, and J. M. Grebmeier. 2009. Ocean Acidification at High Latitudes: The Bellwether. *Oceanography* 22(4) 160-171.
- Mathis, J. T., Cross, J. N., Bates, N. R., Moran, S. B., Lomas, M. W., and P. J. Stabeno. 2010. Seasonal Distribution of Dissolved Inorganic Carbon and Net Community Production on the Bering Sea Shelf. *Biogeosciences* 7: 1769-1787.
- Bates, N.R., J.T. Mathis, M.A.Jeffries. 2011. Air-sea CO₂ fluxes on the Bering Sea shelf. *Biogeosciences*, 8: 1237–1253.
- Mathis, J. T., J. N. Cross, and N. R. Bates. 2011. Coupling primary production and terrestrial runoff to ocean acidification and carbonate mineral suppression in the eastern Bering Sea. *Journal of Geophysical Research*, 116, C02030.

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>
<http://www.sfos.uaf.edu/cmi/>
<http://www.sfos.uaf.edu/oarc/projects.php>

Revised Date: December 2012

ESPIS: Environmental Studies Program Information System

All completed ESP studies can be found

here: http://www.data.boem.gov/homepg/data_center/other/espis/espisfront.asp