APECS Canada Online Conference Schedule

April 24, 2014

*EST time= Québec-Ontario time

11:30 EST Time - Guest speaker - Steve Ferguson: Killer whale predation in the Arctic

12:00 EST Time- Nick Pilfold: Polar bear predatory behaviour reveals seascape distribution of ringed seal lairs.

12:20 EST TIME- Isabel Barrio: Creating a research network to study herbivory in northern and alpine environments.

12:40 EST Time-Patrick O. Englehardt : A textural and lithological examination of the Camp 26 Medial Moraine Atlin, British Columbia, Canada

13:00 EST Time-Leah Beveridge: The Environmental Risks of Shipping in the Canadian Arctic, the Implications for Northerners, and a Way Forward

Break

3:00 EST Time - Guest speaker - Louis Fortier: Deciphering the ontogenic migrations of the Arctic cod using acoustics over the annual cycle in the Beaufort Sea.

3:30 EST Time-Jesica Goldsmit: Early detection of non-indigenous species in ports of the Canadian Arctic: Establishing a baseline.

3:50 EST Time-Matthew Gilbert: Alternative migratory strategies of Arctic char in a highly variable and changing environment.

4:10 EST Time-Karen Dunmall: Arctic Salmon: Monitoring Change through Local Communities

4:30 EST Time-Louise Chavarie: Fatty acid signatures and stomach contents of four sympatric Lake Trout: assessment of trophic patterns among morphotypes and spatio-temportal variability in Great Bear Lake.

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Conference abstracts:

Creating a research network to study herbivory in northern and alpine environments.

Barrio, I.C[1].*, Bueno, C.G[1]., Hik, D.S[1]., Jónsdóttir, I.S., Moersdorf, M. & Ravolainen, V.T.
[1]*University of Alberta*
icbarrio@gmail.com

Ongoing changes in the composition of plant and herbivore communities are likely to have a large impact on the dynamics of northern and alpine ecosystems and their ability to respond to changes, including social, cultural and economic interactions with people living in these environments. Wide regional variability in the ecological responses to global changes highlights the need of coordinated efforts to address these questions across different sites, spatial scales and perspectives. We are creating an interaction-focused research network that will bring together researchers from arctic and alpine regions to investigate the role of herbivores in changing northern and alpine ecosystems. This network will foster collaborations within and across disciplines and facilitate multi-site comparisons through the use of common experimental protocols. Ultimately, this network will assist in understanding the complexity and variability of responses of tundra ecosystems to herbivory and climate change beyond single studies and across different spatial scales. In this presentation we will introduce the aims of the network to APECS Canada, and outline our first results from a founding workshop that will take place during ASSW-AOS 2014.

The Environmental Risks of Shipping in the Canadian Arctic, the Implications for Northerners, and a Way Forward.

Leah Beveridge[1], and Ronald Pelot[1]
[1]*Dalhousie University*
leah.beveridge@dal.ca

It has been well documented that the global climate is changing and that many of the most drastic changes will be seen in the Arctic; the air and sea are warming, the sea ice is melting, and the harsh environment is becoming less predictable. A reduction in sea ice, in extent, thickness, age, and duration, may allow for an increase in shipping in the region, but the risks of operating in the Arctic remain. Regardless, the current prediction is that until 2050, shipping through the Canadian Arctic will not increase with any significance. The fact that there are still over 30 years until a shipping boom is expected means there is the opportunity to study the risks and impacts of increasing vessel traffic proactively, and to establish a management regime that will help avoid the risks before they become realized and avoid the potentially devastating effects.

The purpose of this research is to review the environmental risks of shipping in the Canadian Arctic, to identify how these translate to impacts on the Inuit, and to analyze the

potential for marine spatial planning to minimize negative impacts and maximize positive benefits. This work is not yet complete, therefore, this presentation will discuss the research findings to date.

Fatty acid signatures and stomach contents of four sympatric Lake Trout: assessment of trophic patterns among morphotypes and spatio-temportal variability in Great Bear Lake.

Louise Chavarie[1], Kimberly Howland[2], Colin Gallagher[2], and William Tonn[1].
[1]*University of Alberta,* [2]*DFO, Freshwater Institute*
chavarie@ualberta.ca

Intraspecific diversification in Lake Trout is generally linked to habitat (typically depth) partitioning, consistent with the standard resource polymorphism model of a group of individuals within a population switching to a novel and/or sub-optimal resource(s). However, extensive sympatric divergence has taken place in the shallow waters of Great Bear Lake with morphs exhibiting variation in head and fin characteristics. This unique case of morphological diversification in the absence of depth segregation within this large, complex and pristine lake is poorly understood. To investigate diet partitioning as potential explanatory mechanism, we conducted analyses of fatty acids and stomach contents on four sympatric morphs of Lake Trout co-existing in shallow-water of Great Bear Lake. Fatty acids and stomach content identified Lake Trout, Lake Cisco and *Mysis* were key prey items identified in the diets. Interestingly, terrestrial inputs were also seasonally important among morphs, reflecting temporal variability of available prey in the Arctic Lake. Some diet partioning among morphs; Morph 1 was characterized as a generalist, Morph 3 was more benthic-oriented and Morphs 2 and 4 were pelagic. Morph 4 was the most specialized whereas Morph 2 exhibited alternative ecological feeding tactics between benthic cannibalistic and pelagic piscivorous feeding. Our findings demonstrate that complementary dietary methods can elucidate habits of opportunistic feeders, a task that can often be problematic with their complex and variable diet patterns. We offer new perspectives on the current model of Lake Trout differentiation, adding a new information in the context of shallow-water habitat exploitation, demonstrating niche partioning based on benthic versus pelagic habitat use and generalist versus specialist feeding tactics.

Arctic Salmon: Monitoring Change through Local Communities.

Karen Dunmall[1,2], Neil Mochnacz[1], and Jim Reist[1]
[1]*Fisheries and Oceans Canada, Winnipeg, MB*
[2]*University of Manitoba, Winnipeg, MB*
Karen.Dunmall@gmail.com or www.facebook.com/arcticsalmon

Arctic ecosystems are changing due to climate warming, and biological indicators such as migratory fishes (e.g., Pacific salmons) may be responding by both shifting distributions and also altering abundances in the Canadian Arctic. In this study, Pacific salmon are provided from the subsistence fishery, gathered on a community basis by local organizations, and sent to Fisheries and Oceans Canada for further analyses. Vagrant Pacific salmon that colonize, or natal Chum Salmon that expand existing ranges, increase the potential for interaction with local native

salmonids such as Dolly Varden and Bull Trout. An extensive literature review suggests that species-specific groundwater temperature may allow for resource partitioning where limited spawning habitat occurs, thus reducing the potential for competition among native salmonids and Pacific salmon. Community members, in collaboration with Fisheries and Oceans Canada, monitor water temperature in Dolly Varden spawning habitat to assist in assessing the risks of colonizing Pacific salmon to native salmonids in the Arctic. Greater understanding regarding the presence, persistence, and changes with respect to Pacific salmon in the Arctic will provide insight into adaptation of fisheries to ongoing Arctic change and also contribute to ecosystem-based fisheries management.

A textural and lithological examination of the Camp 26 Medial Moraine Atlin, British Columbia, Canada.

Patrick O. Englehart[1], Ian Spooner[1]
[1]*Department of Earth and Environmental Science, Acadia University*
poenglehardt@gmail.com

Bedrock mapping studies in glaciated, high relief terrains typically identify exposed bedrock (nunatak) geology; however, few have determined to what extent bedrock is transported down glacier, or how the clasts are modified by the transportation process. Mapping moraine clast lithology, morphology and distribution in medial moraines will aid in the understanding of the regional bedrock geology of ice covered terrain, and may provide a more logistically accessible medium for study. This project was a reconnaissance survey of the Camp-26 Medial Moraine located in British

Columbia on the Juneau Icefield. Twenty sites were sampled at approximately one hundred meter intervals. Over thirty clasts were analyzed at each site for lithology, shape and roundness. Preliminary analysis indicates that as distance increases from the Camp 26 Nunatak lithologies sourced from the nunatak decrease in abundance. As the distance from the nunatak increased clasts on average decreased 11-26% in size, and became 10-29% more rounded; these trends elucidate data that can be used to estimate clast transport distance. The results of this study provide field estimates of transport distance of clasts, and indicate that medial moraine mapping could be used, in reconnaissance geological surveys in glaciated terranes, to fill in gaps in bedrock geology.

Alternative migratory strategies of Arctic char in a highly variable and changing environment.

Matthew Gilbert[1]
[1]*University of Alberta*
gilbert@ualberta.ca

In the summers of 2012 and 2013 we began monitoring the migratory patterns and physical environment of Arctic char in Nulahugyuk Creek (NC), the site of a traditional Inuit fishery. During the migration we recorded large daily fluctuations in water temperature (>10°C) and low flows that decreased through the summer, which made the stream impassable by early

August. Adult arctic char began their upstream (return) migration far earlier (late June) in NC than in the surrounding area. At the same time, large numbers of juvenile char were migrating downstream. Fish 30 to 55 cm in length were absent from the migratory population. The timing of the juvenile migration relative to the navigability of the creek suggests that all of the juvenile char that leave NC cannot return within the same year. Furthermore, based on the large gap in size within the population, it is likely that these fish do not return for a number of years afterward. Moving forward, we will determine the population age distribution and migratory frequency by analyzing otoliths. Our findings will inform the local restoration and maintenance of a culturally valuable arctic char population and will assist in regional fisheries management.

Early detection of non-indigenous species in ports of the Canadian Arctic: Establishing a baseline.

Jesica Goldsmit[1], Kimberly L. Howland[2] and Philippe Archambault[1]
[1]Université du Québec à Rimouski (UQAR/ISMER) [2]DFO, Freshwater Institute
jesica.goldsmit@uqar.ca

Global warming, resource exploitation and the resulting increase in Arctic shipping activity are expected to increase the risk of non-indigenous species (NIS) introductions to Arctic waters in the near future. The top three ports at highest risk for introduction of NIS of the Canadian Arctic were surveyed for benthic invertebrates: Churchill (Manitoba), Deception Bay (Quebec) and Iqaluit (Nunavut). Based on cross referencing comparisons of contemporary and historical information on species composition and distributions, 14.4% of the taxa identified can be considered new records within the port regions surveyed and 7.2% within the more extended, adjacent surrounding regions. Increased survey effort is the most likely explanation for the majority of new occurrences. However, 3% of taxa identified, were new mentions for Canada and were categorized as cryptogenic since we could not definitively describe them as being either native or introduced. Another eight species considered native to the Canadian Arctic, have been found to be established NIS, cryptogenic or have a questionable status elsewhere in the world, suggesting that this area should be considered as a potential source of NIS to ports in other regions. This study provides a benchmark for early detection for benthic invertebrates in the Canadian Arctic.

Polar bear predatory behaviour reveals seascape distribution of ringed seal lairs.

Nick Pilfold[1] Dr. Andrew Derocher[1], Dr. Evan Richardson[2], and Ian Stirling[2]
[1]University of Alberta, [2]Environment Canada
pilfold@ualberta.ca

Ringed seal (*Pusa hispida*) breeding distribution has been extensively studied across near-shore habitats, but has received limited attention at a seascape scale due to the difficulty in accessing offshore sea ice environments. Employing highly visible predation attempts by polar bears (*Ursus maritimus*) on ringed seals in subnivean lairs observed by helicopter, the spatial relationship between predatory behaviour and ringed seal breeding habitat was examined.

Resource selection functions were used to determine the relative probability of predation attempts on ringed seals in lairs as a function of habitat during a period of low ringed seal natality (2004-2006). Ringed seal pup kill locations were compared between years of low (2003-2006) and high (2007-2011) natality to assess the effect of reproductive output on habitat use. During years of low natality, polar bear hunting attempts were more likely in near-shore fast ice, and pup kills were observed predominately in fast ice (fast = 65 %, pack = 29 %, P = 0.002) at a median distance of 36 km from shore. In years of high natality, pup kills were observed farther from shore (median = 46 km, P = 0.03), and there was no difference in the proportion of observations in fast ice and pack ice (fast = 43 %, pack = 52 %, P = 0.29). These results suggest that the facultative use of adjacent offshore pack ice by breeding ringed seals may be influenced by natality. This study illustrates how documenting the behaviour of a predator can facilitate insight into the distribution of a cryptic prey.

Guest speaker abstract:

Steve Fergurson[1]
[1] *DFO, Freshwater Institute*
steve.ferguson@dfo-mpo.gc.ca

The Arctic ice-free season has increased in area and duration providing an expanding arena for killer whales (*Orcinus orca*). To understand this change, a research group Orcas of the Canadian Arctic (OCA), initially compiled a database to document the historical occurrence, distribution, feeding ecology, and seasonality of killer whales in the region. Sighting reports, anecdotal evidence, Inuit traditional ecological knowledge (TEK), and photographic identification indicated that killer whale occurrence is increasing. Satellite transmitters were deployed onto killer whales, and following predictable summer movements that likely related to feeding, the tagged whales left the arctic region prior to heavy ice formation in the fall. Through the analysis of biomarkers in killer whale tissue (e.g., dentine within annual growth layer groups), differences were found between individuals from the Arctic and Atlantic regions that correspond to trophic-level variation in diet. Comparison with stable isotope values of potential prey species indicated that Atlantic whales feed on both marine mammals and fish; whereas a TEK survey of Nunavut communities indicated that eastern Arctic killer whales prey upon other marine mammals and not fish. Preferential selection of prey items by killer whales was investigated using stochastic models. Satellite-tagged bowhead whales utilized heavily ice-covered areas in summer, possibly as an anti-predation strategy. Results from a photographic investigation of tail-fluke scaring from killer whales suggest that the bowhead whale population is experiencing increased predation. In conclusion, ice-loving whales in the Arctic are at risk from increasing predation by killer whales that specialize on marine-mammals for food.