MCGILL NORTHERN RESEARCH NETWORK FORUM

May 1st, 2017
Location: Ballroom, Thompson House
3650 McTavish, Montreal, Quebec, H3A 1Y2

AGENDA

Time	Agenda Item
	Morning Presentations
9:00 – 9:10	**Welcome and Opening Remarks** Prof. Murray Humphries
9:10 – 9:30	***"Tuberculosis in Nunavik"*** Prof. Marcel Behr
9:30 – 9:50	***"Understanding the epidemiology, microbiology, and growth trajectories of children with enteric infections in Nunavik and Nunavut"*** Prof. Cedric Yansouni
9:50 – 10:10	***"Lung Cancer in Nunavik"*** Prof. Faiz Ahmad Khan
10:10 – 10:30	***"Social determinants of health and Indigenous Health"*** Prof. Anne Andermann
10:30 – 10:45	**Coffee Break**
10:45 – 11:05	***"Exchanges work in Northern Ecosystems"*** Prof. Nigel Roulet
11:05 – 11:25	***"Gene-environment interactions in Inuit communities"*** Prof. Niladri Basu
11:25 – 11:45	***"Using isotope measurements to understand the fate of organic carbon in a warming Arctic"*** Prof. Peter Douglas
11:45 – 12:05	***"Ouranos Northern Program"*** Robert Siron, Program co-coordinator
12:05 – 13:00	**Lunch Break**

Afternoon Presentations	
13:00 – 13:05	**Introduction to the Afternoon session** Prof. Murray Humphries
13:05 – 13:20	***"Planning for Miyupimaatisiiun (« Being alive well ») in Québec Cree Communities : Addressing Complexity Through Developmental Evaluation"*** Postdoctoral Fellow Martine Levesque
13:20 – 13:35	***"International Polar Year Inuit Health Survey 2007-2008: a scoping review of health and dietary patterns"*** MSc. Student Laura Bellussi
13:35 – 13:50	***"James Bay Cree youth: perspectives on health and health planning"*** MSc. Student Nickoo Merati
13:50 – 14:05	***"Investigation of Mercury Toxicity in Landlocked Arctic char Sampled Along a Mercury Contamination Gradient"*** Postdoctoral Fellow Benjamin Barts
14:05 – 14:20	***"Interactions between shipping and seabirds in the Canadian North"*** Ph.D. Thomas Lazarus
14:20 – 14:35	***"Carbon and Energy Fluxes from a Spatially Heterogeneous Peatland"*** Ph.D. Silvie Harder
14:35 – 14:50	***"Canadian Integrated Northern Greenhouse (CING) Project: Northern Greenhouse Development and Working Protoype"*** Patricia Gaudet, Bioresource Enginnering Student
14:50 – 15:05	***"Capturing Inuit vulnerability to climatic change through an integrated system network approach"*** Ph.D. Nathan S. Debortoli
15:05 – 15:20	**Coffee Break**
15:20 – 15:50	Breakout sessions (Group Discussion): - McGill North Student Group - Mobilizing Northern Research at McGill - McGill North Future Activities
15:50 – 16:10	Report Back and Discussion
16:10 – 16:20	Closing Remarks
16:20 - …	Pub Mixer (Networking)

ABSTRACTS – MORNING PRESENTATIONS

Addressing the burden of respiratory diseases in Quebec's Indigenous populations

Faiz Ahmad Khan[1]

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Respiratory diseases are important causes of morbidity and mortality amongst the Inuit of Nunavik, and Cree of Eeyou Istchee. Dr Ahmad Khan will describe a collaborative epidemiologic-clinical research program to study and improve lung health in these populations to whom the MUHC's respiratory division has provided clinical support for decades.

Social determinants of Health and Indigenous Health

Dr. Anne Andermann[1]

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The World Health Organization defines social determinants as "the conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life," such as economic policies, social norms, and political systems. Those living with disadvantage are often more exposed and less able to protect themselves from external threats to health, and therefore suffer worse health outcomes. The conversation on health inequity in Canada has only recently moved to the mainstream, and we still have a lot to learn about how to better work together across departments and sectors to find effective solutions for complex health and social challenges. The Truth and Reconciliation Commission calls for action to "identify and close the gaps in health outcomes between Aboriginal and non-Aboriginal communities… including infant mortality, maternal health, suicide, mental health, addictions, life expectancy, birth rates, infant and child health issues, chronic diseases, illness and injury incidence, and the availability of appropriate health services." Using a social determinants approach can help to better appreciate and act on the root causes of poor health as a means of improving the health and well-being of Indigenous peoples.

Greenhouse gas exchanges from northern peatlands experiencing permafrost thaw

Nigel Roulet[1, 4], Zheng Wang[1], Silvie Harder[1], Avni Malhotra[1,2] and David Olefeldt[1,3]

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As active layers depths (ALD) increase in peatlands that contain permafrost a number of changes occur in the physical setting that lead to changes in the structure and function of the ecosystem. Changes in ALD or the loss of permafrost alters the spatial distribution of water storage: some areas of a peatland will become drier, while other areas will become wetter. At the wet end of these transitions thermal karst ponds can be created. These structural changes alter the biogeochemical pathways that ultimately control the exchange of CO_2 and CH_4 between the ecosystem and the atmosphere. At the scale of plant communities there generally is a small increase in the net ecosystem exchange with the loss of permafrost but there can be orders of magnitude increase in the flux of CH_4 from the peatland to the atmosphere. Part of the increase in the CH_4 flux is due to changes in the supply of carbon substrates from the decomposition of organic matter while there can be an increased supply of labile carbon from root exudation, particularly if plants with aerenchyma replace moss, lichens and woody shrubs. Further, with wetter conditions the potential for CH4 oxidation relative to the production reduces as the proportion of CH_4 transported through plants and by ebullition increases relative to CH_4 gas diffusion. Spatially integrated annual net ecosystem carbon balances (NECB) based on continuous measurements of NEE, CH_4 and DOC loss for peatlands in permafrost regions do not appear to differ significantly from the NECB of boreal peatlands. However, the relative importance of the NEE, the CH_4 flux and the dissolved organic carbon (DOC) export are very different from that of boreal peatlands. Understanding how NEE, CH_4 flux and DOC loss vary due to environmental change is important because the fate of these different carbon exchanges is very different for biospheric - climate feedbacks over time scales of decades to millennia.

Genetic polymorphisms to improve interpretation of contaminant exposure and risk in Inuit

Nil Basu[1], Laurie Chan[2], Pierre Ayotte[3], Robert Hegele[4], Melanie Lemire[5], Rajendra Parajuli[6], David Hu[7]

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The goal of this project is to better understand how Inuit 'process' contaminants. The ultimate goal is to arm public health decision makers with knowledge to help identify the most susceptible subpopulations and make informed and objective risk assessments. The central hypothesis was that analysis of single nucleotide polymorphisms (SNPs) in environmentally-responsive genes that help the body 'process' toxicants will increase understanding and utility of exposure biomarkers of mercury, PCBs, and other persistent organic pollutants. Over the past three years we studied already collected samples from some members of the Inuvialuit community (N=288 participants) who participated in the 2007-2008 International Polar Year Inuit Health Survey as well as participants from Nunavik (N=669 participants) as part of the 2004 Qanuippitaa Survey. In most participants blood contaminants (Hg, Cd, Pb, Se, DDE, PCB-153) and fatty acids (DHA, EPA) levels were related to genetic polymorphisms (~150 SNPs), while considering pertinent covariates. Several polymorphisms emerged to be influential thus indicating that environmentally responsive genes can influence contaminant and nutrient biomarker levels. Reports are currently being finalized and shared with community members prior to broader dissemination.

Using isotope measurements to understand the fate of organic carbon in a warming Arctic

Peter Douglas[1]

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Arctic and Subarctic regions store huge reservoirs of organic carbon that have been gradually accumulating for thousands of years in permafrost. As the Arctic warms much of this carbon will become destabilized, and could be released to the atmosphere as greenhouse gases, potentially producing a major positive feedback to global warming. However, we currently have a limited understanding of what happens to organic carbon that is released from permafrost, and what proportion is converted to greenhouse gases or is stored in other reservoirs, such as sediments. Measurements of stable or radioactive isotopes in different forms of carbon can be a valuable tracer for identifying the ultimate fate of permafrost carbon. I will be discussing my plans for research in this area, with a focus on two topics: 1) using multiple isotope measurements to understand how and where microbes produce methane in permafrost thaw lakes; and 2) using radiocarbon measurements of plant-derived molecules to identify the storage of old permafrost carbon in lake sediments.

ABSTRACTS - AFTERNOON PRESENTATIONS

Planning for Miyupimaatisiiun (« Being alive well ») in Québec Cree Communities: Addressing Complexity through Developmental Evaluation

Martine Lévesque[1], Mary Ellen Macdonald[2], Susan Law[3], IAMP Evaluation Core Team

[1, 2]Faculty of Dentistry, McGill University, Montreal, Quebec, Canada, H3A 1G1

[3] Faculty of Medicine, Department of Family Medicine, McGill University, Montreal, Quebec, Canada, H3S 1Z1

Not unlike other Indigenous populations worldwide, Eeyou-Eenou (Cree) people of Québec currently face alarming and growing levels of disease (e.g., diabetes) and other health (e.g., obesity) and social problems. This is the case in spite of the Cree Nation benefiting from a relatively well-resourced and highly structured healthcare system, the legacy of historical agreements between the Cree Nation and the federal and provincial governments. As the main Cree Nation regional health authority, the Québec Cree Board of Health and Social Services of James Bay (CBHSSJB) launched, in 2014, the multi-year *Iiyuu Ahtaawin Miyupimaatisiiun Planning* (IAMP) initiative to improve Cree health planning processes and outcomes. Overseen by the CHBSSJB Nishiiyuu (traditional Cree helping methods) and Public

Health Departments, IAMP includes the development of local committees in the nine Cree communities and the mobilization of regional entities (e.g., Cree Trappers Association) to foster community-driven intersectoral collaboration. The CBHSSJB is currently partnering with McGill researchers—funded through CIHR (2015-2020)—to conduct a developmental and participatory evaluation of IAMP. This presentation will focus on some of the epistemological and methodological considerations in this evaluation process aimed at supporting both the CBHSSJB partners and the Cree communities in their efforts towards improving miyupimaatisiiuun planning.

International Polar Year Inuit Health Survey 2007-2008: a scoping review of health and dietary patterns

Laura Bellussi[1], Hope Weiler[2]
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Inuit, an indigenous population residing in Canada has been experiencing a nutrition transition since the 20th century. This has led Inuit to become less reliant on traditional food and increasingly reliant on market food. The aim of this scoping review is to summarize the published findings of the International Polar Year Inuit Health Survey in order to provide an overview on the current status of Inuit health in relation to nutrition and to identify the remaining gaps in the literature. The nutrition transition has been association with decreased food security, increased vitamin D insufficiency, and an increased prevalence in obesity and related chronic diseases such as diabetes mellitus type 2 and oxidative stress. These findings have been attributed to the low nutritional quality of the available energy dense market food, thus imposing a double burden on Inuit. These changes are affecting younger Inuit more than older Inuit as older adults are more likely to adhere to traditional practices and therefore are more likely to consume traditional food. The importance of adhering to a traditional lifestyle is evidenced by associations between traditional food consumption and decreased risk for food insecurity, adequate vitamin D intake, adequate iron consumption, an active lifestyle, and protection against diabetes mellitus type 2.

James Bay Cree youth: perspectives on health and health planning

Nickoo Merati[1], Jon Salsberg[2], Mary Ellen Macdonald[3], Susan Law[4]
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Objectives: While many health challenges in James Bay primarily affect youth, engagement of young Cree voices in health planning is currently limited. In order to understand how to involve Cree youth's perspectives in the health research process, our research aims to: (1) review the best practices regarding Indigenous youth engagement in health planning; and (2) co-design a strategy for engaging Cree youth.
Methods: This project is nested within a larger community-based participatory research initiative to evaluate a process of identifying Cree health priorities and plans. A preliminary literature review will be conducted to review current evidence of Indigenous youth engagement mechanisms in health research. Subsequently, using a qualitative descriptive design, three focus groups will be conducted with approximately 15 Cree youth (aged 14-25) to garner Cree youth's perceptions of their health and health priorities, as well as their perceptions on their role in their own health research. Thematic analysis will be conducted to uncover key themes, ultimately co-designing a Cree youth engagement strategy for health planning.
Anticipated Results: We anticipate this project will contribute to: i) a review of best practices to gather Indigenous youth voices in health planning and research; ii) a better understanding of youth perspectives on planning and priorities for their health and healthcare; and iii) the co-creation of strategies for engaging young Indigenous people in health planning and research processes.
Conclusion: This study will help fill the knowledge gap regarding what Cree youth perceive to be effective engagement strategies, and preliminary insights on priorities for their health and healthcare.

Investigation of Mercury Toxicity in Landlocked Arctic char Sampled Along a Mercury Contamination Gradient

Benjamin Barst[1], Paul Drevnick[2], Maikel Rosabal[3], Peter G.C. Campbell[4], Justine Hadrava[1], Deborah Iqaluk[5], Derek Muir[6], Günter Köck[7], and Niladri Basu[1]

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In the Canadian Arctic, mercury (Hg) concentrations in the tissues of non-anadromous ("landlocked") Arctic char are elevated with ~30% of the sampled populations exceeding toxicity thresholds. In 2011, 2012, 2015, and 2016 we collected tissues (liver, muscle, brain) from Arctic char (n=227) from four lakes (Small, North, 9-Mile, and Amituk) on Cornwallis Island, Nunavut. The lakes sampled span a gradient of Hg contamination, allowing for the comparison of biological endpoints in char with low Hg concentrations to char with high Hg concentrations. The objectives of this research were to (1) measure total Hg and Hg speciation in Arctic char livers, brains and subcellular components, (2) determine correlations between Hg concentrations and biomarkers of oxidative stress in livers and brains, and (3) assess potential histological changes in livers and brains in relation to Hg exposure. Results thus far show a wide range in total Hg concentrations in Arctic char among lakes (0.04 to 2.6 parts-per-million wet weight in muscle), with about 36 % of individuals exceeding a toxicity threshold of 0.5 parts-per-million wet weight. Methylmercury was the predominate form of total Hg in liver (~80 %), where concentrations were two to three times higher than in muscle (to a maximum concentration of 6.5 parts-per-million wet weight). Total Hg was predominately found in the sensitive subcellular pools (mitochondria, microsomes and lysosomes, and heat-denatured proteins, including enzymes) of low- and high-Hg char, suggesting that increasing Hg exposure does not result in the activation of detoxification mechanisms in the liver. This may explain histological changes in the livers of fish from the most contaminated lake. Furthermore, a significant fraction of Hg may exit the liver and reach the brain, as concentrations in the two organs were similar. This research goes beyond documenting Hg concentrations in fish and will provide critical knowledge concerning fish health status.

Interactions between shipping and seabirds in the Canadian North

Thomas Lazarus[1], Kyle Elliott[2]
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The Arctic is for now one of the last and most extensive continuous wilderness areas in the world, making the Arctic a high priority area to protect from multiple stressors, including industrial activities. For instance, a giant open pit iron mine, Baffinland iron mines, just opened in 2014 in Nunavut, increasing significantly the shipping activity in the region and potentially disturbing the marine ecosystem in the region. With such developments, the future of the highly heterogenous Arctic lies most likely in a paradigm of land-sharing in which areas of high ecological importance are protected while less important regions are exploited. In this context, our team's objective is to define in the Arctic marine environment the regions of high and low wildlife densities, to provide information to the industries in order to mitigate their impact on the environment (i.e. modify shipment routes). To do so, I propose to use seabirds as avatars to probe the Artic for us, from their breeding colonies, gathering information on the environment around the colonies via on-board devices such as GPSs, depth loggers, accelerometers and cameras. With these data, we aim at transforming seabird foraging data into proxies of fish densities in the shape of an energy landscape map that could be used at a larger scale on other seabird colonies. By delineating marine bird hotspots in the Arctic, I will be identifying critical habitat for protection.

Carbon and Energy Fluxes from a Spatially Heterogeneous Peatland

Silvie Harder[1], Nigel Roulet[2]
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Various microforms, created by spatially differential thawing of permafrost, make up the subarctic heterogeneous Stordalen peatland (68°22'N, 19°03'E), near Abisko, Sweden. This results in significantly different peatland vegetation communities across short distances, as well as differences in wetness, peat temperatures, snow

distribution and therefore carbon and energy fluxes. In recent decades, the permafrost extent of Stordalen has been markedly shrinking with warming air temperatures as well as increased snowfall.

Since 2012, we have been measuring the spatially integrated CO2, energy and water vapour fluxes from this peatland complex using eddy covariance (EC). We have also been examining the CO2 exchange from specific plant communities within the EC tower footprint (autochambers). LIDAR was used to produce a 1 m resolution digital evaluation model of the complex and the spatial distribution of plant functional types (PFTs) across the peatland was obtained from concurrent high-resolution digital colour air photography trained from vegetation surveys. The EC footprint is calculated for every half-hour and PFT based models are run with the corresponding environmental variables. These models calculate light use efficiency as well as ecosystem respiration for the different PFTs.

Our results show that the Sphagnum, palsa, and sedge PFTs have distinctly different light use efficiency models, and that the tower fluxes are dominated by a blend of the Sphagnum and palsa PFTs. We also see a distinctly different energy partitioning between the fetches containing intact permafrost and those where the permafrost has thawed: the evaporative efficiency is higher and the Bowen ration lower for the thawed fetches.

Canadian Integrated Northern Greenhouse (CING) Project: Northern Greenhouse Development and Working Prototype

Patricia Gaudet[1], Mark Lefsrud[2]

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Food security has become an increasing concern in northern Canada because fresh nutritious food is not accessible to individuals and families for a number of reasons. High transportation costs inflate the cost of food and the long transportation process is degrading the food's quality, while weather and road conditions also limit accessibility during certain periods of the year. The Canadian Integrated Northern Greenhouse (CING) is a possible solution to food insecurity in northern Canada. The CING unit is constructed within a standard shipping container for ease of transport that functions as a closed growth chamber during the winter months and as a solar greenhouse during the summer months. The transition between growth chamber and solar greenhouse will be achieved by closing or opening the unit's outer retractable insulated panels. Closing the panels will convert the unit into a growth chamber limiting heat loss during the cool spring and fall nights and winter months and opening the panels will allow the unit to function as a solar greenhouse. Integrated within the unit is also a complete heating and ventilation system and high production rate hydroponic growing system with integrated inter-canopy ventilation, heating and supplemental lighting. A full scale working prototype has been completed at McGill University, Macdonlad Campus, Montreal in the Department of Bioresource Engineering. The prototype unit will be tested as a whole; experiments on best management and production practices will be conducted, constantly taking into account the unit's dual function, as a solar greenhouse and closed growth chamber. Further optimization of the CING unit will allow for an efficient and sustainable solution for food insecurity in northern Canada enabling northern communities to produce fresh nutritious food year round.

Capturing Inuit vulnerability to climatic change through an integrated system network approach

Nathan S. Debortoli[1]; Jesse Sayles[2]; Dylan C. Clark[3]; James D. Ford[4]

[1,2,3,4] Faculty of Science, Department of Geography, McGill University, Montreal, Quebec, Canada, H3A 0B9

Climatic Change (CC) is affecting Northern Canada abruptly raising concerns about Inuit groups resilience and adaptation in the long term. Even though much has been done at the local level to understand vulnerability in numerous communities in the "Inuit Nunangat", few studies have integrated findings into a system framework to assess Inuit exposure, sensitivity and adaptive capacity. In this study we aim to capture vulnerability described in the literature transposing findings to a multiplex network analysis to determine which variables have a higher degree of connectivity and importance in Inuit total vulnerability to CC. To accomplish this task, we fostered the detection of sources of vulnerability into different segments of Inuit life such as: infrastructure and transportation, business and economy, health and well-being and subsistence and harvesting. Our findings led us to unfold 58 paramount

variables aggregated into 13 categories within three vulnerability dimensions. Overall, vulnerability results depict a high degree of exposure caused by extreme weather events such as floods, temperature changes, storm surge and coastal erosion. Sensitivity in mostly driven by cost of living and relative poverty while adaptive capacity decreases the latter through risk management and future planning, natural resources management and wage income. Furthermore, underlying factors within the three dimensions such as health and TEK ambiguously underpin and undermine variables in the four segments, giving hints towards weaker or stronger connections which nuance segment disparities from total vulnerability analysis. Finally, results are considered as tools to be legitimized within communities, and thus, to launch a couple quali-quantitative integrated index, aimed to map present and future CC vulnerability in the Inuit Nunangat.