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RE: Scientific Research License # **NRI License 03 009 19R-M** Annual Report and 2020 plans.

Dear NRI, NIRB, and interested parties,

Please accept this letter as our report submission for our 2019 oceanographic sampling and mooring operations as part of the Churchill Marine Observatory-Environmental Observatories (CMO-EO), the Southampton Island Marine Ecosystem Project (SIMEP), both conducted aboard the *M/V William Kennedy*, and a sea ice camp based out of Coral Harbour, Nunavut. All work was carried out under the multiyear NRI License number, 03 009 19R-M and DFO License to Fish for Scientific Purposes, S-19-20 1046-NU. The CMO-EO is an inter-annual program that involves annual turnover of 4-5 oceanographic moorings around Hudson Bay (Figure 1). Mooring turnover occurred September 19-25, 2019. The SIMEP program involved biological oceanographic sampling around Southampton Island that occurred August 5-29, 2019 (Figure 2). Finally, a sea ice camp involved trips via snowmobile to sample sites on the landfast sea ice from May 1 to June 7, 2019 (Figure 3). All projects sought to establish a baseline understanding of the marine ecosystem from an oceanographic perspective in a data scarce region of the Canadian Arctic. Below is a summary of our 2019 operations followed by our 2020 plans. We note a detailed data report and preliminary data can be accessed at <http://lwbins-datahub.ad.umanitoba.ca/dataset/simep>.

2019 Summary

CMO-EO oceanographic moorings

In summer 2018, four oceanographic moorings were deployed via the *CCGS Amundsen* (CMO A-D) and one short-term mooring during the sea ice camp (CHST). All moorings were retrieved successfully via the *M/V William Kennedy* in summer 2019 and five moorings were redeployed (CMO A-D and CH01; Figure 1, Table 1). All moorings have hydrophones to listen to ocean sounds (except CHST), conductivity, temperature and depth (CTD) sensors to measure ocean properties, and current meter to measure ocean currents. The CMO moorings also have a sensor (called AZFPs) to measure zooplankton and fish in the water, a collection trap to measure small particles that sink in the water column, and sensors to measure algae concentrations.

SIMEP

With fair weather over most of the 24-day cruise aboard the *M/V William Kennedy*, we collected oceanographic data at 26 full stations (Figure 2). We note hired guides from the Aiviit or Arviq HTOs were onboard during all sampling activities. A typical full station included: 1) deployment of the diver team on one of the ship's two zodiacs (Kelp group), 2) a pelagic trawl for the Zooplankton and Fish group, 3) 1-2 rosette casts and an extra CTD cast for the Physical Oceanography, Biogeochemistry and Phytoplankton groups, 4) vertical and oblique net tows for the

Phytoplankton and Zooplankton and Fish groups, 5) bottom grab, box core, and gravity core collections for the Sediment group, and 6) a benthic trawl while leaving the station for the Zooplankton and Fish group. Summing up all deck operations over the cruise shows that we undertook >470 sampling activities (Ship's Log is available in the full data report) and >200 CTD casts providing an incredible coverage of data around the island in a short period of time. There were a total of 87 dives from the ship's zodiac over 42 excursions, which enabled collection of macroalgal abundance, biomass and diversity around the island's coast. Greater than 300 samples of fish and invertebrates were collected and sediment sampling was very successful during the cruise, including the collection of a gravity core >75 cm long in the bay of Naujaat.

Sea ice sampling

Data collection targeted five study sites (A, B, C, D, F) along a 20-km transect (Figure 3). Sites were sampled ten times over the 6-week study. The transect was orientated perpendicular to the flow edge of an offshore polynya in order to test the hypothesis that sea ice production and algal taxonomic composition increase with proximity to the polynya as a result of enhanced sub-ice turbulence. Sites were accessed via snowmobile rental and hiring of two guides from the Aiviit HTO. Sampling included CTD and light water column profiles, and collection of sea ice cores and water samples for biogeochemistry and primary production (algae) measurements.

2020 Plans

Our plans for this upcoming field season are to retrieve the five oceanographic moorings currently deployed in Hudson Bay (Figure 1). Our Plan A will be to use a Canadian Coast Guard ship (CCGS) to retrieve the four CMO moorings this summer sometime between July and October. Timing is based on a ship of opportunity with the CCG and is thus, "to be determined". Use of a CCGS is our plan A as it will be very difficult to bring a CMO mooring up onto a local vessel with much of the individual equipment weighing more than 50 kg each and more than 1.5 m in diameter each. The CCGS will have a technician from the University of Manitoba, Vladislav Petrusovich (Table 2), onboard the ship to coordinate mooring retrieval with the assistance of CCGS crew. Mr. Petrusovich would board the CCGS in the south and disembark in Churchill, Manitoba. Retrieval will basically take a few hours at each mooring location (Table 1). Plan A will also include retrieval of mooring CH01 with the assistance of four to five community members (names to be determined) from Coral Harbour. Mooring CH01 is made of lighter plastic floats and can be easily brought onto one of the larger boats currently in Coral Harbour. If use of the CCGS is not possible, we will undertake a plan B in August to October, which will involve a community-based retrieval of moorings CH01, CMO-C, and possibly CMO-D and CMO-B. As the CMO moorings are large, they will need to be individually towed back to Coral Harbour. This retrieval is not optimal, as it will result in sample loss from the collection traps. In plan B, mooring CMO-A, and likely CMO-B and CMO-D, will stay out an extra year and be retrieved in summer 2021. Leaving the moorings for an additional year until 2021 is not optimal as acoustic release batteries will expire and thus, potential for retrieval success is much less.

In summary, the oceanographic data collected as part of the sea ice camp, SIMEP and CMO-EO projects will provide invaluable insight into the base of the marine ecosystem in Hudson Bay. On behalf of the various project participants, I thank you for your support of our investigations. We welcome any comments or advice and will be happy to answer questions on the projects if you have any. Please feel free to contact me at your convenience.

Sincerely,



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Figures and Tables:

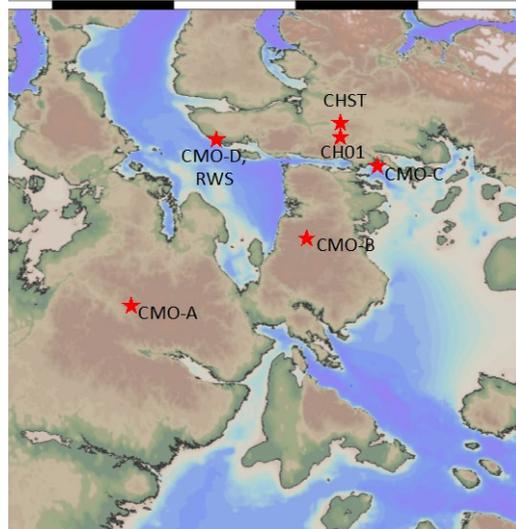


Figure 1. Positions of moorings recovered and deployed in Hudson Bay during August and September 2019.

Table 1. Positions of recovered and deployed moorings in summer 2019.

Date (UTC)	Moorings ID	LAT (N)	LON (W)	Operation	Water Depth (m)
6-Aug	CHST	64°12.098'	83°12.18.62'	Moorings recovery	30
10-Aug	CMO-D	63°42.760'	88°25.583'	Moorings recovery	119
10-Aug	RWS	63°42.777'	88°25.117'	Moorings deployment	118
02-Sept	CH01	63°48.257'	83°17.044'	Moorings deployment	52.2
17-Sept	CMO-A	59° 58.678'	91°56.347'	Moorings recovery	103
20-Sept	CMO-A	59° 58.782'	91°56.268'	Moorings deployment	103
23-Sept	CMO-B	61° 45.613'	84°18.172'	Moorings recovery	179
23-Sept	CMO-B	61° 45.591'	84°18.347'	Moorings deployment	182
24-Sept	CMO-C	63° 11.001'	81°58.873'	Moorings recovery	194
24-Sept	CMO-C	63° 11.342'	81°58.752'	Moorings deployment	195

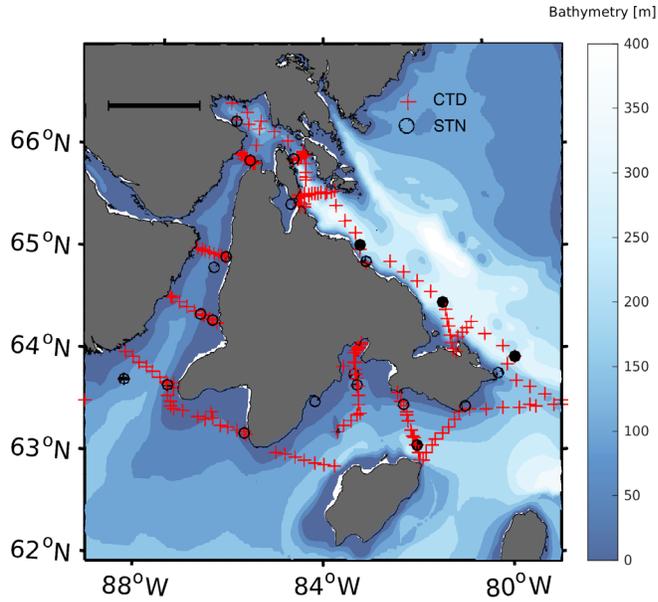


Figure 2. Map of CTDs and full sampling stations during SIMEP 2019.

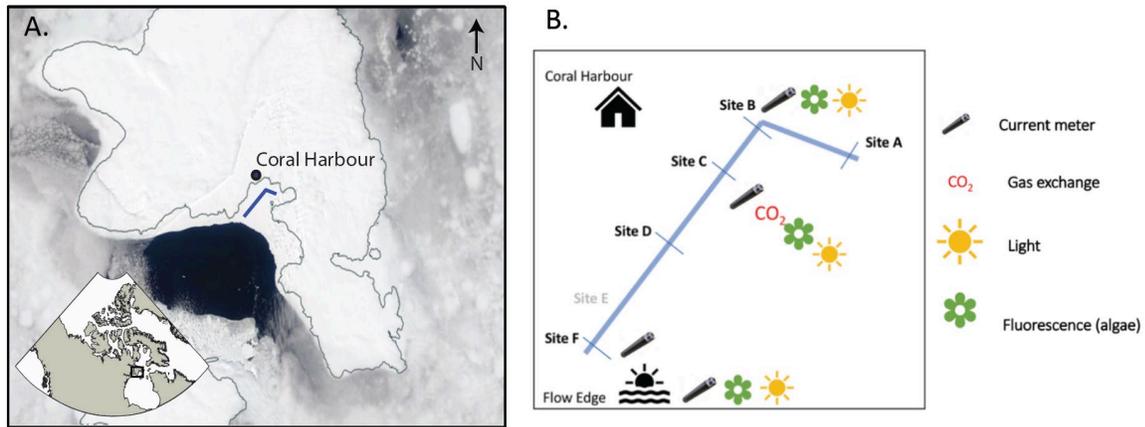


Figure 3. (A) Location of Coral Harbour and transect of sampling (blue line), and (B) schematic of the five discrete sampling locations and types of measurements.

Table 2. Expected participants for 2020 mooring retrieval

15 July – 30 October 2020 (dates to be confirmed)		
Participant	Role	Institution/community
Vladislav Petrusovich	Technician	U. of Manitoba
4-5 community members (to be determined)	Guides and boat captain	Coral Harbour