

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Region: Alaska

Planning Area(s): Beaufort Sea

Title: Shorebirds and Infaunal Abundance and Distribution on Delta Mudflats along the Beaufort Sea (AK-11-10a)

BOEM Information Need(s) to be Addressed: More information is needed about the species composition, abundance, or distribution of the microfauna and meiofauna invertebrates that shorebirds depend upon for pre-migratory fattening along the Beaufort Sea coast. This study will assess the lower trophic levels forming the base of complex food webs and the biochemistry that influences these relationships. The infaunal abundance contributions to shore bird foraging, migration, and reproductive biology as well as bioremediation of oil spills has been shown to be important factors in the recovery and cleanup of past oil spill events in Alaska and other regions. The information obtained from this jointly-funded research will contribute to development of mitigation measures and strategies to reduce potential impacts from post-lease exploration and development.

Total Cost: \$237,169

Period of Performance: FY 2011-2016

Conducting Organization: USGS

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Description:

Background: The Beaufort Sea coast includes a variety of biologically productive habitats in lagoons, barrier islands, river deltas, and adjacent tundra areas. These habitats support diverse biota and could be affected by oils spills or disturbance resulting from offshore oil exploration in the Beaufort Sea. Oil spills could impact shorebirds through direct oiling, potentially impacting their prey and the benthic invertebrate community. The impacts of oil on aquatic invertebrates can be significant. Some components of the infaunal invertebrate community would be extirpated, while in others recovery may take 3-5 years depending on the conditions of the oil and environment. These ecosystems are particularly vulnerable to predicted climate-change effects, such as inundation and increased erosion caused by rising sea levels and longer periods of open water. More information is needed about the species composition, abundance, or distribution of the aquatic invertebrates that shorebirds depend upon for pre-migratory fattening along the Beaufort Sea coast. This information need extends to the lower trophic levels forming the base of these complex food webs and the biochemistry that influences these relationships. Their contributions to shore bird foraging, migration, and reproductive biology as well as bioremediation of oil spills has been shown to be important factors in the recovery and cleanup of past oil spill events in Alaska and other regions. Microfauna (e.g. bacterial, fungal, or protozoan populations), and meiofauna (nematodes, gastrotriches, and other eukaryotic organisms) living within the interstitial spaces of these zones become important considerations in mitigation of long and short-term damage due to anthropogenic oil spill contamination in these

microhabitats and surrounding environments. Additionally understanding the chemical factors that determine the distribution of these microfauna and meiofauna is necessary.

Quality foraging habitat for shorebirds is determined by the abundance of benthic invertebrates, but can also be influenced by lagoon water levels that can inundate the delta making the habitat inaccessible to shorebirds. Most of the change in water level on delta mudflats comes from wind driven waves. If wind patterns are consistent then available habitat is predictable, but changes in tide due to westerly storms can be significant and may inundate the whole delta for several days. Climate change may change the frequency of storms and seems to have changed the intensity of the storms by increasing the size of waves because the reduced amount of ice results in fewer impediments to wave build up. This has the potential to change the availability of shorebird feeding areas, making the occurrence of this habitat less predictable to birds during the post-breeding period.

In addition to quantifying invertebrate resources, the study will assess whether the resources available to shorebirds are sufficient to prepare the birds for their fall migration. A functional response model will be used for this assessment based on the capture rate and handling time modeled against invertebrate abundance.

This study will survey the shorelines and consist of taking core samples for laboratory analysis for chemical analysis, population structure, numbers of individuals, and diversity of populations from the interstitial spaces within the littoral zone of coastlines along the Beaufort Sea.

Objectives: The specific objectives of this study are to:

- Quantify the spatial and temporal distribution of macrofauna assemblages at coastal lagoons and river deltas along the Beaufort Sea coast within the USFWS Arctic Refuge- at 3 sites associated with the coastal lagoons at the Jago, Hulahula/Okpilak, and Canning Rivers.
- Assess whether patterns of invertebrate abundance and distribution correspond to foraging shorebird abundance and distribution.
- Develop a model describing the connection between wind patterns and water levels on the mudflat and sediment dispersion that can be used to assess available foraging habitat for shorebirds.
- Assess whether shorebirds respond physiologically to a greater abundance in food resources through body condition measurements and increased triglyceride levels.
- Assess whether available invertebrate resources in the coastal lagoons and river deltas along the Beaufort Sea are sufficient for pre-migratory fattening of shorebirds or provide information for bioremediation.

Methods: This study builds on an existing study with the U.S. Fish and Wildlife Service (USFWS) and tiers off a previous MMS/CMI shorebird study by Abby Powell across the Beaufort and Chukchi Sea coasts. This study focuses intensively on a few sites along the coast of the USFWS Arctic Refuge and two years data collection has been funded by USFWS. This project is also in collaboration with the Arctic Landscape Conservation Cooperative (LCC). The USGS/BOEM partnership would collect data on a few sites intensively within the USFWS Arctic Refuge at 3 sites associated with the coastal lagoons at the Jago, Okpilak, and Canning

Rivers for two additional field seasons. This project will provide additional sampling locations and core analysis to analyze population structures, chemical footprint, numbers of individuals, and diversity of populations from the interstitial spaces within the littoral zone. The project will continue to map the distribution of common functional groups of invertebrates using spatial analysis kriging techniques. Results will produce data reflecting measures of abundance of benthic invertebrates using mudflat core samples to determine availability of food resources for shorebirds.

Current Status: Ongoing

Final Report Due: December 2016

Publications Completed: None

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>

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