

## **Nunavut Research Institute - Field report - 2012**

### **Project Title**

**NEIGE** (Northern Ellesmere Island in the Global Environment)

### **Permit Numbers**

- Nunavut Research Institute (NRI): **02 125 11N-M**
- Parks Canada Agency Research and collection permit: **QUT-2011-8555**
- Nunavut Impact Review Board (NIRB): **11YN025**
- Polar Continental Shelf Program: **609-12**

### **Principle Investigator**

Warwick F. VINCENT

Département de Biologie,

Centre d'Études Nordiques (CEN)

Université Laval, Québec

G1V 0A6 (QC)

### **Research team**

- Sarrazin, Denis (Mr) Centre d'Études Nordiques (CEN), Université Laval, Québec, Qc G1V 0A6
- Roger, Jonathan (Mr) Centre d'Études Nordiques (CEN), Université Laval, Québec, Qc G1V 0A6
- Lionard, Marie (Ms) Département de Biologie-CEN, Université Laval, Québec, Qc G1V 0A6
- Paquette Michel (Mr) Département de géographie, Université de Montréal, Montréal, Qc, H2V 2B8
- De Grandpré, Isabelle (Ms) Département de géographie, Université de Montréal, Montréal, Qc, H2V 2B8

### **Person nights**

The research team left from Resolute Bay to Ward Hunt Island on 29 June 2012 and it came back on 10 July 2012. The team spent 11 nights in Ward Hunt Island in Quttinirpaaq National Park of Canada. Thus, the total number of person nights for our project was 55 (11 nights x 5 persons) in Ward Hunt Island in Quttinirpaaq National Park of Canada.

### **Aircraft hours**

Twin Otter chartered by PCSP was used on 29 June 2012 to reach Ward Hunt Island from Resolute Bay. We left Resolute Bay around 09:00 am and we arrived around 01:00 pm after 4h of flight and a stop at Eureka. The same time of flight was necessary on 10 July 2012 to come back to Resolute Bay (departure at 01:00 pm and arrival at 05:05 pm) with a stop at Eureka. (8h total).

The helicopter was on site from 2<sup>nd</sup> July 2012 (morning) to 6 July 2011(noon), giving a total of 11.9 hours of flight.

### Fieldwork location

Our work took place in Quttinirpaaq National Park, at Canada's strategically and scientifically important northernmost coastline, with comparative research on lakes in the Resolute Bay region. The station locations are given in Appendix 1.

### Field Activities / Accomplishments



Water was sampled at specific depths in the water columns of Lake C1, Lake A, Milne Fjord, Disraeli Fjord (as in the picture) and Ward Hunt Lake. These samples were partitioned for several different analyses, including those for pigments, flow cytometry, DNA, and water chemistry variables (DIC, DOC, SRP, TN, TP). We also used water column profilers (Hydrolab and RBR) to take *in situ* measurements of conductivity, temperature, pH and dissolved oxygen content of our sites. Water column profiles

were also done at Lake B, C2 and C3. Phytoplankton samples were collected and preserved for later microscopic analyses of the community composition. Profiles of oxygen and pH were made in microbial mats using microsensors (Unisense) and fluorescence was measured using a PAM 2000.

We downloaded and serviced of all our automated stations (Ward Hunt Island, Lake A and Lake C1), including from an automated camera, which produced images throughout the break-up of the ward Hunt Ice Shelf last year, and which may be of interest to Parks Canada..



Geomorphological characterisation of the Ward Hunt watershed continued by field surveys and photography by helicopter. Soil movement was measured at sites on the Northwest (SS1) and Southeast (SS2) of Ward Hunt Lake. Instruments were deployed to observe vertical soil movement during freezing and

thawing. Soil water levels were recorded at both sites. Thermal and humidity loggers installed in 2011 were recovered and replaced with thermistor strings, which allow a more accurate logging of soil temperature conditions. A survey of active layer thickness, and soil moisture conditions was performed around a water track to evaluate its thermal and hydrological dynamics, and instruments deployed to monitor their temperature and water regimes.

### **Preliminary results**

Limnology: Preliminary data analysis shows the highly layered structure of all of the sampled waters. Radarsat data show that Ward Hunt Lake lost its ice cover in 2012, as in 2011, indicating that this region is undergoing rapid transition.

Geomorphology: In 2012, no movement was recorded at dry site SS1, but movements between 11 and 41mm were observed at the humid site SS2, indicating the importance of liquid water in the dynamics of these soils. Soil temperature profiles acquired showed a strong upward freezing of the active layer, which could affect soils property responses to climate change.

### **Community Consultation and Involvement**

Given that Quttinirpaaq National Park is situated far from any community, it is difficult to include local people in the field work. However we published last year two well-illustrated synthesis articles on all our work at Ward Hunt Island and vicinity, and these will be provided to Parks Canada with this report.

### **Challenges**

The remote nature of this site makes logistics always a challenge. Although weather delayed us by several days, we were able to complete all our highest priority work. The extreme expense of the logistics is also a challenge for us given the cutbacks at NSERC and Polar Shelf (this year we had to pay PCSP for all Twin hours). We appreciated the upgrades to the camp made by Parks Canada and the CEN-QNP laboratory greatly facilitated our work.

### **Plans for next season:**

For the 2013 season, we will apply for the renewal of our QNP research permit to continue monitoring and environmental measurements in Quttinirpaaq National Park's lakes, fiords and vicinity. We will determine the diversity of microbial life in shallow water communities using state of the art molecular techniques, characterize the physical characteristics and processes within northern Ellesmere Island's meromictic lakes, and define the structure and function of microbial food webs within Lake A, C1, Ward Hunt, Disraeli Fjord and Milne Fjord using HPLC and flow cytometry analyses at Laval University. Our climate stations will continue to provide long-term air and soil monitoring data for this globally important site. We will also continue our study of the Ward Hunt Lake watershed and of the mass movements on the slopes of the lake. The goals for 2013 are to have an extended field season to conduct snow cover surveys, water level and flow monitoring and active-layer coring before and during the melting period. We will evaluate the hydrology of the Ward Hunt Lake watershed, to evaluate the role of water tracks over permafrost soils for the delivery of water and solutes from the hill slope to Ward Hunt Lake. The lake is an excellent model system for research aimed to provide an improved understanding of permafrost-water interactions.

**Appendix 1. (Inuktitut version not required)**

NEIGE is a multi-year project and all sites sampled were as listed in the Permit Application number QUT-2011-8555. In 2012 the following stations were sampled:

- Ward Hunt Island lake (83°05.30'N 74°08.09'W),
- Ward Hunt Island climate station: Station SILA (83°4'53"N 74°7'51"W),
- Ward Hunt Island Lake: site SS1 (83°05 263'N; 74°10 293'W),
- Ward Hunt Island Lake: site SS2 (83°04 887'N; 74° 10 491'W),
- Milne Fjord (82° 35.479'N; 80°35.824'W),
- Disraeli Fjord (82° 50.658'N; 73° 31,630'W),
- Lake A climate station (83°00.10'N 77°23.09'W),
- Lake A (83°00.112'N 77°25.034'W),
- Lake B (82°58'00''N; 75°25'59''W),
- Lake C1 (82° 51.087'N; 78°08 545'W),
- Lake C2 (82°49'59''N; 78°04.59''W),
- Lake C3 (82°47'59''N; 78°04.59''W).