

BOEM ENVIRONMENTAL STUDIES PROGRAM: Ongoing Studies

Study Area(s): Beaufort Sea, Chukchi Sea

Administered By: Alaska OCS Region

Title: Arctic Integrated Ecosystem Survey, Phase II (AK-16-07)

BOEM Information Need(s) to be Addressed: BOEM needs a comprehensive assessment of both demersal and pelagic fish communities in the Chukchi and Beaufort Seas to improve benchmark information about the distribution, abundance, and life history of Arctic marine fish species. In particular, systematic surveys of the midwater fish community are currently lacking for the western Beaufort Sea. There is also a need for monitoring fish communities on a regular basis at least every 3-5 years to document variability and long-term changes. This information is needed to enhance environmental impact assessments, particularly with respect to early life history stages of key species such as Arctic cod (*Boreogadus saida*) and forage fishes, to develop indices and benchmarks against which to compare future changes, and to identify the distribution of the vulnerable life stages to facilitate development of effective mitigation measures.

Total Cost: TBD

Period of Performance: FY 2017-2021

Conducting Organization: TBD

BOEM Contact: TBD

Description:

Background: Arctic fishes such as Arctic cod, capelin and saffron cod are key components of the Arctic food web and contribute to supporting large numbers of seabirds and marine mammals who migrate to the Arctic to take advantage of high seasonal production. There have been a variety of surveys with different gear types, primarily a small-mesh beam trawl sampling benthic fish resources. The first comprehensive bottom trawl surveys sampling larger fishes were conducted in the western Beaufort Sea in 2008 and in the Chukchi Sea in 2012. The first comprehensive surface and mid-water trawl/acoustic survey in the Chukchi Sea was conducted in 2012/2013. This survey documented for the first time large abundances of young-of-the-year Arctic cod in the northern Chukchi Sea. Their origin (spawning areas) and fate (nursery areas) are unknown at present.

A similar survey has not been conducted in the western Beaufort Sea, and the connectivity of fish populations between the Chukchi Sea and the Beaufort Sea has not been fully assessed. The proposed survey would repeat the 2012 Chukchi Sea survey in summer 2016 to allow direct comparisons of distribution and abundance of fishes and extend the survey around Barrow into the Beaufort Sea. It will provide the first synoptic assessment of fishes in the surface waters and in mid-water throughout the Beaufort Sea. To the extent possible, the spatial resolution of the survey and survey methods will be consistent with established survey designs that are routinely conducted by the

National Marine Fisheries Survey in the Bering Sea to allow for geographical comparisons. The most recent targeted fisheries work in the offshore Beaufort Sea includes: the *Beaufort Sea Marine Fish Monitoring 2008: Pilot Survey and Test of Hypotheses* (OCS Study BOEMRE 2010-048); the *Beaufort Sea Marine Fish Monitoring Survey in the Central Beaufort Sea* (AK-10-06); and the *U.S.-Canada Transboundary Fish and Lower Trophic Communities* (AK-12-04).

This project is a second phase of the study *Distribution of Fish, Crab and Lower Trophic Communities in the Chukchi Sea Lease Area* (AK-11-08a; AK-11-08b), also known as the *Arctic Ecosystem Integrated Survey* or Arctic EIS.

Objectives:

- Quantify the distribution, abundance, and condition of demersal fishes throughout the U.S. shelf waters of the Chukchi Sea and Beaufort Sea.
- Quantify the distribution, abundance, and condition of mid-water marine fishes, in particular young-of-the-year Arctic gadids and forage fishes, throughout the U.S. shelf waters of the Chukchi Sea and Beaufort Sea.
- Establish whether juvenile salmon utilize the coastal waters of the Beaufort Sea during late summer and determine their likely origin.
- Test the hypothesis that a large under-ice spawning aggregation of Arctic cod in the northern Chukchi Sea serves as a source for Arctic cod in the Beaufort Sea, whereas saffron cod form local populations in the coastal waters of the Chukchi and Beaufort Seas.

Methods: Survey protocols will follow established methods such as those employed during the *Arctic Ecosystem Integrated Survey* (Arctic EIS) with sampling conducted from at least two platforms (bottom trawl survey, mid-water/acoustic survey and surface trawl survey). Sampling will be adapted based on Arctic EIS results and experience. In particular, mid-water/acoustic surveys will be the primary surveys in the northern Chukchi Sea and Beaufort Sea for assessing young-of-the-year and forage fish, while surface trawl sampling for juvenile salmon will be adaptive and exploratory as it is unknown if juvenile salmon utilize the Beaufort Sea. Oceanographic and plankton sampling in the Chukchi Sea will be coordinated with the recently funded *Arctic Marine Biodiversity Observation Network* (AMBON) project. However, the sampling design in the Chukchi Sea will likely differ from the transect-based AMBON design to more closely match the 2012 bottom trawl survey and 2012/13 oceanographic and fisheries surveys. The appropriate sampling design for the Beaufort Sea remains to be determined, but may proceed either along a grid or along a series of onshore-offshore transects. If resources permit, acoustic transects will be extended offshore to detect possible aggregations of Arctic cod along the slope and into the basin, based on similar surveys conducted in the Canadian Beaufort Sea.

Survey data will be combined with recent laboratory results on the growth of Arctic gadids and results from modeling possible transport pathways of particles from the Chukchi Sea to resolve the connectivity of Arctic cod and saffron cod between the

Chukchi Sea and the Beaufort Sea. In addition, specimens collected during the surveys may be shared with a variety of researchers to further improve understanding of the biology of Arctic fishes (age & growth, genetic structure, energetics, trophic dynamics). Integration will occur from the benthos to the pelagic and the near surface waters, and will include fish, oceanography, and plankton sampling, coupled with seabird observations. All components will provide inputs into an Integrated Ecosystem Assessment.

Current Status: Planned new start

Final Report Due: TBD

Publications Completed: None

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

Revised Date: August 2016

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