

ABSTRACTS

**Atlantic Provinces Council on the Sciences (APICS)
Aquaculture & Fisheries, Biology, and Environment
Conferences
and
Dalhousie University Sustainable and Environmental Research
Symposium**

**Hosted by Dalhousie University
March 11-13, 2011
Halifax, Nova Scotia**

Aquaculture and Fisheries

Acadia University

marylise lefevre - Graduate Student

Requested to present: Oral

Atlantic Salmon Smolt Migration In the Rivière Saint-Jean, QC and the Gulf of Saint Lawrence: Effect of Environmental Variables and Identification of Migration Pathways

Lefevre, Marylise

Michael J. W. Stokesbury, Frederick G. Whoriskey

Abstract:

Objective:

The objectives of the research were to investigate the effects of water temperatures and of the diel and tide cycles on the characteristics of seaward migration of Atlantic salmon (*Salmo salar*) smolts and to define emigration pathways of post-smolts originating from Rivière Saint-Jean, Québec North shore.

Methods:

Uniquely coded acoustic transmitters were surgically implanted in 44 and 49 smolts in 2009 and 2010 respectively. Hydro-acoustic receiver arrays were positioned at fixed locations in the river, in the Jacques Cartier Passage and in the two openings of the Gulf of St. Lawrence to the Atlantic Ocean: the Strait of Belle Isle (complete coverage) and across the Cabot Strait (partial coverage).

Results:

The smolt run started at river water temperatures of approximately 10°C. The majority of downstream movements of the acoustically tagged fish occurred at night or during twilight. Most tagged smolts entered the estuary at the onset of the ebbing tide. Post-smolts moved rapidly perpendicularly to the coast. Two post-smolts were detected 45 km south of the estuary, 5 km off the west point of Anticosti Island. Only one fish was detected exiting the Gulf of St. Lawrence by crossing the Strait of Belle Isle line, between Newfoundland and Labrador, 44 days after leaving the river mouth (minimum speed of 14.4 km/day).

Conclusions:

Water temperatures, diel and tidal cycle effects on smolt migration were comparable to other populations.

However, post-smolts did not follow the coastline nor the shortest route to their feeding grounds in the Labrador Sea as previously thought.

Aquaculture and Fisheries

DFO

Terry Bungay - Faculty

Requested to present: Oral

Assessment of the Benthic Impacts of Finfish Aquaculture Sites on Hard Bottom Substrates with the Application of a Benthic Index on the South Coast of Newfoundland

T. Bungay, G. Mabrouk, C. Couturier, S. Dufour, D. Drover, D. Ings, L. Sheppard, and S. Kenny

Gehan Mabrouk

Abstract:

The impact of salmonid mariculture is not well understood on hard bottom substrates. To understand these impacts a study was conducted on multiple salmonid sites on the south coast of Newfoundland. Sites were selected on basis of depth, production stage, and bottom type. Visual sampling using video camera was done in pre-identified stations and in transects at each selected site. Videos and still images were examined and species was identified to lowest taxonomic bracket possible. Species identified in preliminary analysis include various urchins, sea stars, crinoids, cnidarians as soft corals and anemones, euphausiids, and chaetognaths. Sensitive taxa like crinoids, soft corals, and other sessile suspension feeders were found on both non-active (fallowed) and active sites. Large numbers of species was found to aggregate at the peak of rock wall formations where larger currents may have an influence. The diversity and abundance of species was found to be greatly decreased directly under cages where deposition is greatest. The further away from the cages the greater the diversity and abundance of naturally occurring fauna. The key species found through sampling will be used to create biotic index that might be helpful in assessing the impact of salmonid culture on the hard bottom habitat on the south coast of Newfoundland.

Aquaculture and Fisheries

Memorial University

Victoria Neville - Undergraduate Student

Requested to present: Oral

A Population Assessment of *Chionoecetes opilio* in Bonne Bay, Newfoundland

Neville, Victoria

Dr. Robert Hooper

Abstract:

In September 2010, tag recapture experimentation was employed in Bonne Bay, NL on snow crab (*Chionoecetes opilio*). This experiment was aimed primarily at measuring the degree of recovery in an area on the second year of a two year voluntary moratorium. *C. opilio* in Bonne Bay supported a commercial fishery from 1995 until its voluntary closure in 2009. After a decade of commercial harvest, catch rates in the area plummeted. The current moratorium is set to be lifted for the spring 2011 fishing season though the extent of recovery has yet to be quantified. This thesis assessed several aspects of the Bonne Bay snow crab population. Firstly, it employed a tag and recapture experiment to estimate population size. Secondly, measurements were collected to determine the size and reproductive structure of the population. A total of 1137 *C. opilio* were trapped and examined throughout the experimental period. 792 of those were marked and released for the tag and recapture experiment. Females were not used in the tag recapture experiment. The mean carapace width of males sampled ($n=1084$) is 93.33 mm and the proportion of the population below 95 mm carapace width is = 0.5175. The majority of the sampled population is not yet legally harvestable. The distribution of male carapace widths was found to be normal with large cohorts existing between 80-110 mm carapace widths and very few large crab (115 mm +). 57 male *C. opilio* measured were above 115 mm ($n=57$); 5.258 % of the 1084 sampled. Regression plots, carapace width versus chela height (and width), showed a positively linear relationship. However, no jumps in chela size, indicating a switch to morphometric maturity occurred. However, there are legal size male *C. opilio* which retain a chela shape suggesting morphometric immaturity. Carapace width of sampled *C. opilio* differed significantly within each site. The catch rates on the inside of the sill were considerably lower than that outside the sill. An analysis of variance comparing proportional bycatch of toad crab (*Hyas araneus*), showed that the effect of different sites on *H. araneus* bycatch was highly significant. These findings, assessing the state of the *C. opilio* population, have significant implications for management and the development of a more sustainable fishery.

Aquaculture and Fisheries

Mount Allison University

Andrew Douglas Taylor - Undergraduate Student

Requested to present: Oral

Movement patterns and habitat selection of Atlantic sturgeon, *Acipenser oxyrinchus*, in the Saint John River, New Brunswick, Canada

Taylor, Andrew; Litvak, Matthew

Litvak, Matthew

Abstract:

Movement patterns and habitat selection of Atlantic sturgeon, *Acipenser oxyrinchus*, was investigated using ultrasonic telemetry from July to September 2010 in the lower Saint John River, New Brunswick, Canada. Twenty Atlantic sturgeon were captured with gill nets set between July 19 and 24 and internally tagged with Vemco V16 ultrasonic coded pingers (15 V16-6X; 5 V16TP). Each fish captured was measured (TL, FL, Girth), digitally imaged, blood sampled, and identified for gender (when possible). For females, egg samples were sampled using a trochar. The tagged individuals were tracked using 27 stationary Vemco VR2s located on navigational buoys throughout the Saint John River, and manually from a 19'™ Carolina Skiff using a Vemco V100 receiver equipped with omni-directional and directional hydrophones that allowed us to determine precise locations of the fish through triangulation. Depth, temperature, oxygen concentration, salinity and substrate type was recorded at each directionally triangulated GPS position. We found that Atlantic sturgeon selected depths between 3-9 meters and were most commonly found on sandy substrate. The fish were observed upstream as far as river kilometer 110 but were primarily observed between river kilometers 23-55 and exhibited localized movement within this range. Eleven of the fish left the system between July 29 and November 11 with the majority leaving between August 13 and September 29. Information on movement patterns and habitat selection of Atlantic sturgeon within the Saint John River system can provide vital information to create effective management strategies and protection of this species.

Aquaculture and Fisheries

Nova Scotia Agricultural College

Emily Van Toever - Faculty

Requested to present: Oral

Integrating blue mussels into a land based halibut farm for waste water remediation.

Van Toever, Emily

Jim Duston, Gerry Johnson

Abstract:

Integrating blue mussels into a land based halibut farm for waste water remediation.

Emily Van Toever

Dept. Plant and Animal Sciences, Nova Scotia Agricultural College

Objective:

Eutrophication of marine ecosystems due to effluent from finfish aquaculture sites is becoming a large environmental concern. A potential solution is multi-trophic aquaculture, which combines the production of plants and invertebrates to utilize finfish aquaculture waste. The present study tested the ability of blue mussels (*Mytilus edulis*) to remove suspended solids from Atlantic halibut (*Hippoglossus hippoglossus*) effluent and utilize the material as a food source.

Methods:

Starting Oct. 31, 2010, effluent from a land-based farm (Halibut PEI Inc., Victoria, PEI) was piped into two insulated tanks (800L), one stocked with 1,280 mussels, the other empty (Control). The mussels were housed in eight vexar cages, each with 32 cells, five mussels per cell. Initial shell length range was 23-66 mm. The well-water supply was 8 oC. Oxygen was around 10 mg/L. Salinity was 26 ppt. Response variables were survival, mean mussel weight, shell lengths, and total suspended solids of the incoming and outgoing water and particle size.

Results:

Survival of the mussels over the 104 day trial was good, 87%, but growth rate was poor. Overall mean (SE) wet weight of mussels remained at 9.2 (0.48)g and shell length increased less than 0.5mm from 40.2 (0.91) to 40.6 (0.82). Total suspended solids were reduced from by both the control and mussel tanks to a similar degree.

Conclusions:

Based on the slow growth, blue mussels and halibut are incompatible for integrated multi-trophic aquaculture.

Aquaculture and Fisheries

Nova Scotia Agricultural College

Julia Sampson - Graduate Student

Requested to present: Oral

The role of neuromasts in non-visual feeding of larval striped bass (*Morone saxatilis*)

Sampson, Julia

Dr. Jim Duston and Dr. Roger Croll

Abstract:

Objective:

Striped bass larvae native to the Shubenacadie River can catch invertebrate prey in dark and turbid waters, but the mechanism for non-visual feeding is unknown. The objective was to test the hypothesis that neuromast mechanoreceptors detect vibrations from swimming invertebrates.

Methods:

The ontogeny of neuromasts was described in schematic form. Neuromasts were then ablated by immersing larvae in 5 mM neomycin for one hour. Fluorescent and confocal microscopy using the vital dye FM1-43FX and S100 immunoreactivity confirmed ablation. In 2x2 factorial feeding trials, larvae either with or without functional neuromasts were offered live brine shrimp (*Artemia salina*) in either darkness or 20 lux. The experiment was repeated at 10, 13, 17, and 20 dph.

Results:

The number of neuromasts increased from eight cephalic and nine trunk at first feeding (5 to 7 days post hatch; dph) to 30 cephalic, 60 trunk, and 45 tail by the juvenile stage (27 dph).

In dark feeding trials, neomycin treated larvae caught significantly fewer prey (~5 *A. salina* h⁻¹) at all ages than larvae with intact neuromasts at 10 dph (~16 *A. salina* h⁻¹) and 20 dph (~72 *A. salina* h⁻¹). In 20 lux feeding trials, neomycin did not affect feeding, indicating no deleterious side-effects. Neomycin did not damage olfactory or taste cells as judged by vital dye and calretinin staining.

Conclusions:

This study provides the best evidence to date that teleost larvae use mechanoreceptors to detect vibrations from swimming invertebrate prey for non-visual feeding.

Aquaculture and Fisheries

Nova Scotia Agricultural College

Xi Xue - Undergraduate Student

Requested to present: Oral

Managing soft-flesh disease among British Columbia farmed Atlantic salmon (*Salmo salar*)

Xue, Xi

Dr. Jim Duston

Abstract:

Objective:

Soft-flesh disease, caused by *Kudoa thyrsites*, costs the BC industry about \$50M annually. The disease cannot be treated, but can be managed. Prevalence of soft-flesh disease varies along coastal Vancouver Island, being low in part of north and severe in Campbell River area. Temporary rearing of smolts at a northern site with low infection pressure (â€˜low riskâ€™™) results in fish acquiring resistance to the disease, this allows farmers to move the fish to â€˜high-riskâ€™™ net-pens sites in Campbell River area and be safely reared to market size. The objective was to evaluate the efficacy of this strategy against the disease.

Methods:

Smolts from a single hatchery were sub-divided and transferred in April 2009 to either a high risk or low risk site. After six months, fish from the low-risk site were moved by well-boat to the high-risk site. In summer 2010 the incidence and severity of the disease was assessed by counting the number of ulcerative â€˜pitsâ€™™ in a single fillet from 30 fish per net-pen among both treatment groups.

Results:

Among salmon reared throughout at the high-risk site, 50.0 to 86.2% of fish per net-pen exhibited soft-flesh disease. By contrast, among salmon reared at the low-risk site for six months then transferred to the high-risk site,

Aquaculture and Fisheries

Nova Scotia Agricultural College

Ming Gong - Undergraduate Student

Requested to present: Oral

Digestibility of nutrients in corn gluten meals and feed containing different protein levels by rainbow trout (*Oncorhynchus mykiss*)

Gong, Ming

Dr. Derek Anderson

Abstract:

Objective:

Feed cost is the main expense in aquaculture. Fish meal in feed has become increasingly expensive. This project tested that plant feedstuffs such as corn gluten feed (CGF), corn gluten meal (CGM) and a high protein CGM called Empyreal[®]75 (EMP) could be used to replace fish meal.

Methods:

Rainbow trout (*Oncorhynchus mykiss*) with an initial mean weight of 760 \pm 11.2g fed one of four experimental diets: control diet or three diets with CGF, CGM or EMP added at 30% to control diets to determine the apparent digestibility coefficients (ADCs) of dry matter (DM), crude protein (CP) and gross energy (GE) in both diet and feed ingredients, and digestible crude protein (DCP) and digestible energy (DE) in feed ingredients.

Results:

The test ingredients had CP ADCs of CGF, CGM and EMP were 94.7%, 92.1% and 92.0% respectively, while the GE ADCs were 75.8%, 83.4% and 89.6% respectively. There were no differences ($P>0.05$) among the three ingredients for the CP ADCs. The DCP of CGF, CGM and EMP were 21.4%, 59.9% and 70.6%, and the DE were 3238, 4278 and 4908 Kcal/Kg, respectively.

Conclusions:

CP and GE of all these three ingredients can be digested well by fish. The DCP of EMP was significantly higher than that of CGM and CGF. The DE of EMP and CGM was significantly higher than that of CGF. EMP can provide more DCP and DE than found in fish meal.

Aquaculture and Fisheries

St. Francis Xavier University

Katelyn White - Undergraduate Student

Requested to present: Oral

The Effects of Land Based Fish Farm Effluent on *Ascophyllum nodosum*

White, Katelyn

Dr. David Garbary, Dr. Jang Kim

Abstract:

Phenotypic plasticity was examined in the economically and ecologically important brown alga *Ascophyllum nodosum* (L.) Le Jolis (Fucales, Fucaceae) in southwestern Nova Scotia. We examined the impact of nutrient loading on vegetative and reproductive features to determine morphometric changes in *A. nodosum* at two sites with direct effluent impact from a land based finfish aquaculture facility, and from two control sites approximately 2 km in opposite directions from the aquaculture facility. Fronds from test sites were significantly younger than from control sites (5 vs. 8 y; p natural resource harvesting of *Ascophyllum*. Further study is necessary to determine the limits of nutrient loading and this potentially beneficial outcome.

Aquaculture and Fisheries

Universite de Moncton

Tina Rousselle - Graduate Student

Requested to present: Oral

Impact de lâ€™Ã©chaudage sur la survie, la croissance et la physiologie de lâ€™huître amÃ©ricaine (Crassostrea virginica)

Rousselle, Tina

Mayrand, Ã‰lise & Comeau, Luc

Abstract:

Lâ€™Ã©chaudage permet de contrÃ´ler les blessures sur les structures de croissance des huîtres. Cependant, aucune Ã©tude n'a vÃ©rifiÃ© lâ€™effet de lâ€™Ã©chaudage sur lâ€™huître mÃªme. Alors, dans cette Ã©tude, des huîtres amÃ©ricaines furent Ã©chauffÃ©es (60Â°C) briÃ©vement (15 sec) dans un bain d'eau chaude, puis Ã©valuÃ©es selon plusieurs critÃ©res physiologiques (mortalitÃ©, croissance, indice de remplissage et stress cellulaire). Aussi, lâ€™effet de lâ€™Ã©chaudage et de la dessiccation sur les huîtres furent comparÃ©s.

Les rÃ©sultats montrent que lâ€™Ã©chaudage d'huîtres juvÃ©niles (35mm) en juin et en aoÃ»t provoque, respectivement, un taux de mortalitÃ© de 50% et 11%. Ã©chauffer des huîtres en juin cause une rÃ©duction de croissance de la coquille de 58% chez les juvÃ©niles et de 22% chez les adultes. Les huîtres Ã©chauffÃ©es ont un plus grand nombre d'hÃ©mocyttes prÃ©sents des membranes lysosomales dÃ©stabilisÃ©es (7,5 Ã 14%) que celle qui ont Ã©tÃ© exposÃ©es Ã lâ€™air. Un Ã©chaudage de plus de 30 secondes sur des huîtres adultes cause une rÃ©duction de lâ€™indice de remplissage de 13 Ã 24% et une augmentation de la mortalitÃ© de 13 Ã 45%. Lâ€™Ã©chaudage Ã lâ€™automne, suivi de lâ€™hivernage, provoque 91% de mortalitÃ© chez les juvÃ©niles et prÃ©s de 30% chez les adultes.

Ces rÃ©sultats indiquent qu'un Ã©chaudage de 15 secondes Ã 60 Â°C cause un stress considÃ©rable sur lâ€™huître.

Aquaculture and Fisheries

University of New Brunswick

Saranyan PV - Faculty

Requested to present: Oral

Comparative heat shock protein responses to temperature in diploid and triploid salmonid erythrocytes.

Pillai V. Saranyan and Tillmann J. Benfey

Dr. Tillmann J. Benfey

Abstract:

Despite theoretical advantages, triploid fish are rarely used in aquaculture because they fare poorly under sub-optimal rearing conditions. We hypothesized that lower stress competence is a reflection of differences in heat shock protein (HSP) levels between diploids and triploids. HSPs are a group of proteins intricately linked to the healthy equilibrium of the proteome (proteostasis). They act as molecular chaperones, individually and in partnership with other HSPs, guiding cellular proteins throughout their lifecycle. Changes in proteostasis are reflected by shifted levels of particular HSPs, with the more severe shifts termed the 'heat shock response'. Adopting HSP70, HSP90, ubiquitin and their common transcription factor - HSF1 - as indicators, the differences between diploids and triploids were explored. Atlantic salmon (*Salmo salar*) and brook charr (*Salvelinus fontinalis*) of both ploidies (n =14) were acclimated to a range of stable temperatures for 100 days and heat shock response indicators assayed from their erythrocytes. In all cases where a significant difference was found between ploidies, triploids showed lower indicator levels. In a follow-up in vitro experiment using Atlantic salmon erythrocytes exposed to acute thermal regimes, triploid erythrocytes suffered significantly higher protein breakdown than diploid erythrocytes after acute heat shock but not after acute cold shock. These results will be discussed in light of our knowledge of comparative HSP levels among fish of the two ploidies and other relevant literature.

Aquaculture and Fisheries

University of New Brunswick

Jessica Whitehead - Graduate Student

Requested to present: Oral

Using gynogenesis to elucidate the sex determining mechanism of Atlantic cod (*Gadus morhua*)

"Whitehead, Jessica^{1,2}" "Benfey, Tillmann¹" "Martin-Robichaud, Debbie²"

Tillmann Benfey and Debbie Martin-Robichaud

Abstract:

Cultured Atlantic cod (*Gadus morhua*) typically reach sexual maturity prior to harvest, causing reduced flesh quality as essential nutrients are utilized by developing gonads rather than muscle tissue. Recent research has shown that female triploid Atlantic cod exhibit suppressed gonadal development, potentially resolving pre-harvest sexual maturation. Therefore industry is looking to produce female mono-sex stocks, but cannot do so until the sex determining mechanism is uncovered. The objective of this research is to determine the genetic basis of sex for Atlantic cod, by means of gynogenesis. This process results in uniparental maternal inheritance following exposure of spermatozoa to UV radiation. The UV treatment that gave the best yield of gynogenetic offspring was pre-dilution of milt to a 15% spermatocrit followed by a further 1:10 dilution and exposure to 113.4mJ/cm² UV light. A hydrostatic pressure shock was applied to zygotes following activation with UV-treated milt, inhibiting the extrusion of the haploid second polar body, resulting in diploid gynogenetic embryos. All presumptive gynogens were genotyped to verify absence of the paternal genome. The sex ratio of gynogenetic and control populations was examined at approximately 9 months of age by macroscopic observation of gonads and is currently being confirmed through histology. Both methods will provide support for male (XY) or female (WZ) heterogamety. If only females result from gynogenesis, then male heterogamety can be supported. A 1:1 or female-biased sex ratio may support female heterogamety. The results from this work reveal which endocrine approach is appropriate to manipulate sex differentiation, allowing for mono-sex stock production.

Aquaculture and Fisheries

University of New Brunswick

SONG LIN - Graduate Student

Requested to present: Oral

Sex control of Atlantic cod (*Gadus morhua*)

Song Lin, Tillmann Benfey, Debbie Martin-Robichaud

Tillmann Benfey, Debbie Martin-Robichaud

Abstract:

Title:

Sex control of Atlantic cod (*Gadus morhua*)

Objective:

Early maturation, a major environmental and economic constraint, commonly occurs in both sexes of Atlantic cod (*Gadus morhua*). Production of sterile triploid fish would alleviate this problem. The objective of this project is to develop techniques to produce monosex stocks of fish as the first step to produce monosex triploids.

Methods:

The experiment involves endocrine manipulation by direct hormone treatments in two consecutive years. 17β -estradiol (E2) and 17α -methyl-dihydrotestosterone (MDHT) were applied to fish diets during the labile period of sex differentiation. In the first year, triplicate treatments of 5, 10 and 20ppm for E2 and 0.67, 2 and 6ppm MDHT were given to fish between 17 ± 2 and 43 ± 1 mm SL. In the second year, duplicate treatments of 20, 40, 80 and 120ppm for E2 and 3, 6, 12 and 18ppm MDHT were given to fish via dietary means between 7.8 ± 1 mm and 43 ± 1 mm SL.

Results:

The shift in sex ratio in both hormone treated groups was proportional to hormone dosage in the second year, while this was not observed in the first year. MDHT treatments \approx 6 ppm in the second year resulted in > 90% male. Significantly reduced male ratio was observed in E2 groups with dosage \approx 80ppm.

Conclusions:

The labile period of sex differentiation of cod occurs around 8mm SL. It is possible to manipulate the phenotypic sex of cod through dietary hormonal manipulation

Biology

Acadia University

Adam Deveau - Undergraduate Student

Requested to present: Oral

The Ratiometric Effects of Pheromones on Odour-Mediated Behaviour and the Neurophysiology of the European Gypsy Moth, *Lymantria dispar*

Deveau, Adam

Dr. Kirk Hillier

Abstract:

RATIOMETRIC EFFECTS OF PHEROMONES ON ODOUR-MEDIATED BEHAVIOUR AND NEUROPHYSIOLOGY OF THE EUROPEAN GYPSY MOTH, *Lymantria dispar*

Adam Deveau, Dr. Kirk Hillier

Department of Biology, Acadia University, Wolfville, NS

Objective:

In European Gypsy Moths (GM) there are two olfactory neurons in every pheromone-sensitive sensillum; one neuron responds to (+) disparlure ((+) D) and the other to (-) disparlure ((-) D). The objective of this study was to measure and record the responses of olfactory receptor neurons to ratiometric blends of (+) D and its enantiomer (-) D via single sensillum recording to determine any inhibitory activity between these neurons through extracellular electric fields called ephaptic communication. As well, to examine if such an inhibitory effect of (-) D was modulated in a higher part of the insect brain.

Methods:

Using electrophysiological extracellular recording techniques, the response of the neurons to varying concentration series of (+) and (-) D within each sensillum was recorded. As well, the antennal lobes were mapped, in both male and female GM for further physiological investigation.

Results & Conclusions:

Single sensillum recording suggested that there was some degree of inhibition of (+) D neurons at higher concentrations of (-) D. There were also synergistic responses from the (+) D neurons with blends that included a lower concentration of (-) D which suggested that the neurons may be more generalists and respond to both (+) D and (-) D. In contrast, there was little response from (-) D neurons when

stimulated with (+) D and a greater response when stimulated with (-) D, suggesting that this neuron acted like a modulator and inhibited responses from (+) D neurons

Biology

Acadia University

Corban Hart - Undergraduate Student

Requested to present: Oral

Watching that diet & getting on those genes: epigenetic modifications and phenotypic plasticity in *Polydora cornuta*

Hart, Corban

Dr. Glenys Gibson

Abstract:

Many organisms exhibit developmental plasticity, whereby the environment affects development and generates alternate phenotypes in young. The developmental mechanisms that lead to this plasticity are largely unknown. My hypothesis is that epigenetic modifications (e.g., histone methylation) lead to changes in gene transcription during embryonic development that result in alternate phenotypes, and that these modifications are altered by environmental factors such as maternal diet. The spionid polychaete *Polydora cornuta* is an excellent model for this investigation: these worms produce two distinct larval morphs (with different morphologies and trophic modes) within a single egg capsule. My objective was to use immunofluorescence to screen for several epigenetic modifications throughout development in the two larval morphs. Furthermore, I tested for changes in epigenetic modifications in young whose mothers were fed diets rich in methyl donors (e.g., folate/vitamin B12). Major results included: (1) detection of histones in the nuclei of all cells of both morphs at all stages of development, validating my method; (2) variation in onset and distribution of some epigenetic modifications (e.g., H3K14 acetylation) among different tissues throughout development, suggesting a link with cell differentiation; (3) earlier onset of one modification (H3K9 monomethylation) in one of the larval morphs; and (4) hypermonomethylation (e.g., of H3K9) in young produced by females fed enhanced diets. These results indicate that changes in the onset of specific epigenetic modifications (e.g., H3K9 monomethylation) at certain ontogenetic stages may lead to developmental plasticity, and that these modifications may indeed be influenced by maternal diet.

Biology

Acadia University

Lydia Stevens - Undergraduate Student

Requested to present: Poster

AMERICAN EEL (ANGUILLA ROSTRATA) POPULATION DYNAMICS AND HABITAT USE IN A PRISTINE WATERSHED IN NOVA SCOTIA

Stevens, Lydia

Dr. Trevor Avery

Abstract:

American eels are a species of "Special Concern" as assessed by the Committee on Status of Endangered Wildlife in Canada (COSEWIC). If the Government of Canada accepts this assessment and lists American eel under the Species at Risk Act (SARA) as such, then a management plan for the species and its habitat must be prepared. The objective of the management plan is to conserve the species and prevent it from becoming "threatened" or "endangered". The purpose of this research is to gain a better understanding of habitat use by American eels and to estimate their population size in a pristine watershed in Nova Scotia as a baseline for a long-term monitoring program. Twenty-nine baited eel pots were set around the near-shore waters of Oakland Lake in various habitats. Habitats were categorized based on depth, topography, and bottom composition. Captured eels were tagged using a Passive Integrated Transponder (PIT) tag and their capture area recorded. In 2009, a total of 91 eels were caught over 15 days of fishing between July 19th and August 21st with 67 total recaptures. In 2010, a total 249 eels were caught over 34 days of fishing between May 21st and August 24th with 130 total recaptures. In 2010, the number of eels caught tended to be fewer at the end of the season in comparison to the beginning. It was also found that few recaptured eels returned to the same trap. Mark-recapture analysis is not yet complete. Gaining a better understanding of habitat use and population size will enable conservation of habitat, and provide valuable information to help prevent further declines in American eel populations.

Biology

Acadia University

Stephanie Powell - Undergraduate Student

Requested to present: Oral

STRESSED OUT: THE EFFECTS OF EPINASTINE AND OCTOPAMINE ON LEARNING, MEMORY, AND HEART RATE IN HELIOTHINE MOTHS

Powell, Stephanie

Dr. Kirk Hillier

Abstract:

STRESSED OUT: THE EFFECTS OF EPINASTINE AND OCTOPAMINE ON LEARNING, MEMORY, AND HEART RATE IN HELIOTHINE MOTHS

Objective:

Octopamine (OA), a biogenic amine, modulates physiological processes in invertebrates and has been found to increase cardiac output and assist in learning and memory. This study will investigate the effect of OA antagonist epinastine (EPI) on learning and memory, and the effects of OA and EPI on heart rate.

Methods:

To study learning and memory, the proboscis extension reflex (PER), based on the Pavlovian conditioning model, was used. *Heliothis virescens* were injected with saline (control) or EPI and conditioned to extend their proboscis during the presentation of an odour. The effect of OA and EPI on heart rate was examined in *Helicoverpa zea* through dissection to expose the heart, which was bathed in saline (control), OA, and finally EPI in four consecutive trials. Following exposure, the beats per minute of the heart were counted.

Results:

It was observed that PER recall was slightly higher in EPI-injected moths. Treatment appeared to play a role in heart rate, which decreased following injections of OA and EPI. However, heart rate decreased gradually over all four trials, therefore, the amount of time that the moth has been dissected is likely affecting the heart rate.

Conclusions:

These data suggest that EPI could be hindering initial learning, and is metabolized before the 45 minute recall begins, as no hindrance is seen at recall trials. Addition of OA or EPI has little to no effect on the

moth heart rate. Continued study of the OA/EPI effect on memory and heart rate has the potential to provide useful insights into stress.

Biology

Cape Breton University

Jeff Clements - Undergraduate Student

Requested to present: Oral

Feeding Ecology of the Northern Moonsnail (*Euspira heros*) (Gastropoda: Naticidae) in Cape Breton, Nova Scotia

Clements, Jeff

Dr. Timothy A. Rawlings

Abstract:

Although the Northern Moonsnail (*Euspira heros*) is an important predator in the shallow, soft-sediment marine environments of Cape Breton, many aspects of its feeding ecology remain poorly understood. In this study I examined the diet breadth and prey selectivity of *E. heros* across its ontogeny at two localities. I specifically asked: 1) Is the breadth of prey exploited by *E. heros* representative of prey availability? 2) Does moonsnail diet change across its ontogeny? And 3) Do moonsnails differentiate between different sizes of prey within a given species? I addressed these objectives through beach collections of drilled and undrilled shells, and laboratory experiments to determine the relationship between borehole diameter and moonsnail size across prey species. Field evidence indicated that moonsnails have a broad diet consisting of bivalves and gastropods, with some variation across locations based on prey availability. Larger moonsnails produced larger boreholes than smaller snails in laboratory experiments and, since this relationship did not vary across prey species examined, I used borehole diameters to assess ontogenetic changes in diet. With increasing size, moonsnails changed from a diet dominated by *Mya arenaria*, *Tellina carpenteri* and *Gemma gemma* to *Spisula solidissima* and conspecifics. In addition, larger predators tended to feed on larger prey items and vice versa, although larger snails also demonstrated a wider range of prey sizes than smaller snails. Cost-benefit analysis showed that moonsnails may select prey based on energetic reward per unit drill time, although size constraints in handling prey also appear to strongly influence prey selection.

Biology

Cape Breton University

Jeff Clements - Undergraduate Student

Requested to present: Oral

Feeding Ecology of the Northern Moonsnail (*Euspira heros*) (Gastropoda: Naticidae) in Cape Breton, Nova Scotia

Clements, Jeffery

Dr. Timothy A. Rawlings

Abstract:

Although the Northern Moonsnail (*Euspira heros*) is an important predator in the shallow, soft-sediment marine environments of Cape Breton, many aspects of its feeding ecology remain poorly understood. In this study I examined the diet breadth and prey selectivity of *E. heros* across its ontogeny at two localities. I specifically asked: 1) Is the breadth of prey exploited by *E. heros* representative of prey availability? 2) Does moonsnail diet change across its ontogeny? And 3) Do moonsnails differentiate between different sizes of prey within a given species? I addressed these objectives through beach collections of drilled and undrilled shells, and laboratory experiments to determine the relationship between borehole diameter and moonsnail size across prey species. Field evidence indicated that moonsnails have a broad diet consisting of bivalves and gastropods, with some variation across locations based on prey availability. Larger moonsnails produced larger boreholes than smaller snails in laboratory experiments and, since this relationship did not vary across prey species examined, I used borehole diameters to assess ontogenetic changes in diet. With increasing size, moonsnails changed from a diet dominated by *Mya arenaria*, *Tellina carpenteri* and *Gemma gemma* to *Spisula solidissima* and conspecifics. In addition, larger predators tended to feed on larger prey items and vice versa, although larger snails also demonstrated a wider range of prey sizes than smaller snails. Cost-benefit analysis showed that moonsnails may select prey based on energetic reward per unit drill time, although size constraints in handling prey also appear to strongly influence prey selection.

Biology

Cape Breton University

Samantha Lawrence - Undergraduate Student

Requested to present: Poster

Using freshwater snails to assess trematode diversity in an urban lake

Lawrence, Samantha

Dr. Timothy A. Rawlings

Abstract:

Parasitic trematode flatworms play an important role in regulating community structure in freshwater ecosystems. Their complex lifecycles, involving one or several intermediate hosts and one definitive host, can lead to a variety of direct and indirect interactions with other organisms. Within aquatic environments, freshwater snails are intermediate hosts to many of the known species of trematodes. As such, these snails can be used to assess trematode diversity by studying the free-swimming cercarial larval stages that are shed from the snails as part of the parasite's lifecycle. Here, I examined the diversity of trematode parasites from Blacketts Lake, located near Sydney, Nova Scotia, by surveying parasite infections in four common species of freshwater snails, *Gyraulus*, *Amnicola*, *Helisoma* and *Physa*, from July to October, 2010. Cercarial larvae that emerged from isolated snails were identified to the lowest taxonomic rank possible using behavioural and morphological features, as well as nucleotide sequences (18S rRNA gene). Seven distinct cercarial morphotypes were recognized, with *Physa* hosting the highest diversity of morphotypes (n=4) and *Amnicola* the lowest (n=1). Prevalence of infection, which varied among hosts, ranged from an average of 21.9% in July to 5.5% in September. Molecular data from four of the cercarial morphotypes examined so far confirmed their genetic distinctiveness: BLAST searches in GenBank found highly similar matches (97-99%) to four genera: *Trichobilharzia*, which causes "swimmer's itch" in humans, *Fascioloides*, a liver fluke of veterinary importance, and two intestinal flukes, *Notocotylus* and *Echinostoma*, which infect waterfowl and fish/amphibians, respectively.

Biology

Crandall University

Yang Zhan - Faculty

Requested to present: Poster

Professor

Smith Mitchell, Smith Laura

Yang Zhan

Abstract:

Silver Nanoparticles as a Possible Alternative to Antibiotic Use.

In past two decades, metallic nanoparticles have exhibited a promising bactericidal property which might circumvent the problem of increasing antibiotic-resistant bacteria strains nowadays. In this study, significantly antimicrobial activities of silver nanoparticles (AgNPs) on both Gram-negative (*E. coli*) and Gram-positive (*B. subtilis*) bacteria were detected in both liquid broth and solid agar culturing. Silver nanoparticles showed greater inhibition on *B. subtilis* than that on *E. coli*. Our results indicated to the great potential of AgNPs as an effective future antimicrobial agent which might replace antibiotics in medical treatment. Also, multiple layered and highly organized peptidoglycan present in G+ bacteria cell wall might not be the answer to explain less penetration and bactericidal effect under the treatment of AgNPs compared with G- bacteria, which was suggested in previous publication by another research group.

Biology

Crandall University

Casey Benson - Undergraduate Student

Requested to present: Poster

Assessment of Brook Trout Population within Gorge Brook, Moncton, New Brunswick

Benson, Casey; Beers, Peter; Humby, Penny

Dr. Penny Humby

Abstract:

Objective:

Artificial and natural barriers in streams may impede fish from upstream movement. Many factors including barrier height, pool depth, and water velocity may restrict fish movement across barriers. The purpose of this study was to determine if the barriers, including a large culvert, along Gorge Brook, impede brook trout from upstream movement and if this would result in different sub-populations.

Methods:

Gorge Brook is a small tributary of Halls Creek running through the Crandall University campus. We selected five sites along this stream delineated by natural or artificial barriers. Physical properties were measured with a Hansatech Quantitherm and a Vernier LabQuest and brook trout were caught via angling and minnow traps from October 5 to November 5, 2010. Fish length and weight were measured, biomass calculated and fins clipped for mark/recapture. A subset from each site was aged using otoliths and the age classes within the stream estimated. Statistical analysis was conducted using ANOVA.

Results:

A total of 81 brook trout were caught, with four recaptures. No upstream movement was detected and there were no statistical differences between the sites. The mean length, weight, and biomass were $109.56 \text{ mm} \pm 25.23$, $23.31 \text{ g} \pm 13.70$, and $0.19 \text{ g/mm} \pm 0.076$, respectively. The oldest fish caught were 4 years old with the majority (34.6%) between 2-3 years old.

Conclusions:

Although there is a large culvert and no upstream movement was detected through mark/recapture, our preliminary data suggests that this stream supports one continuous population. Further study is necessary to determine the extent of movement along the stream.

Biology

Dalhousie University

Melissa - Undergraduate Student

Requested to present: Poster

Comparative Study of Neuronal Degradation in a Model of Multiple Sclerosis in the Presence and Absence of the Voltage-gated Sodium Channel, Nav1.6.

Archibald, Melissa

Dr. Patrice Cote

Abstract:

Voltage gated sodium channels (VGSCs) are densely present in neurons at the nodes of Ranvier where myelin is not present. When demyelination occurs in conditions such as multiple sclerosis (MS), VGSCs diffuse to internodal areas and overall expression increases. Previous studies have linked increased presence of VGSCs along demyelinated neurons with neuronal degradation. Increased intra-axial sodium levels due to increased presence of sodium channels allowing sodium ions to flow into the neuron are observed to directly increase intra-axial Ca^{2+} levels. This is believed to occur by a reversal of the Na/Ca^{2+} exchanger which by attempting to extrude excess sodium functions in a Ca^{2+} -importing mode, resulting in the death of the neuron. Additionally inflammation due to damage results in nitric oxide being emitted which inhibit the capability of mitochondria to produce energy; this limits ability of the ATP dependent channels to expel sodium from the neuron.

Because of the link between sodium channels (specifically Nav1.6), and neuronal degradation, we hypothesize that absence of this channel will result in less degradation in MS and in models of this disease. Using normal and knockout mice (lacking Nav1.6 in their retina and optic nerve), treated to induce experimental autoimmune encephalomyelitis (EAE), a condition that mimics MS, and examining differences in degradation of demyelinated neurons of the optic nerve and spinal cord by histological examination, more information can be gathered about the role of VGSCs in the pathophysiology of MS.

Biology

Dalhousie University

Kayla - Undergraduate Student

Requested to present: Oral

Analysis of high-resolution three-dimensional movement data from leatherback sea turtles (*Dermochelys coriacea*) foraging off Nova Scotia

Hamelin, Kayla

Dr. Christopher Taggart, Dr. Michael James

Abstract:

The leatherback sea turtle (*Dermochelys coriacea*) is the largest turtle in the world, and is a highly migratory, globally distributed species. In summer, the coast of Atlantic Canada hosts one of the largest seasonal aggregations of leatherbacks, but the global decline in the number of turtles in recent decades has led to its designation as Endangered (Schedule-1) under the Canada Species at Risk Act. Assessing and explaining the distribution of leatherbacks in time and three-dimensional space is essential for the recovery of this species, as interactions with human activities such as fishing are a significant cause of mortality. This study involves determining spatial and temporal patterns and trends in leatherback distribution that may identify geophysical and oceanographic features that shape habitat use. Satellite-linked temperature-depth-recorders were deployed on three female leatherbacks off Halifax in 2008 and 2009 and high-resolution time (0.5 Hz), depth ($\pm 1\text{m}$), water temperature ($\pm 0.1^\circ\text{C}$), and geographic location data were retrieved over periods of between 2 weeks and 3 months during the turtle-residence period in Canadian waters. I will present preliminary results indicating that different turtles exhibit very similar dive characteristics (e.g. maximum depth-of-dive) and water mass associations despite navigating different coastal migration routes. There is also evidence that leatherbacks target the thermocline when diving and this suggests prey-related water mass associations. Furthermore, there are strong indications of systematic high- and low-frequency periodicities in the dive data that have yet to be reported in the primary literature.

Biology

Dalhousie University

Andrew Coombs - Undergraduate Student

Requested to present: Poster

The Notch Signaling Pathway plays a Significant Role in Mast Cell Development in the Zebrafish

Sahar Das¹, Andrew Coombs², Adolfo Ferrando⁴ and Jason N. Berman^{1,3}

Dr. Jason Berman

Abstract:

Mast cells are important myeloid cells that play a key role in innate and adaptive immunity. The Berman laboratory has identified zebrafish mast cell equivalents and shown that carboxypeptidase A5 (cpa5) is a zebrafish mast cell specific marker. The laboratory has been exploiting the zebrafish system to elucidate the pathways regulating mast cell development in vertebrates and established pu.1 and gata2 as the key transcription factors required for early mast cell development.

In order to examine the impact of overactive notch signaling on mast cell development, I screened and genotyped a double transgenic zebrafish line expressing the notch intracellular domain under a heat shock promoter (HSP::GAL4;UAS::nicd1a). A double runx1 morpholino oligonucleotide was used to determine if mast cells develop from hematopoietic stem cells (HSCs) or from erythro-myeloid progenitors.

Over-expression of the notch signaling pathway led to increased cpa5 and gata2 expression at 28 hours post-fertilization by whole mount in situ hybridization. In addition, at earlier developmental time-points, I observed a significant increase in myeloid progenitors with no loss to erythroid progenitors, suggesting that over-expression of notch signaling increases mast cell development. The double runx1 morpholino produced a decrease in HSCs with no decrease in mast cells indicating that mast cells do not arise from HSCs.

Taken together, these studies strongly implicate the role of Notch signaling in mast cell development, providing the opportunity for the zebrafish to serve as an in vivo model for targeting this pathway in primary mast cell diseases.

Biology

Dalhousie University

Jaime - Undergraduate Student

Requested to present: Oral

Do mitochondria catalyze programmed cell death in the Lace Plant?

Wertman, Jaime

Dr. Arunika Gunawardena

Abstract:

Developmentally regulated programmed cell death (PCD) plays an integral role in the normal development of plants and animals. The role of mitochondria in animal PCD is well studied, however, less is known about its roles in the plant kingdom. The aim of this study is to examine mitochondrial dynamics throughout plant PCD. The accessibility and predictability of perforation formation during leaf morphogenesis in the aquatic lace plant (*Aponogeton madagascariensis*) makes this an ideal species to study developmental PCD. PCD begins between transverse and longitudinal veins and continues outwards, stopping four to five cells from the veins. This provides a gradient of PCD that can be observed in the area between the veins. The gradient starts with control cells (Non-PCD) near the veins, continues with cells in the early stages of death (Early-PCD), and ends with cells in the late stages of death (Late-PCD). These leaf pieces were stained with 0.6 μM CMXros, a membrane permeability dependent dye, and viewed with confocal microscopy. In Non-PCD cells, mitochondria are evenly distributed and actively streaming around the vacuole. In Early-PCD cells, the mitochondria aggregate together, commonly around the nucleus. In Late-PCD cells, mitochondria then stop moving, and eventually lose their stain; this implies they have undergone the membrane permeability transition and are no longer viable. Subsequent investigation using cyclosporine A (CsA), a mitochondrial pore agonist, indicates the integral role of the mitochondria in plant PCD. Future work with long-term live cell imaging will help elucidate the timeline of plant PCD.

Biology

Memorial - Grenfell Campus

Adam Legge - Undergraduate Student

Requested to present: Oral

A serological examination of Jamestown Canyon virus (Bunyaviridae): the acquisition of immunity

Legge, Adam

Dr. Greg Goff, Dr. Hugh Whitney, Dr. Mike Drebot

Abstract:

Jamestown Canyon Virus (JCV) is distributed widely across North America exclusively by mosquitoes. Common hosts include deer, moose and cattle. JCV has low virulence. Infections are benign. My research examines how and when young calves first acquire antibodies. Active acquisition involves contact with the virus where the host's immune system recognizes the virus and produces antibodies. This is the common pathway to obtain antibodies. Alternatively, passive acquisition occurs where newborn animals cannot produce antibodies and obtain maternal antibodies in utero or through nursing.

Blood serums were analyzed for JCV antibodies as evidence of recent contact with the virus. Blood samples were collected from 30 sentinel newborn calves at two week intervals from May until late September, before mosquito emergence and extending past a killing frost. Sera obtained were stored at -70C. Plaque reduction neutralization testing at 1:20 sera dilutions recorded seroconversion by JCV in the sentinel calves.

Discrete hypotheses were generated for alternative outcomes. Initial data analyses support the passive acquisition of immunity in newborn calves. Other preliminary observations include the unanticipated presence of antibodies to Snowshoe Hare virus. Seropositivity levels of newborn calves correlated with prior levels of seropositivity in adult cattle were observed on the same farm.

Aspects of passive acquisition, the coincidence of mosquito emergence and seroconversion and the influence of differences in farm environments with levels of seropositivity are being examined.

Biology

Memorial University

Patricia Howse - Undergraduate Student

Requested to present: Poster

Potential impacts of Snowshoe hare (*Lepus americanus*) browsing on forest regeneration in the boreal forest of Central and Western Newfoundland

Howse, Patricia M. and Wiersma, Yolanda

Dr. Yolanda Wiersma

Abstract:

Much of the focus of herbivore impacts on forest regeneration on the island of Newfoundland has been on moose (*Alces alces americanus*). The primary objective of this study was to determine whether there was any significant impact of hare browsing on forest regeneration. This was done by quantifying hare browse on preferred species in two areas of the island. Thus, the second objective of this project was to determine how competition with other herbivores, primarily moose, affects browse pressure in various stand types. If snowshoe hare (*Lepus americanus*), a non-native herbivore on the island of Newfoundland, are at sufficient densities to affect regeneration then there will be a high percent of consumption of black spruce saplings. Black spruce saplings (>10 cm and

Biology

Memorial University

Victoria Howse - Undergraduate Student

Requested to present: Oral

An exploratory analysis of colour polymorphism in larval American lobster (*Homarus americanus*): patterns and implications

Howse, V.J., Stanley, R.R.E., and P.V.R. Snelgrove

Dr. Paul Snelgrove

Abstract:

The American lobster (*Homarus americanus*) is generally thought of as a colour monomorphic species, with a characteristic reddish-brown colour pattern. Though different adult colour morphs exist, variability is low. Work on juvenile lobsters has illustrated short-term colour change in response to environmental cues and suggested possible ecological implications of this plasticity. Larval American lobster appear to exhibit greater variation in colour than later life history stages, and this variation has yet to be explicitly addressed. Here we present our exploratory analysis of phenotypic plasticity in larval American lobster colouration. Berried female lobsters collected from three coastal Newfoundland locations were held at the Ocean Sciences Centre until eclosion. Newly hatched larvae were collected and digital photographs were used to score colouration. Through the use of custom image analysis scripts, written in Matlab, we were able to automate the processing and analysis of each image, thus greatly improving our efficiency. Several factors influencing colouration were explored including maternal origin, natal region, temperature, light, background and predation. Preliminary analyses suggest that colour plays a role in predation, and the expression of red pigments appears to be negatively related to survival. Further evaluation of maternal and geographic patterns of colour might shed new light on the mechanisms, and possible implications, of larval colour plasticity. These and forthcoming results provide an initial quantitative look at colouration and provide a platform for further analysis detailing the possible role of environment and colour plasticity on the survival of larval American lobster.

Biology

Mount Allison University

Melissa Hebert - Undergraduate Student

Requested to present: Oral

Diurnal and nocturnal foraging behaviours of staging Semipalmated Sandpipers in the upper Bay of Fundy

Hebert, Melissa A.; Quinn, Jenna T.; Hamilton, Diana J.

Diana J. Hamilton

Abstract:

Each summer more than 70% of the world's population of Semipalmated Sandpipers (*Calidris pusilla*) utilizes upper Bay of Fundy mudflats as staging grounds; doubling their mass in only two weeks in preparation for their non-stop flight to South American wintering grounds. During this period effective foraging is critical to ensure adequate fat deposition. Diurnal and nocturnal foraging is known to occur in this species, but little research has been done on how foraging behaviours differ between day and night. Further, while feeding, Semipalmated Sandpipers typically peck and probe for invertebrates, primarily the amphipod *Corophium volutator*. However, sometimes birds also exhibit a different foraging method, skimming, in which the bill is run along the surface of the sediment, possibly to obtain alternate prey items. We used focal observations to observe Semipalmated Sandpipers foraging both day and night at two mudflats in the upper Bay of Fundy during summer 2010. We tested whether foraging rates and foraging modes used differed between day and night, and assessed the effect of a suite of factors (site, available prey, time of day, distance to shore, and conspecific density) on sandpiper foraging behaviour. We found that pecking was used primarily during the day and skimming was only observed at night. Factors such as time, site, and distance from shore were found to be the more influential to foraging behaviours than available prey. These results highlight the fact that nocturnal activities require further studies and should be considered for the conservation needs of this species.

Biology

Mount Saint Vincent University

Brittini Milligan - Undergraduate Student

Requested to present: Oral

A Descriptive and Comparative Analysis: Morphological Ontogenetic Growth of the Mandibular and Branchial Arches in Zebrafish (*Danio rerio*)

Milligan, Brittini

Dr. Tamara Franz-Ondendaal

Abstract:

Purpose: The purpose of the presented research was to describe how the shape of the mandibular and branchial arches changes during ontogenetic growth in zebrafish (*Danio rerio*). This data can be used as a reference for future studies of these elements in zebrafish.

Method: Samples (n=120) were examined at 5, 10, 15, 20, 30, and 60 dpf and older than 6 months post fertilization (mpf). The type of skeletal tissue present at each stage was determined by alizarin red (bone) and alcian blue (cartilage) staining. Deposition and resorption of skeletal matrix was investigated using alkaline phosphatase (AP) and tartrate-resistant acid phosphatase (TRAP) staining, respectively.

Results: Cartilage was first present at 10 dpf in both the mandible and branchial arches and was observed in all later stages. Bone staining was first observed in the mandible and in some branchial arch samples at 30 dpf, but was not observed consistently in the branchial arches until 60 dpf. AP staining occurred in the mandible and branchial arches at 5 dpf and was observed until 6 mpf when staining became highly variable between samples. TRAP stain was observed in the mandible at 30 and at 60 dpf, and in the branchial arches at 60 dpf. TRAP staining was inconsistent in samples older than 6 mpf .

Conclusions: Changes in morphology of the zebrafish mandible and branchial arches were described during ontogenetic growth. By comparing AP and TRAP staining in the selected age groups it was possible to observe how the remodelling processes in these elements change over time.

Biology

Saint Mary's University

Mark Hornsby - Undergraduate Student

Requested to present: Oral

Do male European starlings use egg spots to make decisions on provisioning effort?

Hornsby, Mark

Dr. Colleen Barber, Evan Fairn

Abstract:

Secondary-cavity nesting species frequently experience ectoparasitic infestations. Previous studies have revealed the extent to which these parasites affect avian hosts, ranging from negligible to significant changes in parental behaviour, decreases in nestling fitness, and death. One ectoparasite species, *Carnus hemapterus*, has been implicated in causing spots to appear on otherwise spotless eggs of the Spotless starling *Sturnus unicolor*, apparently causing the paternal adult to infer the level of parasitism within the nest and reduce his provisioning to the brood. The objective of my study was to investigate the hypothesis that *C. hemapterus* causes these egg spots and to determine how it influences paternal provisioning behaviour and nestling condition in a nest box population of European starlings *Sturnus vulgaris*. After determining which nests contained spotted eggs ($n = 12$) and which ones did not ($n = 9$), we counted the number of *C. hemapterus* on each nestling and took morphological measurements (tarsus and mass) to determine nestling condition. To assess level of parental provisioning, we carefully noted which parent visited the nest and how often over the course of one hour. Results and implications will be discussed.

Biology

Saint Mary's University

Zenon Czenze - Undergraduate Student

Requested to present: Oral

Ectoparasite community structure of two sympatric Maritime bats (*Myotis lucifugus* and *M. septentrionalis*)

Czenze, Zenon

Dr. Hugh Broders

Abstract:

Abstract

Ectoparasite community structure of two sympatric Maritime bats (*Myotis lucifugus* and *M. septentrionalis*)

Zenon Czenze

Ectoparasites may affect fitness of their hosts and therefore it is important to understand their species richness and the size and life history of their populations to understand the biology of the host species. Ectoparasites, were counted and systematically collected from bats at known and potential swarming sites across Nova Scotia and New Brunswick and identified in lab to document community structure and species richness of two sympatric congeneric bats: *Myotis lucifugus* and *M. septentrionalis*. In total I recorded six species of ectoparasite including *Myodopsylla insignis*, *Spinturnix americanus*, *Cimex adjunctus*, *Macronyssus crosbyi*, *Androlaelaps casalis*, and an unknown species of *Acanthopthirus*. Of these, *M. crosbyi*, *A. casalis* and *A. sp.* are new species records for Nova Scotia. In this system the host species have important life history differences which affect the ectoparasites that infect them. Unlike males, females of both species are colonial roosters during the summer which is thought to facilitate ectoparasite transfer. Parasite prevalence was 22% and 68% for adult *M. lucifugus* males and females, respectively and 23% and 44% for male and female *M. septentrionalis*.

Biology

Saint Mary's University

Harrison Moore - Undergraduate Student

Requested to present:

Diet, habitat analysis and microscopic observation of the four-toed salamander (*H. scutatum*) in Halifax Nova Scotia.

Moore, Harrison

Ron Russell

Abstract:

Knowledge of basic ecology and natural history is important for conservation of amphibian species. *Hemidactylium scutatum* is a small secretive salamander common in Nova Scotia. Little information is available about the ecology and natural history of this species. In this study, we asked if males and females differ in diet due to differences in habitat selection between the sexes and if dietary resources are shared among similar sized salamanders in the region.

H. scutatum, *Plethodon cinereus* (red backed salamanders) and *Notophthalmus viridescens* (red efts) were collected during spring and fall from a 30 km stretch of road (44°51.197'N 63°32.984'W) from Goffs to Elderbank NS along Highway 212. Salamanders were sexed, dissected, and gut contents were analyzed for numbers and types of food items. Invertebrate communities in litter samples from three potential habitat types (rotten wood, Sphagnum or leaf litter) were collected using Berlese funnels.

A G-test indicated that female and male diets were not statistically different, suggesting females do not feed during oviposition. The diet of *H. scutatum* did not closely match the invertebrate communities of any of the three sample habitats, suggesting that these salamanders forage in multiple habitats or in subterranean tunnels. The three salamander species have similar diets but partition resources utilizing mites as a main food source with different quantities of Gastropods, isopods and insects. Lower than expected proportions of mature ova suggest that most adult females in this population do not breed in successive years potentially due to food quality or shortened growing season.

Biology

St. Francis Xavier University

Timothy Hayman - Undergraduate Student

Requested to present: Oral

Effects of the presence of a large fish predator on the behaviour of the Spinycheek Crayfish (*Orconectes limosus*).

Hayman, Timothy

Dr. Jim Williams

Abstract:

The Spinycheek Crayfish (*Orconectes limosus*) is a widely successful freshwater invasive species. It has been suggested that in some cases, predatory fish could be introduced as a means of biological control. Predatory fish can limit a population of crayfish through direct predation, but may also be able to alter the behaviour of the crayfish through the imposition of a predatory threat. To test what behavioural changes may exist, crayfish were obtained from the wild and tested in a laboratory setting with hatchery-raised fish. Crayfish behaviour was first observed and quantitatively analyzed in the absence of fish. The same crayfish were then repeatedly exposed to a large fish predator, and the same behavioural analysis was performed. This allowed for a quantitative description of the effects of the fish on the behaviour of the crayfish. Crayfish behaviour was notably affected by the presence of the predatory fish, with a clear shift from conspicuous motile behaviours to less conspicuous non-motile behaviours. The amount of time spent foraging decreased, with more time being spent motionless. The number of antipredator meral spreads increased significantly, and changes were observed in the frequency of grooming, swimming escape responses, and intraspecific aggression. The presence of fish predators will elicit certain behavioural changes in the crayfish, resulting in an impact on the crayfish population even in the absence of direct predation. The shift towards less motile behaviours, most notably the decrease in foraging activity, may be able to improve the efficacy of biological control strategies.

Biology

St. Francis Xavier University

Hannah Buhariwalla - Undergraduate Student

Requested to present: Oral

Cold-induced adaptations in mitochondria-rich cells of eurythermal teleost fish *Fundulus heteroclitus*

Buhariwalla, Hannah E. C.

Marshall, William S.

Abstract:

Objective:

Anion channels (Cystic Fibrosis Transmembrane conductance Regulator, CFTR) in chloride cells of the gills and opercular epithelia of *Fundulus heteroclitus* control secretion of Cl⁻. We examined the effects of cold shock vs. cold acclimation on Cl⁻ secretion across the opercular epithelia and examined adaptations that cause changes in the regulation of Cl⁻ secretion.

Methods:

We used electrophysiology to examine the regulation of chloride transport and investigated three possible explanations for the changes seen. DASPEI was used to estimate density of chloride cells, scanning electron microscopy was used to estimate density of chloride cells exposed to the environment and CFTR immunocytochemistry was used to detect changes in CFTR localization.

Results:

When membranes from warm-acclimated animals were cold-shocked, ability to regulate chloride transport was lost. When membranes from cold-acclimated animals were warmed, there developed high levels of chloride secretion. Chloride cell density did not change following any treatment. Cold-shock sharply decreased Cl⁻ transport, corresponding with a decrease in the number of environmentally-exposed chloride cells. Membranes from cold-acclimated animals displayed deeper localization of CFTR immunofluorescence in the chloride cells.

Conclusions:

CFTR is under complex control in the membrane and thus cannot function properly at cold temperatures unless the animal has been cold-acclimated. When tissues are cooled, chloride cells are covered-over to decrease Cl⁻ secretion. Cold-acclimation of eurythermal mummichogs causes an increase in CFTR sub-apical expression, resulting in a larger standing crop of CFTR below chloride cell apical membranes.

Biology

St. Francis Xavier University

Leanne Delaney - Undergraduate Student

Requested to present: Poster

Expression of five lipopolysaccharide biosynthesis proteins of *P. aeruginosa* PAO1 in *E. coli*

Delaney, Leanne

Dr. J. Lam, Dr. L. Graham

Abstract:

A previously uncharacterised gene locus, which consists of pa5455, pa5456, pa5457, pa5458, and pa5459, may contribute to the biosynthesis of the lipopolysaccharide in *Pseudomonas aeruginosa*. The goal of this project is to overexpress PA5455, PA5456, PA5457, PA5458, and PA5459 from *P. aeruginosa* PAO1 so that high yields of proteins can be purified for assay development to functionally characterize each protein. To amplify pa5455, pa5456, pa5457, pa5458, and pa5459, PCR was performed using template DNA from *P. aeruginosa* PAO1. Each gene was then ligated with pET30a+, a vector used to express proteins in *Escherichia coli* in the presence of kanamycin. Each protein was then expressed in *E. coli* BL21, using a variety of conditions to yield the highest amount of protein expressed in soluble form. The highest yields of PA5455, PA5456, and PA5457 in soluble form were achieved when protein expression was induced with 0.5 mM IPTG for 24 h at 15°C. The highest yield of PA5459 in soluble form was achieved when protein expression was induced with 0.5 mM IPTG for 8 h at 15°C. Expression of PA5458 in soluble form was not seen under any of the tested conditions; more work is warranted to achieve optimal expression of soluble PA5458. Overexpression of PA5455, PA5456, PA5457, and PA5459 will aid in determining each protein's function in the biosynthesis of the lipopolysaccharide of *P. aeruginosa*.

Biology

St. Francis Xavier University

Leanne Delaney - Undergraduate Student

Requested to present: Poster

Expression of five lipopolysaccharide biosynthesis proteins of *P. aeruginosa* PAO1 in *E. coli*

Delaney, Leanne

Dr. J. Lam, Dr. L. Graham

Abstract:

A previously uncharacterised gene locus, which consists of pa5455, pa5456, pa5457, pa5458, and pa5459, has been shown by the Lam laboratory (unpublished data), through constructing individual knockout mutants and examining the phenotypes of the bacteria, to contribute to the biosynthesis of the lipopolysaccharide in *Pseudomonas aeruginosa*. The goal of this project is to overexpress PA5455, PA5456, PA5457, PA5458, and PA5459 from *P. aeruginosa* PAO1 so that high yields of proteins can be purified for assay development to functionally characterize each protein. To amplify pa5455, pa5456, pa5457, pa5458, and pa5459, appropriate primers were designed followed by PCR using template DNA from *P. aeruginosa* PAO1. Each gene was then ligated with pET30a+, a vector used to express proteins in *Escherichia coli* strain BL21 in the presence of kanamycin. We used a variety of conditions with the aim of optimizing the yield of each of the proteins in soluble form. When induced with 0.5 mM IPTG for 24 h at 15°C, small amounts of PA5455, PA5456, and PA5457 were expressed in soluble form. The highest yield of PA5459 in soluble form was achieved when protein expression was induced with 0.5 mM IPTG for 8 h at 15°C. Expression of the membrane protein PA5458 in soluble form was negligible under similar test conditions that were used to successfully express the other four proteins; more work is warranted to achieve optimal expression of soluble PA5458. Overexpression of PA5455, PA5456, PA5457, and PA5459 is a crucial first step for setting up assays to determine the function of each protein in the biosynthesis of the lipopolysaccharide of *P. aeruginosa*.

Biology

St. Francis Xavier University

Jantina Toxopeus - Undergraduate Student

Requested to present: Poster

Classification of *Mycophycias ascophylli*, a marine fungus associated with two brown algae

Toxopeus, Jantina; Kozera, Catherine; O'Leary, Stephen; Garbary, David

Garbary, David

Abstract:

Classification of *Mycophycias ascophylli*, a marine fungus associated with two brown algae

Fungal-brown algal symbioses are rare, and classification of these fungi based on morphological characters is often inaccurate. The marine ascomycete *Mycophycias ascophylli* forms a symbiotum, a mutualistic symbiosis in which the alga is the dominant organism, with two fucoid species: *Ascophyllum nodosum* and *Pelvetia canaliculata*. We studied *M. ascophylli* in a molecular context for the first time using samples from across the North Atlantic and the White Sea. The species identity, host fidelity, and higher level classification of *M. ascophylli* were examined with phylogenetic analysis of nuclear large ribosomal subunit (nuLSU) sequences. The current assertion that *M. ascophylli* encompasses one fungal species was supported by molecular data. The nuLSU data did not support *M. ascophylli* switching between its algal hosts. *M. ascophylli* was closely related to other fungal species in the order Capnodiales, indicating that this fungus is currently incorrectly classified in Verrucariales. The difficulty of classifying ascomycetes in apparently mutualistic symbioses with brown algae remains, and the classification of the other species of *Mycophycias*, *M. apophlaeae*, requires further examination.

Biology

St. Francis Xavier University

Sara - Undergraduate Student

Requested to present: Poster

Mutation mediated disruption of cellulose synthesis in *Arabidopsis thaliana*

MacLellan, Sara

Moira Galway

Abstract:

Although cellulose is one of the most common organic compounds on Earth, the exact processes involved in the synthesis of cellulose and its incorporation into the plant cell wall are still unknown. In *Arabidopsis thaliana*, the enzymes that are responsible for cellulose synthesis are encoded by cellulose synthase (CESA) genes. Genes with sequences similar to CESA genes are called cellulose synthase-like (CSL) genes. The exact functions of many of the enzymes encoded by CSL genes are unknown but because these genes are so closely related to CESA genes CSL enzymes may play a role in cellulose synthesis. In this project I examined plants with mutations in a CESA gene (CESA3) and a CSL gene (CSLD3) to determine whether or not an interaction occurs between the enzymes encoded by these genes. Using root growth measurements and confocal laser scanning microscopy I found that plants with a partially functioning CESA3 enzyme and a partially functioning CSLD3 enzyme have stunted roots and show irregular cellulose staining. However, I examined the shoots of plants with the same mutations using fluorescence microscopy and found that these mutations have a positive effect in shoots, showing better pith cell and vascular bundle organization than plants with only a CESA3 mutation. These results show a complex interaction between CESA3 and CSLD3 which suggests that CSLD3 is involved in cellulose synthesis.

Biology

University of New Brunswick

Garrett Brodersen - Graduate Student

Requested to present: Oral

EVALUATING THE EFFICACIES OF TWO DIFFERENT NUCLEOPOLYHEDROVIRUSES TO SUPPRESS WHITEMARKED TUSSOCK MOTH (*ORGYIA LEUCOSTIGMA*) POPULATIONS

Garrett Brodersen (1), Renée Lapointe (2), Graham Thurston (3), Christopher Lucarotti (3) and Dan Quiring (1)

Dan Quiring, Renée Lapointe

Abstract:

Two nucleopolyhedroviruses, one (OrleSNPV) isolated from whitemarked tussock moths (*Orgyia leucostigma*) and a second (OpMNPV) from Douglas-fir tussock moths (*Orgyia pseudotsugata*), were fed to whitemarked tussock moth larvae in a range of concentrations to ascertain differences in the efficacies of the viruses. Second and fourth instars were infected by being fed droplets of, or artificial diet plugs soaked in, suspensions of viral occlusion bodies, respectively. Larval mortalities were first observed 5-6 days post-infection and mortality was positively associated with dose. In second instars, the LD50 value was lower for OpMNPV than OrleSNPV, but OrleSNPV had the lower LT50. There were no such differences in fourth instars. Manipulative field bioassays were performed to test for the influence of larval nutrition on the efficacy of each virus. To determine the effect of pre-virus-ingestion nutrition on mortality, larvae were reared on artificial diet or living birch foliage, fed droplets of OrleSNPV or OpMNPV suspensions as above, and placed on mature birch foliage. The effect of post-virus-ingestion diet on viral efficacy was examined by rearing larvae on artificial diet (Bell et al., 1981), feeding them suspensions of each virus, and then placing them on mature balsam fir or birch trees. Pre-virus-ingestion nutrition influenced the mortality rates of infected larvae; mortality was greater for larvae fed birch than larvae fed artificial diet. Though the difference was marginally insignificant, following virus ingestion larvae that developed on birch foliage experienced lower mortality than those that developed on balsam fir. Implications for biological control will be discussed.

Biology

University of New Brunswick

Carolyn Wilson - Undergraduate Student

Requested to present: Oral

Characterization of seven microsatellite markers from *Atrichum undulatum* s.l.

Wilson, Carolyn

Linley K. Jesson

Abstract:

Polyploidy is common in mosses, and many moss species have arisen through hybridization. In *Atrichum undulatum* s.l., a bryophyte common to New Brunswick, populations can be haploid, diploid, triploid, or contain mixed ploidy. Seven polymorphic microsatellite loci were developed for *A. undulatum*. From a library of 36 microsatellites, 26 primer sets were designed and used to screen three *A. undulatum* populations: one haploid, one diploid, and one triploid. Twelve loci amplified consistently in at least one population. Of these, one primer pair consistently produced two polymorphic bands irrespective of ploidy; and six loci exhibited multiple banding. Overall, seven polymorphic loci were identified. These microsatellite loci can be used to analyze genetic structure of *A. undulatum* populations and, pending confirmation of Mendelian inheritance, may provide insight into the history of polyploidy formation.

Biology

University of New Brunswick

Matthew - Undergraduate Student

Requested to present: Poster

Hallmarks of Programmed Cell Death in *Micromonas pusilla*

Havenga, Matthew; Dingman, Jennifer; Lawrence, Janice

Dr. Janice Lawrence

Abstract:

Phytoplankton form the basis of nearly all marine food webs and are responsible for a large part of the planet's primary production. Death mechanisms have not been extensively studied, and as such, information concerning phytoplankton turnover rates may be invalid. Programmed cell death (PCD) is an active death process mediated by caspase-like enzymes that have been confirmed to occur in unicellular organisms, including phytoplankton. Environmental conditions of heat-stress and viral infection via MpV were used to induce PCD in the prasinophyte species, *Micromonas pusilla*. PCD hallmarks were detected by employing assays to identify whole-culture and individual-cell caspase-like activity, phosphatidylserine inversion and 3'-OH DNA nicks. Furthermore, experiments were performed utilizing caspase-inhibitor to stop the PCD process once initiated. Results indicate that heat-stressed treatments had 3.7x more caspACE stained cells after 12h, as compared to control, and experienced an 84% decrease in cell abundance. There were 34x more cells displaying phosphatidylserine inversion 60h post-infection, as compared to control. Caspase inhibition resulted in 3x more cells surviving heat stress, suggesting these cells were recovered from the PCD pathway. Results indicate that the process of PCD most likely occurs within *Micromonas pusilla*, contributes to the turnover rate of the species, and that the environmental factor of virus infection plays a significant role in the population dynamics of this organism.

Biology

University of New Brunswick

Maeghan - Undergraduate Student

Requested to present: Poster

Observations on the epidemiology of *Loma morhua* during aquaculture of Atlantic cod

O'Neill, Maeghan, Frenette, Aaron, Duffy, Michael S.

Michael S. Duffy

Abstract:

The intracellular fungal parasite, *Loma morhua*, has been a significant impediment to the developing Atlantic cod aquaculture industry. *Loma morhua* infections are characterized by mortalities and reduced growth rates in both juvenile cod at hatcheries and adult cod during grow-out. The life cycle of *L. morhua* has yet to be elucidated and epidemiological investigations have not been conducted previously. We observed adult cod at an aquaculture grow-out site in Atlantic Canada over a 9-month period and found 100% of cod to carry *L. morhua* infection. The average infection intensity was 69.2 xenomas but ranged from 1-300 per fish. Intensity of gill xenomas showed a correlation with water temperature at cage sites, with highest infection intensities observed 10-12°C. There was also a significantly higher intensity of infection in visually impaired cod ($p = 0.001$). It remains unknown whether this might be attributed to behavioural differences associated with blindness. Biofouling by blue mussels was abundant on sea cages. 76.5% of cod contained blue mussels and 32.1% contained copepods in their intestinal tract, evidence that Atlantic cod are opportunistic feeders that supplement their diet where possible. Blue mussels are reservoirs for related fungal pathogens and copepods represent potential reservoirs during aquaculture. Environmental samples including macro- and micro-invertebrates as well as seawater were collected over a 9-month period 2010-2011. Samples will be assessed using a specific PCR-based method to identify reservoirs of significance during aquaculture as well as to determine correlation between water temperature and peak periods of parasite transmission at sea cages.

Biology

University of New Brunswick

Mouhammad Zeino - Undergraduate Student

Requested to present:

Identification of Algal Endophytic Fungi using a PCR-based Technique

Zeino, Mouhammad

Dr. Christopher Gray, Dr. Chris Martyniuk, Dr. John Johnson

Abstract:

Fungal endophytes have recently been identified as an abundant untapped source of new biologically active compounds. Central to the successful development of endophytes, as a renewable source of novel chemical entities, is the ability to reliably identify strains obtained from both terrestrial and marine plants. As only a fraction of the total estimated species of fungal endophytes have been isolated, and even fewer identified, this is not a trivial task. The objective of this research is to identify fungal endophytes isolated from marine algae in the Bay of Fundy. The process involves DNA extraction, followed by amplification via PCR protocol with the aid of primers ITS1 and ITS4. The DNA is then sequenced and the endophytes identified with the aid of a BLAST search engine. From a broader perspective, this research will provide an efficient method of species identification for use in fields such as phylogeny and environmental science.

Biology

University of New Brunswick

Trevor Bringloe - Undergraduate Student

Requested to present: Oral

A large scale study of the swimming behavior of *Corophium volutator* in the upper Bay of Fundy

Bringloe, Trevor; Drolet, David; Barbeau, Myriam

Drolet, David; Barbeau, Myriam

Abstract:

Corophium volutator is a burrow-dwelling amphipod inhabiting intertidal mudflats in the upper Bay of Fundy at very high density (sometimes over 50 000 ind. m⁻²). *C. volutator* swims in large numbers, predominantly during periods of immersion occurring at night around the new and full moon in the summer. Previous studies on the swimming behavior of *C. volutator* in the Bay of Fundy have been limited to only one site. Our objective was to determine if swimming occurred throughout the Bay of Fundy, and if so examine the differences between mudflats. We deployed three stationary plankton nets over three consecutive night tides to sample swimming *C. volutator* at nine sites in Chignecto Bay and Minas Basin during three spring tides (June 25-28, July 10-13 and August 8-11) in the summer of 2010. Swimming occurred at all mudflats sampled, but was generally more pronounced in Chignecto Bay compared to the Minas Basin. For all variables measured (density of swimmers, proportions by size class [juveniles: 6 mm], proportion of females) the effect of site was not consistent over the different sampling rounds. The density of swimming *C. volutator* and proportion of juveniles increased substantially in August, which is attributed to the emergence of a highly motile second cohort of juveniles. The presence of swimming *C. volutator* throughout the Bay of Fundy ignites the possibility of mudflats as being interconnected populations (i.e. a meta-population).

Biology

University of Prince Edward Island

Véronique Dufour - Undergraduate Student

Requested to present: Poster

Monitoring of epifaunal communities associated to mussel socks in Eastern PEI: seasonal and inter-annual patterns

Dufour, Véronique

Pedro Quijon

Abstract:

Objective:

The overall goal of this study is to explore the epifaunal diversity associated to blue mussel socks and their potential variation over time both seasonally and inter-annually.

Methods:

Replicated samples (n=5-10) were collected from un-treated mussel socks under monitoring since 2008 at St. Mary's Bay, Prince Edward Island. Samples were collected early (May-June) and late (August-September) in the field seasons of 2008-2010. Samples included a 30 cm long mid-section mussel sock that was sorted to remove mussels and debris using 870 micron sieves. Specimens were preserved, identified and counted. Data on composition and abundance helped to characterize communities from each time of the season and year. Diversity indexes as well as levels of community similarities were estimated using the PRIMER-6 software routines.

Results:

A total of 22 mobile epifauna taxa were identified and quantified. Scale worms and amphipods from the Corophiidae, Caprellidae, and Gammaridae families were the numerically dominant groups in most samples. In general, a comparison of these communities over time suggests a strong effect of seasonality and, secondarily, some evidence of annual variation for both early and late season samples.

Conclusions:

Mobile epifaunal organisms do not appear to be particularly diverse, at least not in comparison to similar communities in bottom habitats of the region. Although their abundance was highly variable, over time these changes were clearly driven by the seasonal variation affecting the water column. These

data are relevant for long-term monitoring purposes in areas heavily used for aquaculture as those found in St. Mary's Bay.

Biology

University of Prince Edward Island

Luke Poirier - Undergraduate Student

Requested to present: Poster

Green crab abundance in wild oyster beds of southern Prince Edward Island: potential predation effects on individual and clustered oysters.

Poirier, Luke and Pickering, Tyler

Dr. Pedro A. Quijon

Abstract:

Green crab abundance in wild oyster beds of southern Prince Edward Island: potential predation effects on individual and clustered oysters.

Objectives:

The European green crab (*Carcinus maenas*) is an aggressive predator threatening several marine ecosystems including those created by American oyster beds (*Crassostrea virginica*). Typically, these wild beds include individual and clustered oysters (overlapping or closely growing settlers) whose relative vulnerability to green crab predation is unknown. This study aims to document crab abundances in two southern PEI areas rich in oyster beds, and then to assess if individual and clustered oysters are equally vulnerable to green crab predation.

Methods:

Crab trapping surveys were conducted in 7 sites located in North River (3) and Bedeque Bay (4) between June and November of 2010. Predation experiments involved medium (45-55mm) or large green crabs (55-75mm) placed in laboratory tanks with 30 individual or 15 double oysters (attached pairs) of a same size (15-25mm SL or 25-35mm SL). Feeding rates were checked daily over a 3-day period.

Results:

Average crabs per trap per day indicate that populations rose as the season progressed and then start to decline with the lowering of water temperature. Preference for individual oysters was detected in trials that combined large green crabs and large oysters, and those with medium crabs and small oysters. In the other two predator-prey combinations, the results were mixed and no preferences were detected.

Conclusions:

We suggest that size and oyster attachment provide a partial refuge against green crab predation. However these effects are heavily dependent on green crab size and likely, their number as well.

Environmental Science

Acadia University

Emily Beveridge - Undergraduate Student

Requested to present: Oral

Resource use and freedom of the commons: why a liberal arts education in ecological literacy is fundamental to the human prospect

Beveridge, Emily

Linda Lusby

Abstract:

Objective:

This study looked at whether agriculture could contribute to a greater understanding of sustainability and human dependency on ecosystem functioning among students and the general populace. It was hypothesised that the reincorporation of community-based agricultural concepts into liberal arts education would be both feasible and instrumental in the achievement of this end.

Methods:

The evolution of paradigms which inform the practices of modern agriculture and modern educational institutions were explored as they relate to the freedom of the commons mindset as part of the literature review. Interviews were conducted with educators, students, and agricultural specialists to examine the relationship between agriculture and education. They also sought to determine whether a greater integration of practical and theoretical knowledge of food systems into the educational sphere could contribute to the capacity of educational institutions for informing environmental policy.

Results:

The findings from the literature review and the interviews were compared against the curriculum and programs at Acadia University to establish the feasibility of using the Acadia Community Farm in all degrees as a vector for disseminating knowledge of ecosystem functioning and human reliance on the former.

Conclusions:

It was determined that interpenetration of abstract and practical components of involvement with the farm into the various disciplines at Acadia University is likely an important step toward the development of sustainable environmental policies.

Environmental Science

Acadia University

Amy Buckland-Nicks - Undergraduate Student

Requested to present: Oral

Mercury in dragonflies (Odonata: Anisoptera) from dystrophic lakes in Kejimikujik National Park.

Buckland-Nicks, Amy

Dr. Nelson O'Driscoll and Dr. Kirk Hillier

Abstract:

Mercury biomagnification is a concern due to neurotoxic effects in higher trophic organisms. Dragonflies (Odonata: Anisoptera) are vectors for MeHg in aquatic and terrestrial food chains. Dragonfly naiads, adults, and exuviae were collected from two lakes in Kejimikujik National Park, Nova Scotia. Samples were dried, digested, and analyzed for methylmercury (MeHg), divalent mercury (Hg(II)), and total mercury (THg) using gas chromatography-AFS.

Big Dam West lake dragonfly samples had greater MeHg, Hg(II), and THg than Big Dam East; reflecting higher water mercury concentrations and indicating potential as biomonitors. MeHg concentrations in naiads (n=64) ranged widely (mean: $0.2337 \pm 0.1129 \mu\text{g g}^{-1}$) and %MeHg was high (mean: $92\% \pm 4\%$). Adults (n=28) had similar dry weight MeHg but higher wet weight MeHg and THg, and lower %MeHg than naiads. Exuviae (n=32) had 50-fold lower MeHg than naiads and adults but nearly equal Hg(II). Emerging adults had similar MeHg to naiads and mature adults; however, they had between 1.5 and 3-fold higher Hg(II). Bioaccumulation patterns of Hg(II) in dragonfly life stages may provide information on MeHg detoxification. MeHg and THg increased with nymph age and weight, with a large increase in variation. Oldest and heaviest naiads had both the lowest and highest MeHg. Hg(II) had an opposite pattern to MeHg, with concentrations and variation decreasing with age and weight. Results indicate that dragonflies may have mechanisms of MeHg detoxification; however, they still have a high potential for transferring substantial amounts of MeHg to aquatic and terrestrial food chains.

Environmental Science

Acadia University

Jennie Pick - Undergraduate Student

Requested to present: Oral

An ecosystem services approach to agricultural land management in Greenwich, Kings County, NS: Connecting human well-being and the land

Pick, Jennie

Linda Lusby

Abstract:

This study investigated the practicality of applying an ecosystem services approach, as defined by the Millennium Ecosystem Assessment, to contentious land management issues in Kings County, Nova Scotia. It was hypothesized that such an approach could satisfy landowners looking for compensation, public members looking for land conservation, and decision makers in finding solutions. A struggle over zoning legislation in the hamlet of Greenwich provided a case study for investigation. Two members of provincial government, a farmer on the rezoning application in Greenwich, and a member of the public activist group “No Farms No Food” were interviewed. Public surveys were distributed in Greenwich, scientific literature and Kings County Council publications were reviewed, and a list of ecosystem services pertaining to agricultural land in the area was generated. Ecosystem services were found to be poorly recognized for their importance to human well-being in Greenwich, despite the numerous important services that the land provides. Food production was consistently identified as the primary reason to conserve agricultural land. A strong split in views over whether the land should be conserved and whose responsibility it was to do so was also represented. The study concluded that there are many benefits to conserving agricultural land that reach beyond food security, and that conservation should be not only the responsibility of landowners, but of everyone who benefits. It was also determined that many solutions strengthened by an ecosystem services approach have the potential for compromise amid the involved groups, and should be given more consideration in future management decisions.

Environmental Science

Dalhousie University

Megan Tardif-Woolgar - Faculty

Requested to present: Poster

Climate Change 2050- Nova Scotia Sinks, Soybean Production Floats?

Tardif-Woolgar, Megan., Buszard, Deborah.

Dr. Deborah Buszard

Abstract:

Climate Change 2050- Nova Scotia Sinks, Soybean Production Floats?

M. Tardif-Woolgar and D. Buszard

Potential soybean production in Kentville, Nova Scotia in the year 2050 was estimated given projected changes in regional temperature, sea-level and land-use. Data generated from a statistical downscaled model running predictors from the second generation Canadian Coupled General Circulation model and the B2 Special Report Emissions Scenario for the Kentville region in the year 2050 were used to estimate future crop heat units. An estimation of land available for crop production was made by quantifying the potential land lost to sea-level rise using Li-DAR imaging. Potential land-use changes for the year 2050 were estimated using municipal census data. Potential soybean yields for the Kentville region in 2050 were estimated based upon the yield of varieties grown in other eastern Canadian provinces with a current climate (and crop heat unit rating) reflecting that of 2050 Kentville. The potential total production was estimated based on variety yield and estimated available agricultural land. Changes in global climate may make the regional climate of Nova Scotia more suitable for higher yielding soybean varieties; however an estimated overall decrease in productive agricultural land may lead to an overall decrease in potential soybean production. Regional temperature change projections for the year 2050 imply that Nova Scotia may experience crop heat units similar to that of southern Ontario and north eastern United States. Early planning may be advantageous to avoid future crop failures. The conversion of agricultural land to residential and commercial uses may limit the amount of soybeans that Kentville can produce in the year 2050.

Environmental Science

Dalhousie University

Sarah Keyes - Faculty

Requested to present: Poster

Ms.

Keyes, Sarah

Dr. Peter Tyedmers

Abstract:

Evaluating the Environmental Performance on Agricultural Production: A Case Study of Apples in Nova Scotia

Sarah Keyes and Peter Tyedmers

School for Resource and Environmental Studies

Dalhousie University

Given the global scale environmental problems associated with modern agriculture and the growth of organic production as an alternative, it is important to investigate how each mode of production impacts the environment. Further, apple production in Nova Scotia is a significant industry and to date no research has been conducted to assess its environmental performance. The purpose of this research project is to conduct a life cycle assessment (LCA) of conventional and organic apple production in Nova Scotia. LCA is a biophysical accounting tool that is used to evaluate the environmental effects of a product, process, or activity throughout its entire life cycle, from "cradle to grave". LCA methodology will allow us to quantify the material and energy inputs of each stage of production, along with their associated contributions to a suite of global scale environmental concerns (e.g. greenhouse gas, ozone depleting, and acidifying emissions etc.). By assessing the environmental performance of apple production processes, this study will inform industry by identifying hotspots and areas of improvement. The outcomes will create opportunities for industry to lower costs of material and energy inputs and reduce greenhouse gas emissions. Results will also contribute to environmental reporting, marketing, and environmental strategy development, as well as add to the body of LCA and food research. The overall aim of this research is to contribute to our understanding of how agricultural production impacts the environment, providing information on the best practices for the long-term, which is essential in moving to a more sustainable food system.

Environmental Science

Dalhousie University

Rebecca McNeil - Faculty

Requested to present: Poster

Capturing Canadian University Presidents'™ Conceptualizations of Sustainability

McNeil, Rebecca

Dr. Tarah Wright

Abstract:

OBJECTIVE:

The objectives of this study are to unearth how a cohort of Canadian university presidents conceptualize sustainable development, sustainable universities, the role universities play in achieving a sustainable future, key issues facing the university, and the barriers to implementing sustainability initiatives on campus. The secondary objective is to better understand the demographic of Canadian university presidents, a significant stakeholder group for achieving campus sustainability.

METHODS:

The research is comprised of in-depth interviews with university presidents in Canada. Interviews will include both closed and open-ended questions and two checklists for interviewees to identify concepts associated with sustainable development. Interview transcripts will be analyzed through identification of respondent themes.

RESULTS:

With field research commencing in the spring of 2011, results are pending, however this SSHRC-funded study is unique in two aspects: it is expanding on a 2006 pilot from the primary investigator (T. Wright), and it is one of four cohorts being examined (along with staff, faculty and students). As such, some interesting results from the research team have already been identified and a poster submission to APICS would concentrate on the significance of the study, including its expected contributions to the sustainability in higher education sector and to communities outside the university.

CONCLUSION:

Few studies to date have investigated the level of sustainability knowledge of major stakeholders within the university, or what stakeholders feel the role the university has in creating a sustainable future. This study is a first step towards creating a common conceptualization for all stakeholders.

Environmental Science

Dalhousie University

Nick Nickerson - Graduate Student

Requested to present: Oral

A novel method to measure the isotope ratio of soil respiration

Nickerson, Nick; Egan, Jocelyn; Risk, David

David Risk

Abstract:

Measurement of the isotopic composition of soil-respired CO₂ can provide a wealth of insight into soil level carbon cycle processes that cannot be achieved using measurements of bulk CO₂ emissions alone. Because of this, researchers have increasingly moved toward using natural abundance and tracer isotopic techniques in ecosystem respiration studies.

However, recent experimental and theoretical evidence has called the accuracy and applicability of traditional isotopic measurement methodologies into question. Here we present a brief overview of these traditional techniques and discuss why they yield biased estimates of the soil IsoFlux, largely owing to disturbances to the soil's natural diffusive regime. We will then discuss the theory behind a new technique called Isotopic Forced-Diffusion (IsoFD) that helps eliminate these diffusive biases and offers high temporal resolution IsoFlux data. Lab benchmarking results for the method will be presented, in addition to data from preliminary field trials.

Environmental Science

Dalhousie University

Elizabeth Spence - Graduate Student

Requested to present: Oral

Cultivating curriculum: Investigating how a cohort of sixth grade educators in the Halifax Regional School Board conceptualize and perceive challenges to teaching environmental education.

Spence, Elizabeth; Wright, Tarah; Castleden, Heather

Wright, Tarah; Castleden, Heather

Abstract:

The United Nations has declared 2005-2014 as the Decade of Education for Sustainable Development, recognizing the importance of education in achieving sustainable development and that environmental education (EE) is a catalyst for creating positive change. EE can be complex so it is essential to develop its foundations in elementary grades. Grade six is considered a crucial year for students who are beginning to think critically and formulate perceptions of the world. A lack of Canadian research on the subject provided the inspiration for the exploratory question guiding of this study: How do grade six teachers in the Halifax Regional School Board (HRSB) conceptualize, and perceive challenges to, teaching environmental education in their classrooms? To address this question, three curriculum documents were analyzed for environmental content and quality and 18 sixth grade educators were interviewed.

Preliminary results indicate: 1) Curriculum documents marginalize and under-value the environment; 2) Teachers identify EE as important, but not a priority due to its marginalization within the curriculum, a lack of time and resources, and an absence of support. These findings indicate that for the inclusion and integration of EE to be successful, curriculum documents must include more environmental content that more thoroughly targets student attitudes and provides more hands on experiences. Furthermore, teachers must be supported and encouraged, through resources, access to nature, information, and teaching strategies, in order to more effectively and substantially include EE in their lesson plans.

Environmental Science

Memorial - Grenfell Campus

Ryan Melanson - Undergraduate Student

Requested to present: Poster

NEARSHORE FISH POPULATIONS WITHIN ST. PAUL'S INLET, AN ESTUARINE SYSTEM IN WESTERN NEWFOUNDLAND.

Melanson, Ryan

Dr. Christine Campbell and Dr. Tom Knight

Abstract:

St. Paul's Inlets, a brackish water fjord-type estuary on Newfoundland's west coast, was sampled for fish populations during the month of August 2010. A total of 1451 were caught comprising 16 species and representing 10 families. Sampling was carried out using 10-meter beach seine, minnow traps and gill nets. The objectives of this study had three components: document the nearshore fish fauna within St. Paul's Inlet and compare with other data sets from Newfoundland and Labrador, assess variability in species composition associated with different habitats at different sites and determine if variation in species composition was related to patterns in salinity concentrations within the inlet. A total of 7 sites were sampled. Sites were chosen to best represent a potential range in salinities, as well as for ease of accessibility. At each site salinity, dissolved oxygen and water temperature measurements were taken with a YSI 85 and plotted with GPS coordinates. Cluster analysis was performed showing little difference between sites having at least 76% of species in common. St. Paul's was then compared with Bonne Bay sites, a more marine fjord. This produced a dendrogram showing a distinct marine cluster comprised of Bonne Bay sites and a distinct estuarine cluster comprising the St. Paul's sites. The contribution of the Inlet to the overall biological productivity of the larger west coast marine ecosystem is under evaluation, as part of Memorial University's CURRA (Community-University Research for Recovery Alliance).

Environmental Science

Memorial University

Erin Stevens - Graduate Student

Requested to present: Poster

Patterns of Zooplankton Abundance in St. Pauls Inlet: A brackish water system in Gros Morne National Park, Newfoundland and Labrador

Stevens, Erin

Dr. Christine Campbell

Abstract:

St. Pauls Inlet is a brackish-water estuarine fjord located in Gros Morne National Park (GMNP), Canada. Water sources for the inlet include freshwater input from highland lakes, rivers, precipitation, and groundwater as well as saltwater from the Atlantic Ocean. During June to August of 2009 & 2010 five sites were studied within the inlet as part of Memorial University's Community-University Research for Recovery Alliance (CURRA). The purpose of the study was to determine i) abundance of zooplankton in St. Pauls Inlet, ii) potential patterns in zooplankton species composition along the inlet, iii) whether any such patterns relate to observed longitudinal salinity gradients throughout the inlet, and iv) how species composition in St. Pauls Inlet compares with other regional locations. Zooplankton species composition was primarily marine cyclopoida and calanoida, with some brackish-water cladocerans and zooplankton density was not high, possibly as a result of limited nutrient levels in the watershed. Longitudinal salinity gradients were noticeable mainly in the spring, likely due to snow melt. Cluster Analysis showed no strong patterns in species assemblages in 2010, although in the 2009 season there appeared to be a slight pattern related to salinity. Cluster dendograms indicated that St. Pauls's zooplankton fauna was only about 10% similar to another regional estuarine system. Although estuarine and tidal inlet environments are typically regions that are of high importance to ecosystem productivity, St. Pauls does not appear to be a highly productive or diverse system, based on zooplankton data.

Environmental Science

Saint Mary's University

Peter Horne - Graduate Student

Requested to present: Oral

Evaluating the elevation and spatial dependence of scaling properties within a complex inter-tidal zone

Horne, Peter; Suteanu, Cristian; van Proosdij, Danika; Barker, Greg

Suteanu, Cristian; van Proosdij, Danika

Abstract:

Evaluating the elevation and spatial dependence of scaling properties within a complex inter-tidal zone

Peter Horne¹, Cristian Suteanu², Danika van Proosdij¹, Greg Baker³

¹Geography Department, Saint Mary's University, Halifax, Canada

² Geography Department and Environmental Studies Program, Saint Mary's University, Halifax, Canada

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The processes that govern coastal morphology operate over a range of scales and characterising the effects of these processes requires evaluating the landscape at appropriate scale ranges. Characterizing patterns on relevant scale intervals can help link form with process.

Multi-scale analysis methods have already been successfully applied to coastal environment and provided a quantitative characterization of the spatial variability of coastlines. Quite often these studies focused on the coastline delineated from satellite imagery or even aerial photography. This practice of delineating coastline from these forms of imagery can result in the boundary representing the coastline to occur at a range of elevations. Applying multi-scale analysis to a coastline with an undefined elevation relies on the assumption that one studies a self-affine pattern for which the irregularity is independent from elevation.

This study questions the above assumption by applying the area-perimeter method to a high resolution Digital Elevation Model (DEM) of the Avon Estuary, over a series of different elevations. In addition to evaluating the effects that elevation plays in analysis, the study considers the effects of spatial coverage as it looks to see if a small portion is similar to the whole.

Changes in spatial coverage within the Avon Estuary had a limited impact on results; however, there was a pronounced and coherent elevation dependence of scaling properties (as reflected in the fractal

dimension) on elevation. We discuss the reasons for the elevation $\hat{\epsilon}$ fractal dimension relationship and show that this approach supports a better understanding of the interacting processes that dominate the area on different ranges of scale.

Environmental Science

Sir Wilfred Grenfell

Ashley - Undergraduate Student

Requested to present: Poster

Determining Total Coliform Abundance in Corner Brook Stream

Godin, Ashley

Dr. Christine Campbell

Abstract:

The objective of this study was to conduct a baseline examination of microbial water quality in Corner Brook Stream, using Total Coliform counts as a surrogate for fecal contamination. Sites were selected based on their proximity to a new subsurface flow constructed wetland for wastewater treatment. Total wetland area is 2740 m² and the wetland is currently handling output from approximately 221 patients at the Corner Brook Long Term Care Facility. Two sites each were chosen above, below, and directly in the vicinity of the constructed wetland, operational since June 2010. Water samples were collected from these six sites both in September and October 2010, with three replicates being taken at each site each month. Samples were filtered using a standard scientific test kit Sterifil apparatus employing a 0.45 µm pore size, 47 mm diameter membrane filter. The filters were placed in m-endo media and incubated for 24 hours at 35°C. Coliform bacterial colonies were counted under a dissecting microscope, and coliform identification was based on the presence of green "œsheen" colonies. All Total Coliform counts were determined to be below Health Canada's recommended guideline for recreational waters of 2000 coliforms per 100 ml. Coliform counts were significantly different between sites for both September and October (as assessed by Kruskal-Wallis), with highest numbers of 1817 Coliforms per 100 ml at Site 1 in September, and 1643 Coliforms per 100 ml at Site 4 in October.

Environmental Science

St. Francis Xavier University

Christian - Undergraduate Student

Requested to present: Poster

Multi-Frequency Biophysical Soil Respiration Model

Hart Christian, Risk David

David Risk

Abstract:

Soil CO₂ respiration has proved to be an extremely dynamic process varying greatly on a wide range time scales. New automated real time measurement systems have provided the opportunity to analyze emissions with respect to physical and meteorological data. This is a vital tool in forming and testing hypothesis on how efflux is controlled, and allows us to more accurately predict future emissions. Using this continuously growing data pool, this research project aimed to build a model of soil respiration that is driven both by environmental variables and biochemical changes. The objective was to reproduce short term hourly or sub-hourly changes in heat and moisture content of the soil profile in order to explain efflux and CO₂ storage within the soil profile. This presentation explains the components of this physically based model, which relies on a strategy to estimate the heat content of a soil profile based on field observations of thermal diffusivity. Initial Model runs forced by site environmental data were able to reproduce a large portion of the observed variability. Temporal variability at very short time scales appears due to precipitation, while respiration on daily scales appears due to heat input. Over multiday to multi-week timescales changes in moisture are important. The seasonal signal appears to be dominated largely by fluctuations in soil profile heat content. A series of sensitivity analysis are currently being performed to improve, and help identify the components of the model which are most useful in simulation. So far subcomponents have been analyzed independent one another, but automated multi-component parameterization is in progress. In general this modeling approach is promising and Future models should be geared more closely with physical characteristics of the soil profile, because they play an integral role in moisture dynamics which largely determine CO₂ production rates on daily annual and multi-annual scales.

Environmental Science

St. Francis Xavier University

Jocelyn Egan - Undergraduate Student

Requested to present: Oral

Can tree girdling help distinguish between heterotrophic and autotrophic soil respiration in a NS pine plot?

Egan, Jocelyn; Nickerson, Nick; Risk, Dave

Dr. Dave Risk

Abstract:

The use of carbon stable isotopes are important in understanding soil processes and linking above and belowground ecosystem processes. Recent research has however shown that many previous studies using $\delta^{13}\text{C}$ may be erroneous because they ignore non-steady state (NSS) gas transport fractionation. Our aim was to develop a sampling methodology that would address previous deficiencies and use technically advanced tools to provide data that is temporally dense and free of gas transport artifacts. This new methodology, called Isotopic-Forced Diffusion (Iso-FD), was tested in the lab and using models, and was then implemented in the field for a tree girdling experiment to obtain a continuous data set for $\delta^{13}\text{C}$ in two 400-m² pine plots in Antigonish County, NS. Bark was carefully removed from the trees in the girdled plot to arrest autotrophic soil respiration. A control plot remained intact. In addition to Iso-FD continuous data, spatial $\delta^{13}\text{C}$ data from gas chambers, and meteorological data were also collected. Variation was seen in bulk flux rates between the plots, and girdling both resulted in increased CO₂ fluxes and decreased temporal variability in $\delta^{13}\text{C}$ as compared to the control plot. Overall it was clear that girdling did not have the characteristic effect of decreasing respiratory activity, or shifting the isotopic signature cleanly in one direction. The resolution of the Iso-FD technique was useful, however, in exposing substantial temporal variability, and avoiding possible errors that could have accounted for the variation observed in other oft-cited studies.

Environmental Science

St. Francis Xavier University

Nicole Louiseize - Undergraduate Student

Requested to present: Poster

Winter CO₂ Fluxes from a Nova Scotian Bog

Louiseize, Nicole

Dave Risk

Abstract:

Title:

Winter CO₂ Fluxes from a Nova Scotian Bog

Objective:

This study explores annual contributions of winter CO₂ fluxes and the role of physical and biological flux mechanisms, particularly the freeze-thaw cycle and winter CO₂ production, in an attempt to identify whether physical or biological processes dominate in inducing winter CO₂ fluxes.

Methods:

A semi-automated monitoring system measures two CO₂ fluxes every 3 hours and soil differential pressure, temperature (surface, 15 and 30cm), moisture (10 and 30cm), and oxygen content (hummock and hollow) every hour. Measurements are stored on a datalogger and retrieved from the lab by telemetry every two hours. A qualitative partitioning (biological or physical) analysis is applied using pressure, temperature, and flux data.

Results:

Monthly CO₂ emissions stayed fairly steady except for the spike observed between December 13 and 16. While pressure remained unvarying, soil temperatures and moistures ranged from 7 to 0.5°C and 40 to 80% saturation, respectively. Oxygen in a hollow stayed at or near 0% whereas oxygen content within a hummock lingered around 26%, but has dipped as low as 15%.

Conclusions:

The current data does not yet allow for partitioning of biological and physical signals at the freeze-thaw boundary, because the soil column has yet to freeze. Preliminary data analysis has primarily focused on the CO₂ burst observed in December, to consider whether it represents a measurement error or a physically related flux. Despite these shortcomings, analysis of daily and monthly variations in CO₂ fluxes and other variables does show positive linkages between flux and temperature and flux and moisture.

Environmental Science

University of New Brunswick

Doug Hiltz - Graduate Student

Requested to present: Poster

Identifying Rare Plant Communities and Invasive Plant Planning Using Depth-to-Water Mapping

Hiltz, Doug ; Ogilvie, Jae ; Campbell, David ; Arp, Paul ; White, Barry

Arp, Paul

Abstract:

Objective:

This study examines the relationship between soil moisture potential, as determined by LiDAR derived depth-to-water technology, and vegetation communities. Using known habitat characteristics and species associations of vegetation species of concern, potential habitat/risk maps can then be produced for invasive and rare species across the landscape.

Methods:

Vegetation surveys were conducted on the EMEND research site and the Wilmore Wilderness Area in Alberta. Survey plots were each assigned a moisture index value, from 0 (very xeric) to 8 (hydric), based on the average moisture requirements of the species present. Site vegetation moisture index values are then plotted against the log₁₀ DTW values for those sites. A regression analysis is carried out on these data to determine the strength and nature of the relationship between vegetation index and log₁₀ DTW.

Results:

The trend of the water depths corresponding to moisture index values has proved to be logarithmic. A regression analysis showed a clear linear relationship ($r^2 \hat{=} 0.75$) between vegetation index and log₁₀ DTW values. A correction algorithm was deemed necessary applied to the vegetation index to allow for slope and aspect effects on available moisture.

Conclusions:

Preliminary results show that vegetation types supported in given areas can be predicted with reasonable accuracy and that accuracy can be improved upon by taking into account things like slope and aspect. However, there are areas where predicted vegetation type does not correspond to field observations. The future of this research will focus on addressing these areas as well as further refining and verifying species/site predictions.

Environmental Science

University of New Brunswick

Marie-France Jutras - Graduate Student

Requested to present: Poster

Calibrating Hydraulic Conductivity for Modeling Stream Discharge in Forest Catchments of Eastern Canada, on Varied Bedrock Formations

Jutras, Marie-France

Dr. Paul Arp

Abstract:

Objective:

The objective of this project is to analyze the stream discharge of catchments across Eastern Canada that exhibit different bedrock formations and to generate a lookup table that will streamline future calibrations of watersheds with similar bedrock formations.

There are five catchments across Eastern Canada on different bedrock types analyzed in this project. Moosepit Brook, Nova Scotia with metamorphic slate; Pockwock, Nova Scotia with igneous granodiorite; Hayward Brook, New Brunswick with sedimentary sandstones/shale; Lac Laflamme, Quebec with metamorphic gneiss; and Turkey Lakes, Ontario with igneous mafic, metavolcanic basalt.

Methods:

This project uses ForHyM (Forest Hydrology Model) which is a STELLA-based computer modeling program. The hydrology module within ForHyM uses known daily weather and watershed conditions to predict daily catchment stream discharge. By calibrating known stream discharge against the model derived discharge rate, valuable model outputs such as infiltration and percolation by soil horizon, frost depth, and water column height can be calculated with greater certainty. This project focuses on the hydraulic conductivity modeling output results.

Results:

Discharge patterns were observed while calibrating the hydraulic conductivity of each site. Catchments with finer textured bedrock showed drastic decreases in interflow (up to 50x smaller) when compared to the coarser textured bedrock. This shows a noticeable correlation between infiltration and soil texture derived from bedrock.

Conclusions:

Analyzing the calibration results from the different catchments in this project enables the prediction of general parameter correlations that can be used on future catchment calibrations with bedrock formations similar to those in this project.

Environmental Science

University of New Brunswick - Saint John

Ellen Boyd - Undergraduate Student

Requested to present: Poster

Effects of number of offspring and generation time on population growth rate

Boyd, Ellen

Dr. Jeff Houlihan and Dr. Megan Gahl

Abstract:

Effects of number of offspring and generation time on population growth rate

Objective:

Human population growth has made a major contribution to environmental problems and stabilizing population growth will play a critical role in solving environmental problems. The objective of this study is to determine the effect of number of offspring and generation time on population growth rate, provide insights into key factors driving population growth, and determine the focus for family planning

Methods:

Life table models were built incorporating an average death rate, varying number of offspring, and varying generation times to examine how changing the number of offspring and generation affects population growth rates. The life table models were validated by using actual mortality, fecundity and age at birth data for a subset of countries to compare growth rates predicted by the model with observed growth rates.

Results:

Preliminary analysis showed that both the number of offspring and generation time have large effects on population growth rate. Longer generation times slow rates of both population increase and decline.

Conclusions:

These findings show that it may be possible to lower the world's increasing population growth rates by implementing population growth strategies that delay child bearing especially in developing countries.

Environmental Science

University of Prince Edward Island

Christine - Undergraduate Student

Requested to present: Eith Oral or Poster

A holistic understanding of the possible reintroduction of river otters to Prince Edward Island

McLauchlan, Christine

Dr. Carolyn Peach-Brown

Abstract:

Before the 1800s, the river otter (*Lontra canadensis*) was an established native species in Prince Edward Island's (PEI) various stream ecosystems. A combination of factors related to habitat degradation, pollution, and overharvesting caused their extirpation from the province near the end of the 19th century. Environmental restoration, through the reintroduction of such extirpated species is gaining popularity in the field of wildlife conservation. There are many issues, however, in reintroducing a species to an ecosystem which has changed dramatically since its extirpation. Given that the reintroduction of the river otter is being considered in PEI, an extensive literature review was undertaken to better understand the diversity of factors related to the outcomes of such environmental restoration programs in other parts of the world. In particular, an emphasis was placed on understanding the socio-economic situation and the multiple perspectives of key stakeholders involved in such restoration programs. Results showed, in general, that otter reintroductions have been successful, but problems have surfaced when undertaking such a task. The successes of such restoration programs depend not only on ecological factors, but also social and economic factors, and very few studies address these issues. There are an abundance of stances on the topic of possible reintroduction of otters to PEI, and these complex and sometimes conflicting perspectives can cause difficulty in planning. Lessons learned from previous cases can provide insight to the unique situation on PEI.