

Environmental Studies Program: Ongoing Study

Field	Study Information
Title	The Impact of Marine Fish Communities on Red-throated Loon Productivity in the Beaufort Sea (AK-20-11)
Administered by	Alaska Regional Office
BOEM Contact(s)	Sean Burrell (Sean.Burrell@boem.gov)
Procurement Type(s)	USGS OCS Funds
Conducting Organization(s)	USGS
Total BOEM Cost	\$1,000,000
Performance Period	FY 2020–2024
Final Report Due	December 2023
Date Revised	February 23, 2023
Problem	Red-throated loons are potentially sensitive to disturbance and environmental change. Red-throated loon populations have declined in northern Alaska, and because adults have high survival rates, this trend suggests that reproductive success is poor. Lower reproductive success may be driven by shifts in availability and species composition of marine fish prey that red-throated loons depend upon.
Intervention	This study will evaluate offshore marine factors affecting the reproductive success of red-throated loons in two regions of the Beaufort Sea: Foggy Island Bay and the Canning River delta, Alaska. Cameras at loon nests will be used to estimate nest success and chick survival. A subset of loons will be captured to acquire tissue samples for diet composition and to be outfitted with Global Positioning System (GPS) transmitters that will provide fine-scale resolution of loon feeding habitat prior to oil development. Concurrent fish sampling will assess prey preferences by identifying the relative abundance and species composition of fish prey.
Comparison	This study will compare the reproductive success of red-throated loons nesting in the two focal regions of the Beaufort Sea with differing availability and diversity of whitefish prey (<i>e.g.</i> , least cisco). Offshore use areas will be compared between the two sites and detailed use information will be generated for Foggy Island Bay to allow comparison of pre-development information will be available for post-development comparisons.
Outcome	This project will evaluate if differences exist in fish communities and if these drive changes in loon reproductive success. The project also will assess evidence for a hypothesized driver of the current population decline of red-throated loons on the North Slope of Alaska.
Context	Nearshore Beaufort Sea

BOEM Information Need(s): BOEM requires information to assess cumulative impacts on red-throated loons due to potential disturbance and displacement around offshore and inshore industrial facilities,

ecological changes in nearshore environments, or accumulation of contaminants exposure. Information from this study will support BOEM in assessing red-throated loon habitat use in marine waters prior to oil and gas development and dynamics of predator-prey relationships of loons and their prey to evaluate the sensitivity of loon reproductive success to fish prey type and availability.

Background: Proposed nearshore oil and gas activities in the Beaufort Sea has created a need for identifying potential impacts on wildlife in the region. The proposed Liberty Development Project will include the construction of an artificial island in Foggy Island Bay, an area likely used by breeding red-throated loons, which may be sensitive to anthropogenic disturbance and environmental change. The population decline of red-throated loons in northern Alaska has continued and a possible driver is changing foraging conditions in the nearshore marine environment. Given their predilection for marine fish of high fat content, populations of red-throated loons may be sensitive to the abundance and nutritional value of fish prey. Previous studies from other geographic regions have shown that some keystone fish species (*e.g.*, least cisco) are critical to enabling red-throated loon breeding success. Flight and dive costs to capture fish are high, thus perturbations or habitat differences that result in lower densities or quality of fish prey or decreased foraging opportunities may have energetic consequences that contribute to the observed population decline via deficient breeding success. Ongoing nearshore fish community research in the Beaufort Sea, *Nearshore fish surveys in the Beaufort Sea: Examining long-term community change and the role of nearshore habitats*, provides recent (2017–2018) spatial contrast in fish communities and an understanding of temporal variation in the relevant fish communities by revisiting historic sample sites and drawing comparisons to previous decades.

Objectives: This study will evaluate the offshore marine use areas of breeding adult loons and assess the response of red-throated loon reproductive success to differences in the relative abundance, composition, and nutritional content of nearshore fish communities that vary in space and time.

Methods: Researchers will conduct an integrative study of fish and loons at two locations along the Beaufort Sea coast over three years. Time-lapse cameras will acquire images of nesting loons to estimate breeding success. GPS transmitters attached to a sample of adult loons will allow documentation of flight patterns, foraging areas and foraging behaviors to quantify energy expenditure of loons during foraging trips. GPS locations will be used to identify important marine habitats prior to industrial development. Fat biopsy and serum samples from adult birds and nearly fledged young will be used for fatty acid diet analysis and stable isotope analysis, respectively, to provide taxa-specific prey information through comparisons to a fish prey library. Fyke nets and 3 m beam trawls will be used to sample fish in nearshore habitats. Trawls provide access to habitat distant from the shoreline and comparable to collection methods used on BOEM-funded Transboundary cruise. These gear types allow for comparability to existing databases of fish abundance and species composition in nearshore and continental shelf habitats.

This project will include 50% co-funding from the U.S. Geological Survey Alaska Science Center.

Specific Research Question(s):

1. What is the reproductive success of red-throated loons nesting along the Beaufort Sea coastline?
2. Where are the important Beaufort Sea nearshore and offshore feeding areas for red-throated loons?
3. What is the diet of red-throated loons during the breeding season?

4. What is the relative quality of common fish prey?
5. Is loon reproductive success related to diet composition?
6. Is loon diet composition similar to the fish community composition?
7. Are there differences in foraging activity budgets between study sites?

Current Status: Ongoing, fieldwork underway

Publications Completed: None.

Affiliated WWW Sites:

<http://www.boem.gov/akstudies/>