

Environmental Studies Program: Ongoing Study

Title	Kelp Restoration in the Boulder Patch (AK-19-02-02)
Administered by	Anchorage, Alaska Office
BOEM Contact(s)	Dr. Jeffrey Brooks jeffrey.brooks@boem.gov
Conducting Organizations(s)	CMI, UAF
Total BOEM Cost	\$138,884 plus Joint Funding (\$138,884)
Performance Period	FY 2020–2023
Final Report Due	September 1, 2022
Date Revised	October 9, 2019
PICOC Summary	
<i>Problem</i>	The uniquely diverse kelp habitat in the Boulder Patch is located in an area that could be impacted by oil and gas extraction activities at Liberty.
<i>Intervention</i>	Experimental restoration, using artificial reefs, of kelps as mitigation for potential adverse effects from offshore construction projects
<i>Comparison</i>	Comparison of artificial reefs to adjacent benthic community composition
<i>Outcome</i>	Evaluation of the value of artificial reefs as a mitigation tool for potential disturbances to foundation kelp in the Boulder Patch
<i>Context</i>	The Boulder Patch in the central Beaufort Sea

BOEM Information Need(s): This project will provide information to better understand marine environments affected by oil and gas development. BOEM needs better information regarding restoration of kelp to support management decisions, environmental analyses, and mitigation measures. The proposed work to experimentally enhance new kelp settlement will provide better scientific understanding of how to mitigate potential impacts of OCS oil and gas activities on this sensitive habitat. Future construction of a gravel island for oil and gas extraction in the Liberty region presents an urgent need to investigate how kelp can be preserved and enhanced.

Background: The Boulder Patch in Stefansson Sound, Alaska is a highly diverse and sensitive ecosystem in the midst of ongoing oil and gas extraction activities. Construction activities related to new oil and gas extraction on the Beaufort Sea OCS have a high probability to impact the highly diverse but sensitive ecosystem of the Boulder Patch. Increased sedimentation from the building of a gravel island could affect the kelps, which are a foundation species of the Boulder Patch. Scientists know natural recovery of these kelps to such disturbances is slow and could take decades. The study will test mitigation through artificial reefs for kelp and habitat enhancement, which would increase settlement and recruitment chances of the dominant kelp species. The study builds on existing knowledge from long-term monitoring.

Objectives:

- Establish artificial reefs with reproductive individuals of the main kelp *Laminaria solidungula*, as well as the secondary kelp *Saccharina latissima*.
- Compare kelp recruitment on artificial reef with recruitment on surrounding naturally occurring boulders.

Methods: Three replicate small artificial reefs will be constructed and placed using SCUBA in three different areas within the greater Boulder Patch area. The rock distribution at the Boulder Patch sites is patchy and an area mostly devoid of rocks will be chosen to set up the reefs. One area will be at an established dive site close to the Liberty construction site that typically has the highest kelp production because of the lower total suspended sediment loads and associated higher light conditions (Aumack et al., 2007, Bonsell and Dunton, 2018). The other two locations will be determined based on historical data of community structure and light conditions and accessibility. Each reef will consist of about 15 low profile concrete blocks (~30 x 20 cm) loosely distributed around an approximately 4 m² area. Using concrete over natural rock will help minimize the impact of this experiment on the natural Boulder Patch community. The number of new kelp recruits will be correlated with light and sedimentation measurements using correlation analysis. Kelp recruitment success will also be evaluated for the natural boulders in each year, and the overall community structure, as percent cover, to determine natural variation and occurrence of major disturbance. The experiment will run for 2 years after initial set-up to ensure detectable levels of recruitment.

Specific Research Question(s):

1. Will close proximity of available artificial reef substrate and mature reproductive kelp increase recruitment success of kelp in the Boulder Patch?
2. Do artificial reefs work as an effective mitigation tool for potential disturbances to foundation kelp in the Boulder Patch?

Current Status: Awarded

Publications Completed: None

Affiliated WWW Sites: <http://www.sfos.uaf.edu/cmi/>

References:

- Aumack, C.F., K. H. Dunton, A. B., Burd, D. W. Funk, and R. A. Maffione. 2007. Linking light attenuation and suspended sediment loading to benthic productivity within an Arctic kelp-bed community. *Journal of Phycology* 43:853-863.
- Bonsell, C. and Dunton, K.H., 2018. Long-term patterns of benthic irradiance and kelp production in the central Beaufort Sea reveal implications of warming for Arctic inner shelves. *Progress in Oceanography* 162:160-170.