

Environmental Studies Program: Studies Development Plan | FY 2019–2021

Title	Impacts of Sedimentation and Drivers of Variability in the Boulder Patch Community, Beaufort Sea
Administered by	Alaska OCS Region
BOEM Contact(s)	Rick Raymond, richard.raymond@boem.gov
Procurement Type(s)	Cooperative Agreement
Approx. Cost	\$750 (in thousands)
Performance Period	FY 2019–2022
Date Revised	November 13, 2018
PICOC Summary	
<i><u>Problem</u></i>	The Boulder Patch provides complex and unique habitat and supports high biodiversity in an area of considerable oil and gas interest, which includes the proposed construction of Liberty Island (less than half a mile away). Impacts of industry activity may smother/bury/kill productive biological area, but mitigation measures may be possible.
<i><u>Intervention</u></i>	This study will conduct a monitoring program to examine long-term drivers of community variability during Liberty development activities. In addition, it will test possible mitigation measures using common industry materials to “reseed” or replace habitat lost due to Liberty Island development activities.
<i><u>Comparison</u></i>	The post-development community structure will be compared against historic data to assess impacts of O&G activity. Further, artificial substrate will be compared to buried boulders to test efficacy of using industry materials to mitigate development impacts.
<i><u>Outcome</u></i>	Results will include defined spatial gradients and temporal trends in environmental conditions, benthic community structure, and kelp production in the Boulder Patch community; evaluation of the effect of sediments on Boulder Patch community; and assessment of test artificial substrates as possible habitat mitigation.
<i><u>Context</u></i>	Liberty Development and Production Island construction, Beaufort Sea

BOEM Information Need(s): Impacts to the Boulder Patch from proposed gravel island construction were identified by local communities as a concern during scoping for Liberty Island. Information about how development activities and other disturbances affect Boulder Patch organisms will inform potential future NEPA and EFH analyses for island construction in the Beaufort Sea. Potential mitigation measures will be explored, and may be incorporated in future analyses.

Background: The Boulder Patch, which is located close to the proposed Liberty Development Project (less than a half a mile away), is an area of hard bottom substrate uncommon to the region. Its high biodiversity supports tightly linked food webs, and connects to higher trophic levels such as fishes, seals, and polar bears. It is highly vulnerable to both natural and anthropogenic disturbances. Spatial isolation of boulder fields and slow development of benthic communities limits ecosystem recovery from

disturbances. Previous BOEM-sponsored studies have shown that recovery in this area from disturbances can take a decade or more to resolve (Konar 2007 and 2013). Resiliency to anthropogenic disturbances is unknown, yet critically important to understand in maintaining ecological integrity. Sediment collecting on the hard-bottom rocky habitat could slow community recovery even more through burial and smothering rather than whole organism removal, since the hard-substrate would no longer be available to colonizers. This proposed study builds on previous work and provides an opportunity to assess possible ecological effects of environmental disturbances before and during the construction of a gravel island. Future lease sales in the Beaufort Sea are expected. This study provides invaluable information about impacts of gravel island construction on complex, specialized habitat and will assess potential mitigation measures.

Objectives:

- Define spatial gradients and temporal trends in environmental conditions, benthic community structure, and kelp production in the Boulder Patch community
- Evaluate the effect of sediments and nearby island construction on Boulder Patch community
- Test artificial substrates as possible habitat mitigation.

Methods: Monitoring of Boulder Patch habitat will occur before and during Liberty Island construction. Biological and physical data collected will include: kelp production, salinity, depth, temperature, depth, pH, irradiance, turbidity, fish and invertebrate presence, and stable isotopic trophic structure. Data collected during island construction can be contrasted with historic data. Artificial colonization substrates will be assessed and compared to existing Boulder Patch habitat using typical island materials. Recolonization will be assessed from settling plate experiments and reciprocal transplant manipulations of cobbles.

Specific Research Question(s):

1. What physical and chemical factors affect spatial distribution and abundance of kelp in the Boulder Patch?
2. What are the production and community composition responses of kelp in the Boulder Patch to year-round variations in light availability and oceanographic conditions?
3. How do invertebrate and fish use of under ice habitat in the Boulder Patch vary over time?
4. What is the effect of sedimentation on resilience and the abundance and distribution of Boulder Patch biota under winter and summer conditions?
5. What are potential mitigation and monitoring methods to minimize lost Boulder patch habitat through replacement or substitute substrates?

References:

Konar, B., 2007. Recolonization of a high latitude hard-bottom nearshore community. *Polar Biology* 30.5: 663-667.

Konar, B., 2013. Lack of recovery from disturbance in high-arctic boulder communities. *Polar Biology* 36.8: 1205-1214.