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Invertebrate community structure in Canadian Arctic lakes and ponds: climate-induced impacts project. 2006 Field Season Review

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Changes in climate are expected to have direct impacts on the Arctic ecosystem. A component of Arctic ecosystems that can be used to track climate changes are lakes and ponds, which should be particularly sensitive to long term changes in climate. In this study, we are investigating lake sediments in two central Arctic areas to provide the basis for paleoecological studies of long-term climate changes. Temperature changes have impacts on algal productivity and can influence the ecological organization of arctic food webs. The examination of several bio-indicators that respond to changes in lake and pond temperature, dissolved oxygen, and nutrients can be utilized to infer climate impacts. Family Chironomidae (Insecta: Diptera) community structure and algal sediment pigments are thus used as biomarkers of climate change.

During the July 2006 field-season, we sampled several lakes and ponds in the Rankin Inlet and Iqaluit (Nunavut) areas. Sediment samples were collected from lakes in areas with differing land-cover and hydrological characteristics. Remote sensing methods were used to assist in locating lakes and ponds in areas that have experienced changes in their moisture regimes during the last two decades. Of particular interest were lakes and ponds in proximity to the Meliadine and Char rivers (Rankin Inlet), which have experienced significant changes in terms of their surrounding land-cover and hydrology.

During our time in Iqaluit (July 1 – July 12) we received logistic support from Mary Ellen Thomas and the staff of the Nunavut Research Institute, who provided us with accommodations, lab space, and field support. They were extremely helpful and gracious in their support of this project. With their direct assistance, sediment core sampling was carried out at five lakes north of Iqaluit. The terrain in Iqaluit was difficult to navigate, since the lakes sampled were not close to any ATV trails or roads. Unfortunately, along the hike to several sampling locations human impacts were readily visible. At one location several HazMat asbestos disposal bags (presumably once filled with asbestos) were found dumped into the lake.

The lakes surrounding Iqaluit were characterized by high elevation, rocky surrounding areas, and relatively low surrounding vegetational inputs. It is expected that Iqaluit Chironomidae community structure will primarily be temperature dependant and have less overall diversity than in the Kivalliq region. Invertebrate data from analysis of

sediments from these lakes will thus be used as a reference to compare against invertebrate samples collected in the Kivalliq Region.

While previous studies have examined the sediment core record of lakes south of tree-line, to the west (Yukon, NWT) and across a broad swath of the Arctic Archipelago, regions such as Kivalliq have yet to be sampled. A total of 15 lakes were sampled in the Rankin Inlet area from July 12-August 2, 2006. The terrain surrounding Rankin Inlet is relatively flat and can be accessed by roads and several trails. Many lakes were easily accessed with an ATV. During our stay we were assisted by Dorothy Tootoo of the Nunavut Arctic College and our local guide, Andy Aliyak.

We had the opportunity to discuss several issues with the community elders. The weather this July was abnormally cold and extremely windy, and was often referred to by elders as “September weather”. Most days were characterized by calm mornings and windy afternoons. Whitecaps were common on most lakes, and several days of sampling were cancelled due to a combination of severe winds and rain.

With the assistance of our guide, several sampling locations were found along the Meliadine and Char rivers. With our not-so-trusty collapsible canoe, sediment cores were extruded from the soft lake sediments and water samples were collected from 15 lakes in the Rankin Inlet area.

We were very interested in the series of lakes within the Char river system, since these were once well connected by the river, but have become more hydrologically isolated in the past two decades. Four lakes in this system were sampled, each of which were isolated during July 2006, but some of which carry Char River flow at other times of the year. The streams that connect these lakes to the Char River system were completely dry during our time in Rankin. Previous remote sensing work showed that these lakes were once all connected but that in recent years, the connections dry up in most or all summers.

Future work

Stratigraphic examination of these sediment core samples will provide data to characterize the past invertebrate (mainly Chironomidae) community structure and help to identify any climate induced impacts on lakes within this region. Future work in different biogeographic regions of the Canadian Arctic is also necessary to attempt to further identify possible climatic impacts to aquatic systems. We also hope to return to the Kivalliq region to sample more lakes if possible during the 2007 field season.

This project and updates on future field-seasons can be found at <http://www.inuk.ca>