The Entomological Society of Alberta Annual Meeting
Friday October 21, 2022

Friday October 21, 2022		
Session Moderator: Leslie Holmes		
8:30	Welcome, Dan Johnson, Entomological Society of Alberta President	
8:40	**Plenary - Colwell, D.** After changes upon changes, we are more or less the same	
9:10	**Owen, R. E.** Darwinian rise and fall of bumble bees in Alberta: Philosophical implications.	**Talk #1**
9:25	**Clake, D. J.**, Rogers, S. M., and Galpern, P. Bumble bee speciation associated with a climatic cue: evidence and implications.	**Talk #2**
9:40	**Johnson, D.,** Dueck, E., Schramm, D., Kawchuk, L., Meyhoff, S., Hudson, A., Johnson, D., Uloth, K., and Brust, M. Regional comparisons of DNA of a grasshopper (*Melanoplus bruneri*) found in Peace regions of Alberta, with populations of this species in southern Alberta, east-central Alberta, British Columbia, and Wyoming.	**Talk #3**
9:55	**Gourlie, K.**, and Hoover S. Differential effects of queen and brood on worker ovary development in honey bees.	**Talk #4**
10:10	**Kastelic, H.**, Acorn, J., and Frost, C. How is pollinator behaviour on flowers impacted by the presence of predators?	**Talk #5**
BREAK (20 Minutes)		
Session Moderator: Theepa Jegatheeswaran		
10:45	**Rodrigues, G. M.** Snails as bioindicators of wetland health in landscapes reclaimed from oil sands mining	**Talk #6**
11:00	**Cohen, A.**, Galpern, P. Effects of landscape context on Canadian prairie *Bombus* communities.	**Talk #7**
11:15	**Housch, E.**, Acorn, J., and Frost, C. The perils of using video for flower-visiting insect behavioral analysis.	**Talk #8**
11:30	**Holmes, L. A.**, Nelson, W. A., and Lougheed, S. C. Through the looking glass: age- and stage-structure lenses tell two stories of how host food resources scale through a resource-host-parasitoid community.	**Talk #9**
11:45	**Fatukasi, O. I.**, Wijernatha, A., Thilakarathna, M., and Evenden, M. Effect of different *Rhizobium* strains on pea leaf weevils (*Sitona lineatus*) herbivory on field pea.	**Talk #10**
POSTER SESSION / LUNCH (1 Hour)		
Session Moderator: Dan Johnson		

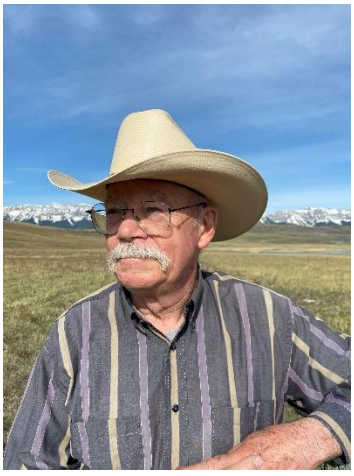
1:00	Floate, K., Wilches-Correal, D., **Craft, A.**, and Galvis, V.I. House fly bioassay to determine if there is a compounding effect with Longrange (Eprinomectin) and Chlortetracycline.	**Talk #11**
1:15	**Chennamkulangara, P.,** Van Slyke, K., Volappi, T., and Evenden, M. Evaluation of capture methods and seasonal movement of alfalfa weevil in alfalfa fields grown for seed in Alberta.	**Talk #12**
1:30	**Cárcamo, H. A.**, Schwinghamer, T., Gabert, K., Daniels, S., Brandt, R., Reid, P., Wist, T., and Tidemann, B. Validation of lygus economic thresholds in canola.	**Talk #13**
1:45	**Guelly, K.**, Mori, B., and Weeraddana, C. Reinvestigating chemical ecology of the orange wheat blossom midge*, Sitodiplosis mosellana* (Diptera: Cecidomyiidae).	**Talk #14**
2:00	**Floate, K. D.** *Chilothorax distinctus* (Coleoptera: Scarabaeidae): an occasional pest in agro-ecosystems on the Canadian Prairies?	**Talk #15**
2:15	**Neame, T.**, Robinson, S., and Galpern, P. Sentinel prey attack rates by ground beetles (Coleoptera: Carabidae) in barley and canola declines with distance from non-crop vegetation.	**Talk #16**
BREAK (15 Minutes)		
Session Moderator: Abigail Cohen		
2:45	**Fisher, B. S.**, Floate, K., and Wilches-Correal, D. Distribution of the generalist predator *Pterostichus melanarius* (Coleoptera: Carabidae) in cropland	**Talk #17**
3:00	**Innes, R.**, Neame, T., Summers, M., and Galpern, P. Determining herbivore spill-over from non-crop vegetation in canola fields.	**Talk #18**
3:15	**Kent, K.**, Martinez, A. R., Pinzon, J, and Mori, B. Community structure and function of spiders in prairie canola agroecosystems.	**Talk #19**
3:30	**Pawluk, A. D.**, Cárcamo, H. A., and Laird, R. A. Predator-pest diversity: the potential of shelterbelts in diverse farming systems.	**Talk #20**
3:45	**Thompson, B. E.**, Lumley, L. M., and Sperling, F. A. H. Identification of molecular markers for sex of spruce budworm immatures (Lepidoptera: Tortricidae).	**Talk #21**
4:00	**Brownoff, F.**, Pinzon, J., and Frost, C. Effects of invasion by the little fire ant, *Wasmannia auropunctata* (Hymenoptera:Formicidae) on spider communities in natural forest fragments of New Caledonia	**Talk #22**
4:15	**Wu, Y.**, and Evenden, M. Adult Mountain pine beetle metabolism: Effect of beetle body condition and flight on adult mountain pine beetle *Dendroctonus ponderosae* Hopkins (Coleoptera: Curculionidae: Scolytinae) metabolic rate.	**Talk #23**
4:30	**Dan Johnson – Closing Remarks/Awards**	
BREAK (10 Minutes)		
4:50	**AGM**	

Poster Presentations, Friday October 21, 2022, 12:00-13:00

Poster #1	**De Clerck-Floate, R.** Tracking the effects of plant phenology on weed biological control.
Poster #2	**Jegatheeswaran, P**., Cárcamo, H., and Johnson, D. Potential of local parasitoids in biocontrol of cabbage seedpod weevils in southern Alberta.
Poster #3	**Johnson, D.** Significant range expansion by Hayden's Grasshopper, *Derotmema haydeni*, in 2021-2022.
Poster #4	**Johnson, D.**, Sapsford, C., Kawchuk, L., and Meyhoff, S. Biogeography, diversity, and results of field and laboratory studies of lady beetles (Coleoptera: Coccinellidae) in southern Alberta.
Poster #5	**McIlwraith, E.**, Johnson, D., Secrist, G., and Richter, B. Monitoring grasshoppers and preparing plans for sustainable pest management in the City of Lethbridge.
Poster #6	**Meyhoff, S**., Johnson, D., Ellert, B., Lutes, K., Byrne, J., and Wiseman, S. Analysis of stable isotopes of feathers to estimate utilization of insect and plant components in the diet of plains sharp-tailed grouse.
Poster #7	**Owen, R. E.**, and Wood, M. Establishment of an insect collection at Mount Royal University.
Poster #8	**Stormer, H.**, and Procter, H. Distribution and diversity of terrestrial Isopods (Isopoda: Oniscidea) and their symbionts in Alberta.
Poster #9	**Todoschuck, J.M.**, and Springer S. Modelling pollinator deception: Why plants lie.

Plenary Session – Doug Colwell, University of Calgary

Doug Colwell was born and raised in Alberta with early years spent on the family farm near Cremona. Post-secondary education brought him to southern Alberta and the start of studies in biological sciences at the University of Lethbridge. Doug graduated with a BSc. and then continued with a M.Sc. from the University of Alberta and finally a PhD from the University of Guelph. As a parasitologist/entomologist, the curiosity about the endless variety of host-parasite interactions and the possibilities for improving animal health, welfare, and production, provided a rewarding career as a principal research scientist with Agriculture and Agri-Food Canada at the Lethbridge Research and Development Centre. An established and extensive network of colleagues from around the world contributed to career enjoyment and successes. These collaborations led to more than 140 publications in peer reviewed journals and more than 100 other publications including a book. In 2009, Doug was recognized by the University of Lethbridge Alumni Honour Society. Doug retired from AAFC in 2020; however, continues connections with science interests through his role as Adjunct Professor at the University of Calgary (Faculty of Veterinary Medicine), editor for the journal Medical and Veterinary Entomology, and as past-president of the World Association for the Advancement of Veterinary Parasitology.



Talk Title: After changes upon changes, we are more or less the same
Abstract:

Two imaging techniques have given relatively new ways of looking at insects that parasitize vertebrate hosts and have helped 'look' into stages that were inaccessible without dissection and the disruption that this engendered. We were also able to get a much better 'look' into how these parasites controlled the mind of their host insects. However, in the end, they are simply new approaches to looking at these fascinating insects that are either vessels for their carrying parasites or are parasites themselves. Included in the discussion are confocal imaging of the head and abdomen of ants (*Formica sp.*) infected with the 'brain-worm' and metacercariae of *Dicrocoelium dendriticum*. The other technique is the use of micro-CT imaging of both the head of ants infected with the 'brain-worm' and metacercariae of *Dicrocoelium dendriticum* in the ant abdomen and the use of micro-CT of oestrid larvae and pupal stages. Both imaging techniques have allowed some interesting approaches to ants and oestrid fly larvae and pupal stages and, in the case of the micro-CT work has offered an opportunity to 'see' tissues and organs that have been accessible only through dissection which can be disruptive and lead to poor resolution

Regular Oral Presentations, Friday October 21, 2022, 09:10-12:00

Talk #1 Title: Darwinian rise and fall of bumble bees in Alberta: Philosophical implications
Author: Owen, R. E.[1]

1. Mount Royal University, Calgary, Alberta

Bombus cryptarum (formerly *moderatus*) occurs in the northern and western regions of North America and reaches its southern limit in Alberta. In 1915, the southernmost record was Banff; by 1987, it had appeared in Kananaskis Country, 40 km southeast of Banff, and by 2010, it had become established in Calgary, where it had never been previously recorded. During the same time period, another two sympatric species, *B. occidentalis* and *B. terricola* have been in decline. Here I will: (1) summarize the taxonomic history of the three species, (2) give an update on their current distribution and abundance, and (3) speculate on the causes of the changes in their distribution and abundance over the last 35 years. It is difficult to pinpoint exact causes of this concurrent rise and fall of these species, as it appears that degree of parasitism (e.g. *Nosema*), levels of fluctuating asymmetry, etc. do not differ among the species. Moreover, all species are closely related, being in the same subgenus, *Bombus sensu stricto*. Here I speculate that we are seeing the process described by Darwin (1859) in his only figure in On the Origin, that some lineages are more successful in replacing others simply due to their intrinsic features, making them more competitive. Some may find this view unsettling as in science we like to be able identify definite causes and effects.

Talk #2 Title: Bumble bee speciation associated with a climatic cue: evidence and implications
Authors: Clake, D. J.[1], Rogers, S. M.[1], and Galpern, P.[1]

1. University of Calgary, Calgary, Alberta

Maintenance of diversity in species, populations, phenotypic traits and genetic material can help buffer against future climate change by producing differing individuals which are more likely to survive in varying conditions. Climate change can put cryptic diversity and populations at risk, and it is important to quantify and understand this diversity before it is lost. Our research focuses on *Bombus sylvicola*, a bumble bee species that has undergone many recent taxonomic additions and revisions based on new genomic data. We answer the following questions: 1) Is there evidence of cryptic genomic or

phenotypic variation in Canadian populations of *B. sylvicola* in the Rocky Mountains? 2) What might be restricting gene flow between diverse populations? To answer these questions we sampled bumble bees from 70 different sites across roughly 40,000 km2. We extracted DNA from three different species of bumble bees (*B. sylvicola, B. melanopygus, and B. mixtus*), and collected phenotypic data on color patterns. We used single nucleotide polymorphisms (SNPs) to measure relatedness and gene flow, and model population distribution based on environmental variables. We found evidence of two phenotypically and genetically distinct parapatric populations of *B. sylvicola*. Our models suggest that these populations occupy different climatic regions, with the new cryptic population found in locations with a lower minimum temperature in the coldest month. This research shows exciting evidence of a new cryptic population of bumble bees, and potential adaptation to different climate conditions which will be important to consider in the face of ongoing climate changes.

Talk #3 Title: Regional comparisons of DNA of a grasshopper (*Melanoplus bruneri*) found in Peace regions of Alberta, with populations of this species in southern Alberta, east-central Alberta, British Columbia, and Wyoming

Authors: Johnson, D.[1], Dueck, E.[1], Schramm, D.[1], Kawchuk, L.[2], Meyhoff, S.[3], Hudson, A.[1], Johnson, D.[1], Uloth, K.[4], and Brust, M.[5]

1. University of Lethbridge, Lethbridge, Alberta
2. Agriculture and Agri-Food Canada, Lethbridge, Alberta
3. University of Alberta, Edmonton, Alberta
4. British Columbia Peace Pest Monitoring Project
5. Chadron State College, Chardron, Nebraska

Bruner's Spur-throat Grasshopper, *Melanoplus bruneri*, is a prominent species in northern and foothills counties, and has been increasing in abundance. Apparent two-year fluctuations in abundance have been documented in the last decade or more of surveillance by the Alberta Insect Pest Monitoring Network Staff, Alberta Agriculture and Forestry), in northern counties. Our previous research determined the geographic range of the lagged time series (even and odd years), estimated hatching and development models, and found from field evidence that the northern population has a very low rate of parasitism and a very low rate of pathology. We collected or obtained specimens of *M. bruneri* from Peace regions in Alberta, Peace region in British Columbia, Cold Lake, Alberta, Cypress Hills, Alberta, Magrath, Alberta, other Alberta locations, and Wyoming. Anatomical dimensions of specimens were measured for regional comparisons. We extracted DNA (Qiagen DNEasy), and used PCR amplification to investigate genetic variation of single nucleotide polymorphisms (SNPs) of 51 individuals (typically 6 to 8 individuals per location) from the regions of origin. Comparisons were based on SNP variation in the 3' end fragment of cytochrome c oxidase subunit I (COI), which is believed to be less conserved than the main COI gene, and therefore more capable of detecting regional differences in genetic variation. Sequences, determined by Azenta Life Sciences, USA, were aligned using MEGA 11.0. DnaSP 6.0 was used to find haplotypes and a haplotype network was generated using PopART 1.7. Haplotype and nucleotide diversity in each population was calculated in DnaSP 6.0. A total of 21 haplotypes were detected, by including a range of numbers of base pair differences to define haplotypes. Haplotype diversity and nucleotide diversity were compared among source regions, with the goal to determine differences between the Peace, Alberta, samples (Tangent, Manning, and locations around Peace River) with Cold Lake, Cypress Hills, Magrath, Mayerthorpe, Vanderhoof, Westlock, and Wyoming to assess possible unique qualities of the Peace populations.

Talk #4 Title: Differential effects of queen and brood on worker ovary development in honey bees

Authors: Gourlie, K.[1] and Hoover, S.[1]

1. University of Lethbridge, Lethbridge, Alberta

Honey bees, *Apis mellifera L.,* are eusocial insects in which individuals cooperate to procure food, find and build nests, and reproduce. One remarkable feature of the species is that typically the sole reproductive individual is the queen, with daughter workers forgoing personal reproduction in favour of rearing half and full-sisters. While workers can lay eggs, they cannot mate, and so are only capable of laying unfertilised haploid male eggs. Egg-laying workers are therefore uncommon, subject to aggression, and their eggs subject to policing by other workers. Queenright colonies with high levels of worker reproduction are exceedingly rare and their presence can quickly lead to colony-level mortality. Worker bees possess rudimentary ovaries, but their development is supressed by several factors, including the presence of the queen and brood and the pheromones they produce, in addition to nutritional and seasonal factors. We examined the relative importance of the presence of the queen and brood on worker ovary suppression. We tested the effects of four colony-level treatments, including (1) Queenright with open brood (larvae and prepupae) (2) queenless but with open brood (3) queenright and brood-less or (4) queenless and brood-less colonies in small experimental colonies at the University of Lethbridge. We dissected five workers from each of six replicate colonies of the four treatments and scored their ovaries to indicate the level of development observed. We will discuss our results, which will further our understanding of reproductive suppression in honey bees, and the evolution of insect societies in general.

Talk #5 Title: How is pollinator behaviour on flowers impacted by the presence of predators?
Authors: Kastelic, H.[1], Acorn, J.[1], and Frost, C.[1]

1. University of Alberta, Edmonton, Alberta

Pollinators are an important resource in agricultural settings as they can increase yield in mass flowering crops like canola. However, pollinator interactions with predators may influence pollination efficiency and crop yield. Much of the published literature on predator-pollinator interactions focuses on how pollinators react to crab spiders, but as certain wasps (Genus: *Vespula*) prey on pollinators, and are abundant in some field margins, we wanted to study how pollinators respond to wasps. Additionally, as both bee and wasp density and species composition can vary between different habitat types, we used two field margin vegetation types, treed and herbaceous, to examine if and how pollinators respond to, or avoid, predatory wasps on Canada thistle flowers, and how this may differ between margin vegetation types. I set up a DSLR camera at 4 treed and 4 herbaceous canola crop margins in Aspen Parkland to record pollinator behaviour in response to dead *Vespula acadica* and *Vespula pensylvanica* pinned to Canada thistle flowers. I plan to score the footage and quantify the behaviour of pollinators in these plots versus in control plots. Additionally, I collected all flower visitors within a 10-m transect next to each filming site for 10 minutes to determine what pollinator species were present in the area. Ultimately, gaining a better understanding of how predators can impact pollinator behaviour teaches us more about how pollinators function within communities and could lend to learning how to manage pollinators as a resource, resulting in better crop yields.

Talk #6 Title: Snails as bioindicators of wetland health in landscapes reclaimed from oil sands mining
Author: Rodrigues, G. M.

1. University of Calgary, Calgary, Alberta

Wetlands cover approximately two-thirds of Alberta's boreal region, making them an important part of Alberta's natural environment and wildlife habitat. Wetlands' ability to fix and store carbon, mitigate flooding, and sequester anthropogenic pollutants (in plant tissues) make them especially important in combatting detrimental effects of climate change. Open-pit mining in the Athabasca oil sands region results in loss of wetland landscapes that the Government of Alberta requires to be compensated via reclamation. Although vegetation has been surveyed, little is known about the condition of aquatic invertebrate communities. In this study, the presence of snails was used as biological indicator of wetland health in 20 reclaimed and 20 reference wetlands near Fort McMurray, Alberta. Two things that can affect snail presence are wetland age and salinity (measured with conductivity). Invertebrate samples were collected with a net and conductivity measurements were taken with a handheld meter. Three snail types were recorded as present or absent in each sample. It was found that the probability of snail presence decreases as salinity increases, and the probability of snail presence increases with wetlands age. Therefore, snails are most likely to inhabit a mature wetland with low salinity. Further research should be conducted on the importance of salinity in wetland health.

Talk #7 Title: Effects of landscape context on Canadian prairie *Bombus* communities
Authors: Cohen, A.[1] and Galpern, P.[1]

1. University of Calgary, Calgary, Alberta

Landscape context informs the nature of insect communities, which can be quantified through species occurrence and abundance. There is a large body of research that links the health of insect communities to non-crop habitat. Within the Canadian Prairie landscape, one land cover type has been a conservation priority- wetlands. These wetlands are important for many bird species and exist as pockets of non-crop habitat in an area dominated by agriculture, acting as a refuge and food source for arthropods. There are many ways to quantify the features of a landscape and the interactions between different land cover types, including diversity, cohesion, and shape. Thus, we hypothesize that the presence of these wetlands, particularly the amount of wetland-crop edge, will positively affect *Bombus* species, which are an overall indicator of ecosystem health. To quantify the effect of wetlands on *Bombus* communities, as well as seven other land cover classes, we used Bayesian models of occurrence and abundance to test the relationship between three types of landscape metrics (diversity, aggregation, shape) on the occurrence and abundance of 27 *Bombus* species sampled over five years across Southern Alberta. We found that some were too rare to successfully model, even with a model that incorporates phylogenetic correlations. For those species with enough data to successfully model, we found that they are positively associated with higher non-crop shape index, which is related to the complexity of land cover patches and indicates that higher non-crop edge is related to *Bombus* occurrence and abundance.

Talk #8 Title: The perils of using Vbideo for flower-visiting insect behavioral analysis
Authors: Housch, E.[1], Acorn, J.[1], and Frost, C.[1]

1. University of Alberta, Edmonton, Alberta

Video is a valuable tool for gathering detailed information about animal behaviour. Video allows for repeated viewings of an event, and high frame rate video gives you more control over viewing speeds. Using video footage for insect behavioral studies is a rapidly changing subject, due to improvements to cameras and related technologies. However, one of the main drawbacks of using video is that it is difficult to identify insects to the species level without physically capturing them, although the pros of video outweigh the cons due to the high level of other information video offers. You can also capture insects after recording ends, for identification purposes. In practice, the objectives of the study will affect the methods used to gather the video. Using video for data analysis is rooted in a system of trade-offs. These trade-offs can vary depending on the morphology and behavior of the insects, and the technological limitations of videography equipment, video editing and analysis software. In particular, adequate resolution and frame rate are vital to a successful study. In addition, data can also be affected by non-technological features such as environmental and meteorological conditions and nearby features, including flowers, prey, predators, pedestrians and the like. By considering all the trade-offs necessary due to subject specifications and by ensuring mindfulness with regard to technological, environmental and meteorological perils, video can greatly enhance insect behavioral studies.

Talk #9 Title: Through the looking glass: age- and stage-structure lenses tell two stories of how host food resources scale through a resource-host-parasitoid community

Authors: Holmes, L. A.[1], Nelson, W. A.[2], and Lougheed, S. C.[2]

1. University of Lethbridge, Lethbridge, Alberta
2. Queen's University, Kingston, Ontario

Parasitoids survive and reproduce by ovipositing on or within host insects. Idiobiont parasitoids paralyze their hosts upon attack and thus are expected to target only hosts that are large enough to support offspring development. Host resources generally impact host attributes and life histories including size, development, and life span. Variation in host size is known to impact parasitoid efficacy; however, we do not know the importance of variation in other host attributes and life histories within and across stages of host development on parasitoid efficacy and life histories. In this study we test whether trait variation within host developmental stages in response to host resources is more important for parasitoid efficacy and life histories than trait variation across host developmental stages. To do this, we exposed seed beetle hosts raised on a food quality gradient (90%, 95%, and 100% black-eye pea artificial seeds) to mated female parasitoids and measured the number of hosts parasitized, parasitoid development, survivorship, emergence mass, and hind tibia length. Overall, parasitoid efficacy was highest, on hosts consuming 95% quality seeds, regardless of host instar, and on fourth instar hosts regardless of seed quality. However, host food quality does not appear to cascade to impact parasitoids life histories, despite large food quality effects on host life history. Instead, variation in host life histories across host developmental stages better predicts parasitoid efficacy and life histories.

Talk #10 Title: Effect of different *Rhizobium* strains on pea leaf weevils (*Sitona lineatus*) herbivory on field pea

Authors: Fatukasi, O. I., Wijernatha, A., Thilakarathna, M., and Evenden, M.

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 beneficial rhizobia in root nodules, respectively. The host-specific rhizobia fix atmospheric nitrogen and receive carbon nutrients in exchange. The rhizobia-plant interaction may affect herbivory by influencing plant food quality and chemical defense. We tested the hypothesis that *Rhizobium*-field pea interactions influence the feeding preference of the *S. lineatus* in the reproductive stage in June, 2022. Field pea seeds were grown at 22 °C (16L:8D) in cages for 2 (Experiment 1) and 4 (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 fertilizer at 0.5g/pot; 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 wild-type or mutant *Rhizobium* strains did not affect adult *S. lineatus* feeding in experiment 1, as compared to fertilized and control plants. In Experiment 2, nitrogen-fertilized plants received more feeding damage than those inoculated with the wild-type strain or the control plants. Damage on plants treated with the mutant strain was intermediate. Relatively less damage on the plants inoculated with wildtype could indicate an effect of the *Rhizobium* on field pea nitrogen-containing defense compounds.

Regular Oral Presentations, Friday October 21, 2022, 13:00-16:30

Talk #11 Title: House fly Bioassay to determine if there is a compounding effect with Longrange (Eprinomectin) and Chlortetracycline

Authors: Floate, K.[1], Wilches-Correal, D.[1], **Craft, A.[2]**, and Galvis, V. I.[1]

1. Agriculture and Agri-Food Canada, Lethbridge, Alberta
2. University of British Columbia, Vancouver, British Columbia

Eprinomectin (also called Longrange) is a Paraciticide and is often used along side Chlortetracycline (an antiobiotic) in the cattle industry. No research has gone in to studying if there is a compounded effect on insect mortality if both drugs are combined. The experimental set up used to determine this was nearly identical to Backmeyer's Bioassay setup; 12oz cups were half filled with sand and 70-100g of dung along with 25 first instar larvae of Musca Domestica. The treatments for the experiment were Control, Chlortetracycline (CTC), Longrange (LR) and Longrange + Chlortetracycline(LR+CTC). Dung was taken from cows after a week of each treatment. But Nieman et al results showed a spike in survival rate after 4 weeks in Longrange so dung of each treatment at 4 weeks was also included. So all treatments had 12 replicates each for a total of 96. After a week the adult flies that emerged from the cups were captured using aspirators and counted. An Anova test with an alpha of 0.05 (along with a the tests necessary for Anova's assumptions)was performed and determined that while Week 1's data was statistically significance week 4 was not. A Tukey-Krammer post hoc test was then performed for week 1's data and it was concluded that while those treatments that contained LR were statistically different from that of the control and CTC, they were not statistically different from each other. So no evidence of a compounding effect was found.

Talk #12 Title: Evaluation of capture methods and seasonal movement of alfalfa weevil in alfalfa fields grown for seed in Alberta

Authors: Chennamkulangara, P.[1], Van Slyke, K.[1], Volappi, T.[1], and Evenden, M.[1]

1. University of Alberta, Edmonton, Alberta

The alfalfa weevil (*Hypera postica* (Gyllenhal), Curculionidae: Coleoptera) is major pest of alfalfa (*Medicago sativa L.*, Fabaceae) that feeds on foliage during the pre-bloom to the early bloom stages. High density larval populations can cause significant damage through leaf skeletonization and adult weevils also feed on foliage. This study examines adult weevil movement in the field at various times throughout the growing season. The study was conducted in five alfalfa fields grown for seed in southern Alberta which were monitored weekly using six capture methods including sweep sample, soil sample, malaise trap, yellow sticky trap, pitfall trap and emergence cages. Alfalfa weevils were recovered from sweep and soil samples and pitfall traps. Sweep samples caught a significant number (~80 %) of the adult weevils. Pitfall traps positioned on the edge of the field, captured equal numbers of adult weevils as traps positioned on the interior of the field. Correlations between larval and adult density were conducted, and results will be discussed.

Talk #13 Title: Validation of lygus economic thresholds in canola

Authors: Cárcamo, H. A.[1], Schwinghamer, T.[1], Gabert, K.[2], Daniels, S.[1], Brandt, R.[1], Reid, P.[3], Wist, T.[4], and Tidemann, B.[3]

1. Agriculture and Agri-Food Canada, Lethbridge, Alberta
2. Canola Council of Canada, Innisfail, Alberta
3. Agriculture and Agri-Food Canada, Lacombe, Alberta
4. Agriculture and Agri-Food Canada, Saskatoon, Saskatchewan

Canola is a top cash crop in the Canadian Prairie Provinces. To protect yields from insect pests, farmers sometimes apply an insecticide. Lygus bugs are sporadic pests of canola, especially during years with hot and dry summers. Economic thresholds require local validation and updating them to current conditions. In the case of canola, modern hybrid cultivars are herbicide tolerant and have much higher yields and mature earlier that those used in the 1990's in Manitoba to develop the current economic thresholds. Our validation relied on a number of field studies conducted during 2010-2013 and 2016-2019, in farmers' fields primarily in southern Alberta near Lethbridge and to some extent in the Parkland Ecoregion around Red Deer. A plot study was also completed near Saskatoon in 2021 and 2022. Lygus rarely reduced yields based on comparisons of sprayed and unsprayed plots, even when abundances per sweep were over the suggested current economic threshold of 1 per sweep. Results of non linear analysis to improve the thresholds will be presented and compared to traditional linear approaches and a higher threshold will be recommended.

Talk #14 Title: Reinvestigating chemical ecology of the orange wheat blossom midge, *Sitodiplosis mosellana* (Diptera: Cecidomyiidae)

Authors: Guelly, K.[1], Mori, B.[1], and Weeraddana, C.[2]

1. University of Alberta, Edmonton, Alberta
2. University of Manitoba, Winnipeg, Manitoba

Orange wheat blossom midge, *Sitodiplosis mosellana* (Diptera: Cecidomyiidae), is a major pest of wheat (*Triticum aestivum* L.) across Western Canada. Larvae feed on developing wheat kernels which results in reduced grain grade, overall grain quality, and yield. As a result, wheat midge is a significant concern to wheat production on the Canadian Prairies. Effective wheat midge monitoring strategies are critical to the continued economic and environmental sustainability of Canadian cropping systems;

however, current strategies rely on time consuming in-field counts on a daily basis during the susceptible crop stage. Sex pheromone traps can be used to help producers monitor populations, but currently only indicate presence or absence of adult midge. A recent study indicated the commonly used commercial monitoring lure had variable release rates which can impact trap capture and the reliability of the pheromone-monitoring system. Here, we reinvestigate and compare the commonly used commercial 'rubber septa' pheromone lure with newly created 'flex' lures for their ability to capture wheat midge males. In addition, we compare the number of males captured to in-field based economic threshold levels of ovipositing females to determine if the number of males captured is correlated with ovipositing females. In parallel with this work, we plan to conduct a transcriptomic analysis to identify olfactory receptors of wheat midge to more thoroughly understand the olfactory genes involved in sex pheromone reception. Ultimately, this work aims to create a more effective and efficient monitoring tool for wheat midge and add to the foundational knowledge of wheat midge olfaction.

Talk #15 Title: *Chilothorax distinctus* (Coleoptera: Scarabaeidae): an occasional pest in agro-ecosystems on the Canadian Prairies?

Author: Floate, K. D.[1]

1. Agriculture and Agri-Food Canada, Lethbridge, Alberta

Chilothorax distinctus (Müller) (Coleoptera: Scarabaeidae), formerly *Aphodius distinctus* (Müller), is an *aphodiine* dung beetle of European origin. Present in North America prior to 1845, it is now widely established across southern Canada and much of the United States of America. Adults are attracted to cattle dung to feed and accelerate the degradation of cow pats on pastures. Eggs, however, are laid in soil where larvae may damage turf grass and agricultural crops. Here I review the biology of this species, summarize reports of suspected larval feeding damage to crops on the Canadian Prairies, and present results of a field study. These collective data support suspicions that *C. distinctus* is an occasional pest in agro-ecosystems for which control measure may not be warranted or even possible.

Talk #16 Title: Sentinel prey attack rates by ground beetles (Coleoptera: Carabidae) in barley and canola declines with distance from non-crop vegetation.

Authors: Neame, T.[1], Robinson, S.[1], and Galpern, P.[1]

1. University of Calgary, Calgary, Alberta

Changes to and removal of non-crop vegetation (e.g., forest and grassland patches) to expand crop fields has the potential to be detrimental to the natural enemies of crop pests, such as the ground beetle family (Coleoptera: Carabidae), that use these areas for foraging, breeding, and overwintering. An argument for maintaining non-crop vegetation is its potential to support the supply of ecosystem services such as pest control to the surrounding crop. Quantifying this ecosystem service has been done by measuring the abundance of natural enemy species, a proxy measure for predatory activity. However, evidence that predators such as ground beetles are attacking pests in crops has been less frequently studied. We distributed sentinel prey (plasticine 'caterpillars' made to be similar in size and colour to potential prey items) in a grid pattern at 15 sites in each of 20 crop fields in central Alberta. We estimated the potential for pest attacks by ground beetles through bite marks on the sentinel prey. Using generalized additive modelling, we found a non-linear decline in attack rate as distance from non-crop vegetation increased. The frequency of bite marks was observed to decline around 200m into

the crop away from non-crop vegetation. These findings are consistent with hypotheses that ground beetle activity is, in part, modulated by their proximity to non-crop vegetation (e.g., by providing habitat or resources the beetles require). The findings also provide evidence of the potential that ground beetles have in supplying pest control ecosystem services within crops.

Talk #17 Title: Distribution of the generalist predator *Pterostichus melanarius* (Coleoptera: Carabidae) in cropland

Authors: Fisher, B. S.[1], Floate, K.[2], and Wilches-Correal, D.[1]

1. University of Lethbridge, Lethbridge, Alberta
2. Northern Arizona University, Flagstaff, Arizona

Carabid beetles (Coleoptera: Carabidae), also known as ground beetles, are mostly generalist predators but some specialize in eating plant matter or a particular prey type. As part of a larger study to characterize the microbiomes of ground beetles, a quantitative study was performed to observe the relative abundance of *Pterostichus melanarius* in three crop types in Southern Alberta. *P. melanarius* was chosen as a species of focus for the study because it is widespread and considered beneficial on arable land where it has a diet that ranges from weed seeds to slugs and pest eggs. The three crops chosen were *Triticum aestivum* (Wheat), *Pisum sativum* (Peas), and *Brassica napus* var. (Canola). All three crops were found at each of the three study sites near Lethbridge, AB. The Palmer site is about 5 km south of Lethbridge, the Fairfield site is about 7 km east of Lethbridge, and the LRDC site is located on the eastern edge of Lethbridge. We placed ten pitfall traps in each crop type at each study site for a total of 90 traps and collected for eleven days in mid-August 2022. Canola was the crop type with both the most (505) and the least (0) *P. melanarius* found. We tried to get exact replicates for each study area but differences such as irrigation likely made a difference in results. Slugs and earthworms are strong candidates for the primary food sources of *P. melanarius*.

Talk #18 Title: Determining herbivore spill-over from non-crop vegetation in canola fields

Authors: Innes, R.[1], Neame, T.[1], Summers, M.[1], and Galpern, P.[1]

1. University of Calgary, Calgary, Alberta

Uncultivated areas in agricultural landscapes, known as non-crop vegetation areas, provide a variety of benefits that help promote biodiversity (e.g. provides habitat for hibernation, breeding, and migratory species). Herbivorous insects also potentially utilize these areas. However, these insects could be spilling into crops, causing damage resulting in economic loss. We explored the distribution of five common insect herbivore taxa to determine if these insects are spilling into canola fields from non-crop vegetation in and around the crop. The five taxa selected for this study were flea beetles, Lygus bugs, weevils, armyworms, and leafhoppers. 15 pitfall and 15 sweep net samples were collected at various distances from non-crop vegetation in each of three canola fields east of Lacombe, Alberta (N=90). Using generalized additive modelling, the abundance of insects in non-crop vegetation was compared to the abundance of insects in within crop sties for each taxon. The changes in abundance at different distances from the non-crop vegetation was also measured. Armyworms and Lygus bugs were found to have no significant relationship with the non-crop vegetation. Flea beetle abundance peaked around 200 metres from the non-crop vegetation. Weevils and leafhoppers were found to be more abundant in the non-crop vegetation. Leafhopper abundance was also found to decrease at increasing distances from the non-crop vegetation, which indicates that this taxon is most likely spilling into the

crop from non-crop vegetation areas. This research is ongoing to further explore the trends observed in this project.

Talk #19 Title: Community structure and function of spiders in prairie canola agroecosystems
Authors: Kent, K.[1], Martinez, A. R.[1], Pinzon, J.[2], and Mori, B.[1]

1. University of Alberta, Edmonton, Alberta
2. Northern Forestry Centre, Edmonton, Alberta

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 in a way that most effectively makes use of spiders as naturally occurring biological control agents against economic pest species. To characterize these interactions, both taxonomic and functional diversity will be assessed. To investigate taxonomic diversity, spiders collected through combination of pitfall traps, systematic net beating sampling, and live trapping will be identified to species. To assess functional diversity, molecular gut content analysis will be used to identify species consumed by the spiders. These gut contents will be compared to representative arboreal and ground-dwelling species to determine the differential effectiveness of each functional group. Finally, using the combination of dietary data and community composition the functional morphology of certain representative species will be developed. Taken collectively, this research will further our understanding of the differential niche contributions of the major functional groups of spiders in canola agroecosystems. Examining the specific biological properties that allow an organism to fulfil its contribution to the larger community will help agricultural management practices maximize the potential of an often-overlooked group of arthropods.

Talk #20 Title: Predator-pest diversity: the potential of shelterbelts in diverse farming systems
Authors: Pawluk, A. D.[1], Cárcamo, H. A.[2], and Laird, R. A.[1]

1. University of Lethbridge, Lethbridge, Alberta
2. Agriculture and Agri-Food Canada, Lethbridge, Albarta

Body: In the face of the ongoing climate crisis, it is becoming exceedingly necessary to find environmentally-friendly solutions to agricultural problems. Beneficial predatory insects can be used as a form of pest control, reducing the need for pesticides which provides both economic and environmental benefits. Shelterbelts lining farmland enhance the abundance of these natural predators, promoting biodiversity, soil regeneration, and environmental protection. Despite the clear role shelterbelts play in pest suppression, there is still a lack of understanding in how they function in diversified farming systems, particularly from an integrated pest management perspective. In a proposed study beginning in Summer 2023, we will explore how shelterbelts in diverse crop landscapes affect the biodiversity and abundance of parasitoid wasps, as well as select species of common crop pests. Utilizing a two by two factorial design we will evaluate how far these insects can penetrate canola fields, conditional to the presence or absence of shelterbelts in diverse and non-diverse farming systems. Samples collected of lepidopteran larvae will also be lab-reared in order to further identify the composition and diversity of beneficial parasitoids.

Talk #21 Title: Identification of molecular markers for sex of spruce budworm immatures (Lepidoptera: Tortricidae)

Authors: Thompson, B. E.[1], Lumley, L. M.[2], and Sperling, F. A. H.[1]

1. University of Alberta, Edmonton, Alberta
2. Alberta Biodiversity Monitoring Institute, Edmonton, Alberta

The spruce budworm (*Choristoneura fumiferana*) is a native species to North America and is a serious pest of fir (Abies spp.) and spruce (*Picea spp*.) forests. Life stages at the L2 larval stage or younger cannot be sexed using phenotypic characteristics. Because the spruce budworm overwinters as an L2 larvae, many forest management practices focus on this life stage. Sex ratios can be an important driver in population change and could potentially be used to predict outbreaks, allowing time to develop methods of control. Furthermore, identifying unbiased sex ratios using wild captured adult specimens is difficult, if not impossible, due to sex-specific behavior. Our work aims to identify sex-limited genetic markers in early life history stages that could be used to sex specimens without the need for morphological expertise or rearing specimens to obtain older larva. We have identified several potential sex-limited markers but all of them apparently are present as multiple copies across the genome. Due to
the ambiguity surrounding the location of these markers, we will determine their synteny (chromosomal locations and homology) relative to all current lepidopteran chromosome assemblies that contain both Z and W sex chromosomes. Our objective is to provide more reliable markers for the sex of early larvae, as well as insights into the structure and composition of spruce budworm sex chromosomes.

Talk #22 Title: Effects of invasion by the little fire ant, *Wasmannia auropunctata* (Hymenoptera: Formicidae) on spider communities in natural forest fragments of New Caledonia

Authors: Brownoff, F.[1], Pinzon, J.[2], and Frost, C[1].

1. University of Alberta, Edmonton, Alberta
2. Canadian Forest Service, Edmonton, Alberta

New Caledonia is a collection of islands in Melanesia that is home to highly endemic biodiversity, which may be particularly susceptible to threats from invasive species. One such invasive, the little fire ant (*Wasmannia auropunctata*), has spread across much of New Caledonia and its impacts on native ant communities have already been noted. However, *W. auropunctata*'s effects on other arthropod taxa in New Caledonia are still understudied. We set out to analyze what effects invasion by *W. auropunctata* would have on biodiversity measures for spider communities in natural forest fragments. We found no significant effects of invasion on abundance for either ground- or foliage-dwelling spiders. Similarly, no significant effects were noted for rarefied species richness or diversity when all sites of the same invasion status were pooled; however, some small effects were observed when pooling by forest blocks. Ant invasion appeared to affect spider species composition, with ant-mimicking spiders (*Zodariidae* and genus *Anatea* in the family Theridiidae) only present in uninvaded sites, suggesting a relationship between ant mimic spiders and native ant fauna. We also observed a significant effect of ant invasion on spider body size, where invaded sites had smaller spiders compared to non-invaded sites. Further analysis is required to understand the underlying mechanisms for these changes, but if ant invasion impacts spider species composition and body size, it may drive endemic species declines or shifts in community function.

Talk #23 Title: Adult mountain pine beetle metabolism: Effect of beetle body condition and flight on adult mountain pine beetle *Dendroctonus ponderosae* Hopkins (Coleoptera: Curculionidae: Scolytinae) Metabolic Rate

Authors: Wu, Y.[1] and Evenden, M.[1]

1. University of Alberta, Edmonton, Alberta

The mountain pine beetle, *Dendroctonus ponderosae* (Hopkins) (Coleoptera: Curculionidae: Scolytinae) is a tree-killing bark beetle in pine forests in western North America. Recent range expansion of the beetle into Alberta has resulted in the beetle encountering new pine hosts and environmental conditions. Beetle body condition and energetic expenditure impact beetle performance, including the rate of physiological and metabolic processes, which in turn can influence various aspects of beetle life history, such as flight, host colonization and flight. There have been no studies to date on the metabolic rate (MR) of the mountain pine beetle and how body condition and flight influence metabolic rate. Here, we measure beetle respiratory rate (mean and total CO 2 production) and pattern (continuous vs. discontinuous) in beetles that have undergone various flight activity. Newly emerged beetles were kept individually at 4°C until they were used in 23-hour flight mill bioassays to examine beetle flight capacity, and subsequent MR and respiratory patterns were assessed using an open flow-through respirometry system. We discovered that beetle age, body size, respiratory strategy impact beetle MR. Beetles that flew and used more energy before MR measurement had a lower metabolic rate than beetles that were not given the opportunity to fly.

Poster Presentations, Friday October 21, 2022, 12:00-13:00

Poster #1 Title: Tracking the effects of plant phenology on weed biological control

Authors: De Clerck-Floate, R.[1]

1. Agriculture and Agri-Food Canada, Lethbridge, Alberta

The European stem-galling weevil *Rhinusa pilosa* (Coleoptera: Curculionidae) was recently introduced to Canada as a biocontrol for the invasive perennial, yellow toadflax (*Linaria vulgaris*). Adult weevils are present from April to late June to mate and oviposit into young tissues of emerging shoots, which change in size and vigour during development. To advise on the optimal timing of release of *R. pilosa* for effective biological control of yellow toadflax, greenhouse experiments were conducted to explore effects of shoot phenology at oviposition on both insect and plant performance. These were set-up in a randomized block design using artificially overwintered toadflax brought to three stages of shoot development at room temperature (3, 16, 30 days growth after removal from cold storage) before exposure to ovipositing *R. pilosa*. When examining the effects of phenology on host impact, control plants (without *R. pilosa*) at the same stages of growth were included. Insect measurements per plant were: number of galls and F1 weevils produced, gall volume. Plant measurements were: length of galled and ungalled shoots, number of dead shoots. Unexpectedly, older stages of shoot growth produced more and larger galls and more weevils. Also, whereas shoots of plants exposed to *R. pilosa* tended to be shorter than those of control plants, there was greater shoot death and a greater impact on shoot length for plants galled at an earlier stage of development. Recommendations are to release

later in spring to achieve strong establishment of *R. pilosa*, but earlier for greater impact on yellow toadflax.

Poster #2 Title: Potential of local parasitoids in biocontrol of cabbage seedpod weevils in southern Alberta

Authors: Jegatheeswaran, P.[1], Cárcamo, H. A.[2], and Johnson, D. L.[1]

1. University of Lethbridge, Lethbridge, Alberta
2. Agriculture and Agri-Food Canada, Lethbridge, Alberta

Biological control has been investigated as an efficient management strategy against invasive insects. Cabbage seedpod weevil is a European invasive pest of canola. Local parasitoids were reported against these weevils, with low parasitism rates. Classical biological control programs using efficient European parasitoids are suggested. Ecological studies reported associations between biocontrol and surrounding landscape and those effects vary greatly with different insects and landscape. Understanding this association is important for successful biocontrol programs. Therefore, our study aimed to collect, identify, and eventually evaluate the potential of local parasitoids of these weevils and to understand the relationship between landscape composition and parasitoid abundance and parasitism rate. Landscape structure was documented by detail ground truthing in all canola fields and GIS maps were constructed using Arc GIS Pro. In each field, canola racemes were collected, and 1000 pods were placed into emergence boxes. All these boxes were inspected daily up to one month and emerged parasitoids were preserved in alcohol. The parasitoids were identified by using available keys. All the emerged parasitoids were belonged to superfamily Chalcidoidea. Further results of this study will help to understand the importance of local parasitoids in the biological control programs of these weevils.

Poster #3 Title: Monitoring grasshoppers and preparing plans for sustainable pest management in the City of Lethbridge

Authors: McIlwraith, E.[1], Johnson, D.[2], Secrist, G.[3], and Richter, B.[1]

1. City of Lethbridge, Lethbridge, Alberta
2. University of Lethbridge, Lethbridge, Alberta
3. Agriculture Services, Lethbridge, Alberta

Warm, dry summer weather over several years resulted in increased survival, growth, and reproduction of the Two-striped Grasshopper, *Melanoplus bivitattus*, at the interface of Lethbridge residential properties and agricultural land. During unusually hot weather in July, 2021, large numbers of late-instar and adult Two-striped Grasshopper unexpectedly moved into lawns and gardens. The City of Lethbridge formed a Grasshopper IPM plan that included public information, regular monitoring in source roadside grass and adjacent fields (late summer 2021 and May to October, 2022), grasshopper species composition tracking, movement mapping, assessment of abundance of natural enemies and pathogens of Two-striped Grasshopper, and planning for non-toxic control actions where they might become warranted. The results yielded a unique regularly sampled time series sequence of abundance and development (immature instars) of the Two-striped Grasshopper before and after rainfall, a major mortality factor. Two intense rainstorms in 2022 markedly and directly reduced numbers of immature Two-striped Grasshoppers in brome grass roadsides near the City limits, averting a second summer of invasion. The fungal pathogen *Entomophaga grylli* infected and killed significant numbers of adult Two-

striped Grasshoppers in July and August, 2021, reducing a portion of oviposition in progress. In 2022, less than 1% of immature Two-striped Grasshoppers were killed by spiders and other predators. Parasites (internal and surface) occurred in less than 2% of Two-striped Grasshoppers, and *E. grylli* was very low or absent. Egg-laying potential, assessed in cages, was typically 40 to over 150 eggs per female. Monitoring of hatching, development, abundance, and pathology in 2023 is recommended.

Poster #4 Title: Analysis of stable isotopes of feathers to estimate utilization of insect and plant components in the diet of plains sharp-tailed grouse

Authors: Meyhoff, S.[1], Johnson, D.[2], Ellert, B.[3], Lutes, K.[3], Byrne, J.[2], and Wiseman, S.[2]

1. University of Alberta, Edmonton, Alberta
2. University of Lethbridge, Lethbridge, Alberta
3. Agriculture and Agri-Food Canada, Lethbridge, Alberta

In recent field studies, we showed that arthropod prey are key components of the diet of plains sharp-tailed grouse (*Tympanuchus phasianellus jamesi*), especially grasshoppers (Orthoptera: Acrididae; 18 species found in crops). Further investigation used analysis of stable isotopes, which when applied to the tissue of a consumer organism can estimate the proportional utilization of foods based on different isotopic signals, and can also be used to estimate changes to diet over time. In this study, stable isotopes of nitrogen (δ15N) and carbon (δ13C) were used to examine feeding relationships. Primary feathers from 40 plains sharp-tailed grouse were analyzed and used to estimate diet proportions of vegetation and arthropods from May to October. Results of stable isotope analysis indicated that plains sharp-tailed grouse mainly utilize nutrients obtained from insect prey, which are mainly grasshoppers (Orthoptera: Acrididae), for primary feather synthesis. Grasshoppers were especially important in the fall diet, notably Dawson's grasshopper *Melanoplus dawsoni*, 62.6% by number, 48.7% by dry weight, followed by Marsh Meadow Grasshopper, *Pseudochorthippus curtipennis* (21.6% n, 19.7% wt), and Bruner's Spur-throat Grasshopper, *Melanoplus bruneri* (10.2% n, 20.8% wt). Food web dynamics are poorly understood, and emerging factors such as climate change are likely to alter bird-arthropod trophic relationships.

Poster #5 Title: Significant range expansion by Hayden's Grasshopper, *Derotmema haydeni*, in 2021-2022.

Author: Johnson, D.[1]

1. University of Lethbridge, Lethbridge, Alberta

Hayden's Grasshopper, *Derotmema haydeni*, (Orthoptera: Acrididae: Oedipodinae) is a small bandwinged grasshopper that has a wide distribution in North America, but low densities. It was previously known in Canada mainly from the extreme south-east corner of Alberta, and southern Saskatchewan along the USA border. Monitoring for this species by the author during 1983-2020 indicated that it was found only in the area near Pakowki lake, with rare specimens from as far west as Writing-on-Stone. Its unmistakeable anatomical features mean that outlying populations can be located, and one small local population near Drumheller, AB, was monitored 1987-1995, when it disappeared. On historical maps (Brooks; Vickery; others) and during annual surveys by the author during 1983-2020, it was never found west of Milk River, AB. This species tends to fly low and short distances only, remains where it hatches, moves little, and feeds locally on forbs, brome, sage, and certain flowering grassland plants. In 2021, Hayden's Grasshopper unexpectedly expanded range to the west, and in 2022, both colour forms (red and yellow hindwing) could be found for the first time across southern Alberta, relatively common including as far west as Lethbridge and Fort Macleod. It was found (red and yellow

forms) on the University of Lethbridge campus, throughout the Oldman River valley, near Manyberries, and in grassland between Cardston, Lethbridge, and Coutts.

Poster #6 Title: Biogeography, diversity, and results of field and laboratory studies of lady beetles (Coleoptera: Coccinellidae) in southern Alberta

Authors: Johnson, D.[1], Sapsford, C.[1,2], Kawchuk, L.[2], and Meyhoff, S.[3]

1. University of Lethbridge, Lethbridge, Alberta
2. Agriculture and Agri-Food Canada, Lethbridge, Alberta
3. University of Alberta, Edmonton, Alberta

We monitored lady beetles (Coleoptera: Coccinellidae) in research sites, agricultural studies, and natural areas in southern Alberta during 2009-2022, via sweepnet sampling, yellow sticky traps, and directed searches. Locations included grassland, agricultural fields (potatoes, cereal, canola, gardens), native and revegetated rangeland, foothills, and montane habitat. Sampling was limited during 2009-2014, and intensified during 2015-2022. The dominant species during 2015-2020 was *Coccinella septempunctata*, followed by smaller numbers of *Hippodamia parenthesis*, *Adalia bipunctata*, and *Hippodamia convergens*. *Hippodamia sinuate* and *Hippodamia tredecimpunctata* were also common in potato fields.

A shift from *Coccinella septempunctata* to other species occurred in 2021-2022. In 2022, *Coccinella septempunctata* became rare, and overtaken in numbers by *Hippodamia parenthesis*, *Adalia bipunctata,* and *Hippodamia convergens*, which were more abundant in 2022 than in any previous year in which we observed. In numerous locations in southern Alberta in 2022, *Coccinella septempunctata* abundance declined to low numbers or zero, where other species increased in numbers, especially early in the season. We conducted laboratory experiments on rate of feeding on tomato-potato psyllids, and aphids. In field situations, we conducted studies to compare capture data in sweepnets and on yellow sticky cards.

Species observed: *Adalia bipunctata, Brumoides septentrionis, Coccinella novemnotata, Coccinella septempunctata, Coccinella transversoguttata, Hippodamia caseyi, Hippodamia convergens, Hippodamia expurgate, Hippodamia glacialis, Hippodamia oregonensis*, *Hippodamia parenthesis*, *Hippodamia quinquesignata*, *Hippodamia sinuata*, *Hippodamia tredecimpunctata*, *Hippodamia unknown sp.*, *Hyperaspis undulata*, *Psyllobora vigintimaculata*, (and *Anatis lecontei*, identified from a specimen photographed by Maureen Sexsmith-West).

Poster #7 Title: Establishment of an insect collection at Mount Royal University

Authors: Owen, R. E.[1], and Wood, M.[1]

1. Mount Royal University, Calgary, Alberta

We describe the establishment of an official insect collection at Mount Royal University for use by students and faculty. The Institute for Environmental sustainability at MRU provided seed funding for entomological supplies (cabinets, etc.) and salary for a Research Assistant this past summer. The core of the collection consist of insects donated by the senior author and insects collected this summer. The collection will serve three main purposes: (1) Teaching – the insects can be used biology courses such as Biol-1204 (Evolution of Eukaryotes), and Biol-2214 (Invertebrate Zoology), (2) Biodiversity data – yearly collections will be done at specific locations varying in latitude and altitude to add to the collection and to monitor changes in species diversity, etc., (3) Research – this will be a resource for faculty and student research. More than just plotting species diversity, distributions, abundances, etc., research can also include morphological comparisons and DNA work. This collection will be a start of long-term insect biodiversity projects at MRU, and will inspire faculty and students to become involved in entomology.

Poster #8 Title: Distribution and diversity of terrestrial Isopods (Isopoda: *Oniscidea*) and their symbionts in Alberta

Authors: Stormer, H.[1] and Proctor, H.[1]

1. University of Alberta, Edmonton, Alberta

Terrestrial isopods (Isopoda: *Oniscidea*), also known as woodlice or sowbugs, are detritivorous terrestrial crustaceans that have been introduced to Alberta, but their diversity has never been surveyed. Sowbugs can be introduced to new areas via transport of gardening products; therefore, greenhouses may be sites of introduction for sowbugs in Alberta, with possible high species diversity in greenhouses as a result. We surveyed sowbugs in Alberta to determine: (a) species richness and distribution; (b) presence of sowbug-associated symbionts; (c) sowbug diversity in greenhouse vs. non-greenhouse sites. Sowbugs were surveyed in 14 greenhouses and (in part via collections by colleagues) across 69 non-greenhouse sites comprising urban and natural areas; citizen scientists provided photos from additional sites. We hand-collected sowbugs, identified them morphologically and examined them for symbionts. All seven species we have collected so far are native to Europe or Asia. *Cylisticus convexus* (De Geer), *Trachelipus rathkii* (Brandt), *Armadillidium nasatum* (Budde-Lund), *Porcellio spinicornis* Say and *P. scaber* Latreille were found in both greenhouse and non-greenhouse sites; *P. dilatatus* Brandt and *Nagurus cristatus* (Dollfus) were only found in greenhouses. Photos from a citizen scientist show a possible eighth species (*Armadillidium cf. vulgare* (Latreille)). Sowbug symbionts included mites and nematodes, both in low prevalence (<5 sites on <4 sowbugs per site). Future work includes COI sequencing to confirm sowbug identification and explore patterns in genetic diversity for a selected species across a range of sites. This study will increase knowledge of Alberta's biodiversity and test hypotheses about routes of entry of sowbugs to Alberta.

Poster #9 Title: Modelling pollinator deception: Why plants lie

Authors: Todoschuk, J. M.[1] and Springer, S.[2]

1. University of Lethbridge, Lethbridge, Alberta
2. University of Prince Edward Island, Charlottetown, Prince Edward Island

When you can't move, sex can be a challenge. Sexual plants incentivise pollinators to visit related flowers to achieve cross-pollination by providing rewards, including pollen or nectar. Some plants have evolved deceptive rewards, providing false incentives to pollinators while investing little energy into nectar production. We developed a plant-pollinator interaction model to predict different evolutionary outcomes of plant deception and pollinator response. In our model there is a plant and pollinator population. We included the following assumptions: 1) pollinators visit plants and receive nectar based on phenotypic match. 2) A close match results in large rewards (nectar or pollen) and vice versa. 3) Significant reward increases the chance that a pollinator will visit a similar plant in the future. 4) Plants have offspring when their pollinators have visited plants with a close phenotypic match. 5) Pollinators have more offspring when they receive large rewards. We modelled a lie function that allows plants to manipulate and influence pollinator behaviour. Pollinators cannot distinguish between real and false nectar, but they can only produce offspring from real nectar. Our results suggest that there are four extremes of plant-pollinator interactions and under the right circumstances plant-pollinator conflicts may form a cycle across three trait dimensions: plant honesty, plant-insect match, and pollinator preference. 1) Insects evolve to match honest plants. 2) Honest plants respond by evolving to be

deceptive. 3) Insects evolve to avoid deceptive plants. 4) Plants re-evolve honest incentives. Our model demonstrates plant-pollinator co-evolutionary dynamics we often see in the field.