Entomological Society of Alberta
Scientific Conference and Annual General Meeting

18-19 August 2023
Maple Leaf Room, Lister Centre
University of Alberta, Edmonton

Program and Abstract Book

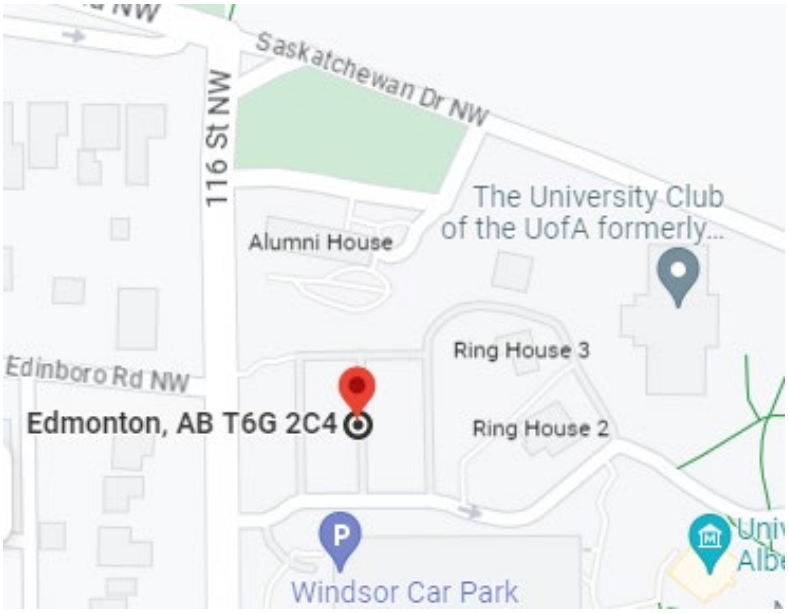
Overview of events

Activity colour-coding indicates event occurs on one day only	**Thursday 17 Aug**	**Friday 18 Aug - Maple Leaf Room, Lister Centre**	**Saturday 19 Aug - Maple Leaf Room, Lister Centre**
Registration and welcome	-	8:30 - 8:45 AM	9:00 - 9:15 AM
Talks I	-	8:45 -10 AM	9:00 - 9:15 AM
Morning coffee break	-	10-10:30 am	10:15 - 10:45 AM
Talks II	-	10:30 AM - noon	10:45 - 11:30 AM
Lunch (catered)	-	noon - 1:15 PM	noon - 1 PM
Talks III		1:15 - 3:00 PM	-
ESAB Board Meeting, Biol Sci Bldg, Centre Wing, CW313	1:30 - 3:00 PM	-	-
ESAB AGM	-	-	11:30 AM - early afternoon, including announcement of winner of Dustin Hartley Award for best student talk
Afternoon coffee break	-	3:00-3:30 PM	-
Talks IV	-	3:30 - 5:00 PM	-
Table reserved at the U of A University Club for pre-conference socializing	3:30 - 7:00 PM	-	-
Poster session	-	5-6 PM	-
Dinner	-	6-7 PM	-

Maps

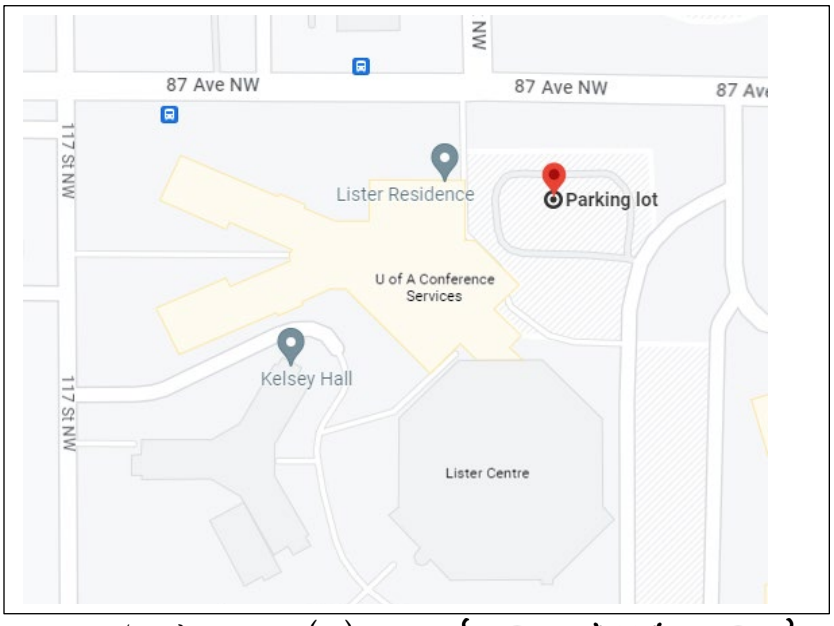
Maps of the North Campus of the University of Alberta are here:
https://www.ualberta.ca/maps.html?l=53.522898,-113.525575&z=15&campus=north_campus

(1) *University Club* (for socializing on Thursday 17 Aug, 3:30-7 pm):



University Club Parking Lot
(red pin at left)
University Club guests only
Hourly: $5.50
Evening: $5.50 (16:00-6:00)
Weekend/Stat: $5.50

(2) *Lister Centre*, Maple Leaf Room (for all events on Friday 18 and Saturday 19 Aug):



Lister Centre Parking Lot 'M'
(red pin at left)
Visitor parking
Hourly: $4.50
Daily Maximum: $15.00
Evening: $5.50 (17:30-06:00)

Presentation schedule for Friday 18 August

Talks:

8:45 am	Shawn Abraham	Adaptive evolution and phylogenomics of shore flies (Diptera: Ephydridae)
9:00 am	Leah Jackson	The Great Spangled Puzzle: genetic and phenotypic evolution within *Speyeria cybele*
9:15 am	Benny Acorn	Impact of linear anthropogenic disturbance on butterfly abundance, diversity, and movement in Canadian Boreal Forest
9:30 am	Jess Lario	Oribatid diversity, distribution, and dispersal along Alberta's North Saskatchewan River
9:45 am	Ilan Domnich	What's bugging you? A survey of entomology extension in agriculture in Alberta
10:00 am		Break
10:30 am	Maggie MacDonald	Using weevil and ground beetle data for secondary landscape analysis
10:45 am	Olajide Fatukasi	Bottom-up effect of *Rhizobium* strains on field pea growth and pea leaf weevil (*Sitona lineatus*) herbivory
11:00 am	Jose Correa Ramos	The impact of canola and field pea intercrops on the behaviour of the diamondback moth (*Putella xylostella*) and its specialist larval parasitoid *Diadegma insulare*
11:15 am	Carina Lopez	*Contarinia nasturtii-Arabidopsis thaliana*: a model system to study gall insect-plant interactions
11:30 am	Kanishka Senevirathna	Unveiling the genetic structure and invasion routes of wheat midge (*Sitodiplosis mosellana*) in the Canadian Prairies
11:45 am	Olivia deBourcier	Flight of the Water Boatman: how urban wetland proximity affects water boatman community composition in Edmonton
noon		Lunch
1:15 pm	Leanne Petro	Building an appetite: energetic condition and host orientation in the mountain pine beetle
1:30 pm	Aldo Ríos Martínez	Arthropod assemblages in canola fields in central Alberta: edge effects and sampling method complementarity
1:45 pm	Kirra Kent	The contributions of spiders as biological control agents in canola and an effort to improve retention rates without fluid preservatives
2:00 pm	Kristen Guelly	Reinvestigating monitoring strategies of wheat midge, *Sitodiplosis mosellana* (Diptera: Cecidomyiidae) on the Canadian prairies
2:15 pm	Emily Armfelt	Effects of water chemistry on dominant aquatic invertebrates in urban stormwater ponds
2:30 pm	Rassol Bahreini	Evaluating miticidal effects of active ingredients against *Varroa destructor*, ectoparasitic mites of honey bees, *Apis mellifera*
2:45 pm	Tianna Tanasichuk	Variation of comb cell size on *Apis mellifera* egg size - the influence of season and colony size on queen egg laying behaviour
3:00 pm		Break

3:30 pm	Hannah Kastelic	Bumblebees on flowers deter other flower visitors, but wasps and smaller bees may attract them
3:45 pm	Emilia Housch	Effects of pollinator abundance and body size on interference competition
4:00 pm	Rachel Pizante	Most metrics for pollinator floral preference produce viable results despite markedly differing predictions
4:15 pm	Caroline Liang	Parasite presence shapes the expression and magnitude of non-consumptive effects in cactophilic flies
4:30 pm	Lisa MacLeod	Spawn camping: non-consumptive effects of ectoparasitic exposure on fruit fly pupation
4:45 pm	Felix Sperling	Genome-wide markers show continental structuring and mitonuclear discordance in the forest tent caterpillar (*Malacosoma disstria* Hübner) (Lepidoptera: Lasiocampidae)

Poster session: 5-6 pm

Acacia Lechot	Morphological comparison of determinants of flight in mountain pine beetle populations in Alberta
Ashlyn Joseph	The shape of wings: geometric morphological comparison of male and female mountain pine beetle wings
Bennett Grappone	Habits, habitats, and taxonomy of carrion beetle associated mites (Mesostigmata: Parasitidae: *Poecilochirus* spp.) in Alberta
Ethan Goh	Effects of water salinity on freshwater snail abundance, size, taxonomic richness, and parasite load in urban stormwater ponds
Maren Vickers	Nematodes or Fungi, that is the question
Norbert Nguyen	Effects of seismic lines and subsequent mounding restoration treatments on wolf spider (Lycosidae) functional traits in Alberta peatlands
Onisty Woods	Oribatid mite diversity in the Fort Saskatchewan area
Sydney Harvey	Edge effects of boreal peatland seismic lines on wolf spider (Lycosidae) functional traits in Alberta
Wei Han Lau	Do broader heads make for a stronger bite? A biomechanical analysis of a putatively ecologically dimorphic trait in the northeastern pine sawyer beetle (Cerambycidae: *Monochamus notatus*)
Antonia Musso	Living in alonely world: population density dependent differences in flight capacity in the mountain pine beetle
Sharavari Kulkarni	Effect of temperature on the survival of striped flea beetles, *Phyllotreta striolata* (Coleopera: Chyrosmelidae)
Lumley & Giacobbo	Alberta's Oribatida: who's new in 2022
	THERE IS NO POSTER SESSION ON SATURDAY - MAKE SURE TO TAKE DOWN YOUR POSTERS BY THE END OF DINNER ON FRIDAY

Presentation schedule for Saturday August 19

Talks:

9:15 am	Antonia Musso	Think of the children! Female host preference and offspring performance of mountain pine beetle in lodgepole and jack pine
9:30 am	Asha Wijerathna	Factors influencing dispersal ability of the pea leaf weevil (Coleoptera: Curculionidae)
9:45 am	Priyanka Mittapelly	Monitoring insecticide susceptibility of flea beetles (Phyllotreta striolata & Phyllotreta cruciferae) on the Canadian prairies
10:00 am	Leah Flaherty	Independent and interactive effects of diet and disease-causing microsporidia on an outbreaking forest defoliator
10:15		Break
10:45 am	Maya Evenden	Effects of larval host and natural microsporidian infection on adult life history traits of the forest tent caterpillar (Lepidoptera: Lasiocampidae)
11:00 am	Alex Walton	Social stress resistance as facilitator of exceptional aging patterns in social insects
11:15 am	Heather Proctor	First report of the highly morphologically reduced subdermal mite *Neottialges caparti* (Astigmata: Hypoderatidae) infesting gannets in Atlantic Canada
11:30		AGM and lunch

Abstracts arranged alphabetically by first author

(A) talks

Adaptive evolution and phylogenomics of shore flies (Diptera: Ephydridae)

Abraham, S.M[1], Flynn, M.R. [2], Sperling, F.A.H.[1]

1. Dept. Biological Sciences, University of Alberta, Edmonton, AB
2. Dept. Mechanical Engineering, University of Alberta, Edmonton, AB

Shore flies (Ephydridae) are a diverse, taxonomically challenging group of higher flies that often inhabit extreme aquatic environments such as hot springs and hypersaline lakes. Shore fly lifestyles range from fully terrestrial to diving and foraging underwater as adults, and their morphological adaptations have generated multidisciplinary interest (e.g. mechanical engineering of life in hot water). Consequently, there is potential utility in developing a genetic framework to study their evolution. I am developing a reference genome for the species *Paracoenia bisetosa*, then using whole genome resequencing of specimens from other locations to examine population differences in *P. bisetosa* from high stress environments compared to more typical semiaquatic locations. This should reveal genetic clues to adaptive evolution and provide insight into the conservation ramifications of natural fragmentation on stress tolerant species' ranges. In addition, I am using scanning electron microscopy (SEM) to examine morphological differences in aquatically associated traits. From these data, I will perform phylogenomic analyses to determine evolutionary relationships within the family Ephydridae, which will be the first large scale molecular assessment of this ecologically diverse, extraordinarily adaptable group of insects.

Impact of linear anthropogenic disturbance on butterfly abundance, diversity, and movement in Canadian boreal forest

Acorn, B.H.G[1], Nelson, C.J.[1], Frost, C.M.[1]

1. Department of Renewable Resources, University of Alberta

Learning how invertebrates respond to disturbance is vital to understanding the impact of our anthropogenic development. In western Canada's boreal forests, linear anthropogenic corridors known as seismic lines associated with energy exploration are a common and wide-spread disturbance. Previous research indicates that seismic lines increase butterfly abundance and species diversity, and that at least one butterfly species has been shown to preferentially use seismic lines as travel corridors for dispersal within the boreal forest. We investigated further how butterfly abundance, species diversity, and movement respond to seismic lines. We compared butterfly abundance and diversity from pan traps on seismic lines (6 - 12 m wide) to traps placed 50 m into the adjacent interior forest, across 12 replicated sites. Malaise traps were also used to compare abundance and diversity, as well as measure butterfly movements on seismic lines and paired interior forests, with consideration for flight direction relative to the orientation of seismic lines. Abundance and richness of butterflies were 4.6 times higher and 1.3

times higher respectively, on seismic lines compared to the forest interior. Butterflies were approximately 6 times as abundant flying across seismic lines rather than along them, which is not consistent with previous research. Our data consisted mostly of *Celastrina lucia*, *Boloria freija*, and *Callophrys niphon*, indicating that these butterflies may have flight habits that differ from previously examined species. These results demonstrate that seismic lines are locally increasing butterfly abundance and diversity in boreal forests, though it is unclear what overall effect they have on movement.

Effects of water chemistry on dominant aquatic invertebrates in urban stormwater ponds

Armfelt, E.[1], DeBourcier, O.[1], Cobb, T.P.[1,2], Frost, C.[1]

1. Department of Renewable Resources, University of Alberta
2. Alberta Biodiversity Monitoring Institute, University of Alberta

Urban stormwater ponds (SWPs) are designed to reduce localized flooding and erosion, but there is a growing interest in their potential additional benefits for biodiversity. Similar to aquatic ecosystems outside the urban setting, water chemistry of SWPs is strongly influenced by factors surrounding the catchment basin. As a result, research is needed to better understand biodiversity responses to water chemistry in city environments. Ecosystem function is often similar within orders of aquatic invertebrates, and dominant taxa contribute the most to ecosystem function. Therefore, by studying water chemistry and its effect on dominant orders of aquatic invertebrates, we can gain insight into how different water chemistry may impact urban SWP systems via selecting for aquatic taxa with different functions. This study investigates relationships between the five most dominant aquatic invertebrate orders of each SWP (taxonomic identity, number of individuals, and proportion of total number of individuals made up by each of these orders), as well as several water chemistry parameters (conductivity, pH, phosphate load, and heavy metal content) in 33 SWPs in the city of Edmonton. At each SWP, a dip-net sample will be collected and then sorted, identified to the order level, and enumerated. We will also collect water samples for chemical analysis. By assessing the effects of differing water chemistry conditions on dominant orders of aquatic invertebrates in SWPs, our results will support residents, the City of Edmonton, and utilities companies (e.g., EPCOR) in making informed decisions about the management and future development of these urban ecosystems.

Evaluating miticidal effects of active ingredients against *Varroa destructor*, ectoparasitic mites of honey bees, *Apis mellifera*

Bahreini, R.[1], Hofmeyr, J. [1], Rueppell, O. [1]

1. Department of Biological Sciences, University of Alberta, Edmonton, Alberta, Canada

Varroa mites are threatening honey bee colony survivorship and the sustainability of beekeeping. This ectoparasite is presumed to be the most important biological factor in declining honey bee health and has contributed to colony mortality of more than 30% in Canada. Evolution of resistance and low efficacy of current control efforts have increased the demand for new

treatment tools that exhibit high efficacy and minimal adverse effects on honey bees. Based on previous investigations that assessed *Varroa* and worker bee mortality from potential miticides with different modes of action (Bahreini *et al.* 2020, 2022), we selected three promising candidates to test for lethal and sublethal effects on *Varroa* mites and different age cohorts of honey bees. Using a combination of lab and field experiments, we assessed mite mortality, miticidal efficacy, queen mortality, queen bee performance, worker bee and brood viability, as well as sublethal effects on queen weight and sperm viability. As predicted, toxicity to queens was dose-dependent in the laboratory bioassay. Queens, foragers, and nurses proved to be less susceptible than newly-emerged workers and drones, but caste differences varied among compounds. All three compounds resulted in a >80% laboratory mite mortality. Field studies indicated that queens are able to tolerate 1000 mg active ingredient of two compounds per nucleus hive. At this concentration, no adverse phenotypic adverse effects were measured on queens, brood or adult bee populations, while *Varroa* experienced significant mortality. Further research is required to test and optimize the delivery of the candidate compounds with the ultimate goal of the development of a new commercial Varroacide to sustain beekeeping.

The impact of canola and field pea intercrops on the behaviour of the diamondback moth (*Plutella xylostella*) and its specialist larval parasitoid, *Diadegma insulare*

Correa Ramos, J.M.[1], Kahlon, J.G.[2], Evenden, M.L[1].

1. Department of Biological Sciences, University of Alberta
2. Alberta Pulse Growers, Leduc

Agricultural intensification is a major driver of climate change and insect biodiversity loss: fertilizer production causes pollution, and large monocultures decrease important ecosystem services such as pest suppression. The diamondback moth is a major cosmopolitan insect pest of brassica crops, including canola, and is responsible for US$4-5 billion in losses per year worldwide. Management for this insect relies on chemical and biological control methods, however, insecticide resistance and ineffective biological control during outbreaks are challenges. Intercropping involves planting more than one crop in an area and is used in various agroecosystems worldwide. Intercropping can impact insect behaviour by altering the chemical and structural diversity of the agroecosystem, resulting in changes to pest suppression and performance. Additionally, intercropping can reduce fertilizer use through strategic companion crops. My research assesses the impacts of canola and field pea intercroppings on the oviposition and feeding behaviour of diamondback moth and *D. insulare*. I present here my thesis proposal in which I will use laboratory caged assays to assess the effect of pea-canola intercropping on diamondback moth behaviour and *Diadegma insulare* parasitism rates and host selection. The results of laboratory tests will be compared with field experiments conducted at commercial sites and experimental plot studies. My goal is to determine how peaola intercrops alter insect pest and natural enemy behaviour and to explore the potential use of intercrops as a sustainable management strategy for diamondback moths in Canada.

Flight of the Water Boatman: how urban wetland proximity affects water boatman community composition in Edmonton

deBourcier, O.[1], Acorn, J.H.[1], Frost, C.M.[1]
1. University of Alberta, Edmonton

Water boatmen (Corixidae) live in a variety of wetlands, including in cities. Some species, like *Callicorixa audeni, Sigara bicoloripennis*, and *Sigara decoratella,* conduct a spring migration from rivers to nearby wetlands where they breed, after which they return to the river. Water boatmen frequently inhabit stormwater ponds, which are utilized by cities to collect floodwater and runoff, allow sedimentation, and replace wildlife habitat. I will discuss how distance between water bodies impacts the abundance, diversity, and species richness of water boatmen. I will also assess how a pond's distance from the North Saskatchewan River influences the abundance of *Callicorixa audeni, Sigara bicoloripennis*, and *Sigara decoratella*. I hypothesize that there will be high abundance of migratory water boatmen in ponds near the river, but fewer in ponds along the city's edge. I also expect that ponds in areas with high wetland density will see greater water boatman diversity, abundance, and species richness given increased habitat for these species. I collected water boatmen from 35 stormwater ponds within Edmonton between July 27th, and August 15th, 2022, using a combination of baited bottle traps and dip netting, and identified them to species. Using GIS I calculated the distance between each pond and its surrounding wetlands to attain a value representing wetland connectivity. Additionally, I calculated each pond's minimum distance to the North Saskatchewan River. By better understanding how insects move around cities, planners can gain a better sense of how the location of stormwater ponds affects the insects living within them.

"What's Bugging You?", a survey of entomology extension in agriculture in Alberta

Domnich, I. [1], Evenden, M. [1], Mori, B. [1], Bulut, O.[1], Carcamo, H. [2]
1. University of Alberta
2. Agriculture and Agri-Food Canada

Recent changes to the structure of agriculture extension in Alberta have raised concerns of the effectiveness and efficiency of the agriculture extension system, which facilitates knowledge and technology exchange between researchers and producers. Discussions among key players have noted a disconnect between the organizations providing extension services and those using the information, the producers. This project aims to better understand the priorities of producers, the effectiveness of different extension efforts, and the best modes of communication for efficient exchange of information and technology by utilizing scientific surveys. We assess producer's views on issues related to entomological extension, their perceived effectiveness of entomological extension strategies in Alberta, and their preferred mode of receiving and accessing extension information. In addition, a second survey targets individuals that conduct entomological agricultural extension to better understand producer needs from the perspectives

of people working in the Alberta extension system. Data from this project will provide novel insight into the preferences and needs of producers, and provide guidance on the enhancement of current and development of future entomological extension efforts in agriculture in Alberta. Results of the surveys will be shown and discussed.

Effects of larval host and natural microsporidian infection on adult life history traits of the forest tent caterpillar (Lepidoptera: Lasiocampidae).

F. Preti[1], L. Flaherty[2], and M. L. Evenden[1*]

1. Department of Biological Sciences, University of Alberta, Edmonton, Alberta, T6G 2E9, Canada
2. Department of Biological Sciences, MacEwan University, Edmonton, Alberta, T5J 4S2, Canada

Host affiliation and entomopathogenic infections play a major role in shaping population dynamics of the forest tent caterpillar (FTC), *Malacosoma disstria* Hübner (Lepidoptera: Lasiocampidae). The effect of these individual factors has been studied, but it is unknown whether interactions between these factors significantly impact FTC life history traits. In the laboratory, we investigated a tritrophic interaction among larval diet, larval microsporidian infection, and FTC life history traits. Larvae were reared on foliage of trembling aspen, *Populus tremuloides* Michx (Malpighiales: Salicaceae) or sugar maple, *Acer saccharum* Marshall (Sapindales: Sapindaceae), or an artificial diet. Natural levels of microsporidian infection were assessed through microscopy. Microsporidian infection and larval diet individually, but not interactively, impacted FTC life history traits. Moths with high infection had smaller wings. Wings of FTC reared on fresh maple foliage were significantly smaller, had a higher probability of wing malformation, and a lower likelihood of cocoon production than FTC reared on other diets, but displayed higher overall survival. While microsporidian infection did not influence FTC-diet interactions, we provide further evidence on how these main effects may individually contribute to shaping FTC adult life history traits, and, ultimately, cyclical population dynamics. Future research should consider how larval mortality, distinct infection levels, and geographical source of FTC populations affect this tritrophic interaction.

Bottom-up effect of *Rhizobium* strains on field pea growth and pea leaf weevil (*Sitona lineatus*) herbivory

Fatukasi, O.I. 1, Wijerathna, A.1, Thilakarathna, M.**2**, Evenden, M.1

1. Department of Biological Sciences, University of Alberta
2. Department of Food and Nutrition, University of Alberta

Pea leaf weevil (*Sitona lineatus* L.) is a major pest of field peas and faba beans (Fabaceae). Economic damage to these legumes is caused by *S. lineatus* adults and larvae that feed on foliage and *Rhizobium* in root nodules, respectively. The host-specific *Rhizobium* fix atmospheric nitrogen and receive carbon nutrients in exchange. The *Rhizobium*-plant interaction may affect

plant growth and herbivory by influencing plant food quality and chemical defense. We tested the hypothesis that *Rhizobium*-field pea interactions influence the plant growth and feeding preference of the *S. lineatus* in the reproductive stage in March, 2023. Field pea seeds were grown at 22 °C (16L:8D) in cages for 3 (Experiment 1) and 5 (Experiment 2) weeks. Plants were grouped (n=10) into four treatments in each experiment: 1) inoculated with *Rhizobium leguminosarum* wild-type strain, WT3841; 2) inoculated with *Rhizobium leguminosarum* mutant strain, MT3940 that does not fix nitrogen; 3) treated with nitrogen; and 4) control plants that received only water. After 2 and 4 weeks, male (4) and female (4) *S. lineatus* were introduced into the cages and allowed to feed for 8 days. We observed that the shoot weight of plants treated with the wild-type *Rhizobium* was significantly greater than that of plants that received only water in Experiment 2. Also, the nodule number and dry weight of the *Rhizobium*-treated plants in Experiment 2 were greater than that of nitrogen treated plants. The growth effect on the wild and mutant-type plants could indicate an effect of the *Rhizobium* on field pea.

Independent and interactive effects of diet and disease-causing microsporidia on an outbreaking forest defoliator

Flaherty, L.[1], Preti, F.[2], Ishangulyyeva, G.[3], Erbilgin, N.[3], Evenden, M.L.[2]

1. Department of Biological Sciences, MacEwan University, Edmonton, Alberta
2. Department of Biological Sciences, University of Alberta, Edmonton, Alberta
3. Department of Renewable Resources, University of Alberta, Edmonton, Alberta

The diet of insect herbivores plays an important role in shaping interactions with pathogens, yet we know little about diet-mediated interactions between insects and microsporidia. Here, we examine interactions between an outbreaking forest defoliator, forest tent caterpillar (FTC), *Malacosoma disstria* Hübner (Lepidoptera: Lasiocampidae), its diet, and *Nosema* sp. microsporidia. We conducted two experiments where diet quality was manipulated by adding lyophilized aspen (*Populus tremuloides* Michaux) foliage, with known concentrations of secondary metabolites, to artificial diet. Diet quantity varied between fully fed and partially starved conditions. Microsporidia infection was either induced naturally or via experimental inoculation. We assessed FTC survival, infection rates, and sublethal effects on larval, pupal, and adult traits. In Experiment 1, the addition of foliage with low concentrations of secondary metabolites to diets (aspen-augmented diet) reduced microsporidia infection and increased FTC survival, relative to FTC fed a standard artificial diet. Diet quality and microsporidia spore load also interacted to influence adult wing traits. In Experiment 2, higher secondary metabolite concentrations in aspen-augmented diets decreased FTC survival, cocoon weight, and wing area, and increased development time. Results suggest that qualitative variation in diet can mediate interactions between FTC and microsporidia, but that this depends on the concentration of secondary metabolites in their diet. Low concentrations may increase resistance to infection, but high concentrations negatively affect FTC performance. Diet quantity, quality, and microsporidia infection also independently influenced FTC survival, and were associated with sublethal effects

on developmental, pupal, and adult traits that may influence the population dynamics and dispersal of this outbreaking forest defoliator.

Reinvestigating monitoring strategies of wheat midge, *Sitodiplosis mosellana* (Diptera: Cecidomyiidae) on the Canadian prairies

Guelly, K.N. [1], Mori, B.A. [1]

1. Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB, Canada

Wheat midge (*Sitodiplosis mosellana* Géhin) (Diptera: Cecidomyiidae), is a pest of economic importance in wheat (*Triticum aestivum* L.). Larval feeding damages the developing wheat kernel resulting in reduced grain grade, quality, and yield. As a result, effective wheat midge monitoring strategies are critical to the continued economic and environmental sustainability of Canadian cropping systems; however, current monitoring strategies rely on time-consuming in-field counts during the susceptible stage. Pheromone-baited traps can be used to help producers monitor wheat midge but currently only indicate presence or absence of adult midge. A recent study found the commonly used commercial monitoring pheromone lure had variable release rates, which impacted trap capture and the reliability of the pheromone-monitoring system. Here, we reinvestigate and compare the commonly used 'rubber septa' lures with newly created 'flex' lures. We will also compare Delta traps and Jackson traps to determine the best trap type for monitoring midge populations. In addition, we will compare emerging and overwintering wheat midge populations with male midge population densities to validate the efficacy of pheromone traps as a monitoring tool. Preliminary results show that more wheat midge are captured by the Jackson traps than the Delta traps. Moreover, more wheat midge are captured by the 'rubber septa' lures than the 'flex' lures, however release rates of the lures have yet to be determined. The quantification of release rates combined with results from emergence traps and soil core sample results will determine if pheromone trap capture is comparable to local midge population density.

Effects of pollinator abundance and body size on interference competition

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1. University of Alberta, Department of Renewable Resources, Edmonton, AB, Canada
2. Universita Degli Studi Di Padova, Padova, PD, Italy

Pollinators provide the ecosystem service of pollination as a community of many individuals within many species. Research on how biodiversity contributes to pollination function has typically focused on how pollinator species diversity relates to pollination success. However, less is known about how interference competition interactions between pollinators affect insect floral visitation and pollination services. In particular, higher abundance and trait divergence of simultaneous flower visitors may lead to more interference competition events and shorter floral visits on average. Using high frame rate video, we looked at the behavioral interactions of

pollinators on cow parsnip (*Heracleum maximum*) in Alberta, Canada. We tested whether sites with greater insect abundances would have more instances of interference competition events and if a greater proportion of these events resulted in an insect leaving the flower. We also tested if the body length of an insect affected its behavior. We found that as insect abundance increased, so did the number of interference competition interactions. Additionally, as body length increased, an insect was able to induce a reaction from another insect based solely on its presence, without having to approach. Body length also influenced how an insect responded to other insects, with insects that were smaller than another insect retreating, while insects that were larger than an approaching insect typically did not respond. Increased interference competition events reduce per capita floral visitation time, and therefore per capita pollination and foraging efficiency. Reduced pollination efficiency could have negative repercussions for agricultural systems, natural area and plant conservation.

The Great Spangled Puzzle: genetic and phenotypic evolution within *Speyeria cybele*

Jackson, L.G.[1], Campbell, E.O.[1,2], and Sperling, F.A.H.[1]

1. University of Alberta, Department of Biological Sciences, Edmonton, Alberta
2. Canadian Food Inspection Agency, Ottawa, Ontario

The Great Spangled Fritillary, *Speyeria cybele*, is a large nymphalid butterfly found across the Nearctic. This butterfly shows wing colour-pattern differences that could be the result of isolation and admixture events along zones of contact and interaction. In particular, the Rocky Mountains could be a zone of contact between western and eastern populations, but whether broadly eastern and western populations are sympatric or allopatric is unresolved. My project uses whole-genome single nucleotide polymorphisms and mitochondrial sequencing to determine the population genetic structure of *S. cybele*, and asks if populations show admixture between clusters in regions where western and eastern populations co-occur. The identified genetic clusters of *S. cybele* will guide future research into the correspondence of genetics and morphological patterns, including the relationship of these characters to the landscape.

Bumblebees on flowers deter other flower visitors, but wasps and smaller bees may attract them

Kastelic, H.[1], Acorn, J. H.[1], Pizante, R.[1], Jimenez Roncancio, I.[1], Frost, C. M.[1]

1. University of Alberta, Edmonton

Pollinators provide valuable ecosystem services to crops, yet there is little published information examining how flower visitation is influenced by interactions among insects. Predator-pollinator and pollinator-pollinator interactions are especially understudied. In addition, habitat may modify pollinator behaviour, as both pollinator density and species composition can vary with dominant vegetation. The objectives of this project were to monitor pollinator flower visitation in response to the presence of hymenopteran competitors and predators on flowers. We investigated whether responses varied by habitat type and responding insect taxon, and whether responses

extended to other flowers in the patch. At four sites at each of two habitat types (treed and herbaceous crop margins), we recorded 10-minute videos to observe pollinator responses to the following: dead *Bombus frigidus, Hylaeus basalis, Vespula acadica* or *Vespula pensylvanica*, and a control (bare pins, but no insects), on Canada thistle flowers (*Cirsium arvense*). Upon scoring the footage, we found that the *Bombus frigidus* treatment had a strong deterrent effect on flower visitation for both treatment flowers and other flowers in the patch, with less visitation than the control. In contrast, the *Vespula* spp. and *Hylaeus basalis* treatments produced a weaker, positive effect, wherein more insects visited flowers occupied by these species than the control flowers, indicating that their presence may have an attractive effect. Examining insect behavioural interactions can tell us more about how pollinators function within communities, both in terms of how interactions can impact insect contributions to pollination in agricultural settings and their own individual foraging success.

The contributions of spiders as biological control agents in canola and an effort to improve retention rates without fluid preservatives

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Spiders make up a large proportion of agroecosystem predators, yet little is understood about their specific roles, community composition, and predator-prey interactions in these systems. Understanding the precise nature of these relationships can inform management decisions to effectively use spiders as naturally occurring biological control agents against economic pest species. To characterize these interactions, taxonomic diversity will be assessed. In the previous two sampling years few spider representatives were captured in pitfall traps relative to other predators, despite spiders being observed in the field. This may be due to low abundance, spiders' propensity for escape, or the niche of large predators being filled by other groups. To overcome this, a modified pitfall trap design is currently being tested, with the goal of improving the retention rates of all spiders, particularly those smaller than 5 mm, without using a fluid preservative. Traps have been modified with the application of fluon and use glass beads as a substrate to provide non-abrasive, light, and reusable ground cover for captured specimens during the 24 hour period. Taken collectively, this research will further our understanding of the differential niche contributions of representative spider species abundant in the canola agroecosystem. Additionally, the modified trapping regime has promising preliminary results for improving the passive-live collection of challenging-to-capture-alive taxa, including representatives from the families: Linyphiidae, Thomisidae and Titanoecidae.

Oribatid diversity, distribution, and dispersal along Alberta's North Saskatchewan River

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River systems, such as the North Saskatchewan River (NSR), are complex networks connecting large portions of land. These networks provide a mechanism for long-range dispersal that could be used by many organisms to travel great distances. Research has focused on aquatic organisms or seed dispersal; limited research has focused on terrestrial organisms using these systems for passive dispersal, such as oribatid mites. These terrestrial arthropods are typically found in soil environments and may be important indicators of soil health. Several species of oribatid mites have been found only in the NSR valley, within and downstream of Edmonton. While this pattern could be due to limited research and they may be an endemic species to central Alberta, it could also be an indication of introduction through urban run-off from Edmonton. This project aims to determine the diversity of species found within the NSR across the province of Alberta and determine if this pattern suggests oribatid mites could be using the river for dispersal. Soil samples are collected upstream, downstream, and within Edmonton, and then invertebrates are extracted using modified Tullgren funnels prior to using microscopy to sort and identify oribatid mites to species level. The results of samples sorted to date show a variety of species along the NSR in various habitat types and characteristics. The data collected in this study can be applied to other terrestrial organisms that may be using this long-distance mode of transportation to new habitats.

Parasite presence shapes the expression and magnitude of non-consumptive effects in cactophilic flies

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Parasites, like predators, instill fear and cause non-consumptive effects (NCEs) in potential hosts. NCEs include changes in behaviour, morphology, and physiology. This ecology of fear is well-exemplified in a fly-mite system. In the Sonoran Desert, *Drosophila nigrospiracula* is parasitized by *Macrocheles subbadius*. When chronically exposed to their ectoparasite, fly fitness is decreased even with no possibility of infection. A previous experiment testing behavioural trade-offs between feeding and grooming found a strong interaction between previous and current parasite exposure: flies that were pre-exposed to mites (but never infected) showed increased feeding in the presence of mites, suggesting compensatory feeding. How does real danger (flies that have experienced infection) modulate fly behaviour in response to parasites? I hypothesized that, to avoid re-infection, previously infected flies will increase defensive behaviours (grooming, jumping and tarsal flicking) compared to parasite-naïve flies in the presence of mites. Flies were first infected with mites, then the mites were removed after successful attachment. Afterwards, feeding, grooming, ambulation, resting, jumping and tarsal flicking were measured in a petri dish arena with or without mites. In the presence of mites, flies

increased defensive (grooming, jumping, tarsal flicking) and ambulatory behaviour whereas resting decreased, whereas feeding was not altered. An overall increase in costly behaviours can potentially trade-off with reproductive success. These changes in time allocation can have long lasting effects on individual fitness and population dynamics.

Contarinia nasturtii-Arabidopsis thaliana: a model system to study gall insect-plant interactions

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Invasive species are a threat to biodiversity and ecosystem function. In Canada, the invasive swede midge, *Contarinia nasturtii* (Diptera: Cecidomyiidae), threatens agricultural production of Brassicaceae plants. Midge larvae manipulate their host plant to create galls—abnormal plant tissue deformations produced in response to salivary secretions—which can cause yield losses up to 85% in Brassicaceae crops. A model system to understand the mechanisms involved in host plant selection and manipulation by this insect pest would enhance our knowledge of this pest and possible management strategies. This project aims to develop a model system with *C. nasturtii* and *Arabidopsis thaliana* wherein insect-plant interactions can be thoroughly studied. This unique system will explore the plant signaling pathways and defense responses that are manipulated by the midge. Specifically, the objectives of this project are 1) To investigate the life cycle and biology of *C. nasturtii* on *A. thaliana*, and 2) To investigate the manipulation of host plant pathways using defense-related mutant lines of *A. thaliana* relevant to insect-plant interactions. These objectives will be achieved by using a series of no-choice tests with *A. thaliana* at three distinct growth stages, and infesting plants at each growth stage separately with five densities of adult female midges. No-choice tests will be repeated using identical plant growth stages and midge densities with mutant lines of *A. thaliana*. Ultimately, this study will begin to elucidate the mechanisms of midge manipulation of the plant and the role of plant defense compounds in response to *C. nasturtii*.

Using weevil and ground beetle data for secondary landscape analysis

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The pea leaf weevil (PLW), *Sitona lineatus* L. (Coleoptera: Curculionidae), is an invasive pest of field pea, *Pisum sativum* L. (Fabaceae), and faba bean, *Vicia faba* L. (Fabaceae), that has established populations in the Canadian Prairie Provinces. Semiochemical-based monitoring can detect *S. lineatus* population spread and local movements but results in significant ground beetle bycatch. Due to its extensive spatial and temporal coverage, bycatch data holds valuable potential for application in landscape ecology studies. Various abiotic factors and landscape variables can influence species distribution and abundance in agroecosystems. Here, we

investigate the influence of abiotic factors, such as rainfall and temperature, on weevil and ground beetle spatial distribution using data collected in 2017-18. Additionally, we test the significance of proximity to non-crop habitats and weevil overwintering sites, specifically forest edges and alfalfa fields, on weevil and ground beetle spatial distribution. Non-crop habitats may provide vital resources like shelter, alternative food resources, and overwintering and oviposition sites. This research leverages bycatch data to gain ecological insights to examine landscape influences on pest and beneficial insect populations.

Spawn camping: non-consumptive effects of ectoparasitic exposure on fruit fly pupation

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Non-consumptive effects (NCEs) arise in the presence of a predator or parasite even when death or infection does not occur and include changes to host behaviour, physiology, or morphology. Previous research has offered evidence of NCEs of parasites on adult hosts, but little is known about the effects on other life stages. Using the *Drosophila nigrospiracula – Macrocheles subbadius* system, I tested how exposing fly pupa to ectoparasitic mites (*sans* infection) either in cages or through direct contact affects pupa development and survival (eclosion success). Currently, the mites are not known to infect or consume the pupal stage, which makes this stage of interest. The duration of pupation, emergence of adults, and wing abnormalities were recorded. Preliminary data suggests a decrease in successful emergence among exposed pupa, with no effect on duration of pupation. Investigating the NCEs of parasites at various life stages of their hosts is important in understanding the ecology of fear and its total impact on host population dynamics and infectious diseases.

Monitoring insecticide susceptibility of flea beetles (*Phyllotreta striolata* & *Phyllotreta cruciferae*) on the Canadian prairies

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Numerous insects damage canola (*Brassica napus* and *B. rapa*) grown on the Canadian Prairies. Among these, the crucifer (*Phyllotreta cruciferae* (Goeze)) and striped flea beetle (*Phyllotreta striolata* (F.)) are chronic early season pests of canola. To manage flea beetle populations, almost all canola is grown from insecticide-treated seed. The most commonly used insecticides for seed treatment are neonicotinoids (first generation flea beetle control) and non-neonicotinoids (second generation flea beetle control). Occasionally, regardless of seed treatment, undesirable losses can still occur requiring additional foliar insecticide applications often with pyrethroids (e.g., active ingredient: deltamethrin). Excessive use of insecticides can potentially have a negative effect on non-target organisms and may lead to insecticide resistance. Previous studies have shown that crucifer flea beetles are more susceptible to neonicotinoid seed treatment compared to striped

flea beetles. In this study, we used laboratory bioassays to determine the current susceptibility of flea beetles to the first- and second-generation seed treatment insecticides and foliar pyrethroids. These results overall will provide both basic and applied knowledge on flea beetles which can be exploited to enhance sustainable pest management strategies.

Think of the children! Female host preference and offspring performance of mountain pine beetle in lodgepole and jack pines

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Mountain pine beetle (*Dendroctonus ponderosae* Hopkins; MPB) can attack and reproduce in as many as 17 different pine species with variable success. In mixed species stands, MPB does not attack all species equally and shows a preference for some species over others. Due to climate change mediated range expansion, MPB is encountering the new host species jack pine which is evolutionarily naïve to MPB attack. If more susceptible naïve hosts provide an advantage for offspring, they could be preferred if MPB are given the option to host switch. Host preference could also be based on natal host experience and MPB will prefer the host species that they grew up in and may not host switch despite the potential advantage. As females are the colonizing sex, we tested female MPB preference for lodgepole and jack pines using walking olfactometer bioassays and quantified the time female beetles spent in proximity to volatiles from lodgepole and jack pine phloem. In performance experiments we introduced MPB pairs to cut logs of either the same or opposite species as their natal host and measured parental success by quantifying galleries and offspring performance by measuring body size and lipid content. Mountain pine beetles' spread through Canada's boreal forest presents a risk to eastern North American pine species. Understanding how MPB performs during a host switch and which species it prefers will aid in predicting spread potential and the behaviour of MPB at the interface of lodgepole and jack pine.

Building an appetite: energetic condition and host orientation in the mountain pine beetle

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Global climate change is a significant driver of range expansion of various taxa, including the mountain pine beetle (*Dendroctonus ponderosae*; MPB) that has recently expanded its range into Alberta . Dispersal and host colonization dictate the spread and establishment of MPB populations. Energy budgeting results in trade-offs between dispersal, host colonization and other life history traits. It is hypothesized that MPB require lipid oxidation through flight exercise in order to respond to the semiochemicals involved in the host colonization process. We tested the effect of energetic condition of MPB on subsequent response to host volatile and conspecific aggregation pheromone. Beetles experienced one of three treatments that resulted in

different levels of body condition: 1) a 23 h flight period; 2) 23 h at room temperature, but restricted from flying; 3) 23 h at 4°C, and restricted from flying. Following treatment, we assayed individuals for response to semiochemicals in a 4-way olfactometer before assessing body condition using fat and body size measurements. Beetles with low body condition had the highest behavioural response to host volatiles. Treatment had no direct effect on the subsequent response of beetles to host volatiles, indicating that energetic condition rather than activity type drives response to chemical cues in the environment. High receptivity of beetles at low energetic states to host volatiles may contribute to polyphenic flight behaviours in the MPB and assist in the development of models to predict continued spread across the boreal forest.

Most metrics for pollinator floral preference produce viable results despite markedly differing predictions

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With limited resources, it is important to ensure that conservation measures are effective. For pollinator conservation, this means determining the best way to select which forb species to include in wildflower plantings. Many researchers have developed preference metrics; mathematical ways of using flower visitation data to determine which flowers will attract the most pollinators. However, when we compared five of these metrics on a flower visitation dataset collected at the University of Alberta's Mattheis Research Ranch (MRR), we found that the metrics returned wildly dissimilar results. In a follow-up test of the metrics, we selected the five most and five least preferred flowers for each metric and collected those species from MRR. In June and July 2023, we conducted flower visitation surveys in which we arranged blooming species in equal abundance and then observed each species for 10 minutes while collecting any insect that visited the flowers. We tested the metrics at MRR (three sites) and in Edmonton (two sites) to see how flower preferences compare in different ecoregions with different insect communities. Surprisingly, we found that only one of the metrics incorrectly predicted which flowers would receive more visits than others and that the metric we predicted would work the worst worked the best. Altogether, these results demonstrate that these metrics are a useful starting point for planning wildflower plantings for pollinator conservation, and that more than one metric should be used in conjunction with expert knowledge and experience.

First report of the highly morphologically reduced subdermal mite *Neottialges caparti* (Astigmata: Hypoderatidae) infesting gannets in Atlantic Canada.

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Deutonymphs of the mite family Hypoderatidae are subdermal parasites of vertebrates, primarily birds. They are highly morphologically reduced and resemble grains of rice. When known, adults and other juvenile stages (larva, tritonymph) of hypoderatids occupy the nests of their hosts. Here we report the presence of deutonymphs of *Neottialges caparti* Fain in the subcuticular tissues of the Northern Gannet (*Morus bassanus* (L.)) from Atlantic Canadian waters. We observed mites in 39% of 90 birds whose skin samples were examined microscopically. Our observations represent both the first record of *N. caparti* in Northern Gannets from the western North Atlantic region and the second report of *N. caparti* since its initial description in 1967 from two Northern Gannets in Belgium. Adults and juvenile stages other than deutonymphs are yet to be observed.

Arthropod assemblages in canola fields in central Alberta: edge effects and sampling method complementarity

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Habitat edges are often associated with increased taxonomic and functional diversity. In agroecosystems, semi-natural vegetation edges surrounding crop fields may increase natural enemy diversity and abundance through the provision of undisturbed refuges, overwintering sites, and alternative food resources. A field survey was conducted to determine the composition of arthropod assemblages in canola fields in central Alberta, its changes throughout the season, and potential edge effects. Pitfall traps, yellow sticky cards, and sweep nets were used to collect arthropods along semi-natural vegetation edges and the interior of five canola fields during three collecting dates. Collected arthropods were identified to family, and richness and diversity of different functional groups were compared between the edge and interior of the field. Joint species distribution modelling was used to determine the influence of collecting date, within-field location, and sampling technique on arthropod assemblage composition, as well as to highlight possible associations between individual families and these factors. Finally, sampling method complementarity was explored in terms of family richness. Results from this study will provide detailed information on the taxonomic and functional composition of arthropod assemblages in canola fields in central Alberta.

Unveiling the genetic structure and invasion routes of wheat midge (*Sitodiplosis mosellana*) in the Canadian Prairies

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Invasive pest species pose a significant threat to agriculture, causing substantial crop damage and increasing production costs. Monitoring the movement and potential routes of these pests is crucial for effective pest management. Population genetic studies provide valuable insights into insect movements and the identification of potential invasion corridors. This study aims to reconstruct the invasion routes of orange wheat blossom midge (*Sitodiplosis mosellana*), a destructive invasive wheat (*Triticum aestivum L.*) pest on the Canadian Prairies and determine its origin in North America. A genome-wide population structure analysis through a restriction site-associated DNA sequencing (RADSeq) approach was used to examine population structure. Preliminary findings indicate genetic similarity among wheat midge populations from the Prairies, forming a cohesive group. Notably, samples from Quebec represent a separate, genetically distinct group as do populations from Montana in the northern United States. Although these results are preliminary, they suggest the existence of diverse wheat midge populations across North America and potential interconnectedness on the Prairies. The population structure observed could indicate multiple independent invasion events for wheat midge across North America. Further analysis involving a larger and more diverse sample set is necessary to draw definitive conclusions. Understanding the genetic diversity and connectivity of wheat midge populations is crucial for effective pest management strategies, including the utilization of midge-tolerant wheat cultivars and targeted insecticide use. These approaches can exert selective pressure on midge populations, aiding in their control and mitigating crop damage.

Genome-wide markers show continental structuring and mitonuclear discordance in the forest tent caterpillar (*Malacosoma disstria* Hübner) (Lepidoptera: Lasiocampidae)

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The forest tent caterpillar, *Malacosoma disstria* Hübner, is an irruptive forest pest found throughout North America. Widespread species are exposed to historical and contemporary processes that are not uniform and can generate regionally distinct genomic variation. Previous analyses used a short mitochondrial fragment to infer broad-scale phylogeographic patterns in *M. disstria,* whereas nuclear markers have only been applied in a smaller geographic region. In this study we quantified *M. disstria* population variation with genome-wide single nucleotide

polymorphisms and a fragment of cytochrome c oxidase from mitochondrial DNA. Using highly variable genome-wide markers, we resolved clear genomic differences among populations of *M. disstria* east of the Rocky Mountains that were not detected using mitochondrial variation alone. We also did not detect host associated divergence in our genomic or mitochondrial data. Our results highlight the utility of genome-wide markers to resolve intraspecific population structure within a widespread species and support the need for further biogeographic sampling of this forest insect pest.

Variation of comb cell size on *Apis mellifera* egg size - the influence of season and colony size on queen egg laying behaviour

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Size influences all organisms no matter what species. It determines how it will maintain body heat, protect itselves from predators, the amount of offspring it needs to produce and several other critical factors for its survival. Organisms within social groups, such as social insect colonies, are influenced by their body size when navigating daily tasks. These organisms depend on each other and often exhibit division of labor. This labor could not be possible without the Queen constantly laying eggs to turn into fellow contributing members of the colony. The contribution of each member is contingent on their gender which is determined by the Queen. Drone or male eggs are laid in larger honeycomb frames in comparison to the female worker bees although when comparing hive contribution worker bees are far more significant. We hypothesized that the difference in frame size is proportional to the size of the eggs. We tested this by using 3D-printed variable comb and having a Queen lay worker eggs on the comb. The accumulated data was complemented by our findings from the previous summer to create a better insight into the influence the environment has on size. The results are discussed in the context of the rules that organize the complex societies of social insects and potentially other systems with efficiency tactics.

Social stress resistance as facilitator of exceptional aging patterns in social insects

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Aging and stress have an intimate relationship across a wide variety of organisms. Generally, resistance to and avoidance of stress confer increased longevity. Honey bees and other social insects have two main advantages over solitary species to avoid or resist stress: Individuals can directly help each other by resource or information transfer, and they cooperatively control parts of their environment by nest construction. These benefits have been recognized in the context of pathogen and parasite stress as the concept of social immunity, which has been extensively studied. However, we argue here that the concept be more generally defined as social stress resistance, including group-level defenses against potentially all biotic and abiotic stressors. We explore examples and discuss how much individual and colony-level differences in life

expectancy can be attributed to social versus individual stress resistance. We reason that social stress resistance may have allowed individual life history optimization with reduced individual-level defenses. Lastly, we speculate on individual and colony-level outcomes of manipulations of social stress resistance mechanisms with implications for understanding social evolution and improving honey bee health.

Factors influencing dispersal ability of the pea leaf weevil (Coleoptera: Curculionidae)

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The pea leaf weevil (*Sitona lineatus*) is a significant pest of field peas (*Pisum sativum*) and faba beans (*Vicia faba*) that causes economic damage through larval feeding on root nodules and adult foliage feeding. Both male and female adult weevils respond to aggregation pheromone in the spring and fall activity periods. A pheromone-baited trapping system for monitoring and predicting pea leaf weevil distribution requires an estimation of the area monitored per trap and the distance that weevils disperse. We investigated the dispersal capacity of spring and fall weevils and the impact of host volatiles on dispersal. Flight mill experiments failed to accurately measure dispersal, but walking bioassays provided insights into weevil movement. Spring weevils dispersed farther at higher speeds than fall weevils. Males dispersed farther than females in the spring, but there were no sex-based differences in the fall. Female walking distance was not affected by host volatiles in spring, but in fall, they walked farther in clean air than in the presence of host material. Our results suggest that pheromone-baited traps should be deployed over a wide area in the spring to effectively monitor weevils with high dispersal capacity. Furthermore, the local crop cover may differently influence weevil distribution in both activity periods. These findings contribute valuable insights for the development of targeted strategies to monitor and manage pea leaf weevils in western Canadian cropping systems.

(B) Posters

Effects of water salinity on freshwater snail abundance, size, taxonomic richness, and parasite load in urban stormwater ponds

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Urban ponds support levels of aquatic invertebrate biodiversity equivalent to natural wetlands. However, winter use of road salt may threaten aquatic invertebrates that are sensitive to changes in water chemistry. Freshwater snails are ubiquitous in urban ponds and many host trematode parasites which are parasitic flatworms that have complex life cycles with snails as their first intermediate host and birds as their definitive host. These parasites are also linked to human health concerns such as cercarial dermatitis ("swimmers itch"). We investigated how increased water salinity affects snail abundance, size, taxonomic richness, and parasite load in 33 urban ponds in Edmonton, Alberta. At each urban pond, snails were collected using three pairs of bottle traps (baited with cat food and glow sticks) placed at three different locations near the shoreline within 4-5 m and depth ≤ 1 m. Bottle traps were left for a period of 24 hrs and snail sampling was supplemented during visits to each site with dip-net collection. In the laboratory, snails were sorted, identified to species, measured, and placed overnight in artificial spring water to shed trematode parasites. These data will be used to examine relationships between water salinity, snail species prevalence and parasite load to support City of Edmonton officials and residents in making informed decisions regarding the management of road salt applications near urban ponds that may influence biodiversity, food-web dynamics and human health issues such as "swimmer's itch".

Habits, habitats, and taxonomy of carrion beetle associated mites (Mesostigmata: Parasitidae: *Poecilochirus* spp.) in Alberta

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Burying beetles (Silphidae: *Nicrophorus* spp.) are common scavengers of small vertebrate carcasses worldwide. When a breeding pair of Nicrophorus arrives at a small carcass, they bury the carrion in a specially constructed underground chamber and feed it to their offspring. These beetles are host to many genera of phoretic mites, with the most well-researched being Poecilochirus (Mesostigmata: Parasitidae). The relationship between Nicrophorus and Poecilochirus is generally mutualistic, with the mites hunting fly eggs and larvae that would otherwise compete with the beetles. Currently, all *Poecilochirus* associated with burying beetles in North America are assigned to either the *P. carabi* species complex, the *P. monospinosus* species complex, or the species *P. subterraneus*. Both complexes cover wide geographic and

host-species ranges. Recent work has shown that each of these clades contains several distinct genetic clusters that may correspond to undescribed species. Interestingly, members of each lineage can be found on multiple beetle species that are not closely related to each other, and some beetles carry mites from multiple genetic clusters. With cospeciation between beetles and their mites seeming unlikely, my research aims to investigate potential origins of genetic isolation between these genetic clusters and to describe any cryptic species that they might contain. I hypothesize that differences in mite ecology rather than host phylogeny are driving mite populations to diverge, with closely related mites being found on behaviorally similar beetles rather than on closely related ones.

Edge effects of boreal peatland seismic lines on wolf spider (Lycosidae) functional traits in Alberta

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Seismic lines are linear clearings through forestlands created during oil and gas exploration projects and have become prominent features in Alberta, contributing to forest fragmentation. Seismic lines dissecting peatlands are especially problematic as most do not regenerate tree cover naturally, influencing the local distribution of species and associated ecosystem functions. There is limited research assessing the edge effects of a disturbance on arthropod functional traits. Wolf spiders (Lycosidae) are prominent arthropods across peatlands in disturbed and undisturbed forested areas and play a critical role in ecosystem function through predation habits. Thus, this study seeks to assess whether wolf spider functional traits at both the family and species level vary with distance from the seismic line into the adjacent peatland. Spiders were collected in June 2023 using pitfall traps at 0m, 25m, and 75m from the seismic line at five locations near Cristina Lake in NE Alberta. The length and width of spider carapace, chelicerae and right anterior femur will be measured, as these functional traits relate to predation abilities. We hypothesize a positive relationship between spider size and proximity to the seismic line edge due to the changes in available prey species. Open areas may provide increased predation opportunities; therefore, we predict spider carapace, chelicerae, and femur size will increase with increasing proximity to a seismic line edge. Analyzing the edge effects on wolf spider functional traits will enhance understanding of the role of spider predation in ecosystem function.

The shape of beetles: analyzing sexual dimorphisms in mountain pine beetle (*Dendroctonus ponderosae* Hopkins) using geometric morphometrics

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Geometric morphometrics is a method of studying shape variation in two and three dimensions. This landmark-based analysis is primarily used in paleontology and is underutilized in the field of entomology. In this study, we examine sexual dimorphisms in mountain pine beetles (MPB; *Dendroctonus ponderosae* Hopkins) using geometric morphometrics. Researchers anecdotally report that MPB males and females have different thorax shapes, but these descriptions are not quantified and vague. While MPB males and females fly similar distances and speeds, recent analyses of MPB flight using measurements of fluid dynamics uncovered differences in the Strouhal number (propulsion) between male and female beetles. This research aims to better understand MPB sexual dimorphism in thorax and wing shape that could affect aspects of MPB biology such as flight. We photographed the pronotum and right wing of ten male and ten female MPB using a stereomicroscope and a cell phone camera. We performed linear measurements and recorded four thorax landmarks and 18 wing landmarks on each photograph using the open-source program, JMorph. The landmarks were analyzed using a Procrustes analysis (*geomorph* in R) that determined the relative shape produced by the landmarks and eliminated any size difference. Our measurements in JMorph confirmed the well-known difference in size between males and females but surprisingly the Procrustes analysis also shows a separation in relative shape of both the thorax and wings of males and females. This study shows that geometric morphometrics is viable method for investigating differences in shapes within an insect species.

Effect of temperature on the survival of striped flea beetles, *Phyllotreta striolata* (Coleopera: Chyrosmelidae)

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Flea beetles (Coleoptera: Chrysomelidae) in canola are serious pests that cause significant yield loss. The striped flea beetle (*Phyllotreta striolata* (Fab.)) and crucifer flea beetle (*Phyllotreta cruciferae* (Goeze)) are dominant species in Alberta. Striped flea beetles are more abundant in northern ecoregions of the Prairies. The effect of different temperatures on egg hatch and developmental time (from egg to adult) were studied. The mean number of days to egg hatch was longest at the lowest temperature tested of 15°C (16.1 ± 0.86 days) which differed significantly from that at 20°C (12.3 ± 1.01 days) and 25°C (6.2 ± 0.86 days). Whereas the shortest time to egg hatch was recorded at 30°C (4.96 ± 0.86 days) which differed significantly from that at 15°C and 20°C but not from that at 25°C. Further, rearing temperature (15°, 20°, 25°, 30°C) of the striped flea beetle impacted developmental time and survival. Temperature significantly impacted the mean developmental time from egg to adult emergence ($F_{2,17}= 14.62$, $p<0.05$). The

mean developmental time at 20°C was the longest (49.3 ± 6.91 days), and developmental time decreased with an increase in temperature. Developmental time did not differ when beetles were reared at 25°C or 30°C (29.4 ± 3.81 days, and 24.3 ± 2.62 days, respectively).

Do broader heads make for a stronger bite? A biomechanical analysis of a putatively ecologically dimorphic trait in the northeastern pine sawyer beetle (Cerambycidae: *Monochamus notatus*)

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Although the diverse array of sexual dimorphism in nature are shaped by sexual selection, some instead arise as a result of divergent patterns of natural selection on homologous traits in ecologically differentiated males and females. Biomechanical studies of such ecological dimorphisms can clarify how differences in performance between the sexes can be shaped by a variation in ecologically relevant modes of behaviour. In this study, I examined the trait of bite force in *Monochamus notatus*, a species of longhorn beetles in which the capacity to chew oviposition slits is a distinctive aspect of female reproductive behaviour. Female *M. notatus* are known to have wider heads than males, and I hypothesized that this represents an ecological dimorphism resulting from the different ways in which the sexes utilize their mandibles. Through an analysis of external morphology and microtomographic scans of specimen heads, I tested whether morphological differences are associated with bite force divergence between males and females. I measured the mechanical advantage of the mandibular lever system, muscle fibre length, and muscle volume to approximate the trait of bite force from ethanol-preserved specimens. My initial results suggest that at small body sizes, females may be subject to stronger selection on bite force than males to meet functional demands related to oviposition slit chewing.

Morphological comparison of determinants of flight in mountain pine beetle populations in Alberta

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The mountain pine beetle (*Dendroctonus ponderosae,* MPB) is the most damaging pest in Western North America. This species recently underwent range expansion into Alberta aided by climate change. Dispersal capacity, and therefore spread across the landscape, is determined in part by physical characteristics of individuals. Wing loading, body size, wing morphology and energetic condition can assist in estimates of an individual's dispersal capacity. We sought to sample MPB populations in Alberta for these important flight determinants. In Summer 2022, we collected MPB from paired funnel traps in 5 locations across Alberta. We measured body length, pronotum width and lipid levels. Wing dissections were also performed to capture wing morphology. We present a comparison of these flight determinants across the expanded range in

Alberta by sex and seasonal flight period. The result of this study will help inform models for spread risk, and allow for better prediction of MPB spread through Canada.

Alberta's Oribatida: Who's New in 2022

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Oribatid mites are typically diverse and abundant in soils and make important contributions to soil structure and functioning. The Alberta Biodiversity Monitoring Institute (ABMI) includes oribatid mites as an indicator group for monitoring changes in biodiversity and habitat at terrestrial ecosystem health sites placed across Alberta. As of 2021, about 384 oribatid mite species and morphospecies were recorded for the province of Alberta. Here, we report the most recent oribatid mite discoveries from soil collections taken in 2022 at ABMI's monitoring sites. This includes new records for Alberta, new records for ABMI, species that may need a new specific epithet, cryptic species, and curiosities.

Living in a lonely world: population phase-dependent dispersal of mountain pine beetle (*Dendroctonus ponderosae* Hopkins).

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Mountain pine beetle (*Dendroctonus ponderosae* Hopkins) has two stable population phases, the high-density epidemic phase, and the low-density endemic phase. Much of what we know about MPB behaviour is from studies in the epidemic phase because it is when they cause economically important damage and are easy to locate. Very little is known about how endemic MPB behave and past research as focused on characterizing the endemic niche and host selection. Dispersal and flight behaviour of MPB is also difficult to study and has been limited to beetles that are part of the epidemic population phase. We used new methods for simulating the endemic niche in the lab and compared the dispersal capacity and flight behaviour of MPB to epidemic lab simulations and beetles from naturally infested trees. Beetles from these three conditions were flown on computer-linked flight mills in a 23-hour bioassay that recorded various flight characteristics. After the flight bioassay we measured and compared body, wing, and energetic condition of responders. We found that beetles that were reared in an endemic condition flew further than beetles from naturally mass attacked bolts even though they were the same size and had similar amounts of fat after flight. Mountain pine beetle populations are currently decreasing on the landscape in Alberta and the populations will be or are entering the endemic phase. Our data on dispersal capacity of MPB in the endemic population phase can help others predict how MPBs range size might change between now and the next outbreak.

Effects of seismic lines and subsequent mounding restoration treatments on wolf spider (Lycosidae) functional traits in Alberta peatlands

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Exploration for oil and gas resources creates seismic lines across the Alberta oilsands, fragmenting the boreal peatlands. As disturbed peatlands often see delayed natural regeneration of tree cover for long periods of time, some species may experience changes in their morphological characteristics and thereby, ecosystem function. Soil mounding is a common restoration practice in Alberta, where peat is dug and piled in mounds to create topographic heterogeneity. Despite promotion as a solution to the seismic line dilemma, mounding is a prominent topic of debate regarding its effectiveness. Wolf spiders (Lycosidae) are common peatland ground predators and therefore a good candidate group to assess the restoration impact through their functional traits (both at the family and species level). Spiders were collected in June of 2023 using pitfall traps in mounded, untreated and undisturbed peatland habitats near Brazeau Dam in SW Alberta. Assessing changes in wolf spider functional traits (carapace, chelicerae and leg sizes) among these habitats evaluates the impact on their predatory role. The drastic ecological changes caused by seismic lines may influence wolf spiders as they adapt to altered environments and new food sources. It is expected for spiders on seismic lines to experience changes in these traits relative to in undisturbed forests, due to shifts in prey availability. However, continually failing regeneration throughout the mounding areas suggests that comparisons between mounding and untreated lines will demonstrate negligible differences across Lycosidae traits. Investigating functional traits may reveal whether mounding is restoring arthropod community function, despite visual observations of the forest.

Nematodes or Fungi, that is the question

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Throughout 2023, a series of carrion-baited pitfall traps in Elk Island National Park have been used to collect specimens and data on burying beetles (*Nicrophorus* spp.) While going through preserved *Nicrophorus* specimens from these pitfall traps, our team noticed specimens whose appendages were covered in small, tubular structures. Later examination of the bycatch from these traps revealed a number of other carrion-associated beetles (Histeridae, Staphylinidae, etc.) with similar mysterious growths on their legs or venter. Our initial thoughts were that the objects were fungi (e.g., Laboulbeniales) or dauer nematode larvae, but efforts to determine their identity using light microscopy has been unsuccessful as of yet, despite consulting with experts in relevant fields (mycology, nematology). We are currently attempting to collect living beetles

bearing these organisms with the hope of culturing them and/or using a molecular approach to determine the true nature of these mysterious 'nematofungi'.

Oribatid mite diversity in the Fort Saskatchewan area

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The Oribatida are a diverse group within the class Arachnida, with about 592 species described and an additional 1,267 species expected to be recorded in future in Canada. Oribatid mites are among the most abundant soil organisms, and play a major role in soil development, structure and functioning, including contributing to soil nutrient cycling and water infiltration. Studying oribatid mite diversity to better understand their geographic ranges and associations with specific habitats can help in monitoring them as bioindicators. Our objective was to examine oribatid mite diversity along the North Saskatchewan River within Fort Saskatchewan, Alberta and area. This region is directly downstream from Edmonton, and land use is different on the north (>agriculture) and south (>urban) sides of the river. Soil samples were collected at roughly 5, 15 and 30 meters from the high water line, with collection sites occurring about every 10 km on both sides of the river. The soil was placed on modified Tullgren funnels for one week to extract soil invertebrates into alcohol. The samples were sieved using 53 μm and 300 μmhj sieves and then the >300 μm fraction was further processed, with all adult oribatid mites identified to species-level using stereo- and compound microscopy. Among the 7 sites focused on in Fort Saskatchewan and area, a total of 20 soil samples were collected which contained over 40 oribatid mite species, including species that were not previously recorded for the greater Edmonton area, and at least one species that appears new to Alberta.