

**DEPARTMENT OF BIOLOGY**

**UNIVERSITY OF SASKATCHEWAN**

**PROGRAM AND BOOK OF ABSTRACTS**

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**Welcome to the Biology 990 Symposium, our showcase of graduate student research**

Welcome to the Biology 990 Graduate Student Symposium. We’re pleased to build on the positive feedback we received last year regarding the format and location, and we are looking forward to learning what everyone has been up to in the past year.

The symposium will kick off with electronic posters on all three floors of CSRB on Monday afternoon (April 29) between 1:00 and 4:10. While you are here, grab a snack and catch up with friends and colleagues you may not have seen for a while. On Tuesday April 30, we will have a day of oral presentations over in Arts 263.

There will be awards for the top poster and talks, which will be announced later in the week at the Biology Celebration of Excellence at Louis’ Loft.

Finally, I want to wrap up by saying that Biology 990 is one of my personal favourite times of the year. I love hearing about the diversity of research taking place in the department and I appreciate the thought, effort, and creativity, put into the student presentations. The ongoing success of events like this lies with the people behind it and I want to thank all the students, supervisors, evaluators, and staff that help put it on. It is the people that make the Biology department such an amazing place to work and learn.

Have a wonderful symposium and best of luck to all of our presenters.

Chris

**SYMPOSIUM SCHEDULE**

**Day 1 – Monday April 29th, 2024**

|  |  |
| --- | --- |
|  | **POSTER PRESENTATIONS – CSRB DISPLAY SCREENS** |
|  |  |  | **Page # of Abstract** |
| **1.** | **1:00 - 2:00 p.m.** | Rhamona McCalla F1 LOBBY R  | 5 |
| **2.** |  | Samira Baldin F1 LOBBY L | 5 |
| **3.** |  | Kaitlyn Fish F1 BY ELEVATOR | 6 |
| **4.** |  | Andres Rosales F2 LOBBY R | 6 |
| **5.** |  | Levi Bettencourt F2 LOBBY L | 7 |
| **6.** |  | Mikayla Rychel F3 BY ELEVATOR | 7 |
| **7.** |  | Lily Buckles-Whittle CSRB 315 | 8 |
|  |  | **Break (5 minutes)** |  |
| **8.** | **2:05 - 3:05 p.m.** | Emmanuel Lyimo F1 LOBBY L | 8 |
| **9.** |  | Jinnath Rehana Ritu F1 BY ELEVATOR | 9 |
| **10.** |  | Cassidy Waldrep F2 LOBBY R | 9 |
| **11.** |  | Katherine Marthens F2 LOBBY L | 10 |
| **12.** |  | Sydney Jones F3 BY ELEVATOR | 10 |
| **13.** |  | Sonia Barrios CSRB 315 | 11 |
|  |  | **Break (5 Minutes)** |  |
| **14.** | **3:10 - 4:10 p.m.** | Zheng Wang F1 LOBBY L | 11 |
| **15.** |  | Portia Mohrbutter F1 BY ELEVATOR | 12 |
| **16.** |  | Alex Beath F2 LOBBY R | 12 |
| **17.** |  | Paul Zeitz F2 LOBBY L | 13 |
| **18.** |  | Julia Flett F3 BY ELEVATOR | 13 |
| **19.** |  | Kelsie Huss CSRB 315 | 14 |

**Day 2 – Tuesday April 30th, 2024**

|  |  |
| --- | --- |
|  | **ORAL PRESENTATIONS (ARTS room 263)** |
|  |  |  | **Page # of Abstract** |
|  | **9:20 a.m.** | Welcome  |  |
| **20.** | **9:30 a.m.** | Owen Luo | 14 |
| **21.** | **9:45 a.m.** | Cresilda Alinapon | 15 |
| **22.** | **10:00 a.m.** | A K M Munzurul Hasan | 15 |
| **23.** | **10:15 a.m.** | Chuanhezi Quan | 16 |
|  | **10:30 a.m.** | **20 minute break** |  |
| **24.** | **10:50 a.m.** | Sravan Putnala | 16 |
| **25.** | **11:05 a.m.** | Dinithi Kumarapeli | 17 |
| **26.** | **11:20 a.m.** | Ilsa Griebel | 17 |
| **27.** | **11:35 a.m.** | Christina Howell | 18 |
|  | **11:50 a.m.** | **Lunch** |  |
| **28.** | **1:00 p.m.** | Amir Sabeti | 18 |
| **29.** | **1:15 p.m.** | Lindsay Carlson | 19 |
| **30.** | **1:30 p.m.** | MD Helal Uddin | 19 |
| **31.** | **1:45 p.m.** | Basirat Liadi-Azeez | 20 |
|  | **2:00 – 2:20** | **20 minute break** |  |
| **32.** | **2:20 p.m.** | Ayicia Nabigon | 20 |
| **33.** | **2:35 p.m.** | Joseph Abrams | 21 |
| **34.** | **2:50 p.m.** | Waseh Mumtaz | 21 |
| **35.** | **3:05 p.m.** | Tammie Windsor | 21 |
|  | **3:20 p.m.** | **Closing Comments** |  |

**ABSTRACTS FOR APRIL 29 POSTER PRESENTATIONS**

**1.Rhamona C. McCalla, Maud Ferrari, Douglas P. Chivers, Philip D. McLoughlin.** Investigating the Effects of Anthropogenic Change (Eutrophication) on the Individual Variation in Cognitive Abilities of Virile Crayfish. Department of Biology, University of Saskatchewan, Saskatoon, SK; Aquatic Predation & Environmental Change (APEC) Lab, Saskatoon, SK.

Animals often display consistent inter-individual differences in behavioural traits, also known as ‘animal personalities’. My thesis will explore animal personality and cognitive ability in the virile crayfish, a model for research investigating neuronal mechanisms involved in navigation. First, crayfish boldness will be measured using standard emergence and escape response tests. Next, crayfish will be allowed to learn to solve a multiple-turn maze with a food reward (spatial learning phase). The time to find the reward and the number of wrong turns will be recorded. Subsequently, the food reward will be placed at the opposite end of the maze, and crayfish will again be tested for their speed and accuracy (reversal learning phase). Performance in each learning task will be assessed in two contexts (a eutrophic or control environment) to explore the impacts of anthropogenic changes on crayfish cognition. I predict that individual crayfish will vary in their time to complete the maze in both phases and that bolder individuals will display a fast-learning style in the spatial phase but exhibit poorer cognitive flexibility (i.e., low reversal success). Crayfish exposed to the eutrophic environment should show impaired learning ability, as altered cognitive performance has been previously described. Such impairment is expected to exaggerate differences in personality and cognitive ability. These findings will enhance our understanding of crayfish cognition and personality, how they covary, as well as the influence of anthropogenic changes on their cognitive ecology.

**2.SAMIRA L. BALDIN & SOM NIYOGI. Investigation of persistent and transgenerational behavioral effects of embryonic cadmium exposure in zebrafish (Danio rerio).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Cadmium (Cd) is a ubiquitous aquatic contaminant and extremely toxic to fish to fish even at low exposure levels. Although Cd causes a wide range of adverse physiological effects in fish, its neurodevelopmental and behavioural effects remain poorly understood. Our study aims to investigate the effects of persistent and transgenerational effects of embryonic Cd exposure on the neurodevelopment and behaviour in zebrafish. It has three major objectives: (i) to examine how embryonic (1-120 hour post fertilization; most sensitive life stage) exposure to waterborne Cd affects neurogenesis and neural development, and behaviours (cognitive, anxiety response and social preference) during early life stages (5-30 days post fertilization), (ii) to evaluate whether the behavioural effects observed in early-life stages persist in mature adults (6 months old), and (iii) to examine whether the effects observed in parental generation (F0) are transmitted across multiple generations (F1 and F2) via epigenetic alterations. We hypothesize that embryonic exposure to Cd would disrupt the developmental programming of the central nervous system of zebrafish leading to persistent and transgenerational behavioural effects. We plan to conduct this study by using an integrative experimental approach that would employ behavioral assays, immunohistochemistry, comparative transcriptomics, quantitative RT-PCR, and gene specific methylation analysis.

**3. Kaitlyn M. Fish, Maud Ferrari, Doug Chivers, Iain Phillips.** Post-hatch antipredator behaviour of juvenile northern crayfish (*Faxonius virilis*) after embryonic exposure to predation risk. Department of Biology, University of Saskatchewan, SK; Aquatic Predation & Environmental Change (APEC) Lab, Saskatoon, SK.

A key component to survival in the early life stages of animals is being able to recognize and learn about predators in their environment. This can be achieved in a variety of ways, however certain senses like sight can be limiting in aquatic environments. Chemical cues are a vital source of information for aquatic animals, but how they are utilized by certain aquatic invertebrates is not yet fully understood. We look to investigate the possibility of predator recognition in embryonic freshwater crayfish after exposure to predation in the early stages of development, and if they can use environmental risk to develop neophobia. Previous literature suggests that repeated exposure to an alarm cue and unknown odour simultaneously can equip the animal with information to accurately predict predators and avoid lethal interactions. Exposure to high levels of predation risk in the environment can also generate a neophobic response to novel stimuli in prey animals. Using previous findings in literature, we predict that freshwater crayfish will similarly develop high-risk phenotypes in early development stages to protect against predation.

**4.ANDRES N. ROSALES1, ANN MCKELLAR1,2 & KIRSTY E. B. GURNEY1,2. Investigating the impact of agricultural activity on Upland Sandpiper (Bartramia longicauda) breeding populations.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2Environment and Climate Change Canada, Prairie and Northern Wildlife Research Centre, Saskatoon, SK.

Escalating agricultural intensification in North America poses a potential threat to grassland species, but there are limited data to evaluate potential effects of agriculture on grassland-breeding shorebirds. The Upland Sandpiper (Bartramia longicauda), a grassland shorebird with geographically variable population trends, encounters diverse threats arising from agricultural intensification and a changing landscape. In my thesis, I aim to examine the impact of agricultural activity on Upland Sandpiper breeding populations using 1) large-scale community science datasets, and 2) tissue samples from captured individuals. Landscape-level factors related to agricultural activity are suspected to play a role in Upland Sandpiper population trends, but such linkages have yet to be tested quantitatively. Using trends from the community science dataset eBird, I will test relationships between breeding populations trends in relative abundance and factors associated with landscape heterogeneity at a range-wide scale. Using plasma samples, I will evaluate whether individuals from different parts of the breeding range vary in exposure to agrochemicals and how such variation aligns with observed breeding population trends. By examining agricultural impacts on a grassland-dependent shorebird, particularly one with limited information in this regard, this study aims to fill critical gaps in understanding how grassland shorebirds are affected across a changing landscape.

**5.LEVI M. C. BETTENCOURT1, KAREN MACHIN2, JENNIFER F. PROVENCHER3 & KIRSTY E. B. GURNEY1,4. Plastics stabilizers in wild birds: understanding fate and potential threats.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK, 2Department of Veterinary Biomedical Sciences, University of Saskatchewan, Saskatoon, SK, Science and Technology Branch, Environment and Climate Change Canada, Ottawa, ON, 4Science and Technology Branch, Environment and Climate Change Canada, Saskatoon, SK.

Benzotriazole ultraviolet stabilizers (BUVs) are synthetic benzene molecules added to plastics to prevent ultraviolet degradation. As persistent organic pollutants with demonstrated toxicological effects, BUVs are a potential threat to wildlife health. I will use field and captive studies to address two key research questions (i) what are baseline levels of BUVs in wild birds and (ii) how does a BUV of known environmental concern (i.e., UV-328) accumulate in different tissues. To establish baseline levels and understand which species might be at greater risk of exposure to these chemicals, I will collect tissues (eggs, muscle, liver) from four northern-nesting species with a variety of life history traits (Calidris pusilla, Charadrius semipalmatus, Anser rossii, and Anser caerulescens). To study the biological fate of UV-328 under controlled conditions, I will use data from eggs collected as part of a captive study, where mallards were exposed by gavage (0.0368g/ml) for 10 days. I anticipate a range of BUVs to be detected in the wild species, with variations among species depending on nutrient allocation strategies, and detection of UV-328 in increasing concentrations over time for the captive egg samples.

**6.MIKAYLA J-A. RYCHEL1, ALVIN A. DELEON2, COLIN D. SPROAT2, EMILY L. BAMFORTH3 & TRACY A. MARCHANT1. Preliminary palaeoecology and ontogeny of Late Cretaceous Saskatchewan polycotylid plesiosaurs from the Herschel Marine Bonebed, SK.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2Department of Geological Sciences, University of Saskatchewan, Saskatoon, SK; 3Philip J. Currie Dinosaur Museum, Wembley, AB.

Near Herschel, SK, an outcrop of the Dinosaur Park Formation (Late Cretaceous) is home to the Herschel Marine Bonebed (HMB), a multi-taxic marine fossil locality deposited in what has been interpreted to be part of a shallow marine barrier island system. The HMB is rich in micro- and macro-vertebrate fossils, trace fossils, carbonized plant matter and some amber, though dominated by polycotylid plesiosaur specimens spanning a range of developmental stages. Preliminary palaeoecological analysis of the HMB microvertebrate faunal assemblage sheds new light on the taxonomic diversity and relative abundance of fish (both chondrichthyan and osteichthyan) and marine reptiles, as well as the encompassing palaeoecological dynamics of the site. The abundance of subadult plesiosaur material presents a unique opportunity to conduct ontogenetic studies within the HMB’s palaeoecological context. Through morphological and histological analyses of long bone elements, this project aims to provide insight into the growth, development, life cycles, and behaviour of polycotylid plesiosaurs. Preliminary histological results depict visible osteological microstructure such as radial vasculature, indicative of rapid growth rates and consistent with what has been reported for plesiosaurs. This project strives to advance our overall understanding of the palaeoecology of plesiosaurs and of this intriguing Late Cretaceous Saskatchewan fossil site.

**7.LILY D. BUCKLES-WHITTLE & NICOLE B. WEBSTER**. **Neural role in biomineralization for the slipper snail *Crepidula atrasolea* (Calyptraeidae, Gastropoda).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Although we have a good understanding of biomineralization as a chemical process, how organisms like molluscs (e.g., snails, nautilus, clams, etc.) control mineral deposition is not yet fully understood.Several studies suggest that biomineralization in molluscs is under neuronal control, however, direct evidence is lacking. Specifically, the neural control hypothesis (NCH) proposes that neurosecretory networks signal to the mantle, the organ that secretes the shell, to control biomineralization. Our goal was to test the NCH by determining if nerves are present throughout all stages of shell formation in the slipper snail *Crepidula atrasolea*. The ontogeny and subcellular connections of mantle neural anatomy will be observed across shell developmental stages using the neural antibodies serotonin, FMRF-amide, and anti-tyrosinated α-tubulin. A spatiotemporal map of the presence and location of each neural marker in the mantle tissue will be created. This will help determine if neural tissue is present throughout development in the shell-secreting tissue, as well as where the neurons connect to shell-secreting cells in the mantle. This research will be the first step in understanding how molluscs control shell secretion. Furthermore, it can aid future molluscan research on shell form variation and alternate shell control hypotheses.

**8.A NEW MULTISPECTRAL AERIAL SENSOR FOR MULTISPECIES WILDLIFE DETECTION IN THE BOREAL PLAINS**

Timely, accurate, and precise data on the distribution and abundance of species and their habitat is critical for developing science-based strategies for conservation. Traditional aerial surveys for wildlife are prone to detection errors, bias, and single target-species constraints; but aircraft (e.g., helicopter) costs also limits their use for assessing trends and testing hypotheses. Building on innovations in 'precision wildlife detection', we use multi-spectral, ultra-fine resolution imaging system (TK7 sensor) to remotely sense large mammals and later use integrate the images with computer science for detection and counting. This is taken as a recent breakthrough and increasing expertise on the topic of deep (machine) learning at the U of S, where equipment and software are being applied to

improve animal detection. Costs are expected to be less than traditional methods to obtain similar data, presenting a 'game-changing' opportunity to further the ecology and conservation of northern wildlife. In this breakthrough we will be able to learn various ecological relevancies of boreal ecosystem in Canada.

**9.Jinnath Rehana Ritu1, Maud C. O. Ferrari2 & Douglas P. Chivers1. Effects of cyanobacterial neurotoxin on the development and behaviour of zebrafish (Danio rerio).**

1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2Biomedical Sciences, WCVM, University of Saskatchewan, Saskatoon, SK.

Rising global temperatures and increasing eutrophication have led to a significant rise in harmful algal blooms (HABs), posing a widespread environmental challenge. During these blooms, certain cyanobacteria and marine microalgal species produce toxins, including β-N-Methylamino-L-alanine (BMAA), a neurotoxic amino acid. BMAA has been identified as a global environmental pollutant, causing developmental abnormalities and neurotoxicity in aquatic organisms, particularly in fishes. Studies have shown that BMAA induces oxidative stress, nerve cell death, and learning deficits in various model species. However, the extent to which BMAA affects cognitive behaviour, including escape response from predators, learning, and memory performance and novel object recognition ability of fishes remains poorly understood. Investigating the adverse effects of BMAA on different developmental stages of zebrafish and their behaviour is crucial, especially at environmentally relevant concentrations. Despite some studies exploring BMAA neurotoxicity in aquatic species, a comprehensive understanding of its mechanisms remains elusive. This research aims to address this gap and shed light on the impact of BMAA on zebrafish development and behaviour, contributing to a broader understanding of its ecological consequences.

**10.CASSIDY L. WALDREP1, MITCH D. WEEGMAN1, JOSH C. STILLER2, JACOB N. STRAUB3, JOHN M. COLUCCY4, & NATHANIEL R. HUCK5. Time-activity budgets and reproductive performance of eastern mallards: A full annual cycle approach.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2New York State Department of Environmental Conservation, Albany, NY; 3State University of New York – Brockport; Brockport, NY; 4Ducks Unlimited Inc. Dexter, MI; 5Minnesota Department of Natural Resources, Saint Paul, MN.

Population change can be driven by one or multiple demographic mechanisms, such as reproduction and/or survival. Yet, it is becoming more evident that these mechanisms can be influenced by factors in and outside the breeding period. Investigating these factors can be done using full annual cycle (FAC) models. With these, we can look at the impact bird movement, behaviour, and weather conditions have on reproductive success in all three periods of a bird’s breeding season – early incubation, full-term incubation, and brood rearing. Furthermore, these models can help inform conservation plans for populations and species of concern, such as eastern mallards (Anas platyrhynchos). To do this, I propose to deploy ~1100 Global Positioning System-acceleration (GPS-ACC) tracking devices to study the FAC of two subpopulations of eastern mallards. The Canada and Maine population is growing, whereas the northeastern US population is declining. I will utilize machine-learning algorithms and hierarchical models to investigate this. Measuring reproductive success throughout the breeding period using high-resolution GPS and ACC data will help us gain a better perspective of demographic rates that are inestimable with current age-ratio data, focusing conservation attention to slow or reverse the declining northeastern US subpopulation of eastern mallards.

**11.Katherine A. Marthens1, Eric T. Reed2, Amelia Coxe3, Michael L. Casazza4, Cory T. Overton4, Tracy Davison5, & Mitch D. Weegman1. Habitat use in a western arctic snow goose population and potential for competition with endemic ungulates.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2 Canadian Wildlife Service, Gatineau, QC; 3Department of Environment and Climate Change, Government of Northwest Territories, Yellowknife, NT; 4U.S. Geological Survey, Western Ecological Research Center, Dixon Field Station, 69924 Tremont Rd., Dixon, CA; 5Department of Environment and Natural Resources, Government of Northwest Territories, Inuvik, NT

Understanding habitat use is important when considering population dynamics, landscape impacts, and broader community interactions. Lesser Snow Geese (Anser c. caerulescens; hereafter SNGO) are a species increasing significantly in population size, with demonstrated negative effects on habitat quality in subarctic breeding areas. There are further indigenous concerns that SNGO populations at western arctic breeding sites may be competing with Peary Caribou (Rangifer tarandus pearyii) and Muskoxen (Ovibos moschatus), contributing to observed declines in these populations. I propose to study habitat use in the SNGO population on Banks Island, NWT, focusing on two objectives: firstly, using a Bayesian Markov Model to quantify and explain movement between habitat types using behaviour; secondly, to use a stacked framework of integrated species distribution models examining overlap in landscape use of SNGO relative to Peary Caribou and Muskoxen on Banks Island, and further to Barren Ground Caribou on mainland NWT. I will utilize a combination of aerial survey and telemetry data beginning in 2013 and running to the present day to develop all models. This data will provide a better understanding of how western arctic SNGO use their landscape, as well as indicate potential future research needs assessing competiotion between SNGO and local ungulates.

**12.SYDNEY MARIE JONES1 , THERESA BURG2 ,KIRSTY E. B. GURNEY1,3 & ANN E. MCKELLAR1,3. Assessing migratory connectivity and genetic population structure in the Upland Sandpiper.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK, 2Biological Sciences, University of Lethbridge, Lethbridge, AB, 3Environment and Climate Change Canada, Prairie and Northern Wildlife Research Centre, Saskatoon, SK.

The grassland-dependent Upland Sandpiper (Bartramia longicauda; hereafter sandpiper) is experiencing declines across its expansive North American breeding range, potentially driven by threats such as agrochemical exposure and grassland conversion. Effective conservation of this long-distance migratory shorebird requires an understanding of population dynamics throughout the annual cycle, including assessing migratory connectivity and genetic population structure. Migratory connectivity describes whether individuals from a single breeding population share migratory routes and nonbreeding areas, providing information for population or site-specific management. Previous research suggests weak connectivity in eastern sandpiper populations, though studies are limited, sample sizes are small, and satellite telemetry has not been analyzed in conjunction with genetic analysis. Molecular techniques complement contemporary movement data by offering insights into natal dispersal and historical connectivity. My ongoing research has two objectives: (i) to determine the strength of sandpiper migratory connectivity between breeding and nonbreeding grounds, and (ii) to evaluate the genetic distinctiveness of breeding sandpiper populations. Migratory connectivity is being assessed using satellite transmitters (n=58) deployed at six breeding sites. Genetic population structure is being evaluated via dd-RAD sequencing of blood samples (n=57) from the same six breeding sites. Knowledge of sandpiper population dynamics will help inform legal designations and shape land management practices.

**13.SONIA BARRIOS & JEFFREY LANE. Little brown myotis (Myotis lucifugus) foraging and roost habitat selection in prairie landscapes.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Little brown myotis (Myotis lucifugus) is a small insectivorous bat found throughout Canada. This species provides vital pest control for both humans and crops but is threatened by the invasive fungal disease White Nose Syndrome (WNS). Once the most common bat species in Canada, it is now federally listed as endangered. A lack of knowledge of populations in grasslands hinders our ability to implement an effective species recovery strategy.

I propose to compare the foraging and roost selection behaviour of little brown bat colonies in grasslands versus forested landscapes. I will first analyze diet using DNA metabarcoding of guano and compare this to insect communities in four distinct habitats surrounding a roost. I will then collect biophysical characteristics of known roosts and determine the home range of colonies using radiotelemetry.

I predict that grassland bats will select for different roost characteristics and prey species than in forests, requiring a tailored management approach. I aim to use these data to construct a resource selection model to directly benefit wildlife managers in discovering new populations, identifying important habitat, and maintaining quality foraging and roost locations for the recovery of the species.

**14.Fine Mapping of Clubroot Resistance Genes Rcr5 and Rcr10 in Brassica napus**

ZHENG WANG1,2, YANGDOU WEI2, FENGQUN YU1

1 Saskatoon Research and Development Centre, Agriculture and Agri-Food Canada, 107 Science Place, Saskatoon, SK S7N 0X2

2 Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK S7N 5E2

Clubroot, caused by Plasmodiophora brassicae, is one of the most important diseases affecting brassica crops globally. Growing cultivars carrying clubroot resistance (CR) genes is the most practical approach to managing the disease. In previous studies, we identified CR genes Rcr5 and Rcr10 from B. rapa turnips and mapped them into two genetic regions on chromosome A03 of brassica species. Canola breeding lines Y2006 and Y154 with introgressed resistance from the turnips carrying Rcr5 and Rcr10 respectively have been developed. However, fine mapping of the genes has not been completed. To develop tightly linked DNA markers for canola breeding and facilitate map-based cloning of the genes, we aim to define the genes into an interval with only few candidate genes. Crosses between canola Y2006 and Y154 with a susceptible canola double haploid line Westar were made to generate F1. F1 self-fertilized to produce two large F2 mapping populations with over 1000 plants. F2 populations were examined by pathogenicity assay against two P. brassicae isolates that can differentiate between disease reactions. We identified four polymorphic Single-Nucleotide Polymorphic (SNP) markers for each population using Kompetitive Allele Specific PCR. These SNP markers are a valuable resource for map-based cloning of CR genes Rcr5 and Rcr10.

**15.J. PORTIA MOHRBUTTER, DANIEL R. GARRETT, CHRISTY A. MORRISSEY and JEFFREY E. LANE. The influence of agricultural intensification on bats in the Northern Great Plains.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Intensive agricultural practices are rapidly increasing throughout North America, contributing to global biodiversity losses, particularly in aerial insectivores. Previous research has documented long-term declines in many avian species; however, there is comparatively little knowledge about the influence of agricultural intensification on bats in prairie landscapes. This study will investigate how little brown bats (Myotis lucifugus) respond to agricultural intensification and its associated pesticide use within different agroecosystems in southern Saskatchewan. We predict that increased agricultural intensification will be inversely related to little brown bat activity, while pesticide exposure will show a direct correlation with intensification. We will identify areas of high and low agricultural intensity based on modeled landscape simplification, pesticide use, and the loss of aquatic habitats (i.e., wetlands). Acoustic monitoring will assess how bats respond to variations in agricultural intensification through changes in their foraging and commuting activities. Additionally, live capture, blood collection, and body composition scans (qMRI) will investigate the consequences of varying pesticide exposure on bat physiology and overall health. Considering the severely declining population of Myotis lucifugus due to other threats (i.e., White Nose Syndrome), our findings will contribute to the much-needed conservation for bats and other aerial insectivores in the Great Plains.

**16.ALEX H. BEATH & MITCH D. WEEGMAN. Non-breeding season habitat use and demography of midcontinent Greater White-fronted Geese (*Anser albifrons)*.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Since the mid-1970s, the midcontinent subpopulation of Greater White-fronted Geese (*Anser albifrons),* hereafter: GWFG,has undergone a pronounced shift in their winter distribution. Recent studies suggest widespread heterogeneity in movement and energy patterns between contemporary and traditional wintering regions, however, drivers and fitness consequences of this range-shift and associated energetic gradient remain poorly understood. This project will draw upon a database of fine-scale GPS and tri-axial acceleration (ACC) data, facilitated by deployment of GPS/ACC neck-collars on GWFG across their non-breeding range. First, using a hierarchical multistate model, we will estimate transition probabilities between and amongst wintering regions and identify major drivers for movement. Second, we will investigate the extent to which summer and fall decision-making can explain variation in annual and fall survival, quantify the representativeness of banded samples, and describe the distribution of GWFG during hunting season. Third, we will describe an ‘energy landscape’ for wintering GWFG, a novel concept in ecology. Lastly, we will assess the fitness consequences of neck-collars on GWFGs, using metal-only banded birds as a proxy. This suite of research aims to facilitate targeted conservation actions across the midcontinent GWFG wintering range and will help to inform key harvest and land management decisions.

**17.PAUL R. ZEITZ & MITCH D. WEEGMAN. Holistic Conservation Planning: the Full Annual Cycle of Midcontinent Greater White-fronted Geese *(Anser albifrons frontalis)*.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Previous studies suggest that the behavior and decisions made by an animal in one season influences the outcome of behavior and decisions made in the following seasons. These “carry-over effects” can be modeled using a hierarchical model in a Bayesian framework known as a Full Annual Cycle Model. These models are especially useful in highly migratory and seasonally distinct species, as other models could be spatially or temporally restricted in scope. We plan to apply this modeling framework to the midcontinental population of Greater White-fronted Geese *(Anser albifrons frontalis)*. This model will be employing the use of GPS and accelerometer (ACC) data collected using the OrniTrack-N38 GPS neck collar, attached to adult female geese. The fine scale year-round data acquired from these collars facilitate a more nuanced understanding of habitats and seasons of importance regarding breeding success. Productivity is often more variable than survival in long-lived species, however, the exact mechanisms for population change and its drivers are not understood. With this analysis we hope to ascertain the seasonal, behavioural, and habitat usage variations that could explain variation in reproductive metrics.

**18.JULIA FLETT1, TIM JARDINE2 & CHRISTY MORRISSEY1. Understanding PUFA and insecticide flux from prairie wetlands via insect vectors under semi-controlled conditions.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK. 2Toxicology Centre, University of Saskatchewan, Saskatoon, SK.

Wetlands in the Prairie Pothole Region serve as important ecosystems for birds and riparian predators that rely on seasonal insect emergence for sustenance. Aquatic insects are important vectors between wetland and terrestrial ecosystems, exporting essential polyunsaturated fatty acids that are limited in the terrestrial environment. Due to the increased demand for agriculture, wetlands have declined due to drainage and degradation. Additionally, agriculture has resulted in higher quantities of pesticide residues entering waterbodies through runoff and spray drift events. Sub-lethal exposure affects the development of insects and can lead to insecticide accumulation and flux out of the wetland. This project aims to understand insecticide exposure impacts on PUFA and insecticide export via two experiments using a field-based limnocorral approach and insecticides, clothianidin, chlorantraniliprole and deltamethrin. Experiment 1 will use multiple doses of a single insecticide while experiment 2 will use the 3 insecticides separately in relative concentrations to each other. Insect samples will be collected every 2 days, along with water and sediment sampling occurring prior to the start of the experiments and weekly throughout. In year 1, each experiment will utilize 12 limnocorrals, with 3 replicates for treatments and controls and be dosed bi-weekly over the 28-day study periods.

**19.KELSIE N. HUSS1, MITCH D. WEEGMAN1, MATTHEW E. DYSON2, PAUL T. LINK3, KAREN L. MACHIN4, CHRIS A. NICOLAI5, & FRANK C. ROHWER5. Comparing the movements, behaviour, survival, and reproductive success of dabbling ducks fitted with tracking devices using different attachment techniques.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2Ducks Unlimited Canada, Winnipeg, MB; 3Louisiana Department of Wildlife and Fisheries, Baton Rouge, LA; 4Department of Veterinary Biomedical Sciences, University of Saskatchewan, Saskatoon, SK; 5Delta Waterfowl, Bismarck, ND.

With climate change and land use change continuing to alter animals’ movements, behaviour, survival, and reproductive success, there is an increasingly apparent need to study animals at high resolution space and time. While miniaturized tracking technologies enable practitioners to study individuals at fine-scale levels, there is evidence that devices can have a significant negative effect on birds (e.g., increased energy expenditure). Yet, with various transmitter attachment techniques being known to influence individuals differently, it is critically important to robustly quantify indirect and direct device effects across attachment techniques. In the last 10-15 years, thousands of waterfowl across North America have been fitted with devices using four different attachment techniques. While the most common techniques are (1) single-loop harnesses and (2) double-loop harnesses, researchers also are using (3) subdermal units and (4) implantable tracking devices. Through deploying 300 Global Positioning System-acceleration (GPS-ACC) transmitters across four different attachment techniques, we aim to compare the movement, behaviour, survival, and reproductive success of mallards (Anas platyrhynchos). Furthermore, 362 leg band geolocators (light sensors) will be deployed as a control. We anticipate results from this work will contextualize past research and help future practitioners select the attachment technique most appropriate for their work.

**ABSTRACTS FOR APRIL 30 ORAL PRESENTATIONS**

**20.Owen H. Luo, Douglas P. Chivers, & Som Niyogi. Exploring interactive effects of arsenic and selenium exposure on larval zebrafish (Danio rerio).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Both arsenic and selenium have been identified as harmful to the health of vertebrates. Extensive research has examined mechanisms that cause these effects. However, considerably less research has examined interactive effects. While there has been some research on the interactive effects of arsenic and selenium on mammals and adult fish, few studies focus on the larval stage. This study delves into the behavioural impacts of interactive exposure to waterborne arsenic and selenium on larval zebrafish. Larval zebrafish were subjected to arsenic and selenium in a 2x4 design with 2 concentrations of arsenic (0, 100 μg/L) and 4 concentrations of selenium (0, 50, and 100 μg/L selenite and 5 μg/L selenomethionine), from 1-96 hours post-fertilization. Developmental changes were assessed, alongside behavioural assays measuring thigmotaxis and reflexive movement. Results indicate that fish are always negatively impacted upon exposure to 100 μg/L arsenic alone however, the presence of selenium reduced the impact of arsenic in some cases.

**21.CRESILDA V. ALINAPON. Characterization of effector PbPE29: Its potential role in successful Plasmodiophora brassicae colonization in Brassica napus L. (canola).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Clubroot, a swollen gall or club-shaped root, is a devastating disease caused by Plasmodiophora brassicae, a soil-borne obligate biotrophic plant pathogen of the kingdom Protista, negatively affecting canola yield. Clubroot management programs have been developed throughout the world to try to mitigate this problem. Unfortunately, these strategies have been unsuccessful in limiting the spread of the disease. This study aims to characterize the molecular function of the P. brassicae secreted effector protein PbPE29 isolated from 35-day-old canola root galls and understand the disease progression program controlled by the PbPE29-plant protein interaction(s). Secondary infection of Arabidopsis roots initiates between 5-7 days post inoculation (dpi) with resting spores of P. brassicae. Transcript of PbPE29 is expressed between 14-28 dpi – throughout the secondary stage of infection and during the development of galls on the roots of infected plants. PbPE29-GFP and PbPE29-mCherry show cytoplasmic and perinuclear localization in N. tabacum leaves and transient expression of PbPE29 reduces the effect of PiNPP1-induced PCD when co-infiltrated into N. tabacum leaves. Uninfected PbPE29-1 and PbPE29-2, over-expressing transgenic Arabidopsis lines, show the same phenotype as WT Arabidopsis (A. thaliana), after 21 dpi with P. brassicae spores, the roots of both PbPE29-1 and PbPE29-2 lines produce more galls and appear to be more susceptible to infection compared to WT roots. However, the molecular function and mechanism of how PbPE29 is involved in the gall formation in roots is yet to be determined.

**22.A K M MUNZURUL HASAN, SOM NIYOGI & DOUGLAS P. CHIVERS. Behavioural effects of bisphenol S exposure in embryonic zebrafish (Danio rerio).** Department of Biology, University of Saskatchewan, Saskatoon, SK, Canada

Bisphenol S (BPS), which is increasingly being utilized in manufacturing various consumer products, has emerged as a priority aquatic contaminant. Previous investigations in our lab showed chronic and maternal exposure to BPS induces neurobehavioral toxicity in adult zebrafish and their offspring, respectively. However, it is currently not known how early-life stage (e.g. embryonic) BPS exposure affects neurodevelopment and behaviour in larval zebrafish and whether these effects are inherited across multiple generations. Thus, the main objectives of the present study are: (i) to examine the effects of embryonic BPS exposure on the oxidative stress and neurodevelopment, and (ii) to evaluate the behavioural effects (thigmotaxis and reflexive movement) of embryonic BPS exposure in larval zebrafish. To this end, zebrafish embryos were exposed to waterborne BPS concentrations of 0 (vehicle control) and 30 μg/L from 2 to 120 hour post fertilization. Following exposure, embryos were collected for the analysis of reactive oxygen species generation and apoptosis by di-chloro-di-hydro-fluorescein diacetate (DCFDA) and acridine orange (AO) staining, respectively, and the expression of genes involved in neurodevelopment by quantitative RT-PCR. Concurrently, reflexive movement and thigmotaxis were evaluated by examining the sensory response to light and anxiety response, respective. Preliminary observations from this study will be discussed in this presentation.

**23.Role of Cucumis sativa Phloem Phosphate-stress-repressed 2 in phosphate homeostasis**

**Chuanhezi Quan1, Jieyu Chen1, Byung-Kook Ham1**

1Department of Biology, University of Saskatchewan, Saskatoon, SK S7N 5E2

Phosphorus (P), not a renewable resource, is essential for plants, so plant scientists have developed phosphate (Pi) - efficiency plants. Recent studies have raised the role of the plant vascular system as an important plant tissue that mediates shoot-root communication to maintain Pi homeostasis. In this regard, root-derived signals induced by the Pi-stress environment are perceived within the shoot through the xylem-transpiration stream. Then, the shoot generates long-distance signals which are delivered into sink tissues via the phloem to reallocate photosynthates and nutrients. Phloem-mobile mRNAs have been proposed as one of potential long-distance signaling molecules in plants to regulate Pi uptake, translocation, and utilization. In this study, a cucumber transcript factor, CsPPSR2 (Cucumis sativa PHLOEM PHOSPHATE-STRESS-REPRESSED 2) was identified as a phloem-mobile mRNA and its expression was decreased in response to Pi-starvation stress. Further, a homolog of CsPPSR2, was isolated from Arabidopsis and designated as AtPPSR2. Similar with the expression pattern of CsPPSR2, the AtPPSR2 mRNA level was reduced upon Pi starvation. atppsr2 mutant shows retarded growth and Pi-accumulation defects under Pi-starvation conditions, compared with the wild-type. We will discuss the potential role of PPSR2 as a regulator to operate phloem-mediated systemic gene regulation for adaptive plant development under Pi-deplete conditions.

**24.SRAVAN KUMAR PUTNALA & SOM NIYOGI. Reproductive effects of arsenic-contaminated natural diet in zebrafish (Danio rerio) during chronic exposure.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Very little is known about the reproductive effects of arsenic in fish. The current study investigated the reproductive toxicity of environmentally relevant chronic arsenic exposure via an oligochaete worm (Lumbriculus variegatus) in adult zebrafish. The worms were exposed to waterborne arsenic [0 (control), 2.5, and 5.0 mg/L as arsenite] for 14 days, which resulted in arsenic body burdens of 0.3 (control), 35.9 (low), and 78.0 (high) µg/g wet weight, respectively. Experimental fish were then fed with either of these arsenic-contaminated worms at a ration of 3.5% body wet weight twice daily for 60 days. At the end of the exposure period, reproductive performance of fish was evaluated by assessing reproductive behaviour, gonadosomatic index (GSI), fecundity (cumulative egg production and mean number of eggs per female), fertilization and hatching success, and larval survival and deformity rate. In addition, sperms were collected from male fish to examine the effects of arsenic on sperm abundance and motility. The results indicated that chronic dietary arsenic exposure impaired reproductive behaviour, decreased fecundity, GSI, fertilization rate, hatching success and larval survival and increased the larval deformity rate in a dose-dependent manner. Furthermore, arsenic was also found to induce a dose-dependent reduction in sperm density and motility.

**25.K.A. DINITHI KUMARAPELI, KEN WILSON, & YANGDOU WEI. Unraveling the Interplay between Phenylpropanoid Biosynthesis and Salicylic Acid Signaling Pathways in Mediating Plant Immunity.** Department of Biology, University of Saskatchewan, Saskatoon, SK

The plant shikimate pathway is the entry to the biosynthesis of salicylic acid (SA) and phenylpropanoids. SA, a key defense hormone in plants, is predominantly synthesized through the isochorismate synthase (ICS1) pathway, with modest amount synthesized through the phenylpropanoid pathway via the entry-point enzyme phenylalanine ammonia-lyase (PAL). PAL serves as a common precursor for a partial SA biosynthesis and the formation of a whole set of phenolic metabolites, including monolignols, flavonoids, and phenolic esters. Monolignols contribute to lignin formation, providing physical barrier against pathogen penetration, while SA acts as signaling molecule orchestrating various defense responses. Our transcriptomic analysis by RNAseq indicates upon pathogen infection, the delayed expression of pathogenesis-related genes (marker for pathogen induced SA production) in Arabidopsis mutants defective in cinnamate 4-hydroxylase (C4H) that catalyzes the second step of the general phenylpropanoids, suggesting a regulatory link between the two branches of shikimate pathways in mediating plant immunity. In this study, we generated a double mutant (ics1/c4h) with impaired SA production and phenylpropanoid biosynthesis through crossing. Pathogenicity assays revealed increased susceptibility to the adapted powdery mildew (Erysiphe cichoracearum) in double mutants, highlighting the significance of the coordination between two pathways in plant defense. Further research will emphasize on fine genetic dissection of C4H-mediated phenylpropanoid metabolisms and their associated molecular and cellular mechanisms that contribute to plant immunity.

**26.ILSA A. GRIEBEL & MITCH D. WEEGMAN. Using non-invasive sampling to test for drivers of mercury exposure in birds.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Traditionally, blood samples are the standard for non-lethally measuring mercury concentrations in wildlife. An alternative is using claw samples, a non-invasive sampling technique that requires less specialized skill than collecting blood samples. Claw samples have been successfully used to measure mercury concentrations in bird species and correlate well with internal organ mercury concentrations. To make mercury concentrations of claw samples more broadly useful and interpretable against published values, the relationship between blood and claw concentrations needs to be understood but has only been tested in one bird species (herring gulls). Further, a difficulty of using claw samples can be getting sufficient sample mass. Therefore, understanding how accuracy of mercury concentration is affected at small sample masses is also crucial. To address questions related to relationships between mercury measured in different tissues and better understand factors that affect measured concentrations, our objectives were to: 1) establish the relationship between blood and claw mercury concentrations in a dabbling duck species, the black duck (Anas rubripes), 2) assess the accuracy of standard laboratory instrumentation when measuring mercury concentrations of samples with low masses, and 3) test hypotheses about factors that may affect mercury exposure in black ducks in the Atlantic and Mississippi Flyways.

**27.CHRISTINA HOWELL1, KEVIN KARDYNAL2, ERIC REED3, & KIRSTY GURNEY1,2. Understand the annual life cycle of Horned Grebe (Podiceps auritus) breeding in Canada.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2Canadian Wildlife Service, Environment Climate Change Canada, Northwest Territories, NT; 3Science and Technology Branch, Environment and Climate Change Canada, Saskatoon, SK.

Migratory birds use a variety of habitats and are exposed to a wide range of environmental conditions throughout the annual cycle, which can influence population demographics and species abundance in subsequent seasons. There are indications that Canadian breeding populations of Horned Grebe (Podiceps auritus) have significantly declined since 1970, yet factors influencing populations and reasons for the apparent declines remain unknown. The objectives of my research were to (i) identify wintering areas used by Canadian breeding horned grebes, and (ii) understand the extent to which breeding populations mix or segregate during the non-breeding season (i.e., migratory connectivity). Using light-level geolocators, 18 birds from two study sites were tracked across one full annual cycle. Stable isotope (13C and 15N) signature from feathers (n = 118) were used in conjunction with geolocator data to assign individuals to distinct wintering populations. Tracked birds used a wide geographic range of marine and freshwater non-breeding locations. Isotope analysis suggest that populations likely mix on wintering areas. Strength of migratory connectivity was estimated as weak (MC = 0.07 ± 0.08). Overall, these findings will fill important knowledge gaps surrounding the migration ecology of horned grebe which will aid in conservation management of this species and their critical habitat.

**28.A. SABETI & C. CARVALHO. C. elegans neurons express a non-transactivating HIF-1 isoform via an internal promoter to antagonize HIF-1-dependent gene expression systemically.**

Department of Biology, University of Saskatchewan, Saskatoon, SK.

HIF-1 is a conserved master regulator of hypoxia-induced gene expression in metazoans. Among animal cells, neurons are metabolically more susceptible to hypoxia-induced damage while neurodevelopment is negatively impacted by unchecked HIF-1 activity. Thus, neurons must have evolved ways to balance HIF-1 activity to survive hypoxia while avoiding miswiring of the nervous system. I identified a shorter hif-1 transcript (hif-1c) in C. elegans highly expressed in neurons. Using reporter lines, I mapped a 200bp internal promoter region in intron 4 of the hif-1 locus that is sufficient and necessary to independently drive expression of hif-1c. The HIF-1c isoform contains domains involved in heterodimerization to HIF-1b/AHA-1 and sensitivity to oxygen, but noticeably lacks the conserved bHLH domain required for promoter transactivation. Predictably, expressing hif-1c(+) transgenes do not rescue hypoxia-induced embryonic lethality in hif-1(zh111) null mutants and CRISPR-generated hif-1c-specific mutants are not sensitive to hypoxia, indicating that HIF-1c does not act as a transcription factor. Instead, I find that overexpression of hif-1c in neurons dampens transactivation of a bona-fide HIF-1 target gene (nhr-57) in intestinal cells and can suppress defects associated with HIF-1 stabilization in egg-laying organs, suggesting that HIF-1c produced in neurons may act cell non-autonomously to downregulate HIF-1 activity systemically.

**29.LINDSAY G CARLSON1, JOSH C. STILLER2, TED C. NICHOLS3, MARC DUNN4, ERNEST RABBITSKIN4, KENNETH F. ABRAHAM5, MITCH D. WEEGMAN1 A closer look at staging areas: energy landscapes of Atlantic brant in James Bay.** 1Department of Biology, University of Saskatchewan, Saskatoon, SK; 2New York State Department of Environmental Conservation, Albany, NY; 3New Jersey Division of Fish and Wildlife, Woodbine, NJ; 4Niskamoon Corporation, Montréal, QC; 5Ministry of Natural Resources and Forestry, Peterborough, ON

Optimal foraging theory states that animals adopt behavioural strategies that maximize net energy gain at the lowest energy cost, thus maximizing fitness. Given this, we often think of habitat use as a metric of habitat quality for wildlife. However, heavily used habitats are not always the best quality, but may be used for a variety of other reasons including avoiding predators or reducing energy expenditure. Spatial variation in energy expenditure (energy landscapes) can contextualize patterns of habitat use, especially when spatially or temporally varying attributes of the landscape are unknown. We deployed 250 Global Positioning System/tri-axial acceleration (GPS-ACC) transmitters on Atlantic brant between 2018-2023. Data from these devices allowed us to calculate a metric of energy expenditure due to movement every 6 minutes, and link to the nearest GPS location (every 30 minutes). We used a linear mixed model implemented in a Bayesian framework to assess the effect of habitat type, coast, and season on the energy landscape of Atlantic brant staging in James Bay. Our findings suggest that brant may have adapted their behaviour and habitat selection to reduce energy expenditure, potentially eschewing higher quality forage elsewhere. Future work will link spatially-explicit forage quality to energy expenditure and investigate reproductive consequences of staging decisions.

**30.MD HELAL UDDIN, DOUGLAS P. CHIVERS & SOM NIYOGI. Environmentally relevant concentrations of seleno-methionine impair neurodevelopment and behaviour in embryonic zebrafish (Danio rerio).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Selenium (Se) is an essential micronutrient to fishes; however, it becomes extremely toxic when its concentration goes slightly above the physiological optimum. In contaminated systems, fishes get exposed to Se primarily as seleno-methionine (Se-Met). While the detrimental effects of Se-Met in adult fishes are well characterized, the embryotoxicity of Se-Met in fishes remains poorly understood beyond the teratogenic effects. With that in mind, zebrafish embryos (2-hour post fertilization, hpf) were exposed to environmentally relevant concentrations of Se-Met (0, 5, 10, and 25 μg/L) until 120 hpf. We found that exposure to Se-Met (10 and 25 μg/L) induced significantly higher larval mortality and deformity rates compared to the control. In addition, our study also indicated that exposure to Se-Met (5 and/or 10 μg/L) impaired thigmotactic and reflexive behaviours in zebrafish larvae. Furthermore, Se-Met exposure induced a dose dependent increase in reactive oxygen species (ROS) generation and apoptosis, and dysregulation of protein expression and genes involved in the dopaminergic, serotonergic, and cholinergic pathways as well as neurogenesis in larval zebrafish. Overall, our findings provide important new insights into the neuro-behavioural effects of Se-Met exposure in embryonic zebrafish, further highlighting the risks by selenium contamination in aquatic ecosystems.

**31.BASIRAT T. LIADI-AZEEZ, JACK R. GRAY, & ERIK G. N. OLSON. Effects of sublethal dose of pesticides on visually guided behaviour of European Honeybees**. Department of Biology, University of Saskatchewan, Saskatoon, SK.

The European honeybees (Apis mellifera) are abundant and effective natural pollinators contributing enormously to mass production of agricultural crops. This group of insects possesses visual systems that are highly sensitive to motion, and efficiently enhance navigation within their complex environment with high precision. They rely on motion of visual elements (optic flow) within their environment to guide sophisticated behaviours and communication. Optic flow stimulates an innate response known as the optomotor response, which enables the bees to orient and maintain a straight course during flight. Agricultural chemicals and other stressors in the environment negatively impact the ability to engage in these economically relevant behaviours. These compounds are currently and persistently being used to treat seeds, despite their negative effect on non-target organisms like honeybees – and include the common neonicotinoids and the novel sulfoximines. Previous studies showed that these compounds impaired walking tracks associated with optomotor responses. This study is investigating the effects of two pesticides, imidacloprid and sulfoxaflor, on bee optomotor response in a newly designed 360° virtual reality arena. Initial analysis indicates effects on orientation behaviour and further analysis will examine specific effects on walking tracks and head orientation to stimuli that evoke robust behaviour in control bees.

**32.AYICIA N. NABIGON & PHILIP D. MCLOUGHLIN. Habitat Selection and Overlap for Boreal Plains Moose and White-tailed Deer in an Anthropogenically Disturbed Landscape.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

The Boreal Plains of Canada are experiencing extensive and interacting landscape and climate change. The northern range of white-tailed deer (Odocoileus virginianus) has typically been limited by the southern boundary of the Boreal Plains due to extreme winter cold and snow depths in the region. In recent years however, white-tailed deer have steadily expanded their range northward, the hypothesized result of less severe winter conditions and the increase in anthropogenic disturbance (ex. linear features, cutovers). This expansion has correlated with declines in populations of moose (Alces alces) across western Canada.

Where they overlap, white-tailed deer can present an indirect threat to moose by increasing the potential for contact with predators and also pathogens. We predict that female moose and white-tailed deer, as browsing ungulate prey species, will generally select habitats offering high nutrition leading to range overlap. Our main hypothesis for this research is that significant geographic and niche overlap exists between white-tailed deer and moose with disturbance acting as a primary overlap vector. This research serves to identify potential areas of range overlap and enable future research in matching moose mortality and recruitment to habitat selection and subsequent niche overlap.

**33.JOSEPH E.S. ABRAMS & JAMES D. BENSON. Estimation of Osmotically Active Fraction of Water in Bovine Granulosa Cells.** Department of Biology, University of Saskatchewan, Saskatoon, SK.

To improve cryopreservation protocols, several key biophysical parameters must be measured. The majority of cryopreservation damage modelling relies on population-level estimates of the osmotic response to cryoprotective agents and their corresponding extra- and inter-cellular concentrations over time. One of these critical parameters is the osmotically active fraction of water within cells. Despite the international use of cryopreserved ovarian tissue, to our knowledge, none of these critical values have been reported for any ovarian cell types beyond the oocyte. Here, we will present preliminary measures of the osmotically active fraction in granulosa cells in bovine tissue extrapolated using the best fit of the Boyle Van 't Hoff equation.

**34.Molecular analysis of MYB transcription factors in phloem-mediated phosphorus-starvation stress signaling in Arabidopsis**

**Abdul-Waseh Mumtaz1 & Byung-Kook Ham1.**

1Department of Biology, University of Saskatchewan, Saskatoon, SK.

Phosphorus (P) is one of major mineral nutrients for plant growth and physiology, and application of phosphate (Pi) fertilizer enables sustainable crop yield in agriculture. However, as the resource of Pi fertilizers is from the finite rock Pi, at current rate of Pi fertilizer consumption, P reserves will be depleted within around 80 years. And Pi-starvation stress causes significant decrease of yield potential in agriculture, therefore, it is crucial to understand P nutrition for enhancing P-use efficiency in crop plants. Various plant responses and adaptation have been studied against Pi-deficiency. It has been proposed that plant phloem serves as delivery conduit of various signaling molecules to sink tissues to maintain Pi homeostasis within a whole-plant level. Recent findings suggested that mobile MYB44 transcription factor (TF) functions as a negative regulator to control over Pi TRANSPORTER1 (PHT1) in Arabidopsis root and other Arabidopsis MYB44 homologs were responsive to Pi-starvation stress. Here, this study aims to elucidate the role of Arabidopsis MYB44 homologs in phloem-mediated long-distance signaling molecules to regulate Pi-starvation responses. We will discuss the function of MYB TFs in adaptive plant responses under Pi-limited stress conditions

**35.WINDSOR T. & MCLOUGHLIN P. The Ecology of the Saskatchewan Cougar (Puma concolor).** Department of Biology, University of Saskatchewan, Saskatoon, SK.

Amid public concerns over cougar encroachment into rural and urban areas, understanding Saskatchewan’s cougar populations is critical for effective management. Cougar’s elusive behaviour complicates conventional data collection methods without prior knowledge of their spatial distribution. I compiled and assessed reports of cougar occurrences from various sources to establish an a priori dataset. In Chapter 1, I compared report credibility organization collected datasets, observer qualifications, ecotype, environmental surroundings, cougar breeding habitat, and Conservation officer reports. For Chapter 2 I analyzed habitat utilization using six ecological factors and used Generalized Linear Modeling with the binomial function. I generated habitat suitability and wildlife corridor maps through ArcGIS Pro to assess the likelihood of occurrence. This study will inform the Saskatchewan Conservation Data Centre’s provincial cougar ranking cougars and aid the Saskatchewan Ministry of Environment in conservation and management strategies

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