Environmental Studies Program: Ongoing Studies

Study Area(s): Beaufort Sea, Chukchi Sea

Administered By: Alaska OCS Region

Title: Alaska Monitoring and Assessment Program (AKMAP) Survey of Estuaries within the National Petroleum Reserve-Alaska (AK-13-03-11)

BOEM Information Need(s) to be Addressed: Information is needed on coastal estuarine habitats and baseline contaminants in the Beaufort and Chukchi Seas to refine our understanding of the connections between marine and coastal habitats. Habitats in the ecologically fragile coastal environments are particularly vulnerable to oil spills. Information from this study will support a better understanding of current conditions to improve understanding of changing distributions of habitats and contaminants under different development scenarios and climate change conditions. This project will operate concurrently with and integrate with ANIMIDA III (AK-11-14b) to provide a current baseline of ecological conditions in coastal areas.

Total BOEM Cost: $250,594 plus Joint Funding ($250,594) **Period of Performance:** FY 2015-2018

Conducting Organization: CMI, UAF

Principal Investigator(s): Dr. Doug Dasher

BOEM Contact: Warren Horowitz

Description:

Background: An aquatic resource survey of estuaries within the National Petroleum Reserve-Alaska (NPR-A) is being conducted by the Alaska Department of Environmental Conservation (ADEC) under the Alaska Monitoring Assessment Program (AKMAP). This survey is based on sampling designs developed with an integrated approach that uses multiple indictors to allow for assessment, evaluation, understanding and forecasting at different spatial scales. The AKMAP surveys allow for statistical inferences to be made for the entire population or region, such as NPR-A estuaries, that can be used to support baseline assessments of ecological condition, cumulative impacts, trends over time and for use in probabilistic risk assessments. The funding provided by BOEM will double the number of sites to be surveyed.

The NPR-A survey will assist local, State, and Federal resource managers to identify issues, alternatives and mitigation measures necessary for NEPA documents. For example, it will provide information for identifying critical habitat areas for multiple uses (i.e., marine mammals, benthic organisms, sea birds, fishes, oil spill response and subsistence use), and to inform the selection of appropriate pipeline corridors. The survey will provide information useful in the development of technical tools, such as

regional sediment normalization curves and benthic response indices, which facilitate evaluation of potential environmental effects from human activities.

AKMAP NPR-A Survey Design: The NPR-A estuary target population was mapped with a combination of NOAA's environmental Sensitivity Index coastline for the North Slope with some shorelines modified for erosion based on 2010 SPOT imagery. Estuaries were defined for the NPR-A as any tidally-influenced water with less than 50% of its perimeter adjacent to the ocean. Indicators to be measured include characteristics of the aquatic resource that provide quantitative or semi-quantitative data on the condition of the aquatic resource. Indicators allow AKMAP to evaluate effects of multiple stressors, such as chemical contaminants and other human activities, on the biological communities. AKMAP considers two types of indicators, condition and stressor. Biological or physical characteristics are condition indicators used to evaluate the condition of the aquatic resource to an environmental value. Biodiversity of marine sediment invertebrates is a condition indicator for the environmental quality of the waters. Stressors, such as low dissolved oxygen or petroleum hydrocarbon contamination, may result in measurable changes in condition indicators, such as benthic or fish community structure.

Objectives: The goal of this project is to expand the existing AKMAP surveys to include up to 20 additional sampling stations, allowing for a more robust statistical analysis, and to incorporate a sediment chemistry analysis into the project. The specific objectives of this project include:

- Estimate the areal extent of NPR-A estuaries that meet or do not meet ADEC and Environmental Protection Agency (EPA) water quality criteria in regard to ecological conditions (sediment, water column, biological).
- Assess whether areal extent and magnitude of ecological conditions vary between the NPR-A Chukchi and Beaufort estuaries.
- Evaluate potential connections between biological responses and contaminant exposure, including relationships between diversity and abundance of macroinvertebrates and habitat conditions, such as sediment grain size, at each station, or contaminant concentrations, including sediment trace metals and polycyclic aromatic hydrocarbons.
- Assess potential differences between regional reference conditions established by the entire survey and the same indicators measured temporally at potentially impacted stations, such as areas near oil seeps.

Methods: The survey will follow National Coastal Condition Assessment (NCCA) methods that are prepared nationally by EPA in coordination with the States for teams conducting aquatic resource surveys. AKMAP NPR-A will use four NCCA indices of condition – water quality (pH, dissolved oxygen, temperature, salinity, nutrients, total suspended solids, light transmittance, chlorophyll a), sediment quality (hydrocarbons, trace metals, total organic carbon), benthic community condition, and fish tissue contaminants.

A Generalized Random Tessellation Stratified survey design for an area resource was used to locate the stations, but the targets may be modified based on a final assessment of bathymetry in relation to the draft of the vessel finally contracted. Two strata were created – Beaufort Sea and Chukchi Sea estuaries – with an equal probability of selection of 20 base stations plus 20 oversample stations within each stratum. At each station, water column data will be collected through the use of a CTD and Niskin bottle sampling. Surficial sediment samples (macroinvertebrate and sediment chemistry) also will be collected. A 1-meter beam trawl will used to collect epifauna and fish samples for tissue contaminants. A microbial hydrocarbon degradation study and a sediment core dating pilot project will share the water and sediment samples.

Current Status: Completed

Final Report Due: March 2019

Publications Completed: None

Affiliated WWW Sites: http://www.boem.gov/akstudies/
http://www.cfos.uaf.edu/cmi/
https://marinecadastre.gov/espis/#/search/study/100127

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