2014 Science Graduate Studies Day
Abstracts

May 23rd, Regis and Joan Duffy Research Centre, Lecture Theater and Hall
University of Prince Edward Island

Keynote speaker presentation:

- **Katherine Frego**
  - **The bryophyte perspective on forest management: think small**

In an ideal world, humans would harvest trees without losing or seriously harming other organisms or processes in the forest ecosystem – but from the perspective of the bryophytes (small primitive plants including mosses), forest management looks pretty scary! Each element of forest management provides its own suite of impacts on biodiversity. How does a minute bryophyte "see" changes in tree canopy and substrate, use of herbicide and thinning, and shortened rotation times? My lab has focused on understanding the responses of bryophytes to the options used in the Acadian Forest Region, with the aim of helping the forest industry to maintain natural bryophyte diversity across the forest landscape. Two major challenges are (1) the fine scale of bryophyte community variation, and (2) the need to "scale up" to forestry-relevant levels. However, we can make some strong predictions about what not to do, and what knowledge gaps need to be filled, if we are to conserve bryophyte diversity in managed Acadian forests.

Affiliation: Director Graduate Studies - Biology, 3M National Teaching Fellow, Department of Biology, University of New Brunswick – Saint John, NB

Student oral presentations (alphabetical by first author):

ESC: Environmental Sciences
HUB: Human Biology
MMS: Molecular and Macromolecular Sciences

- **Qammar Almas (PhD MMS) & Jason Pearson**
  - **Benchmarking computational study of the structure and reactivity of Frustrated Lewis pairs.**

The steric hindrance due to the bulky groups attached to the Lewis acids and bases preclude the typical adduct formation of the "classical Lewis pair" (CLP). The frustration caused between the pair makes the CLP a "frustrated lewis pair" (FLP).[1-3] To overcome the frustration, FLPs give rise to a new reactivity and they attack the small molecules (H_2, CO_2, alkenes, aldehydes etc.) around them.[1-3] Phosphines and amines pairing up with boranes are common examples of FLPs. Many FLPs are found to cleave dihydrogen heterolytically which makes them very useful catalysts for metal free hydrogenation and many other organic and organometallic reactions.[3-4] To our knowledge, there are very few theoretical investigations on FLP reactivity, and so we have benchmarked the performance of 23 computational methods (including wavefunction and density-based theories) on predicting the potential energy surface of small molecule dative bonds, focussing on elongated (or frustrated) internuclear distances. We then applied our chosen methodology to understand the mechanism of a series of FLP-catalysed processes.

[1]Welch GC, Stephan DW, J Am Chem Soc 2007, 129, 1880-81
[2]Yuan Z et al. J Chem Soc Chem Comm 1990, 1489-92
[3]a) Stephan DW, Dalton Trans 2009, 3129-36. 3b) Stephan DW, Org Biomol Chem 2008, 6, 1535-39
[4]Rokob TA, Hamza A, Papai I, J Am Chem Soc 2009, 131, 10701-10

Affiliation: Department of Chemistry

● **Michael Coffin (PhD-ESC), Simon Courtenay, Cristina Pater & Michael van den Heuvel**
○ **Linking land-use to biological effects in estuaries**

Human activity has thoroughly changed the nature of our environment. However, linking specific activities to specific outcomes remains difficult. Furthermore, single stressors may have little effect on the environment when considered independently but in combination can have dire and unforeseen consequences, i.e. cumulative effects. In the aquatic environment, inputs from different types of land-use has resulted in increased sedimentation, contamination and eutrophication. Eutrophication is the phenomena whereby excess nutrients lead to an increase in the biomass of a body of water, typically through primary production. This research focuses on the consequences of eutrophication on PEI, where agricultural land-use is intensive. Using a combination of dissolved oxygen loggers, flow cytometry and high performance liquid chromatography we were able to observe a clear link between land-use and estuarine effects. In areas of intense agriculture, bacterial and primary production increased and dissolved oxygen was severely depressed.

Affiliation: Department of Biology

● **Krista Gill[1], Fabrice Berrue[1], Jennifer Arens[2] & Russell Kerr[1,2]**
○ **Discovery of new peptide natural products from Actinobacteria**

Kitasatospora is a rare genus of Actinobacteria that represents an underexplored resource for the discovery of structurally diverse natural products. They have been shown to have great genetic potential to produce natural products, which is highlighted by the recent genome sequencing of *Kitasatospora* setae that showed 24 putative secondary metabolite gene clusters. To conduct a more in depth analysis of natural products produced by this genus, twelve strain of *Kitasatospora* spp. were fermented and screened using a LC-HRMS/PCA method. This metabolomics approach uses statistical analysis to rapidly identify the production of unique metabolites among multiple chemical profiles. This technique helped to identify three new peptide natural products produced by the strain *Kitasatospora cystarginea*. Cystargolides A and B are two new small, linear peptides that contain a unique β-lactone moiety. A novel cyclic lipopeptide that has similar structural features to the calcium dependent antibiotics was also isolated from the same strain of *K. cyctarginea*. The planar structures of these three diverse peptide natural products were determined using 1D and 2D NMR and tandem mass spectrometry**.**

Affiliation: Department of [1]Chemistry and [2]Biomedical Sciences

● **Daniel Gillespie[1] (MSc HUB), Marva Sweeney-Nixon[1] & Katherine Gottschall-Pass[2]**
○ **Berries - from field to functional food: a preliminary study on bio-availability of blueberry juice**

Cardiovascular disease (CVD) is quickly emerging as a serious health concern, as ischemic heart disease and stroke were the two leading causes of death in 2011. A major component of CVD is hypertension, which can result from endothelial dysfunction stemming from oxidative stress and inflammation. Polypenolic compounds, like those found in blueberries, can reduce the severity of hypertension through their affect on systems that manage oxidative stress in vivo. To measure bioavailability, varying doses of blueberry juice were fed to rats, and subsequent urine collection allowed for assessment for hippuric acid, a metabolite of phenolic compounds that are absorbed after digestion of blueberry juice. Data collection is ongoing.

Affiliation: Departments of [1]Biology and [2]Applied Human Sciences

● **Hope Igboeli (PhD MMS) & Russell Kerr**
○ **Natural product discovery in fungi: an epigenetic approach**

Filamentous fungi are well known for their ability to produce a vast array of secondary metabolites with various biological activities. Many of these compounds such as penicillin, cyclosporine and lovastatin are highly important for human health. However, in the last two decades natural product research has declined mainly because of increased rediscovery rates associated with traditional bioactivity-guided screenings. Genome analysis of several filamentous fungi has revealed the presence of "silent" biosynthetic pathways,

which encoded for unknown natural products. A "silent" biosynthetic pathway refers to biosynthetic genes that are present in an organism's genome but are not expressed during cultivation. The number of these silent biosynthetic gene clusters often greatly outnumbers the number of known secondary metabolites. This insight has fuelled the development of exciting new strategies for natural product discovery in fungi. Currently, several strategies of unraveling these silent biosynthetic gene clusters have been reported, some of which have been successful in stimulating the production of new metabolites. This talk will provide an overview of my planned thesis research directed at natural product discovery from silent biosynthetic genes.

Affiliation: Department of Chemistry

- **Julia McKenna (MSc HUB) & William Montelpare**
  - **HRV and CAS TEAOE as biomarkers for concussion**

Concussion is quickly becoming the most dreaded injury in sports. Both professional and recreational athletes are now more familiar with this type of injury than ever before. However, there are still a lot of unknowns when it comes to the subcortical effects of concussion and when an athlete is fully recovered. There are no practical methods out there now to test this effect, we want to develop measurements that get at the deeper injury. This research will introduce two new testing methods, contralateral auditory suppression of transient evoked oto-emissions (CAS TEAOE) and heart rate variability (HRV) that get at auditory and vagus nerve function. Using a variety of proven testing methods along with CAS TEOAE and HRV, a comprehensive and personalized baseline analysis will be established for each athlete. It will also allow each athlete to track his or her progress post injury and return to play.

Affiliation: Department of Applied Human Sciences

- **William Robbins[1] (MSc ESC), Gary Conboy[2], Raphael Vanderstichel[3], Spencer Greenwood[4], Sheldon Opps[5] & Marina Silva-Opps[1]**
  - **Parasite survey of urban red foxes (*Vulpes vulpes*) in Charlottetown, Prince Edward Island, Canada, by fecal examination**

The red fox (*Vulpes vulpes*) has recently become increasingly prevalent in urban areas. Red foxes share a susceptibility to the same helminth and protozoan parasites as dogs. The movement of red foxes into human inhabited areas may increase the parasite infection exposure risk to pets and humans. To determine the parasites involved, red fox scat samples were collected weekly near 16 dens in Charlottetown, Prince Edward Island. Zinc Sulphate centrifugal flotation and a modified Baermann technique were used for examination. From July 2, 2013 to March 20, 2014, 163 scat samples were obtained and analyzed. One or more canid parasites were detected in most scat samples collected (90.2%) indicating a high prevalence of infection in the urban red fox population. The environmental contamination resulting from the urban red foxes is likely to increase the exposure and risk of parasitic infections to pets and humans in Charlottetown.

Affiliations: Departments of [1]Biology, [2]Pathology and Microbiology, [3]Health Management, [4]Biomedical Sciences and [5]Physics

- **Scott Roloson (PhD ESC)**
  - **Migratory patterns of non-native rainbow trout in Prince Edward Island rivers**

Across the planet, the introduction and spread of non-native species represents one of the greatest threats to biodiversity. The rainbow trout (*Oncorhynchus mykiss*), native to the pacific coast of North America, is one of the most widely introduced fish species on the planet. Over the last century rainbow trout have been introduced and have established on over 25 rivers on Prince Edward Island (PEI). Meanwhile, native populations of brook charr (*Salvelinus fontinalis*) and Atlantic salmon (*Salmo salar*) have experienced stark declines, salmon are now extinct in 70% of their original distribution in the province. Once rainbow trout have established, there is concern over the potential impact on native species and the potential of invasion into new waterways across the region. This research has implemented acoustic tracking techniques to delineate the timing and spatial extent of rainbow trout movements. Preliminary findings indicate that the majority of rainbow trout are estuary residents throughout the summer months. However, several

individuals have exhibited an alternate strategy and departed on a migration beyond the estuary (into the Northumberland Strait). The findings have provided direction for subsequent research and will provide information on the potential for dispersal and invasion of new waterways across the region.

Affiliation: Department of Biology

● **Brendan Sheppard (MSc MMS) & Jason Pearson**
○ **The effects of hydrogen bonding on the topology of localized electron pairs**

The localized pair model (LPM) offers unique insight into the electron-electron interactions within localized regions of chemical space such as bonds and lone pairs. This is accomplished by calculating inter-electronic probability distribution functions (intracules) within the bonds and lone pairs. Previous work has shown intuitive trends in the intracules of unimolecular systems for electronegativity and bond dissociation energies.[1] The current work expands to bimolecular systems to study the effect that hydrogen bonding has on the topology of the electron pairs in the orbitals involved in H-bonds. The orbitals obtained from density functional theory[2] calculations of 32 H-bonding systems were localized, the intracules were calculated and were compared between the monomer and the complex. We show that the magnitude of the change in the intracule is generally proportional to the strength of the interaction and the LPM offers an intuitive description of the interaction.

[1]Zielinski, Z. A.; Pearson, J. K. Comp. Theor. Chem. 2013, 1003, 79-90.
[2]Kohn, W.; Sham, L. J. Phys. Rev.1965, 140, A1133-A1138.

Affiliation: Department of Chemistry

● **Ashok Somalraju (MSc ESC)[1,2], Kaushik Ghose[1], Leanne Carter[1], Karen Samis[2] & Bourlaye Fofana[1,2]**
○ **Phenotypic characterization of an ems-mutagenized dihaploid potato population**

Potato and its processed products are undeniable components for any diet as they are rich in starch, proteins, fiber and vitamins, and depending on varieties and storage conditions, they may also contain anti-nutritional factors, namely steroidal glycoalkaloids and acrylamide forming factors that pose serious threat to food industries. SGAs play an important role in host-plant resistance but are toxic to humans at high levels. Acrylamide is formed as a side product of Millard reaction during cooking at high temperature and is classified by WHO as 'probably carcinogenic to humans'. Traditional breeding and transgenic methods can produce new varieties with reduced anti-nutritional compounds but can be time consuming or the final products may not be accepted by consumers. Hence, the current study aims at using a mutagenized approach meant to speed up the reduction of anti-nutritional factors, while maintaining the desired food attributes and agronomic traits that are accepted by consumers.

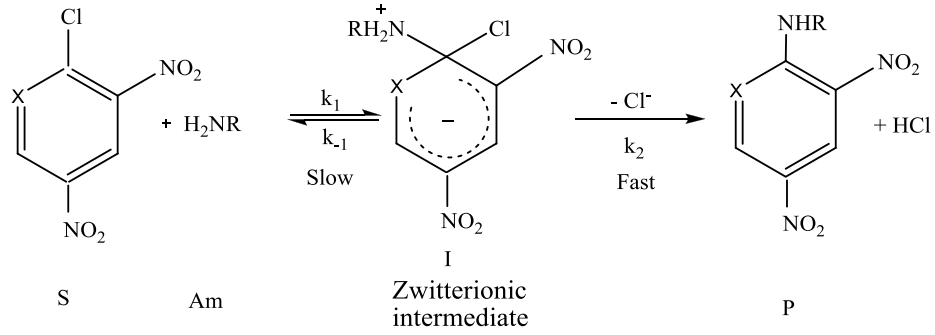
Affiliations: [1]Agriculture and Agri-Food Canada and [2]Department of Biology

Poster presentations (alphabetical by main author):

● **Amani Abdelghani (Visiting PhD student), Jason Pearson, Alaa Abd-El-Aziz**
○ **Kinetics and computational studies of the reaction of 2-Cl-3,5-dinitripyridine with Benzylamine substituents in different solvents**

The reaction of 2-chloro-3,5-dinitropyridine with substituent benzylamine in methanol and acetonitrile undergo uncatalyzed substitution and the formation of the zwitterionic intermediate is the rate-determining step. The process depends on the basicity of the leaving group and its steric hindrance as well as the possible intramolecular hydrogen bond in the transition state. Kinetic results suggest that the reaction obeyed pseudo-first-order rate constants. The pseudo-first-order rate constants (k_{obs}) were determined from the slope of the linear plot of ln (A) vs t. All the plots of k_{obs} vs nucleophile. Were linear passing through the origin suggesting that there is no base-catalysis and the reaction proceeds by uncatalysed process, Scheme 1.

On the other hand, AN stabilized the zwitterionic intermediate being formed in the rate limiting step through its relation by intermolecular and intramolecular hydrogen bonding interactions. Actually, the stabilization of ammonium ion intermediate by AN is evidenced by the existence of their homoconjugation with parent amine.



Affiliation: Department of Chemistry

- **Matthew Boulter (MSc HUB), Jamie Burr & Katie Beck**
  - The Effects of Repeated Bouts of Downhill Running on Arterial Stiffness

Background: Aerobic exercise is typified by health benefits. However, it is possible that prolonged running can produce elevations in arterial stiffness, an established cardiovascular risk factor, both acutely and chronically. Arterial stiffness at rest has been shown related to participation in eccentric exercises, as well as high levels of inflammation and oxidative stress. Therefore, high volume eccentric muscle contractions, such as those in prolonged running, which increase inflammation, could cause arterial stiffening. *Methods:* To replicate the eccentric effect of prolonged running, we will use a 40minute downhill treadmill run. Arterial stiffness will be tracked for 4 days during recovery using carotid-femoral and femoral -dorsal pedis pulse wave velocity (PWV) and blood markers of inflammation. Two weeks after the test, the protocol will be repeated. *Outcomes:* Repeated tests will demonstrate the relationship between stiffness and acute inflammatory response, potential differences between arterial segments, and whether human arteries adapt to repeated stresses. We hypothesize the existence of an attenuated effect.

Affiliation: Department of Applied Human Sciences

- **Jesse Hitchcock (MSc ESC)**, Simon Courtenay, Michael van den Heuvel
  - **The health and distribution of eelgrass (*Zostera marina*) in relation to land use in the Southern Gulf of St. Lawrence**

Eelgrass (*Zostera marina*) is an ecologically important and dominant plant species in the Northumberland Strait. Nitrogen enrichment in estuaries can result in a regime shift from habitat dominated by eelgrass and toward dense blooms of macroalgal species such as sea lettuce (*Ulva* spp.), ultimately resulting in anoxia and a reduction in fish and invertebrate diversity. A total of 12 estuaries in the Northumberland Strait will be evaluated, and the project will be divided into two components: 1) examining the relationship between the distribution of eelgrass and nitrogen loading, and 2) evaluating eelgrass health parameters as potential estuarine eutrophication response variables. To determine how eelgrass varies spatially, this study will use a 210 kHz echosounder coupled with a differential GPS, allowing us to generate high resolution, precise (±0.5m) outputs of eelgrass coverage and biomass. The indices of health will be quantified in 4 estuaries using multiple SeagrassNet paramaters. The outcome of this particular project is twofold: 1) to evaluate existing estuarine monitoring endpoints, and 2) to develop additional response variables to further refine nitrogen loading targets within the Northumberland Strait. Preliminary observations from the 2013 field season are represented here, with research continuing in the spring/summer of 2014.

Department of Biology

● **Travis James**

○ **Investigating Atlantic Halibut movement and population in the Gulf of St. Lawrence**

Atlantic halibut (*Hippoglossus hippoglossus*) is a large, commercially valuable flatfish found throughout the North Atlantic. Despite a long history of fisheries in this region, we still know very little about its life history and population within the Gulf. This project aims at identifying the timing and location of spawning by tracking mature individuals via pop up satellite archival tags (PSATS), identify general trends in fish movement using Floy tags and investigating possible population structuring using DNA microsatellites. Work has begun on the Floy and satellite tagging efforts, as well as the genetic work.

Affiliation: Department of Biology

● **Hailey Lambe (MSc ESC)[1], Marina Silva-Opps[1], Sheldon Opps[2], Marion Desmarchelier[3] & Chuck Gallison[4]**

○ **Movement patterns and den site selection in red foxes (*Vulpes vulpes*) in Charlottetown**

The red fox (*Vulpes vulpes*) is the second largest carnivore on Prince Edward Island and occupies most habitat types across the province including urban areas. Although very little information exists regarding the interactions of foxes with other species, it has been suggested that in Prince Edward Island, the presence and pressures of coyote (*Canis latrans*) populations have displaced red foxes from rural settings to urban areas. There remains to be many population attributes that are unknown for urban foxes. Learning more about foxes will facilitate a better understanding of how foxes use urban areas, and thus allow for appropriate management programs to be implemented in order to promote healthy animal-human interactions. The main goal of our study is to gather information on movement, habitat and den-site selection on foxes occurring in urban areas of the province by using sighting reports generated by the public, GPS collars and den surveys.

Affiliations: Departments of [1]Biology, [2]Physics and [3]Companion Animals, and [4]PEI Department of Fish & Wildlife

● **Alison MacDougall (MSc HUB)[1], Lori Weeks[1], William Montelpare[1] & Sharon Compton[2]**

○ **Exploring the relationship between oral health literacy and chronic disease knowledge**

Unlike previous generations, Canada's aging population is retaining most of their own natural teeth into advanced old age, and will require a continuity of oral health care throughout their lives. Despite a large body of research demonstrating the effect that poor oral health has on overall health, there is limited study into whether aging Canadian's have the oral health literacy skills necessary to obtain, process and understand the information needed to make appropriate health care decisions. In this presentation, we synthesize research on older adults' understanding and knowledge of the association between oral health and general health. To minimize the impacts of oral disease on systemic health, and consequently support the healthy aging of seniors, oral health literacy needs to be assessed. Accessing dental care is an important part of healthy aging for seniors because they are at greater risk for oral conditions and diseases related to age-related physiological changes and underlying chronic diseases, yet many appear unaware of the connection between oral health and general health.

Affiliation: [1]Department of Applied Human Sciences and [2]School of Dentistry, University of Alberta

● **Luke McDougall● Luke McDougall (MSc HUB), Brendan McKeown & Robert Hurta**

○ Magnolol inhibits the expression of ICAM and VCAM in DU145 human prostate cancer cells in vitro

Magnolol is a phenolic compound obtained from the bark & roots of Magnolia officinalis. Magnolol has been shown to possess a number of anti-cancer effects in vitro. The mechanisms by which magnolol exerts its anti-cancer effects are not well understood. This current study addressed the hypothesis that magnolol can affect the behavior of human prostate cancer cells in vitro and that these effects will include magnolol-mediated changes in the migration, invasion and adhesion of prostate cancer cells. Cell adhesion molecules (CAMs) including intercellular adhesion molecule (I-CAM) and vascular cellular adhesion molecule (V-CAM) can have involvement in the progression and metastasis of cancer cells due to their role in migration,

invasion and adhesion. In vitro treatment of DU145 human prostate cancer cells with magnolol resulted in a marked inhibition of both I-CAM & V-CAM protein expression levels [assessed by Western blot analysis]. Magnolol has also been shown to affect EGF-induced CAM protein expression. These magnolol mediated decreases in these adhesion-regulating proteins may contribute to decreases in DU145 cell adhesion. (Funded by the Jeanne and J.-Louis Levesque Foundation)

Affiliation: Department of Biology

- **Brendan McKeown (MSc HUB) & Robert Hurta**
  - **Effects of magnolol on insulin-like growth factor binding protein expression in PC3 and LNCaP human prostate cancer cells *in vitro***

Prostate cancer, one of the most common cancers in the Western world, affects many men worldwide. This study investigated the effects of magnolol, a compound found in the roots and bark of Magnolia officinalis, on the behavior of PC3 and LNCaP human prostate cancer cells in vitro. The insulin-like growth factors (IGFs) and their modulators, the insulin-like growth factor binding proteins (IGFBPs), may play roles in these events. The IGFBPs act by regulating IGF action but also exhibit a range of IGF-independent activities. IGFBP expression in PC3 and LNCaP prostate cancer cells has been determined using Western blot analysis to show that protein expression levels of IGF-1 and IGFBP-5 decrease, IGFBP-3 and IGFBP-4 increase and IGFBP-2 shows no significant change after exposure to magnolol. These magnolol mediated changes in IGFBP expression are novel and further indicate the potential chemoprotective and chemopreventative actions of magnolol in vitro. This project is supported by the Jeanne and J.-Louis Lévesque Foundation.

Affiliation: Department of Biology

- **Mark Nabuurs (MSc MMS)[1,2], Jason L. McCallum[2], Aaron A.S. Mills[2] & Christopher W. Kirby[1,2]**
  - **Bioprospecting for Biopesticides**

Biopesticides, defined as living organisms and/or their natural products, are used to control or suppress pest populations including insects, weeds, and plant diseases. Their mode of action can include a direct toxicity effect on the pest/pathogen or indirect effects through systemic acquired resistance (SAR) within the crop of interest. SAR is reported as an ecologically friendly approach for plant protection in sustainable agriculture. The goal of this project is to discover novel sources of biopesticides by screening natural products for potential pesticides. This project intends to identify and isolate suitable candidates for studying both modes of action through direct exposure with *in vitro* bioassays and indirect *in planta* testing through crop infestation with biotic stresses and bioresource extract applications.

Affiliation: [1]Department of Chemistry and [2]Agriculture and Agri-food Canada

- **Heidi O'Brien**
  - **Analysis of past concussions and current health measures: Long term impacts of concussion on dementia, depression and general health scores**

The presence of concussion in junior, amateur and professional sport is more prevalent and known about than ever before. Current concussion research looks to prevent, cope and treat concussions. Little research has been done on the long-term impacts of concussions on older adults brains, relative to old age cognitive decline, current health status or psychological wellbeing. The purpose of this study was to (a) generate a multidimensional variable to measure cognitive decline using The Shankle Memory Test and SAGE: Self Administered Gerocognitive Exam (b) compare history of concussion in adults aged 45-65 on their measure of cognitive decline (c) to assess scores on mental health, general health and lifestyle in a population of concussed athletes, healthy athletes, and non athletes. Predictions expect to show a significant relationship between older adults history of concussion and their scores on the measures of cognitive decline. This is an ongoing study intended to support future research of long-term impacts of concussion.

Affiliation: Department of Applied Human Sciences

- **Luke Poirier (PhD ESC)[1], Paula Tummon Flynn[1], Sophie St-Hilaire[2] and Pedro A Quijon[1]**
  - **Green crab management: fishery prospects and effects on commercial species**

The European green crab (*Carcinus maenas*) is a threat to the sustainability of shellfish resources on the east coast of Canada as they predate on most bivalves and greatly reduce prey populations. There is a distinct need for novel and creative mitigation measures that not only protect and maintain the ecosystems these crabs invade, but also to directly help sustain the local shellfish industries. A directed fishery for the green crab has been proposed by DFO in an attempt to mitigate the effect of the crab on shellfish; however, the current products suitable for market have very limited profitability. A second aspect of this problem is ecological: how shellfish respond to green crab predation and to their changes due to the fishery. We address the first issue by focusing on the potential of a soft shell crab product that implies identifying the physical changes that would readily indicate pre-molt processes. We address the ecological issue by surveying oyster (*Cassostrea virginica*) wild populations on a high to low green crab gradient across Prince Edward Island. Both of these studies are part of a major research project involving the fishery and management of green crab populations.

Affiliations: Departments of [1]Biology and [2]Health Management

- **Gill Potter (MSc HUB) & William Montelpare**
  - **Identifying predictors of concussion symptoms: examining measures of pain coping, neurocognition, anxiety, and depression in a cohort of athletes**

No injury is without its consequences. In concussion, typical symptoms include memory deficits, confusion, attentional difficulties, emotionality, headaches, dizziness, nausea, and sleep disturbance. Although these symptoms often subside after 5 to 10 days, up to 40% of cases exhibit persistent symptoms without any objective signs of damage. This study argues that pain coping, a relatively new construct within this research, along with anxiety, depression, and neurocognition, will play a significant role in the reporting of concussion symptoms. Through the use of a retrospective cohort design, symptom predictors will be identified in a sample of 100 university varsity athletes.

Affiliations: Department of Applied Human Sciences

- **Adam Proud (PhD MMS) & Jason Pearson**
  - **How to make a lasso with a protein**

Lasso peptides are a relatively new class of natural products that are post-translationally modified resulting in their unique final structures.[1] These compounds are known to exhibit extreme stabilities in comparison to their linear counterparts and have been the focus of much research in recent years. Many of these peptides obtain their stability from sterically bulky groups near the C-terminus that hold the structure in the folded lasso state. Herein, the newly discovered lasso peptide, Sungsanpin[2], will be discussed with respect to molecular dynamics analyses conducted to determine the stability of said structure under extreme temperature conditions. The native peptide was simulated under temperature conditions ranging from 300K to 1300K. Various mutants of Sungsanpin were also created to explore the role that the bulky terminal groups play in the stability of the peptide.

[1]Nat. Prod. Rep. 2012, 29, 996.
[2]J. Nat. Prod. 2013, 76, 873.

Affiliation: Department of Chemistry

- **Tessa Roche (MSc HUB) & William Montelpare**
  - **Assessment of eye-movement and balance behaviours in university athletes following a head injury: A step towards a more comprehensive return-to-play protocol**

The most common assessment tool for deciphering balance problems that occur from a head injury is the BESS (Balance Error Scoring System), which may not be sensitive enough to determine balance changes during recovery as recovery progresses. Balance problems are primarily as a result of damage to the vestibular system, which is directly linked to the visual system. The visual system can be assessed using

eye-tracking devices for a closer analysis of the vestibulo-ocular reflex (VOR) and the fixation reflex for the opportunity to better monitor balance during recovery. University athletes will perform the BESS test, and wear an eye tracking device while using the Nintendo WiiFit® soccer heading game. Actual game scores produced by the WiiFit®, as well as eye deviations from centre, percentage of time that gaze was centered, and scores from the BESS will be the measures. The subjects will be re-tested for reliability after one week.

Affiliation: Department of Applied Human Sciences

- **Colin Stetson[1], Jason McCallum[2] and Robert Hurta[1]**
  - **Phytochemical Profiling and Anti-cancer Analysis of Select Woody Plants**

This research investigates how plant-derived natural products control cell growth in cancer cells, with a focus on berries & fruits from 20 under-utilized agroforestry crop species. Effects of these plant compounds will be tested on several cancer cell lines. This project will utilize instrumental chemistry & molecular/cellular biology techniques. Crude extracts will be initially analyzed using UPLC-MS. The effects of lead candidate crude extracts will be examined on cell growth in human cancer cells in vitro. Mechanistic studies using crude extracts that exhibit growth inhibition will be carried out using western blot analysis to determine protein expression of cell proliferation, cell cycle and apoptosis related activities. Assay guided fractionation of lead candidates, along with isolation chemistry will aim to identify active compounds. Upon completion, these studies will have determined novel bioactive extracts from trees and shrubs planted in prairie or riparian agroforestry systems. (Funding provided by Agriculture and Agri-Food Canada, A-base, Project 1268).

Affiliations: [1]Department of Biology and [2]Crops and Livestock Research Centre, Agriculture and Agri-Food Canada

- **Paula Tummon Flynn, Cassandra Mellish, Luke Poirier & Pedro A Quijon**
  - Cannibalism and intra-guild predation in native and invasive crabs in the southern Gulf of St. Lawrence

The invasion of the green crab (Carcinus maenas) in PEI's coastal waters has resulted in an overlap of habitat with native decapod species, such as the Atlantic rock crab (Cancer irroratus). This study aimed to examine predator-prey interactions between the adults and juveniles of these two species. Laboratory and field experiments were set up to look at both the effect that predator species (rock or green crab) and injury (the loss of a claw) have on the predation rate of adult crabs on juveniles. The results of both the field and laboratory experiments indicated that when adult green crabs were predators the mortality of juvenile crabs (rock and green crabs) was significantly higher (~2x) than when adult native rock crabs were the predators. The mortality of juvenile crabs was also significantly reduced (~2x) when the predator rock or green crab was missing a claw compared to intact predators.

Affiliations: Department of Biology
