

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Region: Alaska

Planning Area(s): Beaufort Sea, Chukchi Sea

Title: Population Assessment of Snow Crab, *Chionoecetes opilio*, in the Chukchi and Beaufort Seas Including Oil and Gas Lease Areas (AK-08-12-09)

BOEM Information Need(s) to be Addressed: This study will provide information on historic and current data on abundance, biomass, stock structure, diet, and trophic position of snow crab (*Chionoecetes opilio*) in the Chukchi and Beaufort Seas including lease sale areas and relate patterns to environmental variables. This information will be used to evaluate and mitigate the potential environmental effects on marine invertebrates of offshore development. Information from this study will support NEPA analysis for potential lease sales, EPs and DPPs, mitigation, and monitoring in the Beaufort and Chukchi Seas.

Total Cost: \$181,019
plus Joint Funding

Period of Performance: FY 2011-2015

Conducting Organization: CMI, UAF

BOEM Contact: [Catherine Coon](#)

Description:

Background: Changing climate in the Arctic is manifesting as warming temperatures and changing sea ice conditions, which appear to be causing changes in marine communities and northward range contractions of Arctic species. For commercially important or subsistence species in particular, we must understand the ecological and environmental parameters that influence population structure and species distributions if we are to predict how climate change or human activities such as oil and gas exploration will affect both new and established populations in sensitive areas. Snow crab (*Chionoecetes opilio*) concentrations have recently contracted northward in the Bering Sea. It is a current predominant commercial fishery in this region and is thought to be a very common species throughout the Chukchi and parts of the Alaskan Beaufort Seas, including oil and gas lease sale areas. However, existing knowledge for adequate management planning and risk assessment is sparse and more background information on stock size and structure and reproductive condition is needed.

To conduct a current assessment of Arctic snow crab, this proposal will cost-effectively use recently collected snow crabs from the Chukchi and Beaufort Seas, in addition to new collections to be made during the 2011 central Beaufort Sea fish survey and a NOAA-funded 2012 Chukchi Sea RUSALCA and BOEM funded Chukchi Arctic EIS survey. The proposed work will address a BOEM research need by providing information to better understand potential resources and marine environments potentially affected by offshore oil and gas exploration and extraction. This information

will also aid in defining the general distribution for crab species Essential Fish Habitats (EFH).

Sensitivity of fauna to potential oil and gas-related pollution is related to trophic level (the position of a taxon in a food web), because bioaccumulation and biomagnification potential of persistent pollutants, including a suite of chemicals contained in petroleum products, are dependent on the trophic position of an organism. Snow crab prey includes polychaete worms, crustaceans, bivalves and brittle stars with some regional and age-specific variability in dominant prey items. Recent research indicates that Snow crabs in the southern Chukchi Sea occupy a trophic level among the highest levels of dominant invertebrates and fishes in the region. Organisms feeding at high trophic levels have a high potential for biomagnification, the accumulation of chemicals in organism tissues through dietary accumulation. Combining stable isotope analysis to determine trophic level and stomach content analysis to determine prey taxa will allow us to interpret the food web connections of snow crab and their bioaccumulation and biomagnification potential in light of food availability and distribution within and outside oil and gas exploration areas.

Objectives:

- To estimate abundance and biomass and assess distribution of snow crab in the Chukchi Sea and Beaufort Sea lease sale areas and adjacent regions in relation to water depth, bottom water temperature and salinity, water mass and sediment type using existing and new data.
- To determine stock structure including: sex ratio, size-frequency distribution, size at maturity, fecundity of female snow crab, and sperm reserves in spermathecae.
- To identify diet and trophic position of snow crab in different geographic areas.
- To compare our findings between years at re-sampled Chukchi Sea stations, compare to existing recent data from the northern Bering Sea and to the few available earlier quantitative studies in the Chukchi.

Methods: Adult specimens of *C. opilio* collected throughout the Bering, Chukchi and Beaufort seas will be examined for degrees of genetic variation in adult populations using a microsatellite approach. Additionally, a limited number of mitochondrial gene sequences will be generated for inclusion in phylogenetic studies and for DNA bar coding purposes. Polymorphic DNA microsatellite loci from adult specimens will be isolated and compared with the genotypes of adult crab between regions using isolation by distance models. This will indicate spatial scales of genetic exchange. This project will provide genetic data from a public database, which can be used to meet BOEM planning needs.

Current Status: Awaiting final report

Final Report Due: May 2015

Publications Completed: None

Affiliated WWW Sites: <http://www.boem.gov/akstudies/>
<http://www.sfos.uaf.edu/cmi/>
http://www.sfos.uaf.edu/research/seaicebiota/CMI_crab/index.html

Revised Date: April 2015

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