

Environmental Studies Program: Ongoing Study

Study Area(s): Cook Inlet

Administered By: Alaska Regional Office

Title: Nearshore Food Web Structure on the OCS in Cook Inlet, Alaska (AK-13-03-22)

BOEM Information Need(s) to be Addressed: Updated and readily accessible intertidal and shallow subtidal habitat information will support environmental analyses for future Cook Inlet lease sales and potential future Exploration Plans, and Development and Production Plans in Cook Inlet, as well as for BSEE's ongoing spill response planning. The subtidal and intertidal areas are home to many grazing invertebrates which provide an important source of prey for marine and terrestrial mammals, birds, other invertebrates and humans and are particularly susceptible to oil spills. Updated information from this study will be important to understanding and assessing potential impacts of an oil spill in Cook Inlet.

Total BOEM Cost: \$124,402
plus Joint Funding (\$124,402)

Period of Performance: FY 2017-2020

Conducting Organization: CMI, UAF

BOEM Contact: [Catherine Coon](#)

Description:

Background: Nearshore marine habitats are particularly vulnerable to potential impacts of marine oil and gas extraction activities and shipping, as well as to influences from climate change or other anthropogenic activities. In addition to the direct lethal effects that a severe incident such as an oil spill could have on nearshore species of all trophic levels, more subtle effects include the reduction of resilience and health of species and the disruption of the energy flow among the various nearshore ecosystem components.

Food web structure is the representation of how species within the nearshore system are linked through energy flow, thus building a network. Food web interactions are responsive to perturbations from human activities such as oil and gas extraction as well as from climate change, potentially leading to disruptions in energy flow to higher trophic levels. This project will examine food web structure in nearshore, macroalgal-dominated systems in Kachemak Bay and in Kamishak Bay, adjacent to the Cook Inlet 2017-2022 Program Area. These nearshore systems are highly diverse, and current efforts are underway to characterize the community composition and diversity of these systems (AK-15-08; AK-14x-10) partnering with National Park Service, University of Alaska Fairbanks, and the Cook Inlet Regional Citizens Advisory Council. Leveraging off these ongoing BOEM funded studies, this study will add a dynamic, food web oriented characterization of the ecosystem. Adding a food web perspective to simultaneously ongoing studies of species occurrence and richness provides a more

dynamic, interaction-driven view of the ecosystem that can be useful in understanding key species function in an ecosystem.

Objectives: The overarching goal of the study is to identify the food web structure (trophic levels and trophic niche use) of the nearshore macroalgal-based systems in Cook Inlet, to provide an assessment of the potential vulnerability of the nearshore food webs, and to establish a benchmark for monitoring changes in food web characteristics over time. Specific objectives include:

- To quantitatively describe and compare nearshore macroalgal-based food web structure in two regions in Cook Inlet using stable isotope analysis.
- To gauge resilience of nearshore food webs in Cook Inlet based on measures of food web structure and trophic niche space.

Methods: This project will provide quantitative measures of nearshore food webs, such as food web length, trophic level of main taxa, food web niche structure, and carbon sources within the Cook Inlet OCS. Sampling will occur in two regions in Lower Cook Inlet: Kachemak Bay and Kamishak Bay in 2017 and 2018. Lab analysis will use carbon and nitrogen stable isotope of nearshore primary producers (macroalgae, phytoplankton) and abundance consumers (mussels, limpets, whelks, sea stars, and crabs) combined with quantitative abundance data.

Current Status: Completed

Final Report Due: February 2020

Publications Completed: None

Presentations:

Siegert, D. & K. Iken. 2018. Nearshore food web structure on the OCS in Cook Inlet
Alaska Coastal Marine Institute 2018 Annual Research Review
Siegert, D. & K. Iken. 2019. Nearshore food web structure on the OCS in Cook Inlet
Alaska Coastal Marine Institute 2019 Annual Research Review

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>
<https://www.uaf.edu/cfos/research/cmi/>
<https://marinecadastre.gov/epis/#/search/study/100136>

Revised Date: June 15, 2020