PC 150985: Temporal monitoring of Arctic kelp forests and associated biodiversity in the Qikiqtarjuaq region.

Close

Proposal Status: Conformity Determination Issued

Overview Documents

Project Overview

Type of application: New

Proponent name:

Camille Lavoie

Proponent company:

Laval University

Project Description:

Coastal marine ecosystems include many important habitats, such as those dominated by large brown seaweeds known as kelp, or kuanniq. Where adequate sunlight and nutrients occur, these plants can form vast underwater forests on the seafloor. These forests are key elements of healthy marine ecosystems, as they provide habitat and food for many organisms and play an important role in ocean and climate regulation. Although kelp forests are well studied in many parts of the world, scientific knowledge of Arctic kelp ecosystems remains very limited and is largely based on one-time observations. Critical ecological information—including changes in biomass, growth rates, species composition, and most ecosystem functions—requires time-series data, particularly to understand ecosystem responses to environmental stressors and their capacity for recovery following disturbance. We aim to address these knowledge gaps by studying the ecology of High Arctic kelp forests around Qikiqtarjuaq through a long-term monitoring program. Our specific objectives are to: (1) quantify the current distribution and composition of kelp forests in the region; (2) measure their seasonal and annual growth and regulating services, including oxygen production, nutrient cycling, and carbon storage; (3) assess the diversity of plants and animals associated with them; (4) evaluate the recovery and resilience of kelp habitats following disturbance; and (5) determine kelp contributions to local food webs. All of this will be achieved through a long-term, community-engaged monitoring program that integrates Inuit knowledge and participation. Together, these objectives will allow us to detect changes related to a warming climate and to make meaningful comparisons with kelp ecosystems elsewhere in Canada and around the world. We intend to begin fieldwork

in August 2026 and continue until 2030 to lay the foundation for long-term kelp studies. Fieldwork will be supported by the Research Station operated by Laval University and by a team formed by 4-6 visitor scientists and, ideally, 4-6 community members. Activities will occur once every season (from 10 days to a month) and involve SCUBA diving and boat-based remote sampling and will include : 1. Initial kelp forest surveys and standing stock estimates at ~30 sites using 6 x 0.25 m2 quadrats for algal collections. Seaweed tissues will also be sampled to prepare DNA vouchers. 2. Measurements of kelp primary production and regulating services through the monitoring of 3-6 permanent sites. At each site, kelps will be tagged and hole-punched along 2 transects to track growth patterns, and some deployed on benthic growth lines (5m long) equipped with pop-up buoys, allowing to monitor seasonal oxygen delivery and tissue content (nutrients and carbon) from the surface. Lines will be equipped with sensors measuring water temperature, salinity, dissolved oxygen, pH, and light. 3. Kelp habitats diversity and resilience through clearing experiments. Adjacent to monitored sites, areas of varying dimensions (max 6m2) will be inventoried (all organisms counted and identified), and cleared of all seaweeds and invertebrates initially present. These plots will then be followed through time to quantify recovery of seaweed biomass and associated biodiversity. Core sediment samples will also be collected for organismal diversity and carbon content. 4. Tracing of kelp in the coastal food web using stable isotopes and lipid biomarkers. This will require the collection of various and conspicuous invertebrates' species (15 individuals per species) using divers or baited cages. A key element of the project's success will be Inuit Knowledge and the involvement of members of the Qikiqtarjuaq community, who have already expressed interest in marine-habitat monitoring in the context of climate change and coastal development. We will train individuals interested in diving and lab work and employ local boat operators and field technicians at every stage of the project. This work will contribute to community-led monitoring and further discussions on changes affecting the coastal zone in this region.

Project Schedule

Start Date:

2026-08-01

End Date:

2030-03-31

Project Map

List of project geometries:

Id

Geometry

Location Name

20797

polyline

Qikiqtarjuaq extended coastal marine area

NPC Planning regions:

No Approved Plan

Project Land Use and Authorizations

Project Land Use:

Scientific Research

Scientific Research

Licensing Agencies:

Government of Canada - Fisheries and Oceans Canada

Nunavut Research Institute

Material Use

Equipment:

Type

Quantity

Type

Use

CTD CastAway

1

6 x 6 x 20 cm

Temperature and salinity profiles (point measurements)

Odyssey PAR sensors

12

4 x 4 x 20 cm

Photosynthetic active radiation (monitoring)

HOBO Temp/Light

20

4 x 2 x 1 cm

Temperature and light on the seafloor (monitoring)

HOBO pH & dissolved oxygen

12

4 x 4 x 20 cm

pH and dissolved oxygen (monitoring)

Nemo Underwater Power Drill

1

15 x 15 x 7 cm

Install small anchors for loggers on the seafloor (monitoring)

Boat

1

24 foot

Fieldwork done with community member owning an aluminum boat.

Snowmobile

1

3 meters

Snowmobiles will be borrowed from the Research Centre to access research sites.

Fuel Use:

Type

Container

Capacity

Use

Gasoline

300

20

Field activities will be carried out in collaboration with a local guide operating a 24-foot aluminum vessel, or alternatively using snowmobiles based at the Research Centre. Approximately 40 field days per year are planned over the four-year duration of the project.

Hazardous Material and Chemical Use:

Type

Container

Capacity

Use

No data found

Water Consumption:

Daily Amount (m^2)

Retrieval Method

Retrieval Location

0

A local freshwater lake (reservoir)

Research Center / Truck delivery

Waste and Impacts

Environmental Impacts:

Environmental impacts are expected to be minimal. Activities may cause minor, short-term disturbance to wildlife (including seaweeds and marine invertebrates) and carry a low risk associated with fuel handling. Mitigation measures include minimizing time at sites, maintaining appropriate distance from wildlife, careful fuel storage and handling (sealed containers with secondary containment), and removal of all waste. Wastewater and

sewage will be managed through the community's existing treated disposal system in accordance with local practices.

Waste Management:

Waste Type

Quantity Generated

Treatement Method

Disposal Method

Sewage (human waste)

0.3 m3 per day

Not applicable

Wastewater and sewage will be managed through the community's existing treated disposal system in accordance with local practices.