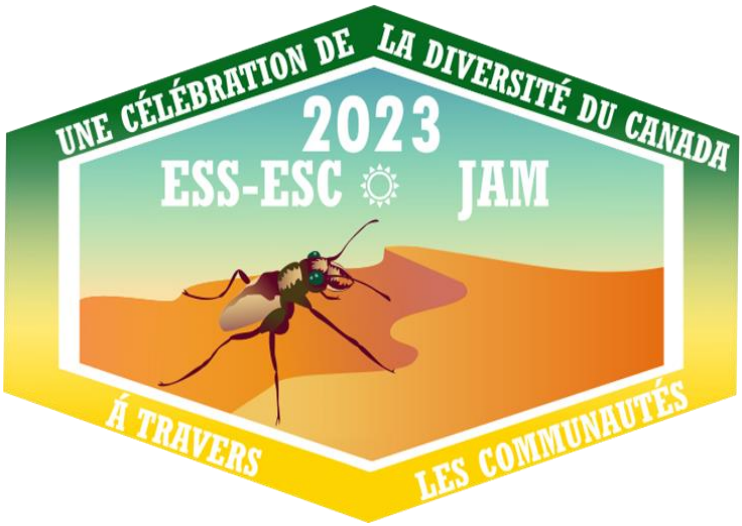
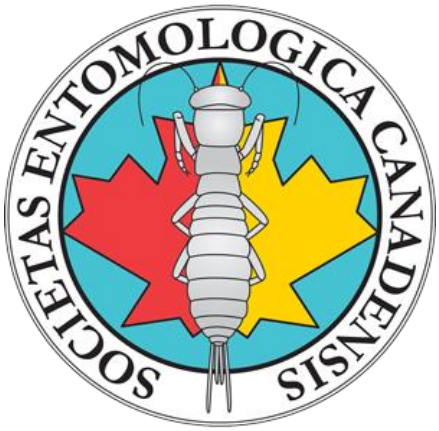
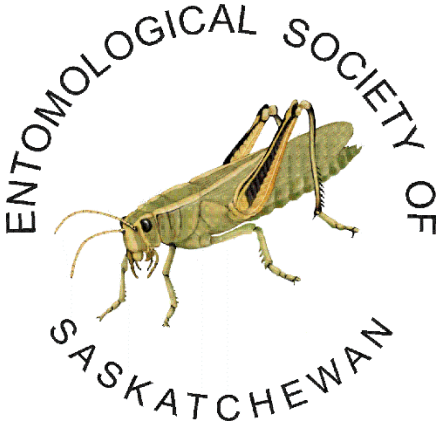
2023 Joint Annual Meeting of the Entomological Societies of Canada and Saskatchewan

Saskatoon, Saskatchewan
Sunday, October 15 – Wednesday, October 16, 2023
Delta Hotels Saskatoon Downtown, 405 20th Street East



Réunion annuelle conjointe des Sociétés d'entomologie du Canada et de la Saskatchewan
Dimanche 15 octobre – mercredi 18 octobre 2023
Delta Hotels Saskatoon Downtown, 405 20th Street East





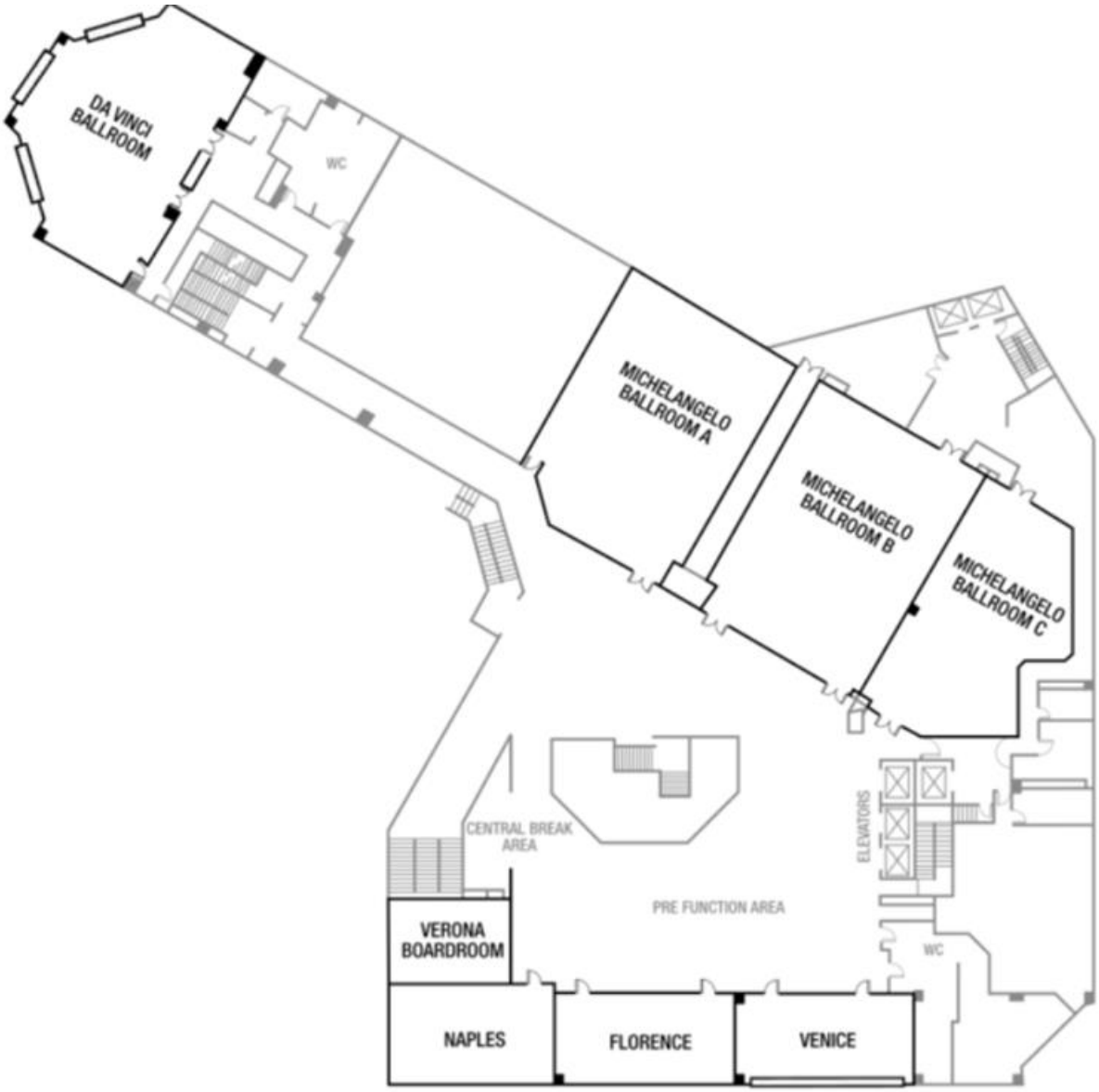


Figure 1. Map of the Convention Level at Delta Hotels Saskatoon Downtown; all events in the Scientific Program will take place on the Convention Level.

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Welcome from the Entomological Society of Canada

On behalf of the Board of the Entomological Society of Canada I would like to welcome you to the 2023 Joint Annual Meeting of the Entomological Societies of Saskatchewan and Canada. I know the organizers have put together an excellent program highlighting the best of entomological research from across Canada, and around the world. Over the next few days when you run into one of the many organizers of this meeting please take a moment to stop and give them your thanks for taking on the commitment of organizing this meeting. It's been a lot of work and we owe them our sincere thanks.

I would encourage you to take in as many of the presentations as you can and avail yourself of the opportunity to network with your colleagues over the next few days. I attended my very first Entomological Society of Canada meeting in Saskatoon almost 25 years ago and people I met there turned into colleagues and friends I work with today.

In these remarks I would be remiss if I did not comment on the fact that this is our first 'normal' meeting since 2017. It's a cliche to say a lot of things have changed since we last met in Winnipeg. We've all experienced a lot of change since then, and the change has often been stressful and challenging. I'm very proud to say that I think the Entomological Society of Canada has weathered this period pretty well, and has come out the other side stronger for it. That is not to say, however, that our work as a society is done. There are many challenges and opportunities ahead, but I think we have a great membership that cares about where we are going. I hope that

Au nom du conseil d'administration de la Société Entomologique du Canada je vous souhaite bienvenue à la Réunion Annuelle Conjointe des Sociétés Entomologique de Saskatchewan et du Canada 2023. Je sais que les organiseurs ont mis ensemble un programme excellent qui démontre le meilleur de la recherche entomologique tout autour du Canada, et autour du monde. A travers des prochaines journées quand vous rencontrez un des plusieurs organiseurs, s'il vous plait prendre quelques moments pour leurs remercier de prendre l'engagement d'organiser cette réunion. C'était beaucoup de travail et nous leurs devons notre remercîment sincère.

Je vous encourage à visiter autant de présentations que vous pouvez et de vous en profiter de l'opportunité pour resauter avec vos collègues dans ces prochaines journées. J'ai eu plaisir d'assister à ma première rencontre du Société Entomologique Canadien en Saskatoon il y a 25 années et le gens que j'ai rencontré ont devenu mes collègues et mes amis avec qui je travaille aujourd'hui.

Avec ces remarques ça serait négligent de ne pas commenter sur le fait que ceci est notre premier rencontre « normal » depuis 2017. C'est un cliché de dire que beaucoup d'affaires ont changé depuis cette dernière rencontre en Winnipeg. Nous avons tous connu beaucoup de changements depuis ce temps, et ces changements ont souvent été stressant et difficile. Je suis tellement fier de vous dire que je pense que la Société Entomologique Canadien a bien résister à

your experience at this years meeting inspires you to take a larger role in the society and helping us move forward through the next six years, and beyond.

Chris MacQuarrie, President, Entomological Society of Canada

cette période, et nous avons sortis plus fort à l'autre cote. Cependant, ce n'est pas à dire que notre travaille comme société est fini. Il y aura beaucoup de difficultés et d'opportunités à l'avenir, mais je pense que nous avons une adhésion super qui se soucie de notre direction.

J'espère que vos expériences à la rencontre cette année vous inspirent de participer encore plus avec la société et de nous aider à avancer dans les prochaine six années et au-delà.

Chris MacQuarrie
Président, Société Entomologique du Canada

Welcome from the ESC-ESS JAM 2023 Organizing Committee

The Entomological Society of Saskatchewan is pleased to welcome the diversity of entomologists coming from across Canada to be guests in Saskatoon and participate in the Joint Annual Meeting of the Entomological Societies of Canada and Saskatchewan this year. We are so proud to be able to host an in-person meeting and show the beauty of our city and the Wanuskewin Heritage site nearby.

The conference this year is going to be both a scientific and cultural experience with three plenary speakers, four symposia, four Graduate Student Showcase presentations, over 60 President's Prize student talks and posters, over 45 contributed talks, a Gold Medal Address by Dr. Maya Evenden, and a Heritage Lecture by Dr. Julie Soroka.

We have worked hard to increase First Nations representation in our meeting, with a presentation by Elder Dennis Omeasoo at the opening ceremonies, an art auction of First Nations art by Tim Tait from which we will establish a First Nations Scholarship in entomology, and a hoop dance by Lawrence Roy at the banquet on Tuesday evening.

Saskatchewan's motto of "*Multis e gentibus vires*" (From Many Peoples Strength) characterizes the diversity of cultures that have built our province, and the Indigenous Peoples with which treaties were signed to allow for the construction of our communities are foundational to the province's existence and future.

La Société Entomologique de Saskatchewan vous souhaite bienvenue à la diversité d'entomologistes qui s'en viens de partout au Canada pour être ici en Saskatoon pour le Rencontre Annuel de Sociétés Entomologique en Canada cette année. Nous sommes fiers d'être capable d'avoir une rencontre en personne et de vous montrer la beauté de notre ville et de la site Patrimoine Wanuskewin.

La conférence cette année sera tous les deux une expérience scientifique et culturelle avec trois conférenciers en plénière, quatre colloques, quatre vitrines des étudiants diplômés, plus de 60 conférences et affiches d'étudiants Prix du Président, plus de 45 conférences contribuées, un discours Médaille d'Or par Dr. Maya Evenden, et une conférence de patrimoine par Dr. Julie Soroka.

Nous avons travaillé fort pour améliorer le présence Premier Nations ici à cette conférence, il y aura une présentation par Ainé Dennis Omeasoo dans les cérémonies d'ouverture, une vente aux enchères d'arts avec l'art Premier Nation de Tim Taite, avec laquelle nous allons établir une bourse Premier Nation en entomologie, et une danse du cerceau par Laurence Roy au banquet le mardi soirée.

Le devise de Saskatchewan "*Multis e genibus vires"* (Avec la force de nombreux peuples) démontre la diversité de cultures qui ont établi notre province, et le Peuple Indigène avec qui les traites ont été signer pour permettre la construction de nos

Organizing a meeting like this is a tremendous amount of work for the volunteers participating in its construction and we are grateful to all the members of the Local Organizing Committee for their help over the past couple years. Their work, your participation, and the generous support of the sponsors for this meeting are crucial for its success.

Iain Phillips, Local Organizing Committee Chair

Tyler Wist, General Meeting Chair

Meghan Vankosky, Program Chair

communautés sont la fondation de l'existence de cette province et la future.

L'organisation d'une rencontre comme ceci demande un effort formidable des bénévoles participant dans sa construction et nous remercions tous les membres du Comité d'Organisation Local pour leur aide ces dernier années. Leur effort, votre participation, et le support généreux des parraines pour cette rencontre sont crucial pour son succès.

Iain Phillips
Président du Comité d'Organisation Local

Tyler Wist
Président de l'Assemblée Générale

Meghan Vankosky
Président du Programme

2023 ESC-ESS Joint Annual Meeting Theme and Logo

A Celebration of Canada's Diversity Through Communities

The handsome beetle characterized on the ESS-ESC JAM 2023 logo is Gibson's Bigsand Tiger Beetle (*Cicindela formosa gibsoni* Brown), the range of which is primarily limited to southern Saskatchewan. This unique tiger beetle's type specimen was first described from the Great Sand Hills in Southwestern Saskatchewan, and is treated as a threatened species in the Species at Risk Act today as dune stabilization and habitat loss have restricted its distribution.

Members of the Entomological Society of Saskatchewan are working on studies characterizing its population size, habitat preference, threats from water management, and diet, and this year's recipient of the Criddle Award is an amateur entomologist named Kiara Calladine of Montreal Lake First Nation and La Ronge, Saskatchewan who has published works on this beetle's distribution, abundance, ecology and genomic distinctness from related species (Bell et al. 2019, French et al. 2021).

This beetle was chosen as a departure from the other important focus of crop pest management to highlight some of the unique entomological diversity present in Saskatchewan, in the context of global declines in insect diversity. Ultimately, the selection of this beetle to feature on the logo for our meeting this year is meant to tie the special diversity of insects we have in the country to the diversity of cultures, communities, and research that

Une Celebration du Diversité de le Canada A Travers des Communautés

Le beau scarabée représenté sur le 2023 ESS-ESC JAM logo est un Cicindèle Gibson's Bigsand (*Cicindela formosa gibsoni* Brown), la gamme de ceci est principalement limiter dans le Sud de Saskatchewan. La spécimen-type de ce cicindèle unique était décrit dans les Grandes Dunes du Saskatchewan, et est traiter comme une espèce menacée par le Loi sur les Espèces en Péril aujourd'hui, depuis que la stabilisation des dunes et la perte d'habitat ont restreint sa distribution.

Les membres de la Société Entomologique de Saskatchewan travaillent sur des études qui caractérisent la taille de population, la préférence en matière d'habitat, les menaces liées à la gestion de l'eau, et son régime, et la destinataire du Prix Criddle cette année est une entomologiste amatrice nommée Kiara Calladine du Premier Nation Lac Montréal et La Ronge en Saskatchewan qui a publier ses travaux sur la distribution, écologie, et la distinction génomique de cette scarabée de ses apparentées (Bell et al. 2019, French et al. 2021).

Ce scarabée ici était choisi comme une différence par rapport à l'autre objectif important de la lutte contre les ravageurs des cultures pour souligner une portion de la diversité entomologique unique présent en Saskatchewan, dans le contexte des déclins mondial de la diversité des insectes. Finalement, la sélection de ce scarabée pour le logo était pour relier la diversité spéciale des insectes dans cette pays aux diversités

entomologists from across Canada are bringing to Saskatoon, as well as celebrating the local Indigenous peoples and insects native to our province. Through the work of our entomological communities there is hope to bridge cultures and sources of knowledge for a better future of biodiversity conservation and scientific achievement.

The Entomological Society of Saskatchewan held a small, logo designing competition around their chosen insect and Sydney Worthy, entomologist in Pest Management with the City of Saskatoon's take on Gibson's Bigsand tiger beetle was chosen. The logo, created in Adobe Photoshop, features a stylized tiger beetle sitting in its habitat, the sand dunes. The colour scheme bleeds from the Saskatchewan official green at the top, through Saskatchewan's official yellow and rests on the orange colour of the sand to tie the colour scheme into the orange hues of the sand dunes within.

des cultures, communautés, et la recherche que les entomologistes autour du canada s'apportent ici à Saskatoon, et aussi pour célébrer les peuples indigènes locales et les insectes originaire de notre province. A travers du travail de nos communautés entomologistes, il y a de l'espoir pour rapprocher les cultures et les sources de connaissances pour une meilleur future dans la conservation de biodiversité et de la réalisation scientifique.

La Société Entomologique de Saskatchewan a organisé un petit concours de création de logo au topique d'un insecte choisi et le Cicindèle Gibson's Bigsand par Sydney Worthy, entomologiste en Lutte Antiparasitaire avec le Ville de Saskatoon, était choisi. Le logo, créé en Adobe Photoshop, démontre une cicindèle stylisée dans son habitat, les dunes. La palette des couleurs passe du vert officiel de Saskatchewan au sommet, à travers du jaune officiel de Saskatchewan et finit avec le couleur orange du sable pour connecter le schéma de couleurs avec les teintes d'orange des dunes de sables dedans.

References

Bell, A. J., K. Calladine, and I. Phillips. 2019. Distribution, abundance, and ecology of the threatened Gibson's Bigsand Tiger Beetle (*Cicindela formosa gibsoni* Brown) in the Elbow Sand Hills of Saskatchewan. Journal of Insect Conservation. 23:957-965.

French, R., A. J. Bell, K. Calladine, J. Acorn, and F. Sperling. 2021. Genomic distinctiveness despite shared color patterns among threatened populations of a tiger beetle. Conservation Genetics. 22(6):1-16.

ENTOMOLOGICAL SOCIETY OF CANADA MEETING CODE OF CONDUCT

[Date code adopted: 21 April 2020]

This Code of Conduct applies to all meetings and events of the Entomological Society of Canada (ESC). By attending any ESC meeting or event you agree to abide by this Code of Conduct. This Code applies to all participants including, but not limited to: attendees, speakers, guests, staff, service providers, vendors and sponsors.

Authorship

All authors listed on a presentation or abstract must agree with all information that is contained in the presentation. Failure to agree will result in the presentation being withdrawn. Submission of a presentation to an ESC Joint Annual Meeting (JAM) indicates the intent of one of the listed authors to attend the meeting. Repeated or consecutive last-minute cancellations may result in the denial of future submissions.

Photography

The ESC requests that there be no photography or videography of presentations or posters without the explicit permission of the presenter.

Expected Behaviour

- Treat all other participants with kindness, respect and consideration.
- Communicate openly and with respect for others, and in the language of your choice.
- Personal attacks are not acceptable. Critique ideas, not people.
- Alert the meeting organizers or staff if you notice a dangerous situation or someone in distress.
- Respect the rules and policies of the venue.

Unacceptable behaviour

Violent or discriminatory behaviour or harassment in any form will not be tolerated. Harassment means engaging in a course of vexatious comment or conduct against another person that is known or ought reasonably to be known to be unwelcome. Note that it is possible for a single incident, if sufficiently serious, to constitute harassment.

Harassment includes, but is not limited to: offensive gestures or comments (verbal or written) related to a person's race, ancestry, place of origin, colour, ethnic origin, citizenship, creed, sex, sexual orientation, gender identity, gender expression, age, marital status, family status, or disability; deliberate intimidation; unwanted photography or recording; sustained disruption of

presentations and events; or any form of unwelcome attention, including physical contact. Participants asked to stop harassing behaviour are expected to comply immediately.
Other examples of unacceptable behaviour include:

- Physical or verbal abuse of any participant.
- Use of sexual or discriminatory images in public spaces or in presentations.
- Bullying behaviour.
- Retaliation for reporting of unacceptable behaviour.

Immediate serious threat to personal or public safety

Anyone experiencing or witnessing behaviour that is an immediate threat to personal or public safety should contact local law enforcement (by calling 911) and immediately notify venue security.

Reporting Unacceptable Behaviour

If you are the subject of unacceptable behaviour or have witnessed such behaviour, please immediately notify a Code of Conduct Advocate. Code of Conduct Advocates will be wearing identification so as to assist you in identifying them.

Notification may be done on-site or by emailing your concern to Meghan Vankosky at meghan.vankosky@gmail.com or phoning Meghan Vankosky (306-371-6477).

Reporting should never be done via social media to protect the confidentiality and fairness of the reporting process, and to ensure that reports are received in a timely manner.

Regardless of whether a notification is made, you are encouraged to document the unacceptable behaviour in writing as soon as possible in the event that further investigation is required.

ESC Investigation and Response to Complaints

Investigations into alleged unacceptable behaviour pursuant to this Code of Conduct shall be the responsibility of a person or committee appointed by the ESC Board of Directors.

The person assigned to conduct the investigation may be internal or external to the organization. The investigator will interview and collect documents from the person who allegedly experienced the violence or harassment, the alleged harasser(s), and any other relevant witnesses.

Information that is provided about an incident or complaint will not be disclosed, except as necessary to investigate the complaint / incident, to take corrective action, or as otherwise required by law. While the investigation is ongoing, the person who has allegedly experienced harassment, the alleged harasser(s), and any witnesses should not discuss the incident or complaint or the investigation with each other or with other ESC members unless necessary to obtain advice about their rights.

Depending on the severity of the alleged incident(s), ESC may impose interim measures to ensure the health and safety of its members, staff and volunteers, including but not limited to suspension from employment with pay or suspension from board/committee duties, pending completion of an investigation.

At the conclusion of the investigation, ESC's Board of Directors will reach a decision as to whether there was violence or harassment and will report its findings, including any corrective action that will be taken, to the person who allegedly experienced the violence or harassment and to the alleged harasser.

In addition to any interim measures taken, violators of this Code of Conduct will receive a written summary of actions taken in response to an investigation or incident report. The ESC Board of Directors shall be responsible for implementing all responses and sanctions that may result from an investigation of a complaint. ESC shall maintain all records relating to the investigation for at least one year from its conclusion.

Consequences

The ESC reserves the right to remove an individual from any meeting without warning or refund, prohibit attendance at future meetings and suspend or rescind membership in the ESC for failing to abide by this Code of Conduct.

ESC-ESS JAM 2023 Advocates

Héctor Cárcamo
Iain Phillips
Deepa Pureswaran
Meghan Vankosky

General Information

Registration Desk
The registration desk will be located in the Pre-Function Area on the second floor of the conference hotel, Delta Hotels Saskatoon Downtown, 405 20th Street East from 08:00 to 18:00 on Sunday (October 15), Monday (October 16), and Tuesday (October 17).

Oral Presentations
Presentations in the Contributed Talks sessions and President's Prize Oral sessions will be limited to 12 minutes plus 3 minutes for questions. Moderators will be asked to strictly adhere to the 15 minute time limit for each speaker as there will be concurrent sessions. Presenters will need to download their presentations (preferred in PPTX format) to a conference laptop in the Verona Room in advance of their presentation, at least two coffee/lunch breaks before their scheduled presentation time. Ideally, all presenters will upload their presentation when they pick up their registration packages from the Registration Desk. Using a USB stick or other portable device is advised. Please format file names as: "First Name_Last Name_Presentation Day and Time."

Posters
We have ample space for posters! The maximum poster dimensions should be 1.2 m high x 1.2 m wide (4 feet wide x 4 feet high). Posters can be set up starting at noon on Sunday, October 15 (until 19:00 Sunday evening) and must be set up by noon on Monday, October 16. Posters are assigned a number (please see the Short Program) and should be set up in the space allocated. Pins or Velcro will be provided for set up, depending on the type of board. Poster presenters should be in attendance for the full duration of the poster session, from 17:00 to 18:00 h on Monday, October 16. The posters entered in the President's Prize competition will be judged during this time. Posters may be taken down at the presenter's discretion after the poster session is completed, but must be removed before the Banquet on Tuesday, October 17.

Conference Locations
All events in the Scientific Program will take place in rooms on the Convention Level at Delta Hotels Saskatoon Downtown. A 'quiet' room and/or family room space is available on the third floor in the Shakespeare Room. Room locations are noted in the Program at a Glance, in the Short Program, and in the Full Program.

Refreshment Breaks and Meals
Coffee breaks are included with meeting registration on Sunday, Monday, Tuesday and Wednesday and will be served in the Pre-Function Area. Lunches will be provided on Monday and Tuesday. ESC members are encouraged to collect lunch on Tuesday and then attend the ESC Annual General Meeting in Michealangelo A/B, starting at 12:30.

Social Functions

- Welcome Reception in Michealangelo A/B at 19:00 on Sunday, October 15.
- Trivia Contest, Monday, October 16 at lunch in the Venice Room
- Student Mixer, Monday, October 16, 19:00 at Winston's Pub
- Banquet, Tuesday, October 17, 19:00 in Michealangelo A/B

Business Meetings

- TCE Editorial Board Meeting in Naples Room, Monday, October 16 at 12:00
- Entomological Society of Canada Annual General Meeting, Tuesday, October 17 at 12:30 in Michealangelo A/B
- Meeting of the New ESC Executive (BOD2), Tuesday, October 17 at 14:00 in Naples Room
- Meeting of the Entomological Societies of Canada, Tuesday, October 17 at 15:00 in Naples Room

Art Auction

The Entomological Society of Saskatchewan welcomes everyone to view two paintings that will be auctioned at the Banquet (Tuesday, October 17). The paintings, by Tim Tait, were commissioned by the ESS and the proceeds of the auction will be used to establish a scholarship for Indigenous students pursuing entomological studies.

ESC-ESS Joint Annual Meeting 2023: Scientific Program at a Glance

Sunday, October 15, 2023

Start Time	Michealangelo A/B
13:30	Opening Ceremony
14:00	Gold Medal Address: Dr. Maya Evenden
15:00	Plenary 1: Dr. Doug Emlen
16:30	Graduate Student Showcase #1: Aaron Bell
17:00	Graduate Student Showcase #2: Saif Nayani
17:30	Graduate Student Showcase #3: Asim Renyard
18:00	Graduate Student Showcase #4: Berenice Romero

19:00 Welcome Reception and Mixer in Pre-Function Area

Monday Morning, October 16, 2023

Start Time	President's Prize 1. Behaviour Naples Room	President's Prize 2. Pest Management Michealangelo A/B	President's Prize 3. Taxonomy, Genetics & Diversity; Venice Room	President's Prize 4. Ecology & Evolution Florence Room
08:00	Andrew Colton	Tyler Hartl	Shawn Abraham	Genevieve van der Voort
08:15	Basirat Liadi-Azeez	Tobyn Neame	Georgiana Antochi-Crihan	Tianyi Ren
08:30	Benny Acorn	Teresa Aguiar Cordero	Zach Balzer	Rowan Rampton
08:45	Cailyn R. McKay	Sylvia Jensen	Donovan Bosnich	Nicola Pollock
09:00	Caleb Bryan	Shayla Woodland	Thilina Hettiarachchi	Rachel Pizante
09:15	Claire Gooding	Priyatha Chennamkulangara	Mackenzie Howse	Matthew Muzzatti
09:30	Emmanuel Hung	Midhun Sebastian Jose	Leah Jackson	Cecil Montemayor Aizpurua
09:45	**Coffee Break**	**Coffee Break**	**Coffee Break**	**Coffee Break**
10:00	Erik A. Etzler	Meganne Harrison	Jessica Lario	Campbell McKay
10:15	Genavieve Desjardin	Marina Carla Bezerra da Silva	Elyssa Loewen	Alexe Indigo
10:30	Kirra Kent	Jose M. Correa Ramos	Claire Paillard	Thomas Hall
10:45	Kyle Van Camp	Jeremy Irvine	Tiffany Pan	Mahsa Hakimara
11:00	Leanne Petro	Ilan Domnich	Cassandra Penfold	Olivia DeBourcier
11:15	Olajide Fatukasi	Aldo Rios	Karolina Pusz-Bochenska	Pedro Conceicao
11:30	Xander Slowenko	Alannah Penno		Scout Butler-Siemens
11:45		Abbe Pawluk		

12:00 Lunch provided in Pre-Function Area

12:00 TCE Editorial Board Meeting in Naples Room

12:00 Trivia Contest in Venice Room

Monday Afternoon, October 16, 2023

13:00: Plenary 2: Dr. Kyle Bobiwash in Michealangelo A/B

Start Time	Symposium: Aphids & Psyllids & Leafhoppers. Oh my! Michealangelo A/B	Agriculture I Florence Room	Forestry Venice Room
14:00	Eric Gerbrandt	Marcelo Polizel Camilli	Sara Edwards
14:15		Roselyne Labbé	Leah Flaherty
14:30	Dinesh Babu Paudel	Daniel Peck	James Hammond
14:45		Ian Scott	Brian Van Hezewijk
15:00	Grace Onu-Odey	Jean-Philippe Parent	Atta Ur Rehman
15:15		Thanuri Edirithilake	
15:30	**Coffee Break**	**Coffee Break**	**Coffee Break**
15:45	Meghan Vankosky	Tracy Hueppelsheuser	
16:00		Emilio Enrique Tellarini Prieto	
16:15	Tyler Wist	Gail MacInnis	
16:30		Suzanne Blatt	
16:45	Berenice Romero	Jill Sauter	
17:00			
17:15	Tim Dumonceaux		
17:30			

17:00 Poster Session in Michealangelo C. Judging of President's Prize entries will take place during this time.

19:00 Student Mixer at Winston's Pub

Tuesday Morning, October 17, 2023

08:00: Plenary #3: Dr. Diana Percy in Michealangelo A/B

Start Time	Symposium: Policy and Emergency Preparedness Michealangelo A/B	Taxonomy & Genetics Venice Room	Ecology, Evolution & Behaviour I Naples Room
09:00	Introduction	Louwrens Snyman	Chris Cutler
09:15	Troy Kimoto	Louwrens Snyman	Barry Cooke
09:30		Felix Sperling	Jennifer Heron
09:45	Ken Fry	Jen Perry	Robert Lamb
10:00		Dwayne Hegedus	Sophie M. Killam
10:15	**Coffee Break**	**Coffee Break**	**Coffee Break**
10:30	Babita Bains	Dezene Huber	**Coffee Break**
10:45		Bryan Brunet	Heather Proctor
11:00	Jeri L. Geiger (50 minutes)	Boyd Mori	Lisa Lumley
11:15		Gen Morinaga	Vivek Srivastava
11:30			

12:00 Lunch provided in Pre-Function Area

Tuesday Afternoon, October 17, 2023

12:30 Annual General Meeting of the Entomological Society of Canada in Michealangelo A/B

14:00 Meeting of NEW ESC Executive (BOD2) in Naples Room

15:00 Meeting of the Entomological Societies of Canada in Naples Room

Start Time	Symposium: Tribute to John H. Borden; Michealangelo A/B	Symposium: Invasives of the Urban Forest; Florence Room
14:00	Introduction	Introduction
14:15	Gerhard Gries (14:10)	Troy Kimoto
14:30		
14:45	Lorraine Maclauchlan	Tyler Wist
15:00	Dezene Huber	
15:15	Maya Evenden	Amanda Roe
15:30	Deepa Pureswaran	
15:45	**Coffee Break**	**Coffee Break**
16:00	Therese Poland	Christian MacQuarrie
16:15	Bob Setter	
16:30	Jeanne Robert	David Ensing
16:45	Ilesha Ileperuma-Arachchi	
17:00	Antonia Musso	Philippe Berthiaume
17:15	Rylee Isitt	
17:30		

18:00 Banquet, including the Heritage Lecture by Dr. Julie Soroka, awards and entertainment in Michealangelo A/B.

Wednesday Morning, October 18, 2023

Start Time	Agriculture II Naples Room	Ecology, Evolution & Behaviour II Florence Room
09:00	Michelle Franklin	Ryan McKellar
09:15	Jeremy Irvine	Delano Lewis
09:30	Kevin Floate	Rémi Hébert
09:45	Carol Frost	Abigail Cohen
10:00	John Soghigian	Stefani de Heij
10:15	Chaminda De Silva Weeraddana	Iain Phillips
10:30	**Coffee Break**	**Coffee Break**

Entomological Society of Canada Award Recipients, 2023

Gold Medal Award: The ESC Gold Medal recognizes outstanding achievement in Canadian entomology.
(French to follow for each award)

Maya Evenden has been a professor at the University of Alberta since 2003. Prior to that, she earned her PhD at Simon Fraser University (1998) and worked at the University of Kentucky and West Chester University (Pennsylvania). She has 112 peer-reviewed publications, of which 89 as first or last author, focusing especially on insect pest chemical ecology. Her research contributes to knowledge on intra-species (pheromone) as well as inter-species interactions at several trophic levels. She and her team apply the knowledge gained in the lab to applications in insect pest management such as mating disruption, attracticides, and pheromone-based monitoring.

Dr Evenden created a highly popular MOOC, Bugs 101, that has already been attended by over 40,000 learners from 130 countries in the four years since it went online. For this endeavour, she was awarded the Entomological Society of America's Science Communication Award (2022) and the University of Alberta's Remote Teaching Award (2021). She has also been recognized by her employer with a Graduate Mentoring Award (2022), having supervised 30 graduate students. She was recognized by the Entomological Society of Canada with a C. Gordon Hewitt Award (2007).

Dr Evenden has served her professional societies at the highest level, acting as president of the Entomological Societies of Alberta (2006) and Canada (2010), and the International Branch of the Entomological Society of America (2017).

Médaille d'or : La médaille d'or de la SEC récompense les réalisations exceptionnelles dans le domaine de l'entomologie au Canada.

Maya Evenden est professeure à l'Université d'Alberta depuis 2003. Auparavant, elle a obtenu son doctorat à l'Université Simon Fraser (1998) et a travaillé à l'Université du Kentucky et à l'Université West Chester (Pennsylvanie). Elle est l'auteure de 112 publications évaluées par des pairs, dont 89 en tant que première ou dernière auteure, portant notamment sur l'écologie chimique des insectes ravageurs. Ses recherches contribuent aux connaissances sur les interactions intraspécifiques (phéromones) et interspécifiques à plusieurs niveaux trophiques. Elle et son équipe appliquent les connaissances acquises dans le laboratoire à des applications dans la gestion des ravageurs tels que la confusion sexuelle, les attracticides et la surveillance basée sur les phéromones.

Dre Evenden a créé un MOOC très populaire, Bugs 101, qui a déjà été suivi par plus de 40 000 apprenants de 130 pays au cours des quatre années qui ont suivi sa mise en ligne. Pour cette entreprise, elle a reçu le prix de communication scientifique de la Société entomologie d'Amérique (2022) et le prix de l'enseignement à distance de l'Université d'Alberta (2021). Elle a également été récompensée par son employeur par un Prix de mentorat des études

supérieures (2022), ayant supervisé 30 personnes de la communauté étudiantes des cycles supérieurs. La Société d'entomologie du Canada lui a décerné le prix C. Gordon Hewitt (2007). Dre Evenden a servi ses sociétés professionnelles au plus haut niveau, agissant en tant que présidente des Sociétés d'entomologie de l'Alberta (2006) et du Canada (2010), ainsi que de la branche internationale de la Société entomologie d'Amérique (2017).

C. Gordon Hewitt Award: The ESC C. Gordon Hewitt Award is given to an individual who received their PhD within the preceding 12 years, and who has made an outstanding contribution to entomology in Canada.

Boyd Mori completed his PhD under the supervision of Maya Evenden in 2014 at the University of Alberta. Following stints at the Swedish University of Agricultural Sciences (SLU), Washington State University, and Agriculture and Agri-Food Canada in Saskatoon, he was recruited back to the University of Alberta in 2019 as an assistant professor, where he holds an NSERC Industrial Research Chair in agricultural entomology. Dr Mori has 32 refereed publications, including 17 as first or corresponding author, focusing on the chemical ecology and integrated pest management of clover, fruit, canola, wheat, and quinoa pests.

Dr Mori is a strong proponent of entomological teaching and research to help train the next generation of entomologists and agricultural scientists. He has mentored graduate students at SLU, the University of Guelph, University of Saskatchewan, and the University of Alberta. At the University of Alberta, Dr Mori was recently recognized for his teaching with two student and staff-nominated teaching awards. He is known for his engaging scientific and extension presentations and is a two-time winner of the ESC's President's Prize for student presentations.

Dr Mori has held multiple service roles, including participation on the ESC's Student and Early Professional Affairs Committee, Equity, Diversity, and Inclusion Committee, and Membership Committee, as a Regional Director and a Student Representative to the ESC, and as (currently) vice president of the Entomological Society of Alberta.

Internationally, Dr Mori has been recognized for his contributions to entomology by the International Branch of the Entomological Society of America (Early Career Research and Leadership Award, 2018) and the Royal Entomological Society (Fellow, 2022).

Prix C. Gordon Hewitt : Le prix C. Gordon Hewitt de la SEC est décerné à une personne qui a obtenu son doctorat au cours des 12 dernières années et qui a apporté une contribution exceptionnelle à l'entomologie au Canada.

Boyd Mori a obtenu son doctorat sous la direction de Maya Evenden en 2014 à l'Université de l'Alberta. Après des séjours à l'Université suédoise des sciences agricoles (SLU), à l'Université de l'État de Washington et à Agriculture et Agroalimentaire Canada à Saskatoon, il a été recruté de nouveau à l'Université de l'Alberta en 2019 en tant que professeur adjoint, où il est titulaire d'une chaire de recherche industrielle du CRSNG en entomologie agricole. Dr Mori a 32 publications évaluées par les pairs, dont 17 en tant que premier auteur ou auteur de

correspondance, portant sur l'écologie chimique et la gestion intégrée des ravageurs du trèfle, des fruits, du canola, du blé et du quinoa.

Dr Mori est un fervent partisan de l'enseignement et de la recherche en entomologie pour aider à former la prochaine génération d'entomologistes et d'agronomes. Il a encadré des membres de la communauté étudiante des cycles supérieurs à SLU, à l'Université de Guelph, à l'Université de Saskatchewan et à l'Université d'Alberta. À l'Université de l'Alberta, Dr Mori a récemment été récompensé en recevant deux prix d'enseignement décernés par la communauté étudiante et des membres du personnel. Il est connu pour ses présentations scientifiques et de vulgarisation attrayantes et a remporté à deux reprises le prix de la présidence de la SEC pour les présentations étudiantes.

Dr Mori a occupé de multiples fonctions, notamment au sein du Comité des affaires étudiantes et de début de carrière, du Comité de l'équité, de la diversité et de l'inclusion et du Comité de l'adhésion de la SEC, en tant qu'Administrateur régional et représentant des membres aux études de la SEC, et en tant que vice-président de la Société entomologie de l'Alberta (actuellement).

Au niveau international, le Dr Mori a été reconnu pour ses contributions à l'entomologie par la branche internationale de la Société entomologie d'Amérique (Early Career Research and Leadership Award, 2018) et la Société d'entomologie royale (Fellow, 2022).

Fellows of the Entomological Society of Canada: Entomological Society of Canada Fellows recognize members for their major contributions to entomology via research, teaching, application, and/or administration. This year the society bestows two new fellowships.

Michel Cusson recently retired (2022) after a long and illustrious career, largely at Natural Resources Canada's Laurentian Forestry Centre, where he is currently emeritus scientist. He earned his PhD at Université Laval (1989) before the genomic revolution, but following a career trajectory first as an insect physiologist then as a biochemist or molecular biologist, he finished as a specialist in genomics applied to forest invasive alien species, most notably, *Lymantria dispar* and *Agrilus planipennis*. Through his career, he authored 116 peer-reviewed articles and 20 book chapters and presented 88 invited conferences. He made seminal advances in several entomological research fields, from semiochemistry to molecular diagnostics to virology.

Dr Cusson has served as president of the Entomological Society of Canada (2012) and the Société d'Entomologie du Québec (2004). He was recipient of the ESC's Gold Medal Award (2020) and NRC's Achievement Award for Exceptional Career (2022).

Donna Giberson is professor emerita at the University of PEI where she held a faculty position for 25 years. Her outstanding teaching and scholarship there earned her the Presidential Merit Award for Teaching, the MacLauchlan Prize for Effective Writing (leadership in the development of writing among students), and the UPEI Award for Scholarly Achievement (twice).

Dr Giberson earned her PhD at the University of Manitoba (1991) and joined the faculty at UPEI after one year as NSERC Post-doctoral Fellow and sessional lecturer at Mount Allison

University. She has published 48 peer-reviewed articles and book chapters and 8 books and identification guides, mostly on aquatic insects. She has presented 24 invited or keynote talks.

Dr Giberson has been a tireless contributor to the entomological community in many ways, but most obviously in her editorial activities, helping to produce over 60 issues as assistant editor of the *Bulletin* of the ESC and as editor of the *Newsletter of the Biological Survey of Canada* (and, incidentally, of the *Mayfly Newsletter*). She has had almost continuous leadership roles in the BSC for over 25 years, led the organization of the ESC JAM in 2004, and was awarded the ESC's Gold Medal in 2022.

Membres associés de la Société d'entomologie du Canada : Le statut de membre associé de la Société d'entomologie du Canada récompense les membres pour leur contribution majeure à l'entomologie par le biais de la recherche, de l'enseignement, de l'application et/ou de l'administration. Cette année, la société nomme deux nouveaux membres.

Michel Cusson a récemment pris sa retraite (2022) après une longue et illustre carrière, en grande partie au Centre de foresterie des Laurentides de Ressources naturelles Canada, où il est actuellement scientifique émérite. Il a obtenu son doctorat à l'Université Laval (1989) avant la révolution génomique, et après un début de carrière d'abord comme physiologiste des insectes, puis comme biochimiste ou biologiste moléculaire, il a terminé comme spécialiste de la génomique appliquée aux espèces exotiques envahissantes des forêts, notamment *Lymantria dispar* et *Agrilus planipennis*. Tout au long de sa carrière, il a été l'auteur de 116 articles évalués par des pairs et de 20 chapitres de livres, et a présenté 88 conférences invitées. Il a réalisé des avancées décisives dans plusieurs domaines de la recherche entomologique, de la sémiochimie au diagnostic moléculaire en passant par la virologie.

Dr Cusson a été président de la Société d'entomologie du Canada (2012) et de la Société d'entomologie du Québec (2004). Il a reçu la médaille d'or de la SEC (2020) et le prix du CNRC pour une carrière exceptionnelle (2022).

Donna Giberson est professeure émérite à l'Université de l'Île-du-Prince-Édouard, où elle a occupé un poste de professeure pendant 25 ans. Son enseignement et sa recherche exceptionnels lui ont valu le Presidential Merit Award for Teaching, le MacLauchlan Prize for Effective Writing (leadership dans le développement de l'écriture chez les communautés étudiantes) et le UPEI Award for Scholarly Achievement (à deux reprises).

Dre Giberson a obtenu son doctorat à l'Université du Manitoba (1991) et a rejoint la faculté de l'UPEI après avoir été boursière postdoctorale du CRSNG et chargée de cours à l'Université Mount Allison pendant un an. Elle a publié 48 articles et chapitres de livres évalués par des pairs et 8 livres et guides d'identification, principalement sur les insectes aquatiques. Elle a présenté 24 conférences invitées ou principales.

Dre Giberson a apporté une contribution sans relâche à la communauté entomologique de bien des façons, mais surtout par ses activités éditoriales, en aidant à produire plus de 60 numéros en tant que rédactrice adjointe du Bulletin de la SEC et en tant que rédactrice du Bulletin d'information de la Commission biologique du Canada (et, accessoirement, du Bulletin Mayfly Newsletter). Elle a joué un rôle de leadership presque continu au sein de la SEC pendant

plus de 25 ans, a dirigé l'organisation de la réunion annuelle conjointe de la SEC en 2004 et a reçu la médaille d'or de la SEC en 2022.

Norman Criddle Award: The Norman Criddle Award recognizes the contribution of an outstanding nonprofessional entomologist to the promotion of entomology in Canada.

Kiara Calladine grew up a member of Montreal Lake First Nation in La Ronge, Saskatchewan. She undertook a statistics degree at the University of Saskatchewan right out of high school but found a group of students working on beetles as she went along and, in that, found a passion for entomology. She worked a couple summers with Iain Phillips and Aaron Bell in Troutreach Saskatchewan during her undergraduate studies and chose to do a Biology 480 independent project on tiger beetles through the Biology Department despite being majoring in statistics. Beyond a couple summers working as a technical assistant and learning an introduction to entomology, she has not worked in entomology or even biology. Ms. Calladine is a professional statistician, pursuing her interest and outreach of beetles in her spare time.

Ms. Calladine has published three carabid/cicindelid beetle papers with a fourth in press. Following her degree, she pursued these additional works on carabids and tiger beetles, even taking her holidays to road-trip across Canada and the U.S. to obtain specimens for the Gibson's big sand tiger beetle (GBSTB) genomics work. Her contributions have led to the expansion of tiger beetle work at the Water Security Agency with South Saskatchewan River GBSTB monitoring and Assessment, and at the University of Alberta in Felix Sperling's lab with the recent successful full genome of the GBSTB being sequenced.

Further to this, she maintains a large entomological collection and is pursuing the weevils of Saskatchewan with zeal.

Prix Norman Criddle : Le prix Norman Criddle récompense la contribution d'un individu entomologiste non professionnel exceptionnel pour la promotion de l'entomologie au Canada.

Kiara Calladine a grandi au sein de la Première nation de Montreal Lake à La Ronge, en Saskatchewan. Elle a entrepris des études de statistiques à l'Université de la Saskatchewan dès la fin de ses études secondaires, mais elle a découvert un groupe d'étudiants qui travaillaient sur les coléoptères et s'est ainsi découvert une passion pour l'entomologie. Elle a travaillé quelques étés avec Iain Phillips et Aaron Bell à Troutreach, en Saskatchewan, pendant ses études de premier cycle et a choisi de réaliser un projet indépendant Biology 480 sur les cicindèles par l'intermédiaire du département de biologie, bien qu'elle se soit spécialisée dans les statistiques. En dehors de quelques étés passés à travailler comme assistante technique et à apprendre à connaître l'entomologie, elle n'a jamais travaillé dans le domaine de l'entomologie ou même de la biologie. Mme Calladine est une statisticienne professionnelle qui s'intéresse aux coléoptères pendant son temps libre.

Mme Calladine a publié trois articles sur les carabidés et les cicindélidés, et un quatrième est sous presse. Après avoir obtenu son diplôme, elle a poursuivi ses travaux sur les carabes et les cicindèles, prenant même ses vacances pour parcourir le Canada et les États-Unis afin d'obtenir des spécimens pour les travaux de génomique sur la cicindèle à grandes taches de Gibson. Ses contributions ont permis d'étendre les travaux sur la cicindèle à l'Agence de

sécurité de l'eau, avec la surveillance et l'évaluation de l'espèce dans la rivière Saskatchewan Sud, et à l'Université de l'Alberta, dans le laboratoire de Felix Sperling, avec le récent succès du séquençage du génome complet de cette cicindèle.
En outre, elle entretient une vaste collection entomologique et s'intéresse avec zèle aux charançons de la Saskatchewan.

Bert and John Carr Award: The Bert and John Carr Award supports research activities in faunistics, natural history, and/or taxonomy of Canada's insects.

Aleksandra J. Dolezal is a finishing PhD student with Andrew MacDougall at the University of Guelph. She requested support for travel to collect insects and visit museums and determine key pollinators of dominant crops and wild plants in Ontario agroecosystems. With the newly collected data, historical data gathered from entomological collections, and calculations of "dark diversity" (the portion of actual but not formally documented diversity), she will study spatial and temporal pollinator alpha and beta diversity.

Prix Bert et John Carr : Le prix Bert et John Carr soutient les activités de recherche sur la faune, l'histoire naturelle et/ou la taxonomie des insectes du Canada.

Aleksandra J. Dolezal termine son doctorat avec Andrew MacDougall à l'Université de Guelph. Elle a demandé un soutien pour voyager afin de collecter des insectes et de visiter des musées et de déterminer les principaux pollinisateurs des cultures dominantes et des plantes sauvages dans les agroécosystèmes de l'Ontario. Grâce aux données nouvellement collectées, aux données historiques provenant de collections entomologiques et aux calculs de la « diversité obscure » (la partie de la diversité réelle mais non officiellement documentée), elle étudiera la diversité alpha et bêta des pollinisateurs dans l'espace et dans le temps.

Sunday, October 15, 2023.

All Scientific Program events on Sunday take place in Michealangelo A/B.

13:30 **Opening Ceremony**. Moderators: Tyler Wist and Iain Phillips.

14:00 **Maya Evenden**. University of Alberta. mevenden@ualberta.ca.
Gold Medal Address: **The IPM pyramid applied to a career of teaching, research and service in entomology in Canada.**

15:00 **Doug Emlen**. University of Montana. doug.emlen@mso.umt.edu
Plenary 1.

16:00 Coffee Break (all in Pre-Function Area)

Graduate Student Showcase. Moderators: Matthew Muzzatti and Rowan French.

16:30 **Aaron J. Bell**[1,2], Stephen Paterson[2,3], Steven Van Wilgenberg[4], Colin Laroque[1], David A. Wardle[5], Iain D. Phillips[1,2,6].
1. University of Saskatchewan, 2. Troutreach Saskatchewan, 3. Saint Mary's University, 4. Environment and Climate Change Canada, 5. Asian School of the Environment, 6. Water Security Agency; aaron.bell@usask.ca

Temporal and spatial pyrodiversity, not island area or nearness, begets biodiversity of beetles on boreal lake islands.

Human-assisted climate warming and decades of fire suppression have altered the spatial and temporal patterns of fire across North America. These changes are characterized by more high intensity, large fires and fewer small fires of low-to-intermediate intensity. Extreme weather events, such as the ongoing heatwave of 2023, have also contributed to a record-breaking fire season in Canada, where fires have already burned an area equivalent to six times the annual average (13,678,162 ha, August 16, 2023). These landscape-scale changes alter habitat heterogeneity within the boreal forest with associated impacts on biodiversity. But, conventional approaches to conservation emphasize patch and landscape dynamics that largely ignore the role of disturbance. Here, we tested the pyrodiversity-biodiversity hypothesis, which posits that variation (i.e., heterogeneity) in post-fire landscape characteristics promote biodiversity, and compared it to other hypotheses commonly used to explain diversity patterns. Using a chronosequence of 42 lake islands spanning gradients in island area (1-350.4 ha), isolation (0.1-7.9 km from mainland), and fire history (1-231+ years since fire), we tested whether alpha and beta diversity of beetles increased with spatial (local variation in burn severity) and temporal (variation in time since fire among islands) pyrodiversity, respectively. Our findings indicate that spatial properties of islands (area and isolation) do not influence alpha diversity at the island-level, nor beta diversity of beetles at the landscape scale. Instead, we found support for the pyrodiversity-biodiversity hypothesis at the landscape-scale and evidence

that beetle richness on islands relates to abrupt influxes of deadwood associated with fire and tree senescence.

17:00 **Saif Nayani**, Sanam Meraj, Gerhard Gries.
Simon Fraser University; snayani@sfu.ca

Bovine mastitis, *Staphylococcus aureus* and stable flies: Evidence for a (not so positive) positive feedback loop.

Stable flies, *Stomoxys calcitrans*, are blood-feeding ectoparasites of cattle. However, the key roles that microbes play in this interaction are often overlooked. My work had two goals: firstly, determining if cattle skin microbes emit chemicals that flies use to locate cows. We swabbed cow skin, grew the resulting microbes, and isolated and identified each microbial species. We then conducted bioassays to determine if flies would be significantly more attracted to any of the 38 identified species than to controls, finding several *Staphylococcus* spp. that induced attraction. These results suggest that commensal skin microbes may play a role in drawing stable flies to their hosts. A different *Staphylococcus* species, *S. aureus*, causes the disease bovine mastitis, but whether stable flies act as mechanical vectors for *S. aureus* is unknown. This inspired the second goal of my work: determining if stable flies are attracted to *S. aureus* and able to transmit it from an infected blood source to a sterile one. After determining that flies were attracted to *S. aureus* in laboratory bioassays, we conducted transmission experiments. We fed flies blood samples inoculated with different concentrations of bacteria, and then fed them sterile blood at different time points. We found evidence of transmission across all time points and concentrations, particularly at the highest concentration. These data suggest that stable flies are attracted to and potentially vectoring disease-causing bacteria. Collectively, these results can be used to help develop trapping systems for stable flies and underscore the need to consider flies as disease vectors.

17:30 **Asim Renyard**, Regine Gries, Gerhard Gries.
Simon Fraser University; asim.renyard@gmail.com

Decision-making and coordination of foraging and defence in ants.

Ants coordinate their vast numbers to accomplish group tasks such as nest defense and foraging. Ants in danger may use multiple signal modalities, such as chemical or vibrational, and may find themselves in multiple dangerous contexts that could alter their responses. Foraging ants must be able to locate and assess the quality of food resources and communicate the location to nestmates. Few studies have examined how ants communicate using multi-modal signals, and if their responses change context-dependently. Moreover, the mechanism that ants use to locate and select food resources are not fully understood. Understanding food choices could help improve ant bait tactics. We used the ants *Camponotus modoc* and *Myrmica rubra* as model species. We characterised ant alarm behaviours and signalling under differing contexts using video recordings, GC-MS and laser doppler vibrometry. We then bioassayed the response of ants to either alarm pheromone, vibration, or the combination and video recorded their responses. To assess how ants locate and assess resources, and to design new ant baits, we used olfactometer bioassays, food choice experiments, GC-MS, and mortality trials. We found that

alarm responses may vary depending on social context, alarm pheromone attracted ants, and vibrations caused ants to either increase their running speed or “freeze”. These modalities synergistically caused ants to freeze for longer. For foraging, we show ants can discern resources based on their odour profile and strongly respond to nutrient types when selecting resources. Lastly, combining preferred nutrient types with an eco-friendly insecticide cause significant reductions of pest ants.

18:00 **Berenice Romero**[1], Tim Dumonceaux[2], Joanna Rojek[1,3], Chrystel Olivier[2], Tyler Wist[2], Sean M. Prager[1].

1. University of Saskatchewan, 2. Agriculture and Agri-Food Canada, Saskatoon, 3. University of Gdansk; berenice.romero@usask.ca

Host plant use in a phytoplasma vector.

Phytoplasmas are obligatory parasites associated with several diseases in plants and can be transmitted by hemipterans. In the Canadian Prairies, phytoplasma subgroup 16SrI is associated with Aster Yellows (AY) disease and is primarily transmitted by migratory populations of aster leafhoppers (*Macrosteles quadrilineatus* Forbes) (Hemiptera: Cicadellidae). In typical years, incidence of AY is below 0.01% for canola; however, the region is subject to outbreaks of unknown cause resulting in up to 95% infection in fields and between 10 and 15% yield reduction in canola and other annual crops. Considering the polyphagous and migratory nature of the vector, and the wide host range of the pathogen, several questions are raised regarding the role of different host plants in disease dynamics. To address this, domesticated and non-domesticated plant species (Poaceae, Brassicaceae, and Asteraceae) commonly found in this geographical region were selected. Aster leafhopper oviposition, nymphal development, and settling and probing behaviors were examined using no-choice and two-choice bioassays. Phytoplasma concentration in leaf tissues and symptoms associated with infection were determined at different timepoints (early, mid-, and late AY infection). Additional work involved examining the probing behavior of aster leafhoppers. In vector-borne pathosystems, specifics of vector probing behavior such as ingestion and salivation from the vascular tissue will play an important role in shaping disease dynamics, since these events are associated with the acquisition and transmission of pathogens, respectively. Altogether, these results will provide a better understanding of the AY epidemiology, resulting in management recommendations for local growers in the region.

19:00 Welcome Reception. Room: Pre-Function Area.

Monday, October 16, 2023.

President’s Prize 1: Behaviour. Room: Naples. Moderator: TBA

08:00 **Andrew Colton**, Angela E. Gradish, Rebecca H. Hallett.

University of Guelph; coltona@uoguelph.ca

Investigating the efficacy of male aggregation pheromone and volatile organic compound combinations for attraction of adult Colorado potato beetle.

Colorado potato beetle (CPB), *Leptinotarsa decemlineata*, a pest of solanaceous crops, has historically been managed with insecticides. However, effective insecticides are being lost to regulatory activities and resistance, and therefore, alternative management tactics are needed. The objective of this study was to determine CPB attraction to various semiochemical combinations and identify an optimal blend of compounds for deployment in a mass trapping strategy. The attractiveness of volatile organic compounds (VOCs) ((Z)3-hexenyl acetate, linalool, methyl salicylate, nonanal, 2-phenyl-ethanol, sulcatone) and CPB aggregation pheromone [(S)-CPB I] to male and female adult CPB was tested in two-choice olfactometer bioassays. Responses to the pheromone alone and in combination with VOCs were observed and compared. Several promising blends were identified that have potential to attract adult CPB effectively. These studies will contribute to the development of a CPB lure to provide potato and/or field tomato growers with an alternative to insecticides for CPB management.

08:15 **Basirat Liadi-Azeez**, John R. Gray, Erik G.N. Olson.
University of Saskatchewan; basirat.azeez@usask.ca

Effects of sublethal dose of pesticides on visually guided behaviour of bees.

The European Honeybee visual system is highly motion-sensitive, which is necessary for orientation in a complex environment. However, recent studies suggest that environmental stressors, such as insecticides, negatively impact orientation. These compounds are currently and persistently being used to treat seeds despite their negative effect on non-target organisms and include the common neonicotinoids and sulfoximines. This study investigates the effects of two common pesticides imidacloprid and sulfoxaflor on visually-guided optomotor responses, which are robust behavioural assays of visual motion detection and motor integration. We presented tethered bees with rotating vertical stripes across a range of rotational velocities and monitored body and head position with a video camera. While recently collected data are in the initial stages of analysis, observations suggest that the pesticides affect locomotor ability. Further analysis will measure putative effects on visual motion detection. These experiments will further our understanding of how pesticides affect ecologically-relevant bee behaviour.

08:30 **Benny H.G. Acorn**, Connor J. Nelson, Carol M. Frost.
University of Alberta; bacorn@ualberta.ca

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

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 six 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.

08:45 **Cailyn R. McKay**, Jeremy N. McNeil.
Western University; cmckay48@uwo.ca

Heat stress experienced during metamorphosis: Impacts on subsequent pheromone mediated mating in the true armyworm (*Mythimna unipuncta*) (Lepidoptera: Noctuidae).

Insects will not only be affected by the long-term effects of climate change but also by the increase in short-term extreme weather events, such as heatwaves. Behavioural changes may reduce the impact of such events but immobile life stages, such as eggs and pupae, will be more susceptible. In a previous experiment examining the effects of exposing true armyworm (*Mythimna unipuncta*) pupae to 30°C for 48 hours, I found negative effects on reproductive success of populations, including a decline in the incidence of mating, suggesting effects on the pheromone-mediated mating system. If this is the case this could be of considerable importance as pheromones are used in many pest management programs. I am currently studying the effects of pupal heat stress on mating behaviours, sex pheromone titers, male fluctuating asymmetry, and antennal responsivity to conspecific sex pheromone. I will present data on female calling behaviour and male hairpencil analyses.

09:00 **Caleb Bryan**, Sean Prager.
University of Saskatchewan; cabebryan@gmail.com

Complex responses to plant stress by bumble bee (Bombus impatiens) foragers and impacts on colonial fitness.

Climate change and agricultural intensification are altering landscapes around the world, increasing severe weather patterns, and decreasing biodiversity and habitat for native animals and plants. These changes have direct impacts on native plants and crops, by increasing both the intensity and duration of stressors. Beyond the fitness impacts on plants themselves, plant stress alters the floral display and can have cascading impacts on pollinators utilizing them. In North America bumblebees play an important role in delivering pollination services in both native and agricultural landscapes. This makes them particularly susceptible to changes in host plant physiology. We investigated the impact of multiple plant stressors on bumblebee foraging behavior and colony fitness, using two choice and no choice assays, assessing larval development within the colony.

09:15 **Claire Gooding**, Layla Gould, Gerhard Gries.
Simon Fraser University; cgooding@sfu.ca

Ticks utilize a saprophytic fungus to identify suitable resting sites.

Ticks are obligatory blood feeders and transmit more disease-causing microbes than any other blood-feeding arthropods. Despite their reputation as blood-feeders, ticks spend most of their life off hosts. Off-host ticks are highly susceptible to desiccation, and for survival must reside in humid microhabitats with little or no sun exposure. These humid microhabitats also provide oviposition and overwintering sites. Although humid microhabitats are essential for tick survival, the cues that ticks exploit to locate, and settle in these microhabitats are not known. As humid microhabitats that enable tick survival are also optimal for fungal growth, it was conceivable that the presence of specific fungi and/or their metabolites reliably indicate microhabitats suitable for the survival of off-host ticks. Here, we tested the hypothesis that ticks preferentially settle on substrates colonized by a soil-dwelling fungus. In two-choice olfactometer bioassays, we show that multiple species of ticks preferentially settle on substrate colonized by a saprophytic, soil-dwelling fungus, and that this settling behaviour is mediated primarily by contact chemoreception. We propose that ticks assess the suitability of microhabitats based on contact chemicals, or metabolites, of fungi that thrive in humid microhabitats.

09:30 **Emmanuel Hung**, Justin Wong, Augustus Negraeff, Anya Gould, Gerhard Gries.
Simon Fraser University; Emmanuel_hung@sfu.ca

The presence of flies increases the attractiveness of objects to host-seeking stable flies, *Stomoxys calcitrans*.

The fly "friend factor" describes the phenomenon that the presence of flies on a foraging site increases its attractiveness to conspecific flies. Stable flies, *Stomoxys calcitrans*, blood-feed once or twice per day on bovine hosts. The presence of conspecifics on host animals may signify host suitability as a feeding site. In cage bioassays, we offered stable flies a choice between two black platforms with or without conspecific females present. Foraging male and female flies preferentially alighted on platforms with conspecific flies present, doing so only when they were both food-deprived and stimulated by CO_2. We further tested whether the flies' preferential responses were affected by the visual characteristics of the platform as well as the numerical density, orientation, sex, and species of flies presented. In both cage and whole-room bioassays, we additionally tested whether the same effect could be elicited by artificial decoys. We found that the stable fly friend factor is expressed on both black and white targets and is neither sex- nor species-specific. The friend factor is triggered by both male and female conspecifics, house flies, and even 3D decoys. However, the friend factor could not be triggered by distinctively different horn flies and blow flies, and by 2D (instead of 3D) decoys. Field testing of the friend factor was underway at the time of abstract submission. Ultimately, the addition of fly decoys may serve as a means for augmenting the efficacy of current vision-based trap designs.

09:45 Coffee Break

10:00 **Erik. A. Etzler**[1], Hannah M. tef Hofstede[2], Darryl T. Gwynne[1], John M. Ratcliffe[1].
1. University of Toronto, Mississauga, 2. University of Windsor; erik.etzler@mail.utoronto.ca
Exposure to traffic noise during development increases baseline auditory neural activity and decision-making time in adult female crickets.

Long-term exposure to anthropogenic noise, such as road traffic noise, has been shown to be detrimental to a wide variety of animals. Evidence of whether exposure to traffic noise over development affects crickets, which communicate via sound, has however, been conflicting. Females reared in traffic noise have been reported to be either faster or slower to locate mates than those reared in silence. These behavioural studies did not identify if the results were due to hearing or decision-making changes in these insects. Here, we reared *Teleogryllus oceanicus* (Gryllidae) females in either traffic noise or silence, and then had them locate speakers playing male song with either background traffic noise or silence as adults. We then recorded the activity of the AN2 auditory interneuron of adult females reared in both environments when listening to male song under traffic or silent background conditions. Regardless of rearing condition, crickets were slower to leave the shelter in silence than traffic noise. In addition, crickets were slower to leave the shelter if they were reared in traffic noise compared to in silence. Interestingly, in silence, crickets reared in traffic noise had higher baseline activity levels in their AN2 interneuron than those reared in silence, but rearing condition did not affect AN2 activity in response to cricket song. Our results indicate that anthropogenic noise can not only impede mate locating ability, but also change hearing. Further, they highlight the idea that silence, not just anthropogenic sound, is an unnatural acoustic condition, one that may be perceived as a threat.

10:15 **Genavieve Desjardin**, Tony Williams.
Simon Fraser University; gdesjard@sfu.ca
Egg size, the forgotten life history trait, using the Asian lady beetle as a model.

Individual quality (variable and correlated with fitness) is determined by phenotypic or life-history traits. Although many studies have focused on phenology and fecundity, few studies have researched the causes and consequences of intraspecific variation of egg size. Fewer studies have considered the impact of warming (cf. cooler) temperatures due to climate change on ectotherms and their future fecundity. Here, we investigated individual variation if egg size in *Harmonia axyridis*, the Asian ladybird beetle. We hypothesized that a) *H. axyridis* egg size will decrease under higher temperatures as individual females will allocate resources to larger clutch size, but b) smaller egg size will not come at a cost in terms of offspring fitness because larvae from smaller eggs will have higher viability at higher temperatures. Our findings will contribute to a better understanding of the trade-offs and the mechanisms behind egg size variation within the context of climate change.

10:30 **Kirra Kent**[1], Jaime Pinzon[2], Boyd A. Mori[1]
1. University of Alberta, 2. Northern Forestry Centre; kirra@ualberta.ca
Improving the retention rate of spiders captured in pitfall traps within agroecosystems.

Little is understood about the role of spiders (Araneae), their community composition, and predator-prey interactions in agroecosystems. Understanding these relationships may inform management decisions to effectively use spiders as biological control agents against insect pests. In a previous study conducted in canola (*Brassica napus* L.) fields in the aspen parkland region of Alberta, few spiders were captured in pitfall traps. To overcome this, additional experiments tested modified pitfall trap designs, to improve the retention rates of all spiders. Three different trap diameters, further modified with the application of fluon (i.e., polytetrafluoroethylene) and with (propylene glycol) and without (glass beads) a fluid preservative, were tested for 24 h and 7-day trapping periods. Trap diameter, fluon application and preservation method impacted the abundance, diversity and richness of spiders collected. Taken collectively, this research will further our understanding of the role of abundant spider species in the aspen parkland-canola agroecosystem.

10:45 **Kyle Van Camp**[1], Meghan A. Vankosky[2], Daniel P. Bray[3], Maya L. Evenden[1], Boyd A. Mori[1].
1. University of Alberta, 2. Agriculture and Agri-Food Canada, Saskatoon, University of Greenwich; k.vancamp@ualberta.ca

Optimizing techniques for *Contarinia brassicola* population monitoring using pheromone-baited traps.

Pheromone-baited traps are effective tools to monitor cryptic insect pest species. *Contarinia brassicola* Sinclair (Diptera: Cecidomyiidae) is a recently described gall midge species whose larvae feed within the unopened flowers and maturing seed pods of canola (*Brassica napus* L.). Optimal monitoring techniques for this species have not been determined. Traps equipped with synthetic pheromone lures optimized for attracting male *C. brassicola* adults were used to evaluate the efficacy of various sticky card trap configurations on the capture rate of adult male midges. The most effective trap configuration was then used to investigate long- and short-term patterns of midge activity and identify which periods provide the most valuable monitoring information. Pheromone-baited Jackson traps deployed 50 cm above the ground at canola field edges in mid-June, checked at dawn or dusk, are the optimal tool for detecting or monitoring populations of *C. brassicola* on the Canadian Prairies.

11:00 **Leanne Petro**, Antonia Musso, Maya Evenden.
University of Alberta; lpetro@ualberta.ca

Hunger and haste: Effect of energetic condition on mountain pine beetle response to semiochemicals.

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 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 received energetic manipulation treatments before being

assayed for behavioural response to semiochemicals in an olfactometer. We then assessed body condition. Enhanced receptivity of beetles at low energetic states to host semiochemicals may contribute to polyphenic flight behaviours in MPB and assist in the development of models to predict spread across the boreal forest.

11:15 **Olajide Fatukasi**, Asha Wijerathna, Malinda Thilakarathna, Maya Evenden.
University of Alberta; fatukasi@ualberta.ca

Bottom-up effect of *Rhizobium* strains on pea leaf weevil (Coleoptera: *Sitona lineatus*) herbivory and development.

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 the rhizobia-containing root nodules, respectively. The host-specific rhizobia fix atmospheric nitrogen and receive carbon nutrients in exchange. The rhizobia-plant interaction may affect pea leaf weevil herbivory and development by influencing plant food quality and chemical defense. We tested the hypothesis that *Rhizobium*-field pea interactions influence *S. lineatus* foliar feeding and development. Field pea plants received one of four treatments in each of three experiments assessing foliar feeding and development: 1) inoculated with the wild-type *Rhizobium leguminosarum* strain, WT3841; 2) inoculated with a mutant *Rhizobium leguminosarum* strain, MT3940 that does not fix nitrogen; 3) treated with nitrogen; and 4) control plants that received only water. After 3 and 5 weeks, male (4) and female (4) *S. lineatus* were introduced into the cages containing the variously treated plants and were allowed to feed for 8 days. There was no treatment effect on adult *S. lineatus* herbivory, which could be due to a trade-off between nutritional food quality and chemical defense. Wild-type *Rhizobium* strain, however, significantly supported *S. lineatus* development from egg to adult stage compared to the mutant-type, and other treated plants in the development experiment. Lower development of *S. lineatus* on plants inoculated with the mutant-type, MT3940 could be due to smaller nodule size and a lack of fixed nitrogen compared to wild-type strain, WT3841 treatment.

11:30 **Xander Slowenko**, Jack R. Gray.
University of Saskatchewan; aes809@usask.ca

Response of a locust motion-sensitive neuron to object motion in the rear visual field.

Locust escape behaviours are evoked by visual neurons that encode images of an approaching object. The lateral giant movement detector (LGMD) and the post-synaptic descending contralateral movement detector (DCMD) detect expanding edges of approaching objects across the locust's eye and synapse onto appropriate motor elements for flight steering. The eyes sample a 360° field of view, allowing the locust to see objects approach from any direction. We presented stimuli of projected spheres on different translational, looming, or translation to looming courses in the rear visual field. Initial observations suggests that the DCMD peak firing rate occurs later relative compared to objects approaching from the front. We also observed a larger delay between the transition of the object from translating to looming

when motion originates from the rear visual field. These findings may suggest a feature of the neural circuit may result in delays of approaching objects approaching from behind.

President's Prize 2: Pest Management. Room: Michealangelo A/B. Moderator: TBA

08:00 **Tyler Hartl**[1], Vivek Srivastava[2], Sean Prager[1], Tyler Wist[3].
1. University of Saskatchewan, 2. University of British Columbia, 3. Agriculture and Agri-Food Canada, Saskatoon; tyh490@usask.ca

Assessing the impacts of climate change on pea aphid habitat suitability at a global scale: A species distribution modelling approach.

The invasion of non-native species is a global concern, with many instances of invasive insect species causing damage to agricultural and horticultural crops as well as natural ecosystems. The pea aphid (*Acyrthosiphon pisum* Harris) is continuing to expand its distribution and is an economic threat to pulse-crop production worldwide. Pea aphids are a pest of numerous legume crops, such as peas, lentils, and alfalfa. This insect is a cause for concern due to its rapid parthenogenetic reproduction that leads to large infestations, its ability to damage crops directly, while also being a vector of over 30 plant viruses. No pea aphid specific risk and distribution maps are available to visualize the potential geographic distribution of pea aphid outbreaks and identify regional locations exposed to increased risk of pea aphid establishment and outbreaks under different climate scenarios. These maps for current as well as future climate change scenarios will help growers and agronomists to target specific locations to search for infestations as early as possible and inform them of potential pea aphid incursions to their areas under various climate scenarios. To make these predictions, we used Species Distribution Models (SDMs) to evaluate the climatic variables influencing pea aphid distribution, identify regions of potential distribution, while also analyzing the global distribution of pea aphids under current and future climate change scenarios (SSP 126, 245, and 370) by utilizing presence-only SDMs with Maximum Entropy (MaxEnt). The modelling results indicate the presence of suitable conditions that are relevant for pea aphid establishment in six out of seven continents, with significant range expansion in western Canada and most of the United States of America possible.

08:15 **Tobyn Neame**, Paul Galpern.
University of Calgary; tobyn.neame@ucalgary.ca

The effects of non-crop vegetation areas on the potential for pest control ecosystem services using trait-based analysis of ground beetles (Coleoptera: Carabidae).

Agricultural intensification through the removal of non-crop vegetation areas (NCVAs) to increase crop area threatens ecosystem services, like pest control, that are critical for global food security. For example, the natural enemies of crop pests, like species from the ground beetle family, Carabidae, may rely on NCVAs as habitat reservoirs. From these reservoirs, carabids may spill-over into adjacent crops. Spill-over of carabids from a reservoir may be influenced by the functional traits, e.g., size, of individual beetles. Size of carabids may also

influence prey preferences. However, there has been little work examining spill-over of natural enemies. We hypothesize 1. at increased distance from NCVAs size of carabids will increase, because larger carabids have increased dispersal abilities, and 2. larger carabids will prefer larger prey due to energy requirements and abilities. We measured ~27000 individual beetles from 300 sample sites stratified by distance throughout 20 crop fields to examine how beetle size changes with distance from NCVAs. To determine the probability of predation by carabids of different sizes on size classes of prey, we exposed different sizes of *Pterostichus melanarius* (Coleoptera: Carabidae) to different sizes of the model pest *Trichoplusia ni* (Lepidoptera: Noctuidae). Results show the smallest quantile of carabids increases in size with distance from NCVAs. We also found that larger *P. melanarius* are more likely to consume larger prey than smaller prey. Together these findings support our hypotheses and the need for more NCVA in agroecosystems to support the predation of a diverse array of pests.

08:30 **Teresa Aguiar Cordero**, Sean Prager.
University of Saskatchewan; teresa.aguiar.c@gmail.com

Quantifying the relationship between Lygus feeding and faba bean seed damage.

In western Canada, Lygus are pests of numerous cultivated plants including canola, seed alfalfa and buckwheat. They also significantly impact pulse crops, particularly faba beans. Their feeding behavior leads to hull perforations, seed coat discoloration, seed pitting, localized tissue wilting, and necrosis, causing a decline in quality. Depending on the region, four Lygus species: *Lygus lineolaris* (Palisot de Beauvois), *Lygus borealis* (Kelton), *Lygus elisus* (Van Duzee), and *Lygus keltoni* (Schwarts), can inflict damage on faba beans. To investigate the potential correlation between insect abundance and seed damage for three Lygus species, we conducted no-choice bioassays. In these experiments, 1, 2 and 4 Lygus were confined to plants at the R4-R5 stage and allowed to feed for observed durations of 3, 6, 24, 48, 96, and 120 hours. Subsequently, the insects were removed, and the pods were examined for signs of feeding damage. Pods exhibiting Lygus damage were collected and compared with the corresponding seed damage.

08:45 **Sylvia Jensen**, Tobyn Neame, Paul Galpern.
University of Calgary; sylvia.jensen1@ucalgary.ca

Predation of sentinel eggs as a measure of biocontrol.

Insect pest damage in crops is exacerbated by reductions in natural enemy populations. Research on natural enemies of crop pests as a form of biocontrol typically focuses on presence and abundance, however, it is difficult to draw conclusions on the effectiveness of pest predation by natural enemies based on these metrics. We expected that proximity to non-crop vegetation would see increased predation due to natural enemy reliance on crop edges as habitat. We used non-viable lepidopteran (*Ephestia kuehniella*) eggs as sentinel prey to simulate pest presence in canola crops and recorded the proportion of eggs eaten with increasing distance from the crop edge. Cameras were used in conjunction with eggs to identify natural enemies. We found a significant decrease in predation inside the crop compared to the edge.

This method has potential for future research on the effects of landscape and crop type on predation by natural enemies.

09:00 **Shayla Woodland**[1], M. Damien[1], H.A. Cárcamo[2], J. Otani[3], T. Wist[4], R. Duncan[1], J. Gavloski[5], A.C. Costamagna[1].

1. University of Manitoba, 2. Agriculture and Agri-Food Canada, Lethbridge, 3. AAFC, Beaverlodge, 4. AAFC, Saskatoon, 5. Manitoba Agriculture; woodlans@myumanitoba.ca

Higher plant density increased canola yield independently of flea beetle management strategies across the Canadian prairies.

Crucifer flea beetles, *Phyllotreta cruciferae* (Goeze) (Coleoptera: Chrysomelidae), and striped flea beetles, *Phyllotreta striolata* (Fabricius) (Coleoptera: Chrysomelidae), are devastating pests in Canadian canola. Currently, flea beetles are managed by prophylactic application of insecticides on seeds and foliar sprays. We investigated the effect of increasing canola density as an alternative method to reduce defoliation and insecticide use in canola. We conducted field trials in four regions of the Canadian prairies testing the effects of three planting densities combined with two management treatments (seed treatment and foliar spray) and two controls (flea beetle-free treatment and untreated) from 2018-2021. We found that flea beetles increase aggregation as plant density increased, but their numbers per plant and defoliation levels decreased. Yield increased with increased plant density regardless of the management treatment or region. We conclude that increasing plant density as an alternative or complementary strategy to chemical control is effective to protect canola yield.

09:15 **Priyatha Chennamkulangara**, Keegan Van Slyke, Taylor Volappi, Maya Evenden.

University of Alberta; chennamk@ualberta.ca

Evaluation of capture methods and seasonal movement of alfalfa weevil in alfalfa fields grown for seed in Alberta.

The alfalfa weevil, *Hypera postica* (Gyllenhal) (Curculionidae: Coleoptera), is a major pest of alfalfa (*Medicago sativa* L., Fabaceae) that feeds on foliage during the pre-bloom to early bloom stages. High density larval populations cause significant damage through leaf skeletonization. This study examines adult weevil movement in the field at various times throughout the growing season. The study was conducted in alfalfa fields grown for seed in southern Alberta over three seasons (2021-2023). Alfalfa fields were monitored using various capture methods including sweep samples, soil samples, and pitfall traps. Alfalfa weevils were recovered and separated by sex from the samples. Sweep samples caught a significant number of the adult weevils. Pitfall traps positioned on the edge of the field, captured equal number of adult alfalfa weevils as traps positioned in the interior of the field. Apart from alfalfa weevils, several other weevils were consistently captured including alfalfa curculio (*Sitona lineellus*) and pea leaf weevil (*Sitona lineatus*). Findings from the samples collected in 2023 will also be included in the discussion.

09:30 **Midhun Sebastian Jose**, E. Baril, M.C. Bezerra da Silva, O. Obshta, T.L.K. Edirithilake, E.E. Tellarini, M.F. Raza, M.P. Camilli, F. Masood, J.M. Thebeau, I. Moshynskyy, A.C. Ruzzini, E. Simko, S.C. Wood.

University of Saskatchewan, Western College of Veterinary Medicine; midhun.jose@usask.ca

Does antimicrobial therapy eradicate *Melissococcus plutonius* from adult bees?

European foulbrood (EFB) is an enteric disease of honey bee larvae caused by the bacterium *Melissococcus plutonius*. Clinical signs of EFB include an uneven brood pattern and a foul odor. Adult honey bees are thought to be asymptomatic carriers of *M. plutonius* and may facilitate disease transmission. While antimicrobial therapy has been shown to be effective in treating larvae with EFB, the efficacy of antimicrobials in eradicating *M. plutonius* colonization of adult bees is unknown. To answer this question, adult worker bees were infected with *M. plutonius* in the laboratory, treated with label doses of one of three antimicrobials approved for use in beekeeping, and sampled for *M. plutonius* quantification by qPCR. We found that treatment with all three antibiotics significantly reduced, but did not eradicate *M. plutonius* colonization of adult bees. These results suggest that despite treatment with antimicrobials, adult bees may continue to spread EFB within a colony.

09:45 Coffee Break

10:00 **Meganne Harrison**[1], Jasmine K. Janes[2], Dezene P.W. Huber[1].

1. University of Northern British Columbia, 2. Vancouver Island University; mharrison@unbc.ca

Life on the edge: Do forested areas impact insect assemblages in agroecosystems in central British Columbia?

Agroecosystem insect assemblages in the central interior of BC have been historically understudied making it difficult for producers to manage pest populations. Producers and pest managers often do not know which pests and natural enemies are in their fields or the surrounding forested areas and edges. To address this, we monitored insect and spider communities in the 2022 and 2023 growing seasons using sweep net collections and pitfall traps at 15 sites along a ~ 600km corridor. Identification of insects and spiders are being completed via morphological keys and DNA barcoding. We are using these data to explore relationships between the adjacent forested edges around agricultural fields and pests and natural enemy communities in crops. We anticipate using this information to develop region-specific recommendations for producers, and to be able to better monitor the ingress of novel pests and natural enemies in the context of a rapidly changing climate.

10:15 **Marina Carla Bezerra da Silva**, Madison G. Kindopp, Midhun S. Jose, Oleksii Obshta, Jenna M. Thebeau, Marcelo P. Camilli, Emilio E. Tellarini, Thanuri L.K. Edirithilake, Fatima Masood, Igor Moshynskyy, M. Fahim Raza, Ivanna V. Kozii, Elemir Simko, Sarah C. Wood.

University of Saskatchewan, Western College of Veterinary Medicine; mab196@usask.ca

***In vitro* gonadotoxicity model for drones: Effects of chronic drone larval and pupal exposure to amitraz.**

The widespread use of pesticides has been shown great potential to affect the reproductive health of honey bees. Previous research showed that honey bee drones had decreased sperm viability when exposed to amitraz, a commonly used miticide against Varroosis. The objective of this study was to develop an in vitro gonadotoxicity model for drones exposed to amitraz used as a positive control compound. We exposed age-synchronized honey bee drone larvae and pupae to repeated incremental doses of amitraz staring at day 4 or 13 post-oviposition and demonstrated that chronic exposure to amitraz during development had dose-depended negative effects on survival, larva body weight, testicular histopathology, and sperm total count. Based on preliminary data, an in vitro gonadotoxicity model for drone pupae and larvae demonstrated great potential for the evaluation of the gonadotoxic effects of other agrochemicals and supplementary methodology to enhance reproductive risk assessment in honey bee drones.

10:30 **Jose M. Correa Ramos**[1], Jagroop G. Kahlon[2], Maya L. Evenden[1].
1. University of Alberta, 2. Alberta Pulse Growers Commission; correara@ualberta.ca

The impact of peaola intercropping on the capture of diamondback moth and parasitoids in commercial fields in Alberta.

The diamondback moth is a cosmopolitan insect pest of brassica crops, including canola, and is responsible for US$4-5 billion in losses per year worldwide. Diamondback moth management currently relies on chemical and biological control, but insecticide resistance and ineffective biological control during outbreaks are challenges to effective pest management. Intercropping involves planting more than one crop in an area and can impact insect behaviour. This research compares the presence of diamondback moths and parasitoids in fields planted to canola-pea intercrops (peaola) as compared to both pea and canola monocrops. We present trap catch data from pheromone-baited traps, sticky cards, and sweep net samples from commercial fields in Alberta. Determining how peaola intercrops alter insect pest and natural enemy composition can inform the development of intercropping as a sustainable management strategy for diamondback moths in Canada.

10:45 **Jeremy Irvine**, Sean Prager.
University of Saskatchewan; jeremy.irvine@usask.ca

Development of economic thresholds for lesser clover leaf weevil (Coleoptera: Curculionidae) in red clover seed production systems.

Red clover (*Trifolium pratense*) is a short-lived perennial crop grown for seed production. The production of red clover seed is a highly important commodity in the Canadian Prairies. The seed is exported into warmer regions where it is used as plough down green manure, which provides nutrients, primarily nitrogen and organic matter, to the soil. However, the production of red clover seed is greatly affected by the lesser clover leaf weevil (LCLW) due to their ability to cause extreme damage to developing crops. Yield losses of up to 50% have been recorded with high infestations of LCLW. LCLW larvae feed on the developing shoots, flower heads and seeds of red clover plants, which cause the most damage. LCLW are traditionally controlled using insecticides which are damaging to non-target insect species, notably bees which are important

pollinators for red clover seed production. However, there are currently no established economic thresholds for control of LCLW in red clover fields. Redundant insecticide applications create a multi-faceted problem. Principally, the producer will have an income reduction due to added costs associated with applying an insecticide. Additionally, pollinator populations present during insecticide applications will be significantly diminished. Lastly, there is a high risk of developing insecticide resistance because there is only one registered insecticide material. This study aims to generate economic thresholds and sequential sampling plans through on-farm plot trials designed to identify the yield reduction from different LCLW densities, so that producers can access management tools for the LCLW that will reduce input costs and environmental damage.

11:00 **Ilan Domnich**, Maya Evenden, Okan Bulut.
University of Alberta; domnich@ualberta.ca

"What's Bugging You?" A survey of entomological extension in agriculture in Alberta.

Recent changes to the structure of agricultural extension in Alberta have raised concerns of the effectiveness and efficiency of entomological extension to facilitate knowledge and technology exchange between researchers and producers. Discussions among key players has uncovered a disconnect between the organizations providing extension services and those using the information, the producers. This project uses a scientific survey that targets producers to better understand the entomological priorities of producers, the effectiveness of different extension efforts, and the best modes of communication to reach producers. A second survey targets individuals that conduct entomological agricultural extension to better understand producer needs from the perspectives of extension providers. Data from this project will provide insight into the preferences and needs of producers, to support the enhancement of entomological extension efforts in agriculture in Alberta.

11:15 **Aldo Rios Martinez**, Kirra Kent, Boyd Mori.
University of Alberta; aldorios@live.com

Exploring edge effects and sampling method complementarity on arthropod assemblages in central Alberta canola fields.

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 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 in 2021. Collected arthropods were identified to family, and richness and diversity of different functional groups were compared between the edge and interior of the field. A joint species distribution model was used to determine the influence of collecting date, within-field location, and sampling technique on arthropod assemblage composition, as well as to highlight 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.

11:30 **Alannah Penno**[1], Rebekah Ferguson[2], Tyler Nelson[3], Chandra Moffat[3], Dezene Huber[1], Michelle Franklin[4].
1. University of Northern British Columbia; 2. Agriculture and Agri-Food Canada, Indigenous Science Liaison Office, 3. AAFC, Summerland, 4. AAFC, Agassiz; penno@unbc.ca
Using digital records to assess insect pest threats to wild and cultivated *Vaccinium* species in Canada.

Fruit-bearing plants in the genus *Vaccinium*, including blueberries, bilberries, cranberries, huckleberries, and lingonberries, are found in a variety of ecosystems and cultivated in diverse agriculture settings across Canada. Although these berries are significant food sources for humans and wildlife alike, much remains unknown about insects associated with this genus. We identified insect species of interest through literature reviews, with particular focus on pests in Canadian government-supplied *Vaccinium* production guides. We used this list of species to inform the collection of digital occurrence records from online databases, which we used to build species distribution models and maps of both *Vaccinium* and insect species in Canada. The distributions of certain insects overlapped with known *Vaccinium* populations in northern Canada, highlighting potential threats to northern *Vaccinium* cultivation. Improving our understanding of where potential insect pest species occur in Canada is important for informing both current and future *Vaccinium* hybrid development and cultivation practices.

11:45 **Abbe Pawluk**[1,2], Héctor Cárcamo[1], Rob Laird[2], Maya Kanashiro[2], Brendan Roy[1].
1. Agriculture and Agri-Food Canada, Lethbridge, 2. University of Lethbridge; abbe.pawluk@uleth.ca
Evaluating edge effects on the abundance and biodiversity of parasitoid hymenopterans in canola crops.

In the agriculture industry, parasitoid hymenopterans are a highly valuable form of natural pest control. These beneficial insects provide a myriad of sought-after services included the ability to target insecticide-resistant pests, host-specific suppression, and secondary pollination. Utilizing these beneficial insects also reduces the need for pesticides, which in turn provides both economic and environmental benefits to producers. Non-crop habitats adjacent to arable land provide critical ecological services for these insects and can act as a corridor from natural land to farmland; this interaction is a form of edge effect. Here, we conducted a study to evaluate how three types of non-crop edges (road verges, tree shelters, and coulees) affected the diversity and abundance of parasitoid hymenopterans in canola fields. We also evaluated the depth in which parasitoids were able to penetrate crops from these edge habitats. This research is intended to increase both our understanding of integrated pest management strategies, as well as provide one of the first contemporary studies on parasitoid biodiversity in southern Alberta.

President's Prize 3: Taxonomy, Genetics & Diversity. Room: Venice. Moderator: TBA

08:00 **Shawn Abraham**, Grace Ren, F.A.H. Sperling.
University of Alberta; shawn.abraham4@gmail.com
Genomics and adaptive morphology of shore flies (Diptera: Ephydridae).

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 plan to 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.

08:15 **Georgiana Antochi-Crihan**, Samantha Morrice, Sean Prager.
University of Saskatchewan; georginaantiochi4@gmail.com
Investigating the distribution patterns of ground-dwelling arthropods throughout Saskatchewan's prairie landscape.

Saskatchewan is located in the heart of the Prairie Pothole Region (PPR), which stretches across Canada's prairie provinces and into the northern United States. The PPR was formed during the Pleistocene, where glacial action carved divots throughout the landscape that now function as shallow wetlands. This area also contains land that is ideal for agriculture. As a result, 80% of wetlands and surrounding native grasslands have been converted for agricultural use. Several conservation groups, however, have been working to restore these habitats. Monitoring these landscapes is crucial for characterizing overall ecosystem health and function. Ground dwelling-arthropods provide a valuable tool: their ease of collection and contribution to ecosystem services make them ideal candidates for monitoring surveys. Filling this knowledge gap can provide valuable information to both conservation and insect management efforts in agricultural settings. The aim of this study was to understand ground dwelling arthropod abundance and diversity throughout key features of the prairie landscape. Sites sampled include canola, barley, wheat, and seeded grassland fields located within 100 km of Saskatoon, SK, Canada. Three pitfall traps were placed along two 150 m transects for each site. One of the transects started from a prairie pothole edge, while the other originated from the field edge. Trap collection occurred every three weeks throughout the summer of 2018. Collected

specimens were curated and identified to family where possible. A PERMANOVA and NMDS were used to analyze the data. Preliminary results indicate that margins, field type, and seasonality play an important role in arthropod community structure.

08:30 **Zach Balzer**, Caroline Grela, Rhiannon Peery, Cathy Cullingham, Dave Coltman.
University of Western Ontario; zbalzer@uwo.ca

Untangling the origins of *Dendroctonous ponderosae* in Cypress Hills.

Mountain pine beetle (MPB), *Dendroctonus ponderosae*, is an eruptive forest pest native to western North America. Prior to the 1980s, Canadian MPB were only found in British Columbia and small parts of Alberta near the Rocky Mountains. However, a group of MPB was found in Cypress Hills Interprovincial Park in the 1980s. This site is genetically distinct from other Canadian MPB, but it is unclear if isolation led to differentiation or if these beetles originated from another population. Possible origins include Montana or more southern US states. Using whole-genome sequence (WGS) data we aim to determine where Cypress Hills MPB originated from by comparing genomes from contemporary samples to WGS data from the historic Canadian range, Montana, and other US locations. Genomes from Utah beetles clustered closer to Cypress Hills than to Arizona, despite their proximity to Arizona. This clustering is likely influenced by a single beetle collected in Cypress Hills which is genetically similar to the Utah cluster. This similarity of the Cypress Hills beetle to those from Utah suggests that long-distance dispersal can introduce genetic variation between long distances in a short time, potentially introducing alleles that enable adaptation and persistence in a new region.

08:45 **Donovan Bosnich**[1,2], Bryan M.T. Brunet[2], Jennifer E. Gleason[2].
Carleton University, Agriculture and Agri-Food Canada, Ottawa;
donovanbosnich@cmail.carleton.ca

Ultra-conserved elements reinforces the evidence of polyphyly within the *Ericaphis* aphid group.

Despite its agricultural importance, the genus *Ericaphis* Börner, 1839, which includes the primary vector of Blueberry scorch virus, *Ericaphis fimbriata* (Richards, 1959), is poorly understood. Our taxonomic understanding of the genus is inconsistent with DNA barcoding of the mitochondrial CO1 gene, which suggests that it is polyphyletic with respect to three other genera, *Aulacorthum* Mordvilko 1914*, Rhodobium* Hille Ris Lambers 1947, and *Wahlgreniella* Hille Ris Lambers 1949*,* forming what has been called the *Ericaphis* group. Since single-gene approaches have limitations in detecting genomic variation among closely-related taxa*,* this study utilizes 2,731 highly conserved non-coding regions of DNA (ultra-conserved elements) to better delineate the evolutionary relationships among genera and species within the group. The resulting phylogeny is consistent with that derived from DNA barcoding and confirms that the genus is polyphyletic and arranged into three clades: one encapsulating *Ericaphis fimbriata, Ericaphis scammelli* (Mason, 1940), and *Rhodobium porosum* (Sanderson, 1900), another involving the genus *Wahlgreniella*, and a final clade consisting of *Aulacorthum dorsatum* Richards, 1967 and *Aulacorthum pterinigrum* Richards, 1972, the only Nearctic representatives of *Aulacorthum*, as well as *Ericaphis lilii* (Mason, 1940) and *Ericaphis wakibae* (Hottes, 1934).

Furthermore, the species *Ericaphis gentneri* (Mason, 1947) is shown to be distantly related to the group, providing evidence that it does not belong in the genus *Ericaphis*. Redescription of genera and species in the *Ericaphis* group is necessary to bring our taxonomic concepts in line with phylogenetic relationships, and to clarify communication around several important pest species, including the vectors of Blueberry scorch virus.

09:00 **Thilina Hettiarachchi**, Jason Gibbs.
University of Manitoba; hettiart@myumanitoba.ca

Three new species from a problematic species complex of *Lasioglossum* in North America (Hymenoptera: Halictidae).

The bee genus *Lasioglossum* is well known for being taxonomically challenging. A problematic species complex within the subgenus L. (Sphecodogastra) is described from southern California and Arizona. Unlike other L. (Sphecodogastra) in North America, this complex has metallic reflections on the mesosoma. Metallic colouration is usually considered a diagnostic character for the subgenus L. (Dialictus). Three new species in this complex are described using morphometric data and geographical patterns. The discovery of this new species complex requires recalibration of the diagnostic characters used for subgenera of *Lasioglossum*.

09:15 **Mackenzie Howse**, Dezene P.W. Huber.
University of Northern British Columbia; mhowse@unbc.ca

An under-sampled oasis: Forest pollinator assemblages on British Columbia's fire-prone plateau.

Pollinators have been highly studied where people and nature interact most, but in areas with reduced anthropogenic influence, little to no data are currently available relating to local biodiversity. British Columbia's Chilcotin Plateau represents one of these research-neglected areas. The Plateau is a fire-maintained ecosystem, but due to an increase in woody fuels and human-driven climate change, wildfires are having more severe and lasting effects on the local biota. Using six colours of ultraviolet reflective pan traps on three occasions during 2022, I sampled 15 wildfire sites ranging from one to 90 years old. Specifically, I evaluated pollinator communities for early-, mid-, and late-successional fires, position within the fire (burned forest/fire edge/unburned forest), and trap colour preference. I also collected a variety of environmental variables for regression analysis. I sorted pollinators into morphospecies groups using morphology-based keys and I am completing DNA barcoding work on representative specimens. Over 1500 pollinators were collected during 2022, more than 1000 of them belonging to Apoidea. Preliminary analysis shows that traps in younger fires and interior burned plots were more likely to accumulate pollinators, possibly due to a lower crown closure. Lepidopterans were caught equally as often in the red-toned pan traps as the standard yellow/blue/white. Our study adds to the growing body of knowledge surrounding pollinator and fire ecology and bridges the gap between the two disciplines. Furthermore, specimen records will improve species distribution maps in an area of the province that has long been neglected by biodiversity research.

09:30 **Leah Jackson**[1], E.O. Campbell[1,2], F.A.H. Sperling[1].

1. University of Alberta, 2. Canadian Food Inspection Agency, Ottawa; lgjackson@ualberta.ca

The genetic and phenotypic evolution of *Speyeria cybele*.

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, particularly along the Rocky Mountains. Preliminary genetic data shows three genotype clusters to the west, east and south of the Rocky Mountains. A sharp transition between western and southern genotypes occurs in Utah, and intermediate specimens between east and west are found in Alberta. Continued sampling will determine the frequency and nature of admixture among genotypes, using wing colour, size, and pattern of *S. cybele* to determine the correspondence of genetics and morphological patterns, and the relationship of these characters to the post-Pleistocene landscape.

09:45 Coffee Break

10:00 **Jessica Lario**[1,2], Lisa Lumley[1,2], Heather Proctor[1].

1. University of Alberta, 2. Alberta Biodiversity Monitoring Institute; lario@ualberta.ca

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

The North Saskatchewan River (NSR) is a complex network connecting large portions of land. This network provides a mechanism for long-range dispersal that could be used by many organisms to travel. 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 have been found only in the NSR valley, within and downstream of Edmonton. This pattern could be due to limited research, and they may be an endemic species to central Alberta, or it could 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 invertebrates are extracted using Tullgren funnels prior to using microscopy to sort and identify oribatid mites to species level. 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.

10:15 **Elyssa Loewen**[1,2], Caelan Libke[1], Christine Sosiak[3], Phillip Barden[3], Christopher Somers[1], Ryan C. McKellar[2,4].

1. University of Regina, 2. Royal Saskatchewan Museum, 3. Rutgers-Newark University, 4. University of Kansas

New fossil ants in Saskatchewan amber inform the timing and ecological evolution of modern ants.

Reconstructing ant paleoecology is essential for understanding their evolution and biogeography. Here, we predict the paleoecology of two new partial ants (Formicidae: Aneuretinae; Formicidae: Pseudomyrmecinae: Tetraponera) from a Late Cretaceous (67.04 ± 0.16 Ma) amber deposit in the Big Muddy Badlands, Saskatchewan, using a Random Forest machine learning algorithm. We employed a broad extant ecomorphological dataset to evaluate the effectiveness of the model on partial fossil material. The predicted Cretaceous ecological roles of the Big Muddy ants are different than those of their modern relatives. We recover the fossil Aneuretinae, today represented by a single extant leaf-litter dwelling species in Sri Lanka, as arboreal. We recover the fossil Tetraponera, whose extant relatives are exclusively arboreal and restricted to the Palaeotropics and Australia, as leaf-litter dwelling. The two Big Muddy ants represent the first definitive Cretaceous Aneuretinae, and the oldest Tetraponera (Pseudomyrmecinae) by over 20 million years. Our results suggest that, besides broader Cretaceous geographic ranges, both ant lineages may have occupied a wider range of ecological roles in the past. Their relictual biogeography may reflect a response to palaeoenvironmental changes, including the rise of flowering plants and the retraction tropical biomes, during the Late Cretaceous and Cenozoic.

10:30 Dezene P.W. Huber, **Claire Paillard**, Lisa M. Poirier.
University of Northern British Columbia; paillard@unbc.ca

Urban diversity on the fly, what scuttle flies can tell us about a small British Columbia city.

Phoridae contains thousands of species, but only a fraction of these species has been described. Because of their abundance, ubiquity, and diversity, phorid flies make excellent model organisms for studying how insect communities respond to urbanization. In the summer of 2022, I sampled phorids from 30 sites in industrial, residential, and forested areas, in Prince George, a small British Columbia city. Residential, followed by greenbelt areas yielded the highest trapping rates of phorids, and the most diverse communities. Industrial areas were significantly warmer, experienced larger temperature fluctuations, and had significantly lower trapping rates. Flies were sorted into morphospecies, then selectively sent to the Centre for Biodiversity Genomics for DNA barcoding. From these flies, over 60 potential species (operational taxonomic units) were detected, and more than 70 OTUs were found when including data from 2015. Overall, urban areas can host diverse, abundant, scuttle fly communities, but factors like land use type, temperature, food sources, and other local conditions influence their richness.

10:45 **Tiffany Pan**, John Soghigian.
University of Calgary; tiffany.pan@ucalgary.ca

Investigating the evolution of the loss of blood-feeding in Sabethini mosquitoes.

Across the mosquito family, Culicidae, there are a number of species that exhibit the ability to reproduce without a blood meal. Some can reproduce without a blood meal for the first egg clutch, others do not require a blood meal at all. However, the evolution of the loss of blood-feeding is not well understood. By better understanding the evolution of the loss of blood-feeding, we can also better understand blood-feeding. The Sabethini tribe is an under-

studied population of the mosquito family and contains two genera that have completely lost the ability to blood-feed. I have reconstructed evolutionary relationships among the Sabethini to examine the relationships among non-biting mosquitoes using genomic data and phylogenetic software. The resulting tree of evolutionary relationships has been analyzed to determine the number of times blood feeding has been lost within the tribe and resolve the phylogenetic relationships between the genera within the tribe.

11:00 **Cassandra Penfold**[1], Jeanne A. Robert[1,2], Christopher Snowdon[3], Brent W. Murray[1].
1. University of Northern British Columbia, 2. British Columbia Ministry of Forests, 3. Renaissance BioScience Corp.; cpenfold@unbc.ca

Developing RNA interference (RNAi) as a biopesticide for mountain pine beetles (*Dendroctonous ponderosae*).

In western North America, the mountain pine beetle (*Dendroctonus ponderosae*, MPB) is the most destructive pest of pine trees, consequently causing ecological, economic, and socio-ecological impacts. Previous and current management techniques are ecologically and economically costly, creating a need for a low-cost, ecologically safe method for MPB population management. A naturally occurring pathway, ribonucleic acid interference (RNAi), can be used to silence targeted genes in insects by disrupting cellular function. Developing RNAi to use in ecologically safe trap trees can create a novel tool for managing MPB populations. Existing and new gene targets were tested using microinjection (injection of dsRNA) and feeding (oral delivery) methods for causing species-specific MPB mortality. Oral delivery involved the use of both in vitro synthesized dsRNA and heat-inactivated, dsRNA-expressing yeast delivered through direct feeding and translocation through pine phloem. Success of RNAi induction is determined using mortality observations alongside gene expression analysis.

11:15 **Karolina Pusz-Bochenska**[1,2], Tyler Wist[2], Jack Gray[1], Tim Dumonceaux[2].
1. University of Saskatchewan, 2. Agriculture and Agri-Food Canada, Saskatoon; k.pusz@usask.ca

The importance of rapid pathogen detection in insect vectors: Insights from aster yellows phytoplasma and its vector *Macrosteles quadrilineatus*.

Outbreaks of Aster Yellows (AY) can lead to substantial production losses, causing devastating economic effects on agriculture and related industries. Insights gained from the study of the aster yellows pathosystem can be extrapolated to enhance the understanding of epidemiology in other vector-borne diseases. While the spraying of insecticides remains the predominant pest control strategy for insect vectors, integrated management of phytoplasma diseases requires awareness of insect vectors' population levels and infectivity. This awareness empowers growers and producers to make judicious choices regarding the implementation of insecticidal control measures. Furthermore, the rapid and accurate assessment of field-collected insect samples through molecular diagnostic tests is imperative for effective management strategies. Hence, the urgency of employing adaptable molecular techniques for rapid pathogen diagnostics in field conditions is emphasized. Additionally, the potential universality of these pathogen detection methods is suggested, highlighting their applicability beyond the context of AY phytoplasma and its vector.

President's Prize 4: Ecology & Evolution. Room: Florence. Moderator: TBA

08:00 **Genevieve E. van der Voort**[1], Jasmine K. Janes[2], Jeffery Vogt, Lexy A. Green, Dezene P.W. Huber.
1. University of Northern British Columbia, 2. Vancouver Island University; gvan@unbc.ca
Pollinator biodiversity assessments in wetlands of northern British Columbia.

Pollinators provide important ecosystem services. Pollinator-plant relationships are important for habitat resiliency. However, studies examining pollinator or floral visitor assemblages are lacking in some vulnerable habitats. British Columbia contains many types of wetland habitats, each of which may sustain different plant and pollinator communities. The aim of our project is to examine insect and pollinator biodiversity in wetlands in central and northern British Columbia. We sampled 12 wetlands during the summer of 2022. We used various collection methods including vane trapping, sweep netting, and paired UV and non-UV painted pan traps of five colours (blue, white, yellow, red, pink). Our preliminary findings for insect and plant biodiversity as well as the effectiveness of pan trap colour and fluorescence are presented here. Future plans for this project are also discussed.

08:15 **Tianyi Ren**, Paul Galpern.
University of Calgary; tianyi.ren1@ucalgary.ca
Non-crop vegetation enhances volunteer canola seed predation by invertebrates in wheat and barley fields.

Weed control in conventional agriculture depends on herbicides and resistant cultivars, which create new challenges as resistant volunteer crops emerge as weeds between rotations. Landscape complexity and protecting natural areas enhance seed predation by invertebrates, which substantially decreases seed abundance. We hypothesize that volunteer canola predation rates in crops increase closer to the non-crop vegetation patches. Using a novel study site selection algorithm, we deployed seed predation cards at 149 stations along a gradient of distances to natural areas in seven wheat and three barley fields of southern Alberta in summer 2023. The study sites ranged from field edge to 500 meters within the field. Our results show that natural areas provide augmentation to invertebrates' predation on volunteer canola seeds, especially later in the growing season and in areas with higher precipitation. Our study highlights the importance of preserving non-crop vegetation patches within intensified landscapes to support seed predation service.

08:30 **Rowan Rampton**, Paul Galpern.
University of Calgary; rowan.rampton@ucalgary.ca
Does removing invasive plants risk degrading structural integrity of plant-pollinator networks?

Bipartite network analysis describes the structure of plant-pollinator interactions, using metrics to describe properties such as stability and specialization. Some invasive plants are highly attractive to pollinators and can integrate into networks with little change in overall structure despite heavily altered interaction patterns. Controlling invasive plants is a common goal in conservation and restoration, but the impacts of removing key pollinator plants on network structure are poorly understood. Here we present a network composed of two seasons

of camas meadow surveys, plus the results of simulations that preferentially remove either introduced or native plants from networks. We found that removals impact network stability and specialization differently depending on whether introduced or native plants are removed, and that impacts are dependent on the composition of the initial network. Removing invasive species may benefit native flora, but the impacts on networks and native pollinator fauna are less clear cut.

08:45 **Nicola Pollock.**
University of Regina; nicolampollock@icloud.com
Pan trapping for bees and wasps in the Canadian Prairies: A comparison of trap placement.

Pan traps are one of the most commonly used methods for surveying bees and wasps, though standard methodologies for their use are seldom used across studies. Specifically, pan trap colour, positioning in the field, trap height, and deployment duration often vary due to the specific characteristics of the habitats being surveyed. In addition, trap colour proximity often varies, as many studies use pans arranged as a colour triplet. A pilot study done in Arizona in 2009 suggested that the triplet approach resulted in lower abundance and diversity than when pans were arranged uniformly spaced. The purpose of my honours thesis research is to determine if these results are applicable to pan trap usage in Saskatchewan. I will be presenting results from my 2023 field season. I sampled in six different locations monitoring bee and wasp abundance and diversity using two replicates of coloured pan traps (blue, yellow, and white). The first replicate had pan traps placed together in close proximity in triplets, while the other had pan traps spaced apart from one another in a Latin Square formation.

09:00 **Rachael Pizante**, John H. Acorn, Carol M. Frost.
University of Alberta; pizante@ualberta.ca
Treed field borders have fewer hover flies but supply more individuals to canola crops than herbaceous field borders.

Documenting how hover flies move in and out of mass-flowering crops such as canola could allow for better land management that promotes the pollination and pest control services provided by hover flies. From May 31 to August 20 2021, we measured hover fly movement using bi-directional Malaise traps set up in a herbaceous field border and a treed field border adjacent to 10 canola crops in the Aspen Parkland. We caught more individuals in herbaceous borders than in treed borders, but more individuals moving towards the crop in treed borders than in herbaceous borders. We collected more individuals moving towards the crop than towards the border in treed borders but not in herbaceous borders. Because treed borders act as exporters of hover flies to the crop while herbaceous borders act as concentrators, preserving both field border types is important for promoting both hover flies and their ecosystem services.

09:15 **Matthew Muzzatti**[1], Marshall W. Ritchie[1], Emilie C. Bess[2], Heath A. MacMillan[1], Sue M. Bertram[1].
1. Carleton University, 2. Bug Mars; mattmuzzatti@cmail.carleton.ca
A thorn in the side of cricket farming – how do *Dermestes ater* affect *Gryllodes sigillatus*?

During heavy *Dermestes ater* (Dermestidae) infestations, cricket farms report extremely low harvest yields, but the reasons for this low yield are unknown. Dermestid larvae are covered in dense, detachable, barbed setae called hastisetae that are used by the larvae as protection and can obstruct the digestive tracts of predators. Dermestids are xerophilous necrophages and can be reared in captivity on fishmeal, a primary ingredient in cricket feed. Mass reared cricket farms are ideal environments for dermestids to thrive in, offering an unlimited source of animal protein and endless oviposition and pupation sites. Best practices of pest management in mass reared insect facilities are not well documented, in part because we do not know how reared species and pest species interact. Given this, we asked: how do *Dermestes ater* affect *Gryllodes sigillatus*? We hypothesized that dermestids may be directly impacting cricket yield through physical effects of hastisetae ingestion or indirectly through competition for resources. We designed two experiments that tested 1) the effect of feeding crickets diets infested with hastisetae and whole dermestids, and 2) the effect of rearing both species together in captivity with and without fishmeal. Our results describing dermestid-cricket interactions provide possible mechanisms behind reduced cricket farm yield.

09:30 **Cecil Montemayor Aizpurua**, Yvonne Lawley, Jason Gibbs, Alejandro C. Costamagna.
University of Manitoba; montemac@myumanitoba.ca

Assessing the effects of flowering plant mixtures on beneficial arthropods and pests in experimental plots.

Strips with flowering plant mixtures can be important refuges and floral resources for beneficial arthropods beside crops. Establishment of flowering plants in field borders can be challenging and little is known on how different plant mixtures function to establish a community that attracts beneficial insects. In this study, diversity and abundance of pollinators, natural enemies, and pests were evaluated in three flowering plant mixtures treatments: domesticated annuals mix, native perennials mix, and tame perennials/annuals mix in replicated experimental plots (4 x 8 m, n=28). Each treatment was evaluated with and without oats (cover crop). Rye perennial grass was established as the control plot treatment. Blue vane and bee bowls were used to capture pollinators. Sweep nets, D-vac, clear sticky traps, and pitfall traps were used capture predators and pests. Samples were collected every two weeks starting from the blooming period. First year preliminary results of this study are presented.

09:45 Coffee Break

10:00 **Campbell McKay**, Jeremy N. McNeil.
Western University; cmckay46@uwo.ca

Effect of larval host plant on development and migration of the monarch butterfly (*Danaus plexippus*).

Warmer than usual temperatures due to climate change may cause migratory insects emerging earlier in fall to face conflicting environmental cues, such that some adults may continue reproducing rather than emigrating. These conditions would represent an evolutionary trap, as any resulting adults would emerge too late to migrate. I investigated how changes in the

emergence time could affect migratory success of the monarch butterfly (*Danaus plexippus*). Starting with eggs from immigrants, I reared consecutive generations on three species of milkweed under controlled laboratory and field conditions. I will discuss my results on developmental times, energy budgets, body mass and wing loading, as well the incidence of mating in adults emerging under field conditions at different times after mid-August, within the context of fall migration.

10:15 **Alexe Indigo**, Paul Manning, Xiaohong Sun.
Dalhousie University; alexehanlon@gmail.com

The effects of *Eurosta solidaginis*-induced stem galls on botanical dyes extracted from goldenrod.

Goldenrod (*Solidago* spp.) is a genus of perennial plants that are ubiquitous throughout North America, and have been long-used for producing botanical dyes. These dyes mainly consist of phenolic compounds such as flavonoids that are found within the plant. Phenolic compounds are also known to be present in increased quantities in the plant within the tissue of the stem gall induced by the goldenrod gall fly, *Eurosta solidaginis* (Diptera: Tephritidae). The gall can also act as a sink on the plant's resources. This research investigates how the presence of these galls affect the color, strength, and chemical composition of the dyes produced by the goldenrod plant. Leaves collected from upper and lower stem sections of galled and un-galled plants, as well as leaves growing from the galls will be processed to extract the dye into a soluble form, which will be analyzed through spectrophotometry and comparison of dyed fabric swatches.

10:30 **Thomas Hall**[1], Thomas M. Onuferko[1,2], J. Scott MacIvor[1].
1. University of Toronto, 2. Canadian Museum of Nature; thomas.hall@mail.utoronto.ca

Mowing regime effects on stem-dwelling insect mortality and community structure in an urban meadowscape.

When conservation priorities conflict with urbanization, green spaces can provide opportunities for habitat restoration in a city. The Meadoway is a 16-kilometre right-of-way in Toronto, ON, where restoration practitioners are creating novel urban meadow habitats. To prevent unwanted meadow-to-forest succession, restoration practitioners have employed mowing to replace natural meadow disturbances (e.g., fire) that are unfeasible due to the Meadoway's proximity to human activity and infrastructure. Though mowing and natural disturbance regimes have similar effects on the meadow plant community, little is known about how other directly-impacted groups respond to mowing. My research focuses on determining how one ecological guild, stem-dwelling insects, is affected by urban meadow mowing regimes. Through an experimental simulation of mowing at different threshing levels on *Solidago altissima*, mowing was found to have an intensity-dependent effect on insect mortality rates and may interplay with the spatial organization of stem-dwelling insects in urban meadows.

10:45 **Mahsa Hakimara**, Emma Despland.
Concordia University; mahsa.hakimara@concordia.ca

Vertical stratification effect on insect herbivory patterns in sugar maple (*Acer saccharum*) forests in Quebec.

This study underscores the importance of investigating herbivorous insects as a driving force in the decline of Sugar Maple (*Acer saccharum*) forests in Quebec. Our objectives are to assess the impact of herbivores on the decline of Sugar Maple forests and document the insect biodiversity supported by maples, which may be threatened by this forest degradation. We monitored twelve sugar maple trees in southern Quebec, examining herbivore patterns from the understory to the canopy. Three sampling sessions took place in the summers of 2020, 2021, and 2022, recording environmental factors and leaf quality across vertical three strata. Leaf damage analysis quantified insect herbivory rates, focusing on affected surface percentage and damage type in the first two years. Overall, herbivory damage decreased from the understory to the shade canopy and sun canopy in 2020. The 2021 sampling showed a similar pattern, albeit weaker. The abundance of insect herbivores collected in 2022 followed the observed damage trend. Vertical stratification in leaf traits of sugar maple trees seemed to significantly affect insect herbivory patterns in the forest. Notably, the recorded annual herbivory damage rate of 9.1% suggests limited evidence supporting a significant contribution of background herbivory to the decline of sugar maple forests.

11:00 **Olivia DeBourcier**, John H. Acorn, Carol M. Frost.
University of Alberta; debourci@ualberta.ca

Flight of the water boatman: How urban wetland proximity affects water boatman community composition in Edmonton.

Water boatmen (Corixidae) live in a variety of wetlands, including stormwater management ponds in cities. Further, some species migrate from rivers to these wetlands for breeding, then return to the river in the fall. This study explores how the proximity of stormwater ponds to the North Saskatchewan River impacts water boatmen abundance, diversity, and species richness in Edmonton, Alberta. Additionally, it assesses the influence of distance on migratory corixid species in these ponds. I hypothesize that ponds closer to the river will have a higher abundance of migratory water boatmen species, while those on the city's outskirts will have fewer. Moreover, ponds in areas with a high wetland density will exhibit greater water boatmen diversity, abundance, and species richness, due to enhanced habitat availability. This research collected water boatmen from 35 Edmonton stormwater ponds in the summer 2022 using baited bottle traps and dip netting. GIS analysis calculated each pond's distance from surrounding wetlands and its minimum distance to the North Saskatchewan River. This study aims to provide insights into how stormwater pond locations affect insect populations in urban environments.

11:15 **Pedro Conceição**, Zoë Lindo.
Western University; pconcei@uwo.ca

The influence of environmental factors on predatory mite (Mesostigmata) communities in Ontario's peatlands.

Peatlands are important ecosystems for biodiversity and ecosystem function as they often contain unique species (e.g., carnivorous plants) and sequester large stores of soil carbon through the formation of highly organic soils called peat. These deep accumulations of organic peat are habitat for species rich communities of soil-dwelling arthropods, such as mites, many of which are specific to peatlands. The Mesostigamata are a group of largely predatory mites that feed on other microarthropods and nematodes. Although these mites play an important role in the soil food web, very few studies to date have addressed mesostigmatid mites in peatlands and no studies to date have been performed in Canada. The overall objective of this work is to explore the diversity and community structure of mesostigmatid mite communities in three Sphagnum (moss) dominated peatlands in Ontario investigating whether species richness, total abundance and the composition of these communities are influenced by current local environmental factors such as temperature, pH, soil moisture, surrounding habitat.

11:30 **Scout Butler-Siemens**[1,2], Iain D. Phillips[1,2].
1. University of Saskatchewan, 2. Troutreach Saskatchewan; sbb079@usask.ca
Impacts of cattle grazing on the assemblage of ground beetles (Coleoptera: Carabidae) in riparian areas.

Beef cattle grazing patterns are well documented in prairie ecosystems and without intervention of rotational grazing systems, beef cattle spend a higher proportion of time grazing in and around riparian zones than on adjacent plateau grass lands. Riparian areas provide ecological goods and services for aquatic ecosystems and are essential in maintaining the stability and quality of prairie waterbodies. Persistent grazing in riparian areas often results in an increase in bare ground, loss of bank stability, manure build up, and soil erosion, resulting in potential impacts on the insects living in these habitats. Grounds beetles (Coleoptera: Carabidae) in particular are valuable bioindicators to assess the health of the terrestrial environment which makes them a good candidate to be used alongside vegetation analysis to assess riparian zone health. Here we experimentally investigate the relationship between varying levels of cattle altered riparian zones and carabid beetle assemblage along a gradient of cattle riparian activity and through recovery from cattle exclusion. The goal of this study is to better understand how the alteration of soil and vegetation from cattle activity impacts the assemblage of ground beetles in riparian areas.

12:00 Lunch served in Pre-Function Area

12:00 TCE Editorial Board Meeting in Naples Room

12:00 Trivia Contest in Venice Room.

13:00 Plenary: Dr. Kyle Bobiwash. Room: Michealangelo A/B.

University of Manitoba; kyle.bobiwash@umanitoba.ca
Entomology and agricultural research as a tool for reconciliation.

Ecosystem services are defined through processes, or functions performed by species and ecosystem features that benefit humans. This partnership, and the reciprocity required to

maintain these services and functions are the basis of many Indigenous Knowledge traditions. Increasingly, the role of anthropogenic modifications to ecosystems are being incorporated into our understanding of the provisioning and resiliency of ecosystem services. This trend has resulted in an increasing ability and need to create space for Indigenous Knowledge into the future of science and evidence-based policymaking. The incorporation of humans within ecological networks provides a conceptual tool to build a more realistic understanding of the world and creates a framework for humans to understand their relationality with their surrounding environment. Indigenous and other local knowledge systems often encompass culturally specific concepts and beliefs of how the world should (and does) operate or what values need to be prioritized. Through providing the opportunity for communities to better elaborate Indigenous Knowledge and research priorities we are enabling the ability of ecology and scientific research to better fulfill its responsibility to society.

Symposium: Aphids & Psyllids & Leafhoppers. Oh My! Routes of transmission of plant diseases in agriculture. Room: Michelangelo A/B.

14:00 Bryan Brunet and Michelle Franklin, Organizers and Moderators
Introduction.

14:05 **Eric Gerbrandt.**
1. Research Director, BC Blueberry Council; research@bcberries.ca
Taxonomic resolution of aphid species mediating spread of Blueberry Scorch Virus (BlScV) in BC blueberry fields as an integrated component of multi-disciplinary research.

Most of Canada's highbush blueberries are produced in British Columbia (BC), and a major epidemic of blueberry scorch virus (BlScV) has arisen in the geographically concentrated region of the Fraser Valley, leading to widespread infection across major production regions. BlScV results in yield decline to the point that plantings are no longer economical to farm, and there are neither genetic resistance nor curative treatments aside from removing infected plants. BlScV is aphid-transmitted, and vector control is the industry's primary defense. However, the aphid species involved in vectoring the virus and their parasitoids are poorly understood. To counteract the effects of the BlScV epidemic in BC, entomology research is integrated with collaborations: 1) Improving understanding of viral diversity and diagnostic tests; 2) Utilizing aerial drone and satellite imagery to better track viral spread; and 3) Developing genetic resistance to aphid vectors through the efforts of the BC Berry Breeding Program.

14:30 **Dinesh Babu Paudel**, Ningxing Zhou, Grace Onu-Odey, Tyler Hartl, Sean Prager.
University of Saskatchewan; paudel.db@usask.ca
Protecting pulses from vector-borne virus diseases in Canada.

Canada exports nearly 86% of its pulses to more than 120 countries, contributing to global food security. Although more than 168 viruses are known to infect legumes causing significant damage to plants, they are rarely reported in the pulse-growing region of Canada. Virus prevalence in the region is expected to rise due to the increase in the international trade of

plant materials and global warming-induced changes in insect (vector) behaviour, populations, and geographical distribution. To comprehend this virus-induced threat, the pea seed-borne mosaic virus (PSbMV)-aphids-legume model system is being used. This model system is used to explore various aspects of virus transmission, evaluate the minimum feeding time and the number of insects required for transmission, as well as employing PCR-based detection for infected plants and insects. Furthermore, disease symptoms and virus evolution on different pulses are being studied, which will provide valuable insights into protecting Canadian pulses.

15:00 **Grace Onu-Odey**, Sean Prager.
University of Saskatchewan; grace.onu-odey@usask.ca

Documenting symptoms of pea seed-borne mosaic virus in Saskatchewan pulse crops.

Canada is the second largest producer of pulses in the world, second only to India. Saskatchewan and Alberta are the leading provinces in terms of pulse production. Canadian pulses are largely for export, exporting about 80% of production. Pulse production is being constrained by unpredictable weather patterns, these hot and dry weather patterns have resulted in increased insect pressure, with one important insect pest being the pea aphid (*Acyrthosiphon pisum*) and the viruses they vector. One of such viruses is the *pea seed-borne mosaic virus* (PSbMV). This virus is also seed transmitted, with a 100% transmission in field pea and reaching significant levels in other pulses. Seed quality is affected with PSbMV causing brown ring patterns and spots on the seeds of field pea, faba bean, lentil and chickpea seeds. To understand the transmission of the virus in pulses and the symptoms that is induced on the plants, pulse crop will be mechanically inoculated with PSbMV to monitor symptom establishment on pulse varieties, qPCR will be carried out to quantify the titre value and all symptoms will be described and photographed at different growth stages.

15:30 Coffee Break

15:45 **Meghan Vankosky**[1], Ivan Milosavljevic[2], Mark S. Hoddle[2].
1. Agriculture and Agri-Food Canada, Saskatoon; 2. Department of Entomology, University of California – Riverside; meghan.vankosky@agr.gc.ca

Biological control of disease vectors in urban communities: Asian citrus psyllid management in southern California.

The Asian citrus psyllid (ACP), *Diaphorina citri*, is a vector of *Candidatus* Liberibacter asiaticus, which causes a lethal and incurable citrus disease, huanglongbing (HLB, also known as citrus greening disease). ACP was detected in California in 2008 and a classical biological control project targeting this pest was initiated in 2010. The biological control program targeted ACP in urban areas because of the abundance of citrus trees in gardens and because large-scale insecticide control was not feasible and unpopular with the public. The project imported two Hymenopteran parasitoid species from Pakistan for release in California: *Tamarixia radiata* (Eulophidae) and *Diaphorencyrtus aligarhensis* (Encyrtidae); petitions for release were approved in 2011 and 2014, respectively. Monitoring at parasitoid release sites across southern California continued until 2018. *Tamarixia radiata* has been recovered consistently at many release sites,

has parasitism rates averaging around 20%, and has shown evidence of dispersal from original release sites. In contrast, *D. aligarhensis* does not appear to have established in southern California. Since the inception of the biological control program with *T. radiata*, ACP population densities have declined by ≥ 75%. There have been no HLB epidemics in urban citrus, and ACP-*C*Las have not yet established in commercial citrus orchards.

16:15 **Tyler Wist**[1], Karolina Pusz-Bochenska[1,2], Sean Prager[2], Tim Dumonceaux[1].
1. Agriculture and Agri-Food Canada, Saskatoon, 2. University of Saskatchewan; tyler.wist@agr.gc.ca

Still Watching the Winds: Migratory aster leafhoppers and aster yellows phytoplasma.

Aster leafhoppers, *Macrosteles quadrilineatus*, (Hemiptera: Cicadellidae) are the primary vectors of the aster yellows phytoplasma (AYp) that causes aster yellows disease in a multitude of Canadian field crops with canola the main crop of concern. This insect migrates into Canada almost every year and issues with disease in field crops occur when large numbers of these insects migrate and when a high percentage of them are infected with AYp. We have been tracking the arrival dates of and wind patterns that bring aster leafhoppers into western Canada, and using genetic and stable isotopic techniques to understand the origins of these leafhoppers each year. Infected leafhoppers are determined using molecular methods and we developed a more rapid and sensitive molecular tool for AYp diagnostics than the older, slower and less sensitive, nested PCR lab assay.

16:45 **Berenice Romero**[1], Farrah Fischer[1], Tyler Wist[2], Sean M. Prager[1].
1. University of Saskatchewan; 2. Agriculture and Agri-Food Canada, Saskatoon; berenice.romero@usask.ca

Combining field surveys with molecular gut content analysis of insect samples to identify potential hosts involved in a vector-borne plant pathosystem.

Phytoplasmas are phloem-limited bacteria associated with several diseases in plants and can be transmitted by hemipterans. In the Canadian Prairies, phytoplasma subgroup 16SrI is associated with Aster Yellows (AY) disease and is primarily transmitted by migratory populations of aster leafhoppers (*Macrosteles quadrilineatus* Forbes). In typical years, incidence of AY is below 0.01% for canola; however, the region is subject to outbreaks of unknown cause resulting in up to 95% infection in fields and 15% yield reduction in canola and other annual crops. The identification of plant species that can function as feeding hosts or disease reservoirs is crucial for gaining a better understanding of AY epidemiology. For this purpose, field surveys conducted over four seasons (2018-2021) were complemented with molecular gut content analysis (GCA) of field-collected aster leafhoppers. For GCA, sequencing of trnF and ITS regions of plant DNA was used to examine the feeding history of aster leafhoppers.

17:15 Nicolas Plante[1], Jeanne Durivage[1], Anne-Sophie Brochu[1,], **Tim Dumonceaux**[2,3], Dagoberto Torres[4], Brian Bahder[5], Joel Kits[6], Antoine Dionne[9], Jean-Philippe Légaré[7], Stéphanie Tellier[8], Frédéric McCune[1], Charles Goulet[1], Valérie Fournier[1], Edel Pérez-López[1].

1. Université Laval, 2. Agriculture and Agri-Food Canada, Saskatoon, 3. University of Saskatchewan, 4. Instituto Tecnológico de Monterrey, 5. FLREC-University of Florida, 6. Agriculture and Agri-Food Canada, Ottawa, 7. Laboratoire d'expertise et de diagnostic en phytoprotection, MAPAQ, 8. Direction régionale de la Capitale-Nationale, MAPAQ. The first two authors contributed equally and share first authorship.

Leafhoppers: Sentinels of the impact of climate change on agriculture.

Climate change is reshaping agriculture and insect biodiversity worldwide. With rising temperatures, insect species with narrow thermal margins are expected to be pushed beyond their thermal limits, and losses related to herbivory and diseases transmitted by them will be experienced in new regions. Here, it is proposed that climate change's impact on agriculture can be traced through the study of migratory leafhoppers. To test this hypothesis, leafhoppers in strawberry fields located in eastern Canada, were evaluated. Here, we found that in the last ten years, the number of leafhoppers has been increasing in correspondence with the number of plants affected by diseases transmitted by leafhoppers, although the leafhopper diversity has been seriously affected. Our model showed that their abundance is influenced by temperature, a factor that we found also influences the insect microbiome. We also found that the insecticides used by strawberry growers can't control leafhopper incidence, which could be linked to microbiome changes induced by changing temperatures.

Contributed Talks: Agriculture I. Room: Florence. Moderator: Roselyne Labbé

14:00 **Marcelo Polizel Camilli**, U. Glavinic, M.F. Raza, D. Peng, E. Baril, M.S. Jose, M.C. Bezerra da Silva, O. Obshta, T.L.K. Edirithilake, E.E. Tellarini, M. Pietropaoli, I. Moshynskyy, S.C. Wood, E. Simko. University of Saskatchewan, Western College of Veterinary Medicine; marcelo.camilli91@gmail.com

Yellow and green horizons: Honey bee hives productivity on Saskatchewan landscapes.

Canada is the largest producer and exporter of canola. There is a win-win relationship between this crop and honeybees. Canadian canola industry benefits from honey bee pollination services which contribute to increased canola yield. For beekeepers, honey from canola represents 70% of all honey extracted in western Canada. In Saskatchewan (SK) majority of the agricultural land is covered by canola. However, besides this golden crop, SK is home of endless boreal forests which can be a good source of organic nectar for honey bees. In this study, we aim to determine how patterns of honey productivity differ between colonies placed in different regions on canola fields during the mass flowering period and boreal forest in Saskatchewan. Accordingly, a total of 80 colonies were used - 60 in canola fields (15 apiaries x 4 hives) and 20 in the boreal forest region (5 apiaries x 4 hives) from July to August of 2023. Each colony was placed on an electronic hive scale and colony weights monitored during all the experimental period. This study will help us to better understand the honey production dynamics on canola fields and native boreal forest in Saskatchewan.

14:15 **Roselyne Labbé**[1], Andrew LaFlair[2], Diana Catalina Fernandez[1], Paige Desloges-Baril[2], Carly Demers[2], Sherah VanLaerhoven[2], Lauren DesMarteaux[1].

1. Agriculture and Agri-Food Canada, Harrow, 2. University of Windsor; roselyne.labbe@agr.gc.ca

Exploring the greenhouse biological control potential of native hemipteran predators in eastern Canada.

Generalist hemipteran predators have an important and well-recognized role in greenhouse biological control as their host switching capacity means they can suppress populations of multiple pest species and stave off periods of prey scarcity. And yet, few of the native species that occur in Canada have been characterized to date for their greenhouse biocontrol potential. To address this, from 2018 to 2020, we conducted field surveys across Ontario, Canada to identify to identify several predatory hemipteran species that can be easily maintained in lab cultures, adapt well to greenhouse crops, and demonstrate good control potential for a diversity of arthropod pests. Through these surveys, we successfully established colonies for the predatory nabid (*Nabis americoferus*) and two predatory mirids (*Dicyphus famelicus* and *D. discrepans*). To date, we have characterized the life histories and the basic predatory capacities for each of these predators and have confirmed that they can successfully establish on greenhouse crops. This talk will provide an overview of some of our key findings, along with a summary of preliminary greenhouse trials aimed characterizing pest prey feeding capacity and the value of supplemental foods for supporting these predators. Together, this work will help establish best practices for application for such hemipteran predator species and serves as the key first steps to development of new biocontrol tools for application in Canadian greenhouse crops.

14:30 **Daniel Peck.**

Vestaron Corporation; dpeck@vestaron.com

Introduction to Spear-Lep and Spear T, novel peptide-based insecticides recently approved for use in specialty ag and greenhouse crops.

The peptide-based bioinsecticides Spear-Lep and Spear T were recently approved for commercial use in specialty ag and greenhouse crops in Canada. The active ingredient GS-omega/kappa-Hxtx-Hv1a has a novel neuromuscular mode of action (IRAC Group 32) so is an obvious fit for insecticide resistance management. Several seasons of experimental and commercial use in the US and Mexico demonstrate product performance on par with conventional insecticides, but with the benefits of biologicals such as 4 h restricted-entry interval, 0-day preharvest interval, no maximum residue limits, and an excellent safety profile. After a brief background on the origin and development of insecticidal peptides, an overview will be presented on product labels, target pests/crops and best use practices.

14:45 Ala Abdel Rahman[1], **Ian Scott**[2], Hugh Henry[1], Todd Kabaluk[3].

1. Western University, 2. Agriculture and Agri-Food Canada, London, 3. AAFC, Agassiz; ian.scott2@agr.gc.ca

Combinations of *Metarhizium brunneum* and cover crops: A novel wireworm management strategy.

Entomopathogenic fungi are used to manage insect pests including wireworm (Coleoptera: Elateridae) species. *Metarhizium* species have been isolated from wireworm in B.C., for example *M. brunneum* strain LRC112 infect *Agriotes* spp. (*Agriotes lineatus* and *A. obscurus*). In Ontario, strategies for wireworm suppression have evaluated cover crops, but not the interaction with soil fungi. The objectives of the research were to determine: 1) the effect of LRC112 with *Limonius agonus* and 2) the interaction of strain LRC112 with cover crops. Lab experiments were completed with LRC112 to compare the infection of *L. agonus* versus *A. lineatus*, and the effect on the growth of barley, buckwheat and brown mustard. Field trials with LRC112-treated seed in combination with the 3 cover crops examined post-treatment *L. agonus* populations. Results indicate LRC112 is less infectious to *L. agonus* but had a positive effect on plant parameters. Greater application rates for LRC112 should be tested in future trials.

15:00 **Jean-Philippe Parent**[1], Josée Doyon[2], Paul Abram[3].
1. Agriculture et Agroalimentaire Canada, St-Jean-sur-Richelieu, 2. Université de Montréal, 3. AAFC, Agassiz; jean-philippe.parent2@agr.gc.ca

Vibrational waves through space and time: Scaling up vibrational pest control of aphids in both duration and size.

Vibrational pest control is a novel and experimental pest control alternative to chemical pesticides. Most experimental evidences on the efficacy of vibrational pest control have been obtained from small scale, short-term experiments. In this study, our objectives were to understand the effect of vibrational treatment over a long period of time, and with larger plants. For the duration, we exposed green peach aphid *Myzus persicae* on 30 cm pepper plants to a vibrational treatment over a two-week period. For the larger plants, we tested our vibrational treatment on aphids feeding on plants ranging from 1.5 to 1.8 m pepper plants over a two-week period. In both cases, the population growth was greatly reduced, but as plants grow larger, the efficacy was lessened. This is most likely due to a reduction in the vibration intensity through the plant. Larger, more powerful shakers will need to be used in future large-scale experiments.

15:15 **Thanuri Edirithilake**, M.S. Jose, M.P. Camilli, M.C. Bezerra da Silva, M. Blanchemanche, M. Desmarais, O. Obshta, J.M. Thebeau, F. Masood, E.E. Tellarini, M.F. Raza, I Moshynskyy, A.C. Ruzzini, E. Simko, S.C. Wood.
University of Saskatchewan, Western College of Veterinary Medicine; thanuri.edirithilake@usask.ca

Does Propolis Protect Honey Bee Larvae from European Foulbrood Disease?

Propolis, plant resins collected by bees, possesses medicinal properties including antimicrobial and anti-inflammatory effects. A recent *in vitro* study demonstrated that propolis inhibits *Melissococcus plutonius*, the causative bacterium of European foulbrood (EFB) disease of honey bee larvae. Here, we studied the effect of propolis on the survival of honey bee larvae from EFB. Newly-hatched larvae were infected with *M. plutonius* and reared in plastic wells coated with 1.1 mg/mL or 4.6 mg/mL propolis recovered from one of three geographical areas: North Dakota, Brazil, and Louisiana. We found that propolis treatment did not prevent clinical signs of EFB in honey bee larvae; however, treatment with 1.1 mg/mL Louisiana propolis

significantly prolonged larval survival from EFB. These results suggest that propolis is not an effective therapy for EFB, but may lessen clinical severity.

15:30 Coffee Break

15:45 **Tracy Hueppelsheuser**[1], Troy Kimoto[2].

1. British Columbia Ministry of Agriculture, 2. Canadian Food Inspection Agency; tracy.hueppelsheuser@gov.bc.ca

Japanese beetle (*Popillia japonica*) in British Columbia: Progress towards eradication.

Japanese beetle, *Popillia japonica*, a regulated pest in Canada, was detected in annual survey by the Canadian Food Inspection Agency for the first time in Vancouver, British Columbia, in July 2017. Western North America is free of this pest. Vancouver is highly urbanized and surrounded by a diverse agriculture sector, as well as unique natural environment. In response to this pest incursion, a collaboration of three levels of government, industry, and non-government, we set out to eradicate the pest from British Columbia. Surveillance with pheromone-baited traps is the cornerstone for data collection on pest distribution and tracking effectiveness of treatments. As a result of ground treatments and movement control regulations, beetle numbers have plummeted, and the original detection site appears free from the pest. However, detections have occurred in two adjacent cities. Information about progress of the project innovations, and future directions will be discussed.

16:00 **Emilio Enrique Tellarini Prieto**, M. Pietropaoli, Y. Camus, M.P. Camilli, M.F. Raza, M.S. Jose, O. Obshta, M.C. Berezza da Silva, U. Glavinic, T.L.K. Edirithilake, E. Baril, E. Simko, S.C. Wood.

University of Saskatchewan, Western College of Veterinary Medicine; emilio.tellarini@usask.ca

Effect of incremental doses of vaporized oxalic acid on honey bee workers and queens.

The ectoparasitic mite of honey bees, *Varroa destructor*, is a leading cause of honey bee colony loss worldwide. Oxalic acid (OA) is one of the most popular treatments for *Varroa* mite management. However, the potential toxicity of OA to adult bees and queens is poorly understood. To investigate further, we exposed 32 colonies to incremental doses (0, 5, 10 and 20 g) of vaporized OA once per week for 4 consecutive weeks and monitored adult bee mortality. After OA treatment completion, queens were introduced into new nucleus colonies to assess their performance and the remaining queen-less colonies, with OA-treated worker bees, were evaluated for their ability to raise replacement queens. Colonies treated four times with 20 g of OA (20 times recommended dose) had increased worker bee mortality. Data collection on queen performance and replacement is in progress.

16:15 **Gail MacInnis.**

National Bee Diagnostic Centre; gail.macinnis@mail.mcgill.ca

Regenerative farming increases wild bee diversity in northern Alberta agroecosystems.

Regenerative farming uses a systems approach to build soil health and return nutrients back to the soil. Unifying principles consistent across regenerative farming systems include minimizing soil disturbance (tillage), maintaining continual living plant roots, increasing plant

and crop diversity and integrating livestock. In northern Alberta, large monoculture cropping systems whose productivity is maintained through high-input farming are becoming more difficult to sustain. Thus, many producers in Alberta's north have developed a regenerative model of crop production that promotes soil health, crop diversity and sustainability while maintaining profitable production. To determine what effect regenerative farming may have on wild and native pollinator diversity, we conducted wild bee surveys over two years on regenerative and conventional farms in northern Alberta. We found that self-identified regenerative farms had higher bee and plant species richness and abundance than conventional farming systems. No-till farming systems in particular hosted a higher proportion of ground-nesting bees. Our results suggest that incorporating more regenerative farming practices in agricultural landscapes can have a significant impact on wild bee diversity.

16:30 **Suzanne Blatt**, Rebecca Rizzato.
Agriculture and Agri-Food Canada, Kentville; suzanne.blatt@agr.gc.ca
European apple sawfly shows cultivar preference but does it show preference for rootstock?

European apple sawfly (*Hoplocampa testudinea* Klug, Hymenoptera: Tenthredinidae) is a consistent pest in apple throughout Eastern Canada. Damage from this pest is initiated during bloom when control products are not applied. Known to exhibit a preference for cultivars of apple, we hypothesized that a similar preference could exist for apple rootstocks with a Honeycrisp scion. In a rootstock trial consisting of over 20 different rootstocks we documented, over multiple years, oviposition preference during bloom and sawfly damage at harvest. Larval survival was noted during development and correlated with fruitlet chemistry. Preference for rootstocks under Honeycrisp showed similar trends to those observed in cultivar preference. Implications for pest management and future breeding programs are discussed.

16:45 **Jill Sauter.**
Synthesis Agri-Food Network; jill@synthesis.ag
An update on the Field Heroes Campaign.

Contributed Talks: Forestry. Room: Venice. Moderator: Brian Van Hezewijk

14:00 **Sara Edwards**[1], Rob C. Johns[1], Jacques Régnière[2], Véronique Martel[2], Emily Owens[1].
1. Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre, Natural Resources Canada, Canadian Forest Service, Laurentian Forestry Centre; sara.edwards@nrcan-rncan.gc.ca
Early Intervention Strategy for spruce budworm: Can we contain outbreak spread?

Spruce budworm (*Choristoneura fumiferana* Clemens) is the major defoliating pest of spruce (*Picea* sp.) and balsam fir (*Abies balsamea* (L.) Mill) in northeastern North America. The recent resurgence of a spruce budworm outbreak in North America has rekindled interest and discussion around how best to manage its potential impact across the region. Early Intervention Strategy (EIS) is an area-wide management program aimed at containing the spread of spruce budworm in Atlantic Canada. In brief, intensive regional monitoring is used to help identify

emerging “hot spots” along the leading edge of outbreak, which are then treated with relatively narrow-spectrum insecticides (i.e., Btk or tebufenozide) to slow or prevent further population expansion. Our research represents a large-scale test of the efficacy of the EIS approach. Results from the first six years of this program indicate that under the right conditions the EIS has strong potential for containing budworm outbreaks with minimal impacts on non-target species.

14:15 **Leah Flaherty.**
MacEwan University; flahertyl@macewan.ca
Climate change-mediated diet shifts for an outbreaking forest defoliator: Direct effects and interactions with insect disease.

Climate change is expected to create phenological mismatches between insect herbivores and their hosts. For example, early-spring egg hatch dates for forest tent caterpillar (FTC) (*Malacosoma disstria* Hübner) is expected to advance less significantly with warming than budbreak of its primary host, trembling aspen (*Populus tremuloides* Michx). This change in resources may have direct effects on FTC, but may also interact with entomopathogens. Using lab and field experiments, we examined interactions among FTC, climate warming-associated diet shifts, and two entomopathogens: microsporidia and *Bacillus thuringiensis* var Kurstaki (Btk). Preliminary results suggest that neither microsporidia infection, nor climate-induced diet shifts, alter susceptibility of FTC to Btk at the concentrations tested. We do however report significant direct effects of microsporidia infection and diet shifts on FTC performance. We anticipate our results can be applied to predict how climate change may impact outbreaking forest defoliators, which is crucial for effective forest and pest management.

14:30 **James Hammond**, David W. Langor, Philip G.K. Hoffman, Linhao Wu, Jaime Pinzon, Anna Dabros, Tod Ramsfield, Brad Tomm.
Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre; james.hammond@nrcan-rncan.gc.ca
Do arthropod communities assemble according to ecological land classification of upland forests in the boreal mixedwood region of Alberta?

The use of biodiversity surrogates offers a scientifically sound, robust, and cost efficient way of supporting conservation strategies over large landscapes. We examined the habitat associations of ground beetles, rove beetles and spiders collected with pitfall traps from 12 undisturbed forest types that conform to different ecophases using the ecosystem classification system for the boreal mixed wood subregion of Alberta, Canada. A total of 79,578 epigaeic arthropods, representing 370 species, were collected during the summer of 2018. Catches of ground and rove beetles were highest in deciduous mesic forest stands, whereas spider catch were highest in xeric, open canopy jack pine stands. Species richness and diversity differed among taxa and ecophases, however for all three taxa assemblage evenness increased along the moisture gradient. Ecosite and ecophase classification accounted for more variation in arthropod assemblage structure than did spatial factors, as did tree cover and understory vegetation cover for environmental variables. Most of the common arthropod species were distributed widely among ecophases suggesting that arthropod communities form a continuum

across forest nutrient and moisture regimes, which allowed arthropod assemblages to be categorized into broad ecotypes. In general the distribution of epigaeic arthropod assemblages conformed to the ecosite edatopic grid and use of the forest ecosystem classification system is a good surrogate for estimating epigaeic arthropod biodiversity across the larger landscape.

14:45 **Brian Van Hezewijk.**
Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre; bryan.vanhezewijk@nrcan-rncan.gc.ca

Multi-scale response of generalist predators helps keep western spruce budworm populations at endemic levels.

In contrast to most areas in the Pacific Northwest, populations of western spruce budworm (*Choristoneura occidentalis*) on Vancouver Island, Canada, have not reached outbreak densities for nearly a century. To test the hypothesis that generalist predators contribute to the stability of a low-density equilibrium, budworm pupal densities were manipulated in four years at three sites at the scales of branches to multi-tree clusters. Pupal survival was measured from one to six days post-deployment and mortality factors were identified using characteristics of the damaged pupae and by rearing recovered pupae for parasitoids. Overall, we found strong evidence that survival from predation is highest at the lowest densities tested and decreased to nearly zero at the highest densities. The response of the predator community to pupal density was strongest at the tree scale, but also evident at the scale of multi-tree clusters. These results support the hypothesis that predators are important in maintaining low-density populations of western spruce budworm.

15:00 **Atta Ur Rehman.**
Hazara University KPK Pakistan, SPIN; spinkhan97@gmail.com

Fruit fly threat to peach production and quality in District Swat KPK Pakistan.

Peach is the record significant stone fruit per temperate landscape. District Swat is the most highly productive and high quality supplier in Pakistan. In the last few years some challenging and extensive problems caused reduction in peach production in District Swat. Four Tehsils such as Charbagh, Matta, Khwaza Khela, and Mingora were randomly were selected for the study. Data were collected from randomly 15 peach fields by two years (2021 and 2022). SPSS software was used to analyze the data. Outcomes confirmed that common problems as fruit fly, scab disease, leaf curl disease, lack of cold storage facilities and non-availability of extension field services cause poor peach fruit quality, productivity, and economic loss. The results shows that 98.5% of orchards were affected by fruit fly which leads to loss 8 to 9% of fruit loss. By recommendations we suggest that fruit fly is a big threat and problem lowering the quality, quantity and economy of peach in present and in the future for District Swat.

15:30 Coffee Break

17:00 Poster Session. Room: Michealangelo C. President's Prize authors in **BOLD and UNDERLINED** font.

1. **Abraao Almeida Santos**, Edel Pérez-López.
   Université Laval; abraaoufs@gmail.com
   Environmental niche overlap, similarity, and species richness of economically important leafhoppers in North America.

   Leafhoppers are vectors of phytoplasmas and climate change is influencing their distribution and abundance worldwide. We evaluated the niche overlap and similarity between 15 leafhoppers species known as vectors of phytoplasmas in berries and small crops. We also estimated species richness in North America and addressed the question: Are these species' environmental niches similar? Our results indicated that two species, *Ceratagalli humillis* and *Colladonus geminatus* present a lower overlap with other species. In contrast, widely distributed species, such as *Empoasca fabae*, *Macrosteles fascifrons*, *M. quadrilineatus*, and *Jikadria olitoria*, showed a high niche similarity with almost all species studied. The estimated richness map indicates that the northeastern region of North America potentially harbors more species (up to 15), while dry land areas have almost no species. Our study revealed that mainly leafhoppers species that are vectors of phytoplasma in berries and small fruit crops occupy a similar environmental niche in North America.

2. **Amélie Morin**, Frédéric McCune, Virginie Durand, Valérie Fournier
   Université Laval; amelie.morin.13@ulaval.ca
   Conservation of biodiversity and endangered bumblebee species: Effects of flower strips in agricultural landscapes.

   Pollinators are currently experiencing a significant decline. The establishment of flower strips along field edges constitutes a conservation tool aimed at providing them with high-quality habitats and food resources. However, several parameters of this tool need to be specified. This project aims to assess the impact of floral species composition and strip width on the abundance and species richness of bumblebee populations. It also aims to determine the preferred habitat and resources favored by endangered bumblebee species in Canada. Flower strips have been implemented on 24 large-scale farms in Montérégie, QC. Different seed mixtures and strip widths are being studied. A non-lethal monthly inventory is conducted locally and at the landscape scales, which is a pertinent scale for assessing the effectiveness of conservation measures. So far, 1900 bumblebees have been captured, leading to the identification of 37 specimens belonging to two endangered species (*Bombus terricola* and *B. fervidus*). Through generalized mixed models, it will be possible to determine the characteristics that flower strips must possess to be effective conservation tools for bumblebee species in Canada.

3. **Bennet Grappone**, Heather Proctor.
University of Alberta; grappone@ualberta.ca
Habits, habitats, and taxonomy of carrion beetle associated mites (Mesostigmata: Parsitidae: *Poecilochirus* spp.) in Alberta.

Burying beetles (Silphidae: *Nicrophorus* spp.) are common scavengers of small vertebrate carcasses worldwide. When a breeding pair of *Nicrophorus* arrive 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 phoretic mite genera, with the most well-researched being *Poecilochirus*. The relationship between *Nicrophorus* and *Poecilochirus* is generally mutualistic, with the mites hunting fly eggs and larvae that would otherwise compete with the beetle larvae. Currently, all *Poecilochirus* in North America associated with burying beetles are assigned to either the *P. carabi* species complex, the *P. monospinosus* species complex, or the species *P. subterraneus*. Both complexes cover a wide geographic and host species range. Recent work has shown that each of these clades contain 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 closely related ones. My research involves pitfall trapping in a variety of habitats and using a variety of dead animals as bait to determine preferences for the burying beetle hosts, as well as culturing of mites from adult beetles in order to formally describe the cryptic mite species using morphology and genetics.

4. **Bryan Fisher**[1,2], Theresa Burg[2], Kevin Floate[1].
1. University of Lethbridge, 2. Agriculture and Agri-Food Canada; bryan.fisher@uleth.ca
Gut microbiome diversity in ground beetles (Coleoptera: Carabidae).

The microbes that reside in the guts of animals (the gut microbiome) aid in digestion and provide protection from pathogens, thereby influencing host survival and reproduction. To fully understand the biology and ecology of the host, it is necessary to study their gut microbiome. Bacteria are usually the major constituent in gut microbiomes. Here we report results of next generation sequencing techniques that characterize the gut bacteria of four species of ground beetles (Coleoptera: Carabidae): *Pterostichus melanarius* (a predator/scavenger), *Amara littoralis* (a granivore), and *Cicindela repanda* and *Cicindela oregona* (carnivores). About 2500 ground beetle species span North America where they eat many pests and are predominant in agroecosystems. The results shown here are part of our larger study on 45 ground beetle species which examines the relative effects of host phylogeny, diet, habitat, and geographic location on insect microbiome diversity.

5. Kevin Floate[1], **Diana Wilches Correal**[1], Paul Coghlin[1], Andrew Smith[2].
1. Agriculture and Agri-Food Canada, Lethbridge, 2. Canadian Museum of Nature;
dm.wilchescorreal@alumni.uleth.ca
Assessment of the *Aphodius fimetarius* and *Aphodius pedellus* (Coleptera: Scarabaeidae) species complex in Canada.

Aphodius fimetarius (Linnaeus, 1758) (Coleoptera: Scarabaeidae: Aphodiinae: Aphodiini) *sensu lato* is a taxon of probable European origin common in cattle dung across North America. This species has recently been recognised as a species complex composed of *A. fimetarius* and *Aphodius pedellus* (De Geer, 1774), with overlapping distributions in North America. A previous report that only *A. pedellus* is present in Canada was based on examination of specimens almost solely from the United States of America. In the present study, we examined the morphology of specimens (n = 2091) from localities across Canada. In combination with DNA barcoding, our results confirm that only *A. pedellus* is present in Canada. Results of similarity analysis confirm reduced genetic diversity among North American specimens of *A. pedellus*, consistent with the hypothesis that this species was introduced onto the continent during European settlement.

6. Abbe Pawluk[1,2], **Héctor Cárcamo**[2], Rob Laird[1], Valentina Ibarra Galvis[2], Brendan Roy[2].
1. University of Lethbridge, 2. Agriculture and Agri-Food Canada, Lethbridge;
hector.carcamo@agr.gc.ca
***Peristenus* (Hymenoptera: Braconidae) parasitism of lygus bugs in field crops: from plots to fields.**

Lygus bugs (Heteroptera: Miridae) are pervasive pests in most crops across the northern hemisphere. They cause significant economic loss to producers and evolved insecticide resistance in the USA, thus raising the need for alternative pest-management strategies. In Alberta, three native species of *Peristenus* wasps (*P. dayi*, *P. mellipes*, and *P. howardii*) are the main parasitoids of lygus bugs, attacking 2nd and 3rd instar nymphs. Unlike semi-perennial forage crops, little is known about parasitism rates of lygus in annual field crops. Thus, our goal was to establish baseline parasitism levels of *Peristenus* wasps on lygus bugs in various annual field crops, including, hemp, flax, mustard, canola, and to compare them to semi-perennial crops like alfalfa and sainfoin. The baseline data established in this study will inform relocation plans for a European parasitoid, *Peristenus digoneutis*, from Eastern Canada into the Canadian prairies.

7. **Héctor Cárcamo**, Kevin Floate, Diana Wilches, Valentina Ibarra Galvis, Abbe Pawluk, Brendan Roy.
Agriculture and Agri-Food Canada; hector.carcamo@agr.gc.ca
A comparison of PCR screening, dissection and rearing methods to assess parasitism of lygus bugs by *Peristenus* wasps.

Biological control of lygus bugs with *Peristenus* wasps is a promising pest management alternative to insecticides. Only small lygus nymphs (2nd and 3rd instars) are successfully attacked, which results in distinct cohorts of parasitized nymphs across habitats. In 2022 and 2023, we conducted a study in the Lethbridge area in southern Alberta, to compare the accuracy of parasitism estimates by dissection of 2nd to 5th instar nymphs, rearing 2nd instars to adults, and

PCR analysis with primers specific to native *Peristenus*. We collected lygus with a sweep net from various crops and habitats including annual field crops (canola, mustard, peas, lentils, hemp, flax, faba bean), semi perennial forages (alfalfa, sainfoin) and uncultivated habitats (a city park, weedy areas). Data analysis is in progress, but so far, PCR analysis gives a higher estimate of parasitism relative to conventional methods, especially for 2nd instar lygus. For management purposes, however, the conventional methods provide adequate estimates, especially considering the high cost and laborious nature of traditional PCR analysis.

8. **Jess Vickruck**, Pamela MacKinley, Fatima Mitterboeck, Kyle MacKinley, Louis-Pierre Comeau.
Agriculture and Agri-Food Canada, Fredericton; jess.vickruck@agr.gc.ca
Using metabarcoding to examine collembola community composition in Atlantic Canada.

Soil microarthropods such as collembola can be important indicators of soil health, yet our ability to quantify these communities has been hindered by taxonomic challenges. However, there is a growing desire to be able to quantify changes in the collembola community under different farming practices. Previously we were able to identify species reliably to family, however identifying individuals beyond this point was challenging and generally inconsistent. Here we begin to develop and test a metabarcoding pipeline for collembola. Soil samples were taken from 203 sites across different habitat types in Atlantic Canada in 2019 and 2021, and soil microarthropods extracted using Berlese-Tullgren funnels. Collembola were sorted and identified to family morphologically. DNA was extracted from each community sample and we sequenced a ~220 bp chunk of COI. The resulting reads were quality checked and then run through the MetaWorks pipeline. We identified 11 collembola families morphologically, but only 8 were returned from our metabarcoding procedure. However, sequencing returned 34 different genera (assuming a rate of 95% correct assignments) a level of precision unattainable with our morphological analysis. Up next we plan to incorporate the mites, as well as test different primer pairs.

9. **Katelyn Stokes**, Paul Manning.
Dalhousie University; stokesk@dal.ca
The impact of insect activity on greenhouse gas fluxes from the dung of domesticated and wild mammals.

When microorganisms feed on organic matter within mammalian dung, they generate greenhouse gases (GHGs) including carbon dioxide, methane, and nitrous oxide. The relative concentrations of these GHGs are influenced by microorganisms in the mammal's gut and diet, and interactions with other organisms (e.g., dung beetles, Coleoptera: Scarabaeoidea). Dung beetles burrow through dung, introducing oxygen and increasing the surface area of the dung; this influences GHG emissions from the dung of pastured cattle, but few studies have explored the potential for wild animals. Here, we use a laboratory experiment to determine how a common introduced dung beetle (*Colobopterus erraticus*) affects GHGs produced from the dung of eastern coyote (*Canis latrans*), American black bear (*Ursus americanus*) and moose (*Alces alces*). Lastly, we explore how potential changes in GHG emissions are reflected in the suitability

of different dung sources as a nesting and food resource by comparing dung burial rates and reproductive output.

10. **Lesa S. Giesbrecht**[1], Aaron Bell[1,2], Sean Prager[1].
1. University of Saskatchewan, 2. Troutreach Saskatchewan; lesa.giesbrecht@gmail.com
Rearing *Cicindela repanda* (bronzed tiger beetle) larvae in the laboratory.

Cicindela repanda (Coleoptera: Carabidae) can be found along moist, sandy riverbanks and lake shores throughout the Canadian provinces. Both the adult and larval stage are carnivorous. The larvae reside in burrows where they ambush their prey. Methods of tiger beetle rearing have been described in literature, but none have done so using *C. repanda*. For my experiment I collected 39 *C. repanda* larvae along the South Saskatchewan River in Saskatoon mid-July 2023. The larvae were placed into 532 ml cups filled 2/3 with native substrate and were allowed to form a burrow. Once habituated, they were fed *Trichoplusia ni* caterpillars every second day. After 30 days I observed 12.8% mortality and 97.4% had gone from second instar to third instar. The method described here may be applied to future studies involving *C. repanda*, or other Cicindelids that share similar habitats such as *C. hirticollis*.

11. **Meghan Vankosky**[1], Jaimie Schnell[2], John Gavloski[3], David Holden[2], James Tansey[4], Tracey Baute[5].
1. Agriculture and Agri-Food Canada, Saskatoon, 2. Canadian Food Inspection Agency, 3. Manitoba Agriculture, 4. Saskatchewan Ministry of Agriculture, 5. Ontario Ministry of Agriculture, Food and Rural Affairs; meghan.vankosky@agr.gc.ca
Invasive insects to watch out for: A Canadian Plant Health Council initiative.

Invasive insects pose a serious threat to Canada's important agriculture and forestry landscapes. To aid in the early detection and eradication, community science tools can be used to report insect sightings, but other information resources are needed to inform the public about which insects to look out for. The Insect Surveillance Community of Practice, within the Canadian Plant Health Council, has recently developed regional lists of invasive insects of concern and posters to help advertise and inform those interacting with, observing, or photographing insects of what species to look for. Each of the four regional posters features 12 priority insects to look for in that region and a QR Code for reporting observations.

12. **Muhammad Fahim Raza**, O. Obshta, M.P. Camilli, U. Glavinic, M.S. Jose, E.E. Tellarini Prieto, M.C. Bezerra da Silva, T.L.K. Edirithilake, I. Moshynskyy, M.W. Zabrodski, I.V. Kozii, R. Kozii, S.C. Wood, E. Simko.
University of Saskatchewan, Western College of Veterinary Medicine; fahim.raza@usask.ca
The germination of *Paenibacillus* larvae spores improves the efficiency of qPCR-based quantification method.

American foulbrood (AFB) is devastating disease of honey bee brood, caused by spore-forming bacterium, *Paenibacillus larvae*. To reduce the turnaround time for quantification of *P. larvae*, we investigated a TaqMan-based qPCR assay targeting single-copy chromosomal metalloproteinase gene. Since lysis of *P. larvae* spores is extremely challenging, which leads to

inaccurate enumeration of spores in subsequent qPCR reaction, we therefore introduced a spore germination step prior to DNA extraction. The incubation time allowing germination but not cell division was assessed using spectrophotometry by measuring the decrease in OD580 nm and microscopic observation of Schaeffer-Fulton-staining. We found that 5 h of incubation was adequate for spore germination, which not only improved the efficiency of DNA extraction, but also showed a reliable quantification up-to 5 spores/reaction in the subsequent qPCR assay. These results could be a key feature for the improved quantification of *P. larvae* spores in hive-related samples using qPCR technique.

13. **Rosemarie De Clerck-Floate**, Kevin Floate.
Agriculture and Agri-Food Canada, Lethbridge; rosemarie.declerck-floate@agr.gc.ca
A revisit of *Longitarsus* species (Coleoptera: Chrysomelidae) introduced or relocated in Canada for tansy ragwort biological control.

The flea beetle *Longitarsus jacobaeae* was introduced to North America starting in the 1960s as a biocontrol agent for tansy ragwort (*Jacobaea vulgaris*, Asteraceae); a toxic weed of Eurasian origin afflicting agricultural regions of British Columbia and eastern Canada. Beetles from different European countries were initially released and established on tansy ragwort in Oregon and British Columbia. Further introductions and relocations of *L. jacobaeae* (putative) in Canada continued until at least 2013. Subsequent surveys of previous release sites have revealed the occurrence of other European *Longitarsus* species besides *L. jacobaeae* (i.e., *L. flavicornis*, *L. ganglbaueri*, *L. succineus*, *L. gracilis*). Hence, a molecular study was undertaken to provide an update on the history of *Longitarsus* introductions and relocations in Canada, and to clarify the identity of *Longitarsus* species at previous biological control release sites in British Columbia and Nova Scotia.

14. **Ryan Oram**.
Royal Saskatchewan Museum; ryan.oram@gov.sk.ca
Royal Saskatchewan Museum Invertebrate Zoology Collections: An overview.

Museum collections are regularly used for research in the sciences and other disciplines. Within life sciences, museum collections provide materials for population and diversity studies, taxonomic and phylogenetic studies, species at risk assessments, as well as other forms of research. At the Royal Saskatchewan Museum (RSM), the invertebrate zoology collection houses over 400,000 specimens, the majority as pinned specimens but also specimens stored in alcohol which have been actively collected by museum staff, as collaborative efforts with other researchers, and through donations from other researchers and collectors. The three major insect orders represented at the RSM are Hymenoptera (53 %), Coleoptera (20%), and Lepidoptera (13%) and are well representative of North America, but most other insect orders and a number of other invertebrate taxa (i.e., Arachnida, Mollusca, Crustacea, etc.) from the province are represented. The invertebrate zoology collection at the RSM has been used to facilitate the research of museum employees and researchers from other institutions throughout North America. The long-term aim of the RSM is to continue to expand the

provincial invertebrate collections and build collaborations across North America and Worldwide.

15. **Sainey Ceesay**, Sean M. Prager, Berenice Romero.
University of Saskatchewan; sainey2@gmail.com/wul465@usask.ca
Investigating the role of phytoplasma infection and different host plant in the aster leafhopper microbiome.

The role of microbial communities in insects' ability to vector pathogens and adapt to new hosts is an emerging field. Aster leafhoppers (*Macrosteles quadrilineatus*) are the primary vectors of *Candidatus* phytoplasma asteris, the bacteria that causes Aster Yellows Disease (AY) in crops. *Macrosteles quadrilineatus* feeds on various host plants with different amounts of success, and the role of its microbiome in adaptation to hosts is unknown. Drawing on Hopkin's host-selection principle (HSP) and microbial roles in development, this research explores the effects of antibiotics on insect-symbiont relationships. The aim is to unravel the intricate relationship between the Aster leafhopper's microbiome, AYp, and host plants. As a first step and as a test, we evaluated the HSP and examined the fitness of Aster leafhoppers when changing hosts or remaining on their natal hosts. Initial findings indicate that leafhoppers exhibit higher fitness levels on their natal host compared to when exposed to an alternative host. This observation is evident across survivability, reproductive success, and growth rates.

16. **Samuel Robinson**[1], Timothy Schwinghamer[2], Héctor Cárcamo[2], Paul Galpern[1].
1. University of Calgary, 2. Agriculture and Agri-Food Canada, Lethbridge;
samuel.robinson@ucalgary.ca
Precision yield data can make crop insect studies easier, more powerful, and more general.

Pest insects can decrease crop yield, while beneficial insects (e.g., predators, pollinators) can increase or stabilize crop yield, but crop data used to support management decisions is expensive and time-consuming to collect. Precision yield data (PYD) are large geo-referenced crop datasets collected using combine yield monitors, and can be used to make high-precision maps of crop yield within fields. Typically collected at high spatial resolutions (>30,000 points per field), these datasets can be used to improve the accuracy of insect impact studies within crops. We present case studies that use insect data and PYD to uncover the effects of insecticide application in canola crops. Ecologists and agronomists should consider using PYD more broadly, as it can be used to test a range of hypotheses about ecosystem services (or disservices) from insects. We provide examples of potential future studies on insect-crop interactions that could be implemented using PYD.

17. **Wei Han Lau**, Felix Sperling.
University of Alberta; wlau2@ualberta.ca
Methods for quantifying elytral pattern variability in the *Cicindela formosa* species complex.

Colour pattern variability in organisms can provide insight into different aspects of their adaptive evolution. Although quantifying and comparing colour patterns is a necessary first step in addressing any question about them, there is little consensus on the best way to quantify

colour patterns in nature. Several tools have recently emerged that provide automated methods for quantifying colour patterns in a diverse variety of organisms. These include the R packages "patternize" (Van Belleghem *et al.* 2017) and "recolorize" (Weller *et al.* 2022). Here, we examine the effectiveness of both these R packages, and the effectiveness of geometric morphometric tools, for quantifying elytral patterns in tiger beetles. In the *Cicindela formosa* species complex, elytral colour patterns are important for delimiting subspecies. However, previous attempts to describe elytral patterning have largely been qualitative. A repeatable, quantitative method to analyze elytral patterning will thus add clarity to subspecies limits in *Cicindela formosa* and aid our understanding of its ecology and demography. Using specimen images from research and museum collections, we test 1) whether elytral pattern variation is best captured by colour-based analyses or through a shape-based morphometric analysis, and 2) whether current subspecies delimitations are corroborated by a quantitative approach to comparing elytral colour patterns.

19:00 Student Mixer at Winston's Pub.

Tuesday, October 17, 2023.

08:00 Plenary: Dr. Diana Percy. Ecology and turnover: psyllids in space and time. Room: Michealangelo A/B.

Symposium: Policy and Emergency Preparedness. Room: Michealangelo A/B.

09:00 **Joshua Pol**, Organizer and Moderator.
Introduction.

09:15 **Troy Kimoto.**
Canadian Food Inspection Agency; troy.kimoto@inspection.gc.ca
How the Canadian Food Inspection Agency is addressing invasive regulated pests in western Canada.

The Canadian Food Inspection Agency (CFIA) is Canada's National Plant Protection Organization and is responsible for regulating a variety of invasive plant pests across the country. The CFIA conducts a variety of survey-related research and operational surveys for regulated plant pests in western Canada. Today's talk will discuss some of this research (e.g., drones, developing traps and lures for invasive wood boring insect surveys, spotted lanternfly survey development, etc.), citizen [community] science programs (e.g., box tree moth survey) as well as operational surveys (e.g., oak wilt, emerald ash borer, spotted lanternfly, etc.) conducted by CFIA or in collaboration with various partners.

09:45 **Ken M. Fry**[1], J. Feddes-Calpas[2].

1. Olds College, 2. Society to Prevent Dutch Elm Disease; kfry@oldscollege.ca

Monitoring of elm bark beetles in Alberta: An overview of Dutch Elm Disease and vector occurrence.

Monitoring for the vectors of Dutch Elm Disease (DED), *Ophiostoma novo-ulmi*, in Alberta has been conducted since 1976. There are two species of vector present in the province, the smaller European elm bark beetle, *Scolytus multistriatus*, and the banded elm bark beetle, *S. schevyrewi*. The occurrence and abundance of these species have been monitored using white sticky traps with 30 0r 90-day lures. The abundance of *S. multistriatus* has declined while the distribution and abundance of *S. schevyrewi* has increased substantially in the past decade. Dutch Elm Disease has been observed in only two localities, with both instances addressed with no subsequent diagnosis of the disease. Detection and abundance of the vector species over time and space will be detailed. A description of the resources for monitoring DED and the response plans in place will be provided.

10:15 Coffee Break

10:30 **Babita Bains.**

British Columbia Ministry of Forests; babita.bains.gov.bc.ca

The battle to keep B.C. spongy moth-free.

The European spongy moth (*Lymantria dispar*) was introduced from Europe to the northeastern U.S. in 1868 and was first detected in British Columbia (B.C.) in 1978. Since 1978, there has been a long history of repeated spongy moth introductions into B.C., however, intensive eradication efforts have successfully prevented the establishment of this non-native, invasive pest. Detection and eradication programs were conducted by the Canadian Food Inspection Agency (CFIA) and its predecessor, Agriculture Canada, until 1998. In 1999, The B.C. Ministry of Forests inherited the eradication program from CFIA, and the Ministry has successfully planned and implemented over 65 treatments over the last 24 years. Eradication programs have become increasingly contentious due to an increase in the circulation of misinformation, despite the Ministry's rigorous communications plan.

11:00 **Jeri L. Geiger**[1], Matt Tyree.

1. Ministry of Environment, Government of Saskatchewan, Aquatic Invasive Species Program 2. Ministry of Environment, Government of Saskatchewan, Director of Fisheries; jeri.geiger@gov.sk.ca

Introducing Saskatchewan's Invasive Species Framework.

Now more than ever, Saskatchewan's waters, forests, and resources are vulnerable to the negative impacts of invasive species and infectious diseases of plants and animals. Government Ministries, Branches and Departments play a role in managing invasive species in Saskatchewan, and while the magnitude and nature of these threats and their prioritization for action vary, results can be maximized if resources and capacities are shared or leveraged across organizations. While overlapping responsibilities between organizations can

help to ensure that there are no gaps in action, this overlap may also add a compounding layer of complexity to managing invasive species in Saskatchewan. Here, I discuss the province's Invasive Species Framework which was developed to ensure that provincial invasive species prevention and management efforts are aligned. This framework establishes a foundation for future strategies, programs and committees dedicated to managing risk perceptions, resource and tool availability, and management methods, which vary across organizations.

Contributed Talks: Taxonomy & Genetics. Room: Venice. Moderator: Sean Prager

09:00 Kayla Buhler[1,2], **Louwrens P. Snyman**[2], Eva Fuglei[3], Rebecca Davidson[4], Sokratis Ptochos[5], Terry Galloway[6], Emily Jenkins[2].

1. Inland Norway University of Applied Sciences, 2. University of Saskatchewan, Western College of Veterinary Medicine, 3. The Norwegian Polar Institute, 4. Section for Research, Norwegian Veterinary Institute, 5. Section for Microbiology, Norwegian Veterinary Institute, 6. University of Manitoba; lokisnyman@gmail.com

A circumpolar parasite: Evidence of a cryptic undescribed species of sucking louse, *Linognathus* sp., collected from Arctic foxes, *Vulpes lagopus*, in Nunavut (Canada) and Svalbard (Norway).

The North has experienced unprecedented rates of warming over the past few decades, impacting the survival and development of insects and the pathogens that they carry. Since 2019, Arctic foxes from Canada (Nunavut) have been observed with fur loss inconsistent with natural shedding of fur. Adult lice were collected from Arctic foxes from Nunavut (n = 1) and Svalbard (n = 2; Norway) and were identified as sucking lice (suborder Anoplura). Using conventional PCR targeting the mitochondrial cytochrome c oxidase subunit 1 gene (cox1), lice from Canada and Svalbard were 100% similar (8 pooled samples from Nunavut and 3 pooled samples from Svalbard), indicating that there is potential gene flow between ectoparasites on Scandinavian and North American Arctic fox populations. The cox1 sequences of Arctic fox lice and dog sucking lice (*Linognathus setosus*) had significant differences (87% identity), suggesting that foxes may harbour a cryptic species that has not previously been recognised. Conventional PCR targeting the gltA gene for Bartonella bacteria amplified DNA from an unknown gammaproteobacteria from two pooled louse samples collected from Svalbard foxes. The amplified sequences were 100% identical to each other but were only 78% like *Proteus mirabilis* reported in GenBank (CP053614), suggesting that lice on Arctic foxes may carry unique microorganisms that have yet to be described.

09:15 **Louwrens P. Snyman**[1], Emily J. Jenkins[1], Jade Savage[2].

1. University of Saskatchewan, Western College of Veterinary Medicine, 2. Bishop's University; lokisnyman@gmail.com

A contribution to and review of molecular barcodes used for the identification of ticks in Canada.

Ticks play a significant role in transmitting various pathogens to humans, animals, and wildlife. With over 40 species of ticks occurring in Canada, morphological identification can be

challenging, especially for males and immatures. The development and utilization of barcoding techniques have proven valuable in identifying and studying these vectors. Open access to accurate reference sequences is however pivotal and could shed light on their taxonomic diversity, distribution, and potential implications on human and animal health. Here we review the sequences available from GenBank and BOLD systems by evaluating their utility as barcodes and assessing name designation accuracy as well as adding substantially to these libraries. Special reference is made to the genera *Dermacentor* and *Ixodes*. In *Dermacentor*, three widely used molecular markers, including COI were capable of distinguishing among four species. In the more speciose *Ixodes*, COI showed remarkable potential for discerning among *Ixodes* species. Inconsistencies in reference sequence name designations, however, complicate the utility of barcoding. To resolve this, we propose name designation changes for some "problem" sequences as well as sequences lacking species-level designation. The need for nuclear markers as alternative barcodes is discussed, and finally, recommendations for the way forward are made.

09:30 Oksana Vernygora[1], **Felix Sperling**[2], Julian Dupuis[3].
1. Canadian Food Inspection Agency, 2. University of Alberta, 3. University of Kentucky; felix.sperling@ualberta.ca

Toward Transparent Taxonomy: Introducing a web tool for evaluating alternate classifications.

Informative and consistent taxonomy above the species level is essential to communication about evolution, biodiversity, and conservation, and yet the practice of taxonomy is considered opaque and subjective by scientists and the public alike. Here, we present TaxonomR, an interactive online decision-support tool to evaluate alternative taxonomic classifications. This tool implements an approach that quantifies the criteria commonly used in taxonomic treatments and allows the user to interactively manipulate weightings for different criteria to compare scores for taxonomic groupings under those weights. We use the butterfly taxon Argynnis to demonstrate how different weightings applied to common taxonomic criteria result in fundamentally different genus-level classifications that are predominantly used in different continents and geographic regions. TaxonomR is not a prescriptive application. Rather, it aims to be a tool that potentially supports global harmony in biodiversity assessments through evidence-based discussion and community-wide resolution of historically entrenched taxonomic tensions.

09:45 **Jen Perry.**
St. Francis Xavier University; jperry@stfx.ca

The social lives of fruit flies: Identifying genes that govern interactions with kin in *Drosophila melanogaster*.

Male fruit flies (*Drosophila melanogaster*) are often aggressive towards other males, but recent studies report that males reduce their aggression towards male relatives, compared with unrelated males. However, how this behavioural plasticity is enacted remains unknown. We used transcriptional profiling to identify genes whose expression changes when male *D. melanogaster* interact with related males. We found that males expressed 103 genes differently

in head tissue in response to interacting with their kin. Genes with downregulated expression were enriched for olfaction, suggesting that males use odour cues to inform their responses to related versus unrelated rivals. However, we found that mutant male flies that cannot smell also showed stronger aggression towards unrelated males. This result suggests that males might detect kin through multiple cues. Our work contributes to understanding the genetic basis of social plasticity in the fruit fly model.

10:00 Boyd Mori[1], **Dwayne Hegedus**[2].
1. University of Alberta, 2. Agriculture and Agri-Food Canada, Saskatoon;
dwayne.hegedus@agr.gc.ca
Characterization of the swede midge, *Contarinia nasturtii*, first instar larval salivary gland transcriptome.

Contarinia nasturtii, the swede midge, is a pest of brassicaceous vegetables (cabbage, cauliflower, broccoli) and canola. Females lay eggs on meristematic tissues on which larvae feed, resulting in swollen and distorted leaves, shoots, and buds that surround the larvae within a gall. Proteins in saliva of gall-forming insects govern insect-host plant interactions. We examined the salivary gland transcriptome of first instar larvae reared on *Brassica napus* and catalogued genes encoding secreted proteins that may contribute to larval establishment, the synthesis of plant growth hormones that promote gall formation, extra-oral digestion and secreted effectors that may alter or assist larvae in evading host defenses. A significant portion of the secreted proteins with unknown functions were unique to *C. nasturtii* and were often members of larger gene families organized in genomic clusters with conservation patterns suggesting that they are undergoing selection.

10:15 Coffee Break

10:30 **Dezene Huber**[1], Mackenzie Howse[1], Clair Paillard[1], Cassie Penfold[1], Alannah Penno[1], Genevieve van der Voort[1], Joel Gibson[2].
1. University of Northern British Columbia, 2. Royal British Columbia Museum; huber@unbc.ca
Keys to the cabinet: Unlocking biodiversity data in public entomology collections.

Entomological collections are important sources of biodiversity data. While physical specimens are the core material of collections, it is the data represented by those specimens that are of immeasurable value. We interrogated a publicly available entomological dataset of Odonata collected between 1913 and 2021 in British Columbia (>34,000 records). We examined sampling and identification trends, geographic and taxonomic collection gaps, and elevational and ecoprovince associations. Our work suggested revisions to the current provincial checklist and underscored the need for closer monitoring of several red-listed species as well as one unlisted species, *Enallagma clausum* Morse (Odonata: Coenagrionidae). In the context of accelerating biodiversity loss, this study – completed as a graduate class project – emphasizes the potential of ongoing digitization efforts. More importantly, it underscores the critical importance of training a new generation of arthropod biodiversity curators skilled in creating, working with, and analyzing growing databases.

10:45 **Bryan Brunet**[1], Eric Maw[1], Robert Foottit[1], Nate Hardy[2].

1. Agriculture and Agri-Food Canada, Ottawa, 2. Auburn University; bryan.brunet@agr.gc.ca

UCE Phylogenomics resolves relationships among pterocommatine aphid genera: resurrecting the Pterocommatini (Hemiptera: Aphididae: Aphidinae).

The phylogenetic position of the aphid genus *Pterocomma* and several related genera has been subject of much uncertainty over the last century. Collectively referred to as the pterocommatine genera, this group has been treated as a distinct subfamily, both with and without association with the Aphidinae, as a distinct tribe within the Aphidinae, along with the tribes Aphidini and Macrosiphini, and is currently treated as separate genera within the Macrosiphini. While prior hypotheses on the higher-level relationships of the Aphididae have relied on morphological characterizations and single- or multi-gene DNA sequencing, few studies have employed genome-wide approaches. Here, we use targeted enrichment of up to 2731 ultra-conserved elements totaling over 400 kb of nucleotide sequence across 400+ taxa and representing approximately 25% of known aphid genera to reconstruct the aphid phylogeny. Our study confirms that the Pterocommatini should be treated as a distinct tribe within the Aphidinae, and that it includes the genus Cavariella. Moreover, the tribe shares a common ancestor with the previously recognized subtribe Liosomaphidina, and together these with the genus *Capitophorus* form a lineage distinct from the Macrosiphini and Aphidini. Among other taxonomic implications, our study identifies a need for a revised classification for the Aphidinae.

11:00 **Boyd Mori**[1], Héctor Cárcamo[2], Kevin W. Wanner[3], Oksana V. Vernygora[4], Sheina B. Sim[5], Scott M. Geib[5], Julian R. Dupuis[4].

1. University of Alberta, 2. Agriculture and Agri-Food Canada, Lethbridge, 3. Montana State University, 4. University of Kentucky, 5. United States Department of Agriculture; bmori@ualberta.ca

Population genomics reveals insights into alfalfa weevil strains in North America.

Alfalfa, *Medicago sativa* (L.) (Fabales: Fabaceae), is one of the most important forage crops grown in temperate regions throughout the world. In North America, the productivity of alfalfa fields is threatened by an invasive insect, the alfalfa weevil, *Hypera postica* (Gyllenhal) (Coleoptera: Curculionidae). Alfalfa weevil was introduced to the U.S. on three separate occasions, resulting in three separate strains: 1) 'western', 2) 'Egyptian', and 3) 'eastern'. The species now occupies all 48 contiguous U.S. states and most Canadian provinces. To gain insight into the distribution of alfalfa weevil strains, and possible insecticide resistance, we sequenced the genome of alfalfa weevil, and carried out a population genomics assessment of populations throughout North America. Preliminary results indicate genetic differentiation among historical strains, but little correlation in population structure, alfalfa weevil strain nor geographic origin with insecticide resistance. These results will contribute to sustainable integrated pest management of this pest moving forward.

11:15 **Gen Morinaga**[1], Andrea Gloria-Soria[2], Jeffrey Powell[3], John Soghigian[1].

1. University of Calgary, Faculty of Veterinary Medicine, 2. The Connecticut Agricultural Experiment Station, 3. Yale University; gen.morinaga@ucalgary.ca

Comparative genomics of *Aegypti*-group mosquitoes.

The yellow fever mosquito (*Aedes aegypti*) is the primary vector for diseases such as yellow fever, zika, dengue, and chikungunya, making it an organism of high medical importance. In an effort to better understand the biology of these mosquitoes, they have been the subject of numerous genomic studies—leading to the development of a high-quality reference genome. However, this reference genome was sourced from a highly inbred, lab-based colony, and thus it may not be representative of natural populations. Here, we aim to probe how the genomes of individuals from natural populations of *Ae. aegypti* differ from that of the reference genome. We do so by using the recently developed Pacific Biosciences HiFi sequencing platform and assemble genomes from single individuals from two populations—Burkina Faso and New Mexico–each representing the two sub-species (*Ae. aegypti formosus* and *Ae. aegypti aegypti*, respectively) which differ in their degree of affinity to seek humans as blood hosts.

Contributed Talks: Ecology, Evolution & Behaviour I. Room: Naples. Moderator: Leah Flaherty

09:00 **Chris Cutler**.

Dalhousie University; chris.cutler@dal.ca

Why mild-stress stimulation of insects matters for entomologists.

Exposure to high levels of stress can inhibit biological processes. However, it is increasingly appreciated that mild levels of stressor can induce stimulatory, i.e., hormetic, effects in organisms. In this context, insects are exposed to many stressors at mild levels in natural and manmade systems, presenting multiple considerations for hormetic responses in insect management, and ecological structure and function in agricultural or forest ecosystems. In this paper I discuss the various phenotypic effects that may manifest in insects stimulated by mild stress and consider some of the molecular/biochemical underpinnings associated with those responses. Multiple examples of stimulatory effects of mild stress on insect herbivores, predators, parasitoids, detritivores, and pollinators have been reported in individuals and populations, with consequences for communities and ecological functioning. From a practical standpoint, there may be opportunities to use hormetic principles to improve commercial production of insects, or to better understand how beneficial insects like pollinators respond to low doses of pesticide.

09:15 **Barry Cooke**.

Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Service; barry.cooke@nrcan-rncan.gc.ca

Do cyclic systems yearn to align? Two historical experiments and one experience.

Bjornstad (2000), referring to the periodically outbreaking forest Lepidoptera, wrote that “cyclic systems yearn to align.” However, data on spruce budworm and forest tent caterpillar from eastern and western Canada indicate these insects “yearn” for the benefits of mis-alignment, including avoiding the negative consequences of over-crowding (due to starvation, disease, and parasitism) at the peak of an outbreak cycle, and the Allee effect of

mating failure at the bottom of the cycle. Dispersal is the adaptive mechanism by which this mis-alignment is generated. Dispersal is not continuous radial diffusive, as assumed in simple models. It is pulse advective and discontinuously host-dependent. It is multi-scale, including aggregative and congregative host- and mate-location behaviour. Combined with the nonlinear dynamics of eruption, real-world dispersal is likely de-synchronizing and possibly a source of traveling wave behaviour. In conclusion, complex adaptive biological systems that fluctuate periodically are highly resistant to the damning implications of synchronization.

09:30 Cory Sheffield[1], **Jennifer Heron**[2].
1. Royal Saskatchewan Museum, 2. British Columbia Ministry of Water, Land & Resource Stewardship ; jennifer.heron@gov.bc.ca

British Columbia's community bumblebee project.

There are approximately 37-39 bumble bee species in British Columbia, and most are wide-ranging and live in a variety of habitats across the vast provincial landscape. Five of these species have been assessed as Endangered, Threatened or Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and at least three additional species are potentially at risk (Morrison's Bumble Bee, Van Dyke's Bumble Bee and Obscure Bumble Bee). Data on bumble bee species population trends is lacking, making it difficult to monitor trends and assess a species conservation status. This presentation summarizes a BC pilot project that aims to establish long term (> 10 years) bumble bee monitoring routes throughout the province, and concurrently build a community of trained volunteers who, once or twice within the summer months, would survey one or two of these routes within the areas they live and work. Survey routes include some of the same routes monitored as part of the North American Breeding Bird Survey program, as well as new routes; and routes travel through all the provinces ecozones. Ultimately, the data collected over the ten-year assessment timeframe will be used to determine long-term trends in bumble bee distribution and abundance, update conservation status assessments and range maps, and allow for targeted threat mitigation, for the province's bumble bees. 2023 is the third year of the pilot (the project started in 2021); challenges and successes to date will be briefly summarized.

09:45 **Robert Lamb**, Patricia A. MacKay.
University of Manitoba, lambmack@mymts.net

Relative population stability of a monophagous aphid, *Uroleucon rudbeckiae*, and its wildflower host, *Rudbeckia laciniata*, over 20 years.

Interactions between a native, monophagous herbivore and its host were predicted to be more stable than those for pests and crops. We tested this hypothesis by quantifying population and life history parameters for the native, monophagous aphid *Uroleucon rudbeckiae* and its wildflower host *Rudbeckia laciniata* using weekly assessments over 20-24 years. Population density of the plant was relatively stable (Population Variability: PV=0.35, scale of 0-1) compared to other plant populations. Flower stem height was remarkably stable with most annual variation due to climate change which reduced height by about 1 cm per year. Aphid abundance was less stable (PV=0.72), similar to that of crop pests. Annual variation in aphid

abundance was not related to that of its host. Interactions between a native aphid and host were no more stable than for pests and crops; the dynamics of this monophagous aphid were not regulated by its host.

10:00 **Sophie M. Killam**, Graham J. Thompson.
Western University; skillam@uwo.ca

Effects of lactic acid-producing bacteria supplementation on the hygienic behaviour of Western honey bees.

Honey bees live in densely populated colonies of closely related individuals and are therefore susceptible to disease. One behavioural response to this threat is to detect and remove any dead or diseased brood from the hive. Despite the potential to artificially select for hygienic behaviour, no short-term solution can stimulate this olfactory-mediated response within apiaries. We supplemented hives with two specific lactic acid-producing bacteria to promote a hygiene response through olfactory-associated neurotransmitter production. We found colonies were naturally variable in their hygienic response, clearing 40-90% of freeze-killed brood after 48 hours. Against this background, we show that colonies twice fed a living dose of *Bifidobacterium asteroides* improved their average response by ~10% over a two-week period. This promising result is now the focus of a second field experiment to reduce inter-colony variance, and lab work to any monitor changes to gut microbe composition and brain neurochemistry associated with hygiene.

10:15 Coffee Break (30 minutes)

10:45 **Heather Proctor**[1], Pierre-Yves Daoust[2], Nicolas Decelles[3].
1. University of Alberta, 2. University of Prince Edward Island, 3. McGill University; hproctor@ualberta.ca

I've got you under my skin: Morphologically reduced subdermal mites (Astigmata: Hypoderatidae) infesting gannets in Atlantic Canada.

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.

11:00 **Lisa Lumley**, Ermias Azeria, Victoria Giacobbo, Tyler Cobb.
Alberta Biodiversity Monitoring Institute, University of Alberta; lisa.lumley@ualberta.ca
Effects of natural land cover, anthropogenic disturbance, space, and climate on oribatid mite communities in Canada's oil sands region.

Oribatid mites are among the most abundant and diverse soil mesofauna and make important contributions to soil functioning. The Alberta Biodiversity Monitoring Institute (ABMI) has monitored oribatid mites across Alberta for more than a decade, including at 420 sites in the oil sands region (OSR). To assess how land use and spatial-climatic factors influence oribatid mite communities in the OSR, we completed an analysis of over 29,000 oribatid mites (201 species) collected over 13 years of soil sampling. In general, the study showed strong connections between oribatid mites and human land use activities that impact soil integrity (e.g., mines, cultivation), highlighting the utility of this taxonomic group as an indicator for assessing soil health over broad spatial scales, and the influence of a wide range of ecological factors and environmental stressors.

11:15 **Vivek Srivastava**[1], Subodh Adhikari[2], Sanford Eigenbrode[2], Tyler Wist[1].
1. Agriculture and Agri-Food Canada, Saskatoon, 2. University of Idaho;
viveksrivastava09@gmail.com
Charting the course of invasion: Ensemble species distribution models predict the range expansion of *Metopolophium festucae cerealium* in North America.

Agricultural crops and natural ecosystems are susceptible to invasive insect species, which is a global concern. Innovative strategies are necessary for mapping pest risk and early detection. Ecological models, combined with remote sensing data in a geographical information systems (GIS) framework, can help surveillance programs find infestations in their earliest stages of establishment when they are most amenable to management. These models can provide information on current and future potential for pest establishment, spread and impacts. An early assessment of plant health requires robust pest risk maps and future potential impacts. In our case-based study, we used the newly invasive aphid *Metapolophium festucae cerealium* (mfc; cereal grass aphid), which is a prevalent aphid in wheat across the inland Pacific Northwest and is spreading rapidly. The mapping framework presented is robust and easy to follow by the risk assessors and the results can guide plant health monitoring and can also be used to make scientifically informed management choices around agricultural pests. The application of science-based pest risk assessments is critical in minimizing the impacts of range-expanding native and non-native insects in the face of changing climates and increasing international trade and globalization.

12:00 Lunch served in Pre-Function Area.

12:30 ESC Annual General Meeting. Room: Michealangelo A/B.

14:00 Meeting of NEW ESC Executive (BOD2). Room: Naples.

15:00 Meeting of the Entomological Societies of Canada. Room: Naples.

Symposium: Tribute to John H. Borden. Room: Michealangelo A/B.

14:00 Maya Evenden, Deepa Pureswaran, Organizers and Moderators.

Introduction.

This symposium is a tribute to Dr. John Borden as he turns 85 this year. He continues to passionately conduct research as a consultant in BC. Dr. Borden was a professor at Simon Fraser University between 1966 and 2003. His research unraveled the chemical ecology of insects while developing solutions for the management of insect pests and beneficial insects in forest, agriculture and urban environments. He described the intricacies of plant-insect interactions in host selection that advanced our understanding of co-evolution between insects and their hosts. Over the span of 55 years, Dr. Borden has published 404 peer-reviewed journal articles, one book, 17 book chapters and two reviews. Over 42 years at SFU, Dr. Borden wrote 120 successful research proposals to acquire a total of $11 million from 16 government agencies, 11 industrial agencies and 29 companies. He used these funds to train a total of 101 students with 119 degrees awarded under his supervision. At one point, all six Regional Forest Entomologists and the Provincial Forest Entomologist in the BC Forest Service, four Forest Entomology Professors, two Forest Health College Instructors, four Forest Health Consultants, seven Research Scientists in the Canadian Forest Service, and numerous other forestry and forest health professionals were graduates from his research program. We propose a series of 10 invited presentations to showcase Dr. Borden's influence on entomological research and ecosystem management in Canada and beyond.

14:10 **Gerhard Gries.**

Simon Fraser University; gries@sfu.ca

John Borden's legacy and impact on today's innovative research.

The talk will review John Borden's contribution to entomology and chemical ecology, and his training of graduate students and postdoctoral fellows that now hold research positions all over Canada and North America. Being one of John's mentees myself, I will then use a couple of research projects from the Gries Lab to showcase innovative research projects on multimodal communication systems and/or foraging cues in a variety of arthropods and insects, including widow spiders, honey bees, cabbage butterflies, seed bugs, German cockroaches, blow flies, stable flies, mosquitoes, and bumble bees.

14:45 **Lorraine E. Maclauchlan**[1], Julie E. Brooks[2].

1. British Columbia Ministry of Forests, Thompson Okanagan Region, 2. Forest Health Management; lorraine.maclauchlan@gov.bc.ca

The practice of forest entomology in British Columbia: Integrating science into management.

Dr. John Borden has always understood and promoted the necessity of having qualified entomologists and a science-based Forest Health Program within the BC Forest Service. He was instrumental in developing many strategies and tactics for managing bark beetles that today are ingrained in BC's bark beetle response and management program. John knew the value of having tools in the "tool-box" before you even realized that you needed them, and he inspired his

students and colleagues alike to delve into the intricacies of forest ecology, insect biology and forest management. This unwavering curiosity spearheaded by John Borden, led to a better understanding of a once rather innocuous bark beetle that is now unfortunately a textbook example of how climate can impact both host and insect in northern and high elevation forests. This presentation highlights B.C. research on *Dryocoetes confusus*: semiochemical communication, host selection, stand and landscape-level impacts, and life history adaptations.

15:00 **Dezene Huber.**
University of Northern British Columbia; dezene.huber@unbc.ca

Asking nature the right questions.

During my time as a Ph.D. student with John, we were designing an experiment. He said, "*nature will always give you an answer, but you need to know what you've asked in order to interpret it correctly.*" While I can't recall if this concept originated with him – and I don't remember which experiment we were working on at the time – that statement exemplifies John's influential and ongoing career. It has remained with me ever since. Understanding the questions we pose to nature requires us to scrutinize our preconceived notions and approach old inquiries with fresh perspectives. As we careen along the accelerating and interacting biodiversity loss and climate change curves, it is increasingly critical to formulate precise and relevant questions to guide proactive and effective conservation policies.

15:15 **Maya Evenden**[1], Boyd Mori[1], Kelsey Jones[1,2], Leanne Petro[1], Regine Gries[3].
1. University of Alberta, 2. Pest Management Centre, Agriculture and Agri-Food Canada, 3. Simon Fraser University; mevenden@ualberta.ca

The influence of Dr. J.H. Borden on Chemical Ecology research in managed ecosystems in Alberta.

Few people have influenced my life as much as Dr. John Borden. John supervised my Master of Pest Management research on pheromone-based monitoring for the western hemlock looper, *Lambdina fiscellaria lugobrosa* (Hulst) (Lepidoptera: Geometridae). He encouraged me to pursue PhD studies on pheromone-based mating disruption of orchard pests (Lepidoptera: Torticidae), under his supervision and that of another of his mentees, Dr. Gary Judd. John's influence on my research trajectory continues at the University of Alberta, where part of my program focusses on applied chemical ecology. I will present research on mating disruption of the red clover casebearer moth, *Coleophora deauratella* Leinig & Zeller (Lepidoptera: Coleophoridae), pheromone-based monitoring of diamondback moth, *Plutella xylostella* (L.) (Lepidoptera: Plutellidae) and pheromone production and response of mountain pine beetle, *Dendroctonus ponderosae* Hopkins (Coleoptera: Curculionidae). These are projects that John directly or indirectly influenced and show his influence on applied chemical ecology research in Alberta.

15:30 Coffee Break

15:45 **Deepa Pureswaran.**

Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre; deepa.pureswaran@nrcan-rncan.gc.ca

Causes and consequences of forest insect outbreaks.

As a graduate student with John, I was fascinated by the magnitude and impact of forest insect outbreaks. I was also inspired by John's dedication to science, his organisational skills, his ability to identify talent in students and to see the best in people. I was particularly intrigued by how and why outbreaks occur, factors leading to their collapse and the aftermath. In addition to bark beetles, my research led me to investigate the outbreak ecology of buprestids, cerambycids and defoliators, each study shedding light on why outbreaks occur. I will provide an overview of the different research groups I worked with after I graduated, the research questions we addressed and results from various forest insect systems that I studied over the past 15 years.

16:00 **Therese Poland**[1], Jennifer L. Koch[2], Toby R. Petrice[1], Mary E. Mason[2], David W. Carey[2].

1. USDA Forest Service, Northern Research Station, Michigan, 2. USDA Forest Service, Northern Research Station, Ohio; therese.poland@usda.gov

Protecting North American ash trees in peril from the invasive emerald ash borer.

Dr. John Borden's mentorship through my MPM and PhD degrees instilled a passion for forest entomology and curiosity that inspire me to this day in my research on invasive forest insects. Global invasions are among the most significant threats to forest ecosystems. The emerald ash borer (EAB) is the most devastating invasive forest insect ever to have invaded North America. We have conducted research to better understand EAB biology and impacts to develop detection and management tools which led to semiochemical-based traps for early detection and monitoring, guidelines for insecticide treatments to protect landscape trees, establishment of a biological control program for long term management in forested areas, and development of a breeding program for trees with increased resistance to EAB for long term restoration. Together these tools will lead to implementation of integrated management and restoration with more resistant trees to help conserve ash ecosystems that are in peril.

16:15 **Robert Setter**[1], Jorge Macias-Samano[2].

1. Synergy Semiochemicals Corporation, 2. Forest Health and Semiochemicals Consulting; bob@semiochemical.com

A survey of the forest coleoptera in the Burns Bog Ecological Conservancy Area utilizing pheromone baited multiple-funnel and panel traps.

The Burns Bog Ecological Conservancy Area is a rare, raised peatland bog covering approximately 2200 ha in metropolitan Vancouver. Deemed a "globally unique ecosystem", in 2004 a covenant for the management of Burns Bog into the future was established with the Metro Vancouver Regional District and the City of Delta. Large reserve areas provide great well buffered habitat for all species present in an area, including those that are invasive and/or destructive. Monitoring local insect populations will help to understand current biodiversity levels in reserve areas and inform on the presence of potentially destructive species. Here we

present results from a 2-year survey program using semiochemical baited traps to survey for a wide range of forest insect species flying within the Burns Bog Ecological Conservancy Area.

16:30 **Jeanne Robert.**

British Columbia Ministry of Forests

John Borden: Mentor of pest management.

Dr. John Borden is one of the founders of Entomology in BC. He is an accomplished scientist and mentor to scientist and students across BC, Canada, and internationally. I will give a brief history of my best interactions with Dr. Borden beginning as a young graduate student to illustrate his enormous impact on my scientific career and to shed light on his past, and ongoing, scientific contributions to generations of scientists.

16:45 **Ilesha Ileperuma-Arachchi**[1], Stephen B. Heard[1], Peter H.W. Biedermann[2], Christopher Ranger[3], Jenny Barnett[3], Deepa S. Pureswaran[1,4].

1. University of New Brunswick, 2. University of Freiburg, 3. United States Department of Agriculture, Agricultural Research Service, Horticultural Insects Research Lab, 4. Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre; Ilesha.ileperuma@unb.ca

Continental variation in brood production by two non-native ambrosia beetles on native and non-native host trees.

Ambrosia beetles, *Xylosandrus germanus* and *Xylosandrus crassiusculus* are introduced species with varying degrees of establishment in North America (NA) and Europe (EU). We examined the effect of host trees on brood production in allopatric beetle populations in the USA, Germany and Canada to understand factors that contribute to variation in invasion potential and their current success in established regions. Using eight host tree species, we found that intra- and inter-specific variation in brood production occurs among allopatric *X. germanus* and *X. crassiusculus* populations and among native and non-native host trees (n> 25 replicates per host). The overall average total progeny is higher in hardwood than softwood tree species in both beetle species. The growth rates of main nutritional symbionts (ongoing) may explain the above variation. Our results will further the understanding of invasion success of ambrosia beetles in relation to host species and nutritional symbionts.

17:00 **Antonia Musso.**

University of Alberta; musso@ualberta.ca

Of mice and mountain pine beetles, from farms to forests.

My interest in chemical ecology began with insects, but I started my graduate career studying mice in the Gries lab. My MPM thesis research examined how male house mouse pheromone could improve snap trap efficacy in the field and this is where I first worked with Dr. John Borden. After a few years of catching mice in the hot attics above barns, and a field course in forest pest management, I chose to switch fields and apply to the PhD program at the University of Alberta with Dr. Maya Evenden. I was accepted, in no small part due to references provided by Dr. Gries and Dr. Borden, and I spent the next five years studying mountain pine beetle mass attack dynamics in the expanded range. Even though my career started with mice, I

ended up with mountain pine beetle and every step has been influenced by someone academically related to Dr. Borden

17:15 **Rylee Isitt**[1], K.P. Bleiker[2], S.B. Heard[1], N.K. Hillier[3], D.P.W. Huber[4], D.S. Pureswaran[5].
1. University of New Brunswick, 2. Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, 3. Acadia University, 4. University of Northern British Columbia, 5. Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre; rylee.isitt@gmail.com
The many pheromone blends of the spruce beetle.

The spruce beetle (*Dendroctonus rufipennis*) is a North American bark beetle that uses pheromone blends to attract mates, coordinate mass attacks against resistance spruce, and regulate attack density. Synthetic lures resembling these pheromone blends have been used for monitoring, management, and study of spruce beetle populations. Geographic variation in the aggregation (attractive) pheromone blend has long been suggested in literature, but poorly studied until recently. To test for and quantify this variation, we collected spruce beetles from several sites in eastern and western Canada, extracted pheromone blends from the hindguts of individual beetles, and characterized them via GC-MS. We found significant pheromone variation both between and within populations. Much of this variation is represented by the presence or absence of pheromone components across individuals and populations. We expect our results to lead to improved lure formulations and new knowledge regarding the chemical ecology of the spruce beetle.

Symposium: Invasives of the Urban Forest. Room: Florence.

14:00 **Sydney Worthy,** Organizer and Moderator. Introduction.

14:15 **Troy Kimoto.**
Canadian Food Inspection Agency; troy.kimoto@inspection.gc.ca
Summary of Asian long-horned beetle in Canada – Canadian interceptions and eradication in Toronto/Mississauga.

The Asian long-horned beetle (ALHB, *Anoplophora glabripennis*) is an invasive pest native to China and the Korean peninsula. This long-horned beetle is regulated by the Canadian Food Inspection Agency. It has been introduced and become established in many temperate countries around the world including the USA and Canada, through the movement of infested international wood packaging material (e.g., crates, pallets, boxes, etc.). This presentation will discuss ALHB biology, signs and symptoms and the successful eradication of this pest from Toronto and Mississauga in 2020.

14:45 **Tyler Wist**[1], Francis Wamonje[2], Jeff Boone[3], Sean Prager[2].
1. Agriculture and Agri-Food Canada, Saskatoon, 2. University of Saskatchewan, 3. City of Saskatoon; tyler.wist@agr.gc.ca
Invasion and life history of the cottony ash psyllid into western Canada.

The cottony ash psyllid, *Psyllopsis discrepans*, (Hemiptera: Psyllidae), first appeared in western Canada and was identified in Edmonton AB, before also being found in several other western Canadian Prairie cities such as Lethbridge, AB and Saskatoon, SK. Its host trees are black ash, *Fraxinus nigra*, Mancana ash, *F. mandshurica*, and their hybrids but not green ash, *F. pennsylvanica*. Early instar feeding by nymphs in the spring causes leaflet edges to curl into a pseudo-gall around the nymphs. Waxy material covers the nymphs and many host trees were so badly infested that they had almost no normal leaf development. Many trees declined, died and were removed in these cities. Emergency efforts to protect trees were implemented but had limited success. Recently, the likely causal agent of the tree death was identified in psyllids in Saskatoon.

15:15 **Amanda Roe.**

Canadian Forest Service, Great Lakes Forestry Centre, Natural Resources Canada;
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Surprising lower lethal limits of the invasive spotted lanternfly.

Spotted lanternfly (*Lycorma delicatula*) is invasive in North America. This species continues to spread beyond its initial infestation site and has established in over 14 states in the eastern USA. Cold winter temperatures are predicted to limit the northern spread of this species, however the cold tolerance and lower thermal limits of this species have not been examined in the North American invaded range. We demonstrate that the egg masses (the overwintering stage of the spotted lanternfly) are surprisingly cold tolerant. We observed hatch after short and long term exposure to temperatures below -20°C, well below previously published thermal limits for the species. These results will be critical to inform future risk assessments and distribution modeling for this high risk invasive.

15:45 Coffee Break

16:00 **Christian MacQuarrie.**

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Emerald ash borer and the urban forests of western Canada.

Emerald ash borer (EAB) has become the most significant disturbance agent in urban forests in eastern Canada over the past 20 years. The insect's range now encompasses all of southern Ontario and Quebec, parts of New Brunswick and Nova Scotia. The climate of western Canada was hypothesized to prevent significant incursion of emerald ash borer into the prairie provinces but the detection of the insect in Winnipeg and Thunder Bay suggested the insect could survive in harsh winter conditions of the region. Later work would confirm that EAB is able to survive temperatures in the -40s meaning that all of western Canada is potentially within the range of the insect. Urban foresters will therefore need to familiarize themselves with survey, detection, and management strategies for EAB, and how they can be adopted in the urban forests of Canada's prairies.

16:30 **David Ensing**[1], Robert Bourchier[2], Rosemarie De Clerck-Floate[2], Val Miller[3], Chandra E. Moffat[1].
1. Agriculture and Agri-Food Canada, Summerland, 2. AAFC, Lethbridge, 3. British Columbia Ministry of Forests; david.ensing@agr.gc.ca

Understanding variable biological control of invasive spotted knapweed (*Centaurea stoebe* ssp. *micranthos* Asteraceae) in British Columbia.

Recent reviews have identified that variable control of widespread invaders is a common pattern. One such species is spotted knapweed (*Centaurea stoebe* ssp. *micranthos*), a widespread and problematic invader of rural and urban areas worldwide, including much of southern Canada. Together with diffuse knapweed (*C. diffusa*), spotted knapweed has been the subject of a North American biocontrol program since the 1970s, resulting in the release of 13 insect agents. Despite effective biocontrol of diffuse knapweed in British Columbia, and widespread reductions in the density and fecundity of spotted knapweed across the province, pockets of abundant spotted knapweed remain with considerable costs to rangeland tenure holders. Integrating various long term datasets on spotted knapweed density for BC, we found, on average, a long term decline under biological control. However, control is highly variable among study sites. Here we report on ongoing work exploring potential mechanisms for this variability. We identified spotted knapweed life history traits, short-growing season sites as refugia from a key control agent species, and diverse land use practices as key predictors of knapweed success. Taken together, the longer term successful control of spotted knapweed in BC will require an integration of biological control efforts and revised land use to reduce this species' abundance to non-problematic levels.

17:00 **Philippe Berthiaume**[1], Antoinette Ludwig[1], David Lapen[2], Greg Mitchell[3].
1. Public Health Agency of Canada, 2. Agriculture and Agri-Food Canada, Ottawa, Environment and Climate Change Canada; philippe.berthiaume@phac-aspc.gc.ca

Mosquito-borne diseases research in the Environmental Change One Health Observatory (ECO2) in Canada.

Since 2017, researchers from several different agencies and departments have been working together within the ECO2 multidisciplinary study project performed in the South Nation River watershed, bordering Ottawa on mosquito-borne diseases. These researchers come principally from Agriculture and Agri-Food Canada, the Public Health Agency of Canada, Environment and Climate Change Canada, and the Canadian Food Inspection Agency. The objectives pursued within ECO2 are diverse but getting a better understanding of the determinants of the circulation of endemic mosquito-borne viruses in Canada is an important one for the Canadians health. The ECO2 has been providing an excellent platform to support the collection of field data on mosquitoes and related factors. Since 2017, mosquitoes have been collected from more than 80 geographical sites throughout the summer season. In 2018 and 2019, birds (mainly domestic sparrows) were also collected. Additionally, trapping sites are being monitored, allowing for logging temperature, humidity, precipitation variations while land use and landcover are characterized at multiple spatial and temporal scales using cutting edge remote sensing approaches. Since the start of the project, West Nile virus positive mosquito pools as well as California serogroup viruses mosquito pools have been detected each year. West

Nile virus and Eastern Equine Encephalitis virus antibodies have been detected in bird samples. Samples collected are analyzed from different angles in order to support multiple research projects maximize the outcome from the sampling effort. This presentation aims at providing an overview of a few selected projects seeking to better understand the environmental and climatic determinants of the exposure of human and animal populations to viruses transmitted by mosquitoes.

18:00 Pre-dinner drinks and entertainment. Room: Michealangelo A/B.

19:00 ESC-ESS JAM Banquet. Room: Michealangelo A/B.

20:00 Heritage Lecture: Dr. Julie Soroka. Forage Entomology on the Prairies, Life Lessons, and a Tale of Two Insects. Room: Michealangelo A/B.

Wednesday, October 18, 2023.

Contributed Talks: Agriculture II. Room: Naples. Moderator: Michelle Franklin

09:00 **Michelle Franklin**[1], Ross Weiss[2], Patrice Bouchard[3], Yonathan Uriel[1], Sheldon Hann[4], Meghan Vankosky[2].

1. Agriculture and Agri-Food Canada, Agassiz, 2. AAFC, Saskatoon, 3. AAFC, Canadian National Collection of Insects, Arachnids, and Nematodes, 4. AAFC, Fredericton; michelle.franklin@agr.gc.ca

Improving the search: Using climate analysis to guide surveillance to delimit the range of the invasive strawberry blossom weevil, *Anthonomus rubi* (Herbst).

The invasive strawberry blossom weevil, *Anthonomus rubi* is a new pest to North America, first reported in the Fraser Valley of British Columbia, Canada in 2019 and in Washington State, USA in 2021. It poses a risk to agriculture and native biodiversity, as it feeds on a range of plants in the family Rosaceae, including native and cultivated berries. Here we present tools that aid in the rapid detection of this weevil, with the goal of delimiting its current distribution. As climate has a significant impact on species distribution, we first developed a Climate Match model to identify suitable regions for the establishment of *A. rubi*. Large regions of Canada are highly suitable for *A. rubi*, including coastal BC, parts of the prairies, and southern regions of Ontario, Quebec, and the Maritimes. The distribution of suitable host plants was also considered and showed a similar distribution to that identified by the climate analysis. Using this information, a large team conducted a two-year Canada-wide standardized survey for *A. rubi*. Results from the first year suggest that *A. rubi* remains a localized pest to the Fraser Valley of BC; the examination of survey collections from the second year is ongoing.

09:15 **Jeremy Irvine**, Berenice Romero, Sean Prager.

University of Saskatchewan; jeremy.irvine@usask.ca

Effects of phytoplasma infection on aster leafhopper (*Macrosteles quadrilineatus* Forbes) (Hemiptera: Cicadellidae) settling behaviour, oviposition, and development.

Pathogens, including fungi and bacteria, viruses, and mollicutes, often attack plants in agricultural systems. Once a plant senses a stressor, many plants will produce secondary metabolites, which can alter the plant's physiological state. Previous work has established that the presence of these compounds can alter the feeding behaviour of herbivorous species. Past studies have shown that plants infected with a pathogen can have decreased levels of amino acids and sugar compounds compared to uninfected plants, consequently contributing to decreased insect attraction to infected plants. Aster Yellows phytoplasma (AYp) is a mollicute that infects a wide variety of hosts, many of which are essential to the agricultural sector in Canada. Research into the pathosystem involving AYp, insect vectors, and the host plant is needed to understand to what degree infected plants might influence insect behaviour and disease dynamics. This study used healthy canola plants (*Brassica napus* L.) along with plants infected with Aster Yellows phytoplasma in no-choice and two-choice bioassays to evaluate the effects of pathogen infection on vector settling behaviour, developmental time, and rate of oviposition. Further, it examined phytoplasma titre in *B. napus* plants at two different times; two weeks and four weeks post-infection. AY-infected aster leafhoppers preferentially settled on AY-infected *B. napus* plants at the early stages of AY infection, compared to AY-uninfected *B. napus* plants. However, there was no settling preference with AY-uninfected leafhoppers during the later stage of AY infection. There was little to no association between plant infection status and leafhopper oviposition. Increasing AYp titre was positively correlated with the time in which visual symptomology of AYp infection became apparent. This project helps to shed additional light on the epidemiology of Aster Yellows phytoplasma and its relationship with aster leafhoppers.

09:30 **Kevin Floate.**
Agriculture and Agri-Food Canada, Lethbridge; kevin.floate@agr.gc.ca

***Chilothorax distinctus* (Coleoptera: Scarabaeidae): an occasional pest in agroecosystems on the Canadian Prairies?**

Chilothorax distinctus (Müller) (Coleoptera: Scarabaeidae) is an aphodiine dung beetle widely distributed throughout Canada and the United States of America. Adults feed in fresh dung, but larvae develop in soil and may be pests of turf and agricultural crops. Here I review the biology of the species and summarize reports and observations of suspected larval feeding damage to different crops from the Canadian Prairies. These data support suspicions that *C. distinctus* is an occasional pest in agro-ecosystems for which control measures may not be warranted or even possible.

09:45 **Carol Frost,** Pilar Jimenez Roncancio.
University of Alberta; cmfrost@ualberta.ca

Mapping trophic connections between all crop pests and their natural enemies in Alberta major crops to predict indirect interactions.

Nature-based solutions for biological control of crop pests often fall short because of unpredicted direct and indirect interactions, such as intraguild predation, or predator satiation by non-target prey species. Ecological networks are models of the complex web of interactions

between species, and can be used to predict both direct and indirect interactions. We searched the literature and published databases to assemble a dataset of all known interactions between Alberta's major crop species, herbivorous insects that feed on these crops, and predator and parasitoid species known to attack these herbivores. We created an ecological network that represents these trophic interactions across all crop types, which can be subsetted to create crop-specific networks. We will present hypotheses generated from analysis of this network on: 1) which natural enemy species have the strongest potential for competition; 2) which crop pests have the strongest within-season and between-crop-rotation potential for apparent competition.

10:00 Hailey Shaw[1], Ty Pan[1], Alexandra Coker[2], Michael Jenkins[3], Gen Morinaga[1], **John Soghigian**[1].
1. University of Calgary, Faculty of Medicine, 2. City of Calgary, 3. City of Edmonton; john.soghigian@ucalgary.ca

Recent detection and rapid expansion of the invasive mosquito *Culex pipiens* in Alberta.

Climate change and anthropogenic activities, such as the growth of global trade, are causing rapid range expansions of many pest insect species. One example is the mosquito *Culex pipiens*, the northern house mosquito, which is native to parts of Europa, Asia, and north Africa, but is globally invasive on every other continent but Antarctica. This mosquito is an efficient vector of avian malaria and West Nile virus, and is considered among the most problematic species for public and veterinary health. Moreover, this species has two morphologically similar ecotypes: form pipiens and form molestus. The two ecotypes vary in behavior and ecology, but can interbreed, leading to fertile hybrids. Until recently, this mosquito was thought confined to coastal British Columbia and eastern Canada. Here, we describe a recent expansion of this mosquito into Alberta. We present initial information on the detection of this mosquito over the last few years, and a sudden and rapid expansion in 2023. We also detail our results on molecular genotyping of the ecotype of Alberta *Culex pipiens*, and discuss these results in context of public and veterinary health risk.

10:15 **Chaminda De Silva Weeraddana**[1], Ramya Wijesundara[1], Sheila Wolfe[2], Alejandro C. Costamagna[1].
1. University of Manitoba, 2. Agriculture and Agri-Food Canada, Morden; chaminda.weeraddana@umanitoba.ca

The effect of wheat nutrition on oviposition behaviour of orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin) (Diptera: Cecidomyiidae).

The orange wheat blossom midge (hereafter wheat midge), *Sitodiplosis mosellana* (Géhin) (Diptera: Cecidomyiidae), is a significant pest in wheat agroecosystems in the Canadian Prairie Provinces. Host plant quality is a crucial factor that mediates ecological interactions between herbivores and host plants. Nutritious plants attract herbivores due to their higher food quality. We tested wheat nutrition's effect on the wheat midge's oviposition behaviour. A range of fertilizer rates (0.5, 1.5, 2.5 g/pot) were applied to susceptible wheat cv. Roblin. More eggs were received on plants that had moderate and high fertilizer treatments. Plant growth was highest in plants that have moderate and high fertilizer treatments. This differential

oviposition behaviour may be influenced by volatile organic compounds (VOCs) emitted by plants with different fertilizer applications. Future studies are focused on analyzing VOCs from fertilized plants and testing behavioural active VOCs in Y-tube assays.

10:30 Coffee Break

Contributed Talks: Ecology, Evolution & Behaviour II. Room: Florence. Moderator: Iain Phillips

09:00 **Ryan McKellar**, James McWilliams, Elyssa Loewen.
Royal Saskatchewan Museum; ryan.mckellar@gov.sk.ca
Toward a synthesis on western Canadian amber deposits and their faunas.

Over the last two decades, the number of known amber deposits in Canada and the USA have grown significantly. Much of this material has been collected as part of research on amber associated with coal seams and dinosaur bonebeds, or recovered from secondary deposits in modern lakes and rivers. The ambers provide a source of arthropod inclusions, as well as comparisons to modern resin chemistry to identify source trees, and stable isotopic data that shed some light on ancient ecological conditions. Altogether, this material is helping to fill in a gap that exists within the fossil record of the Late Cretaceous and early Paleogene. This time interval is particularly important for our understanding of how the end-Cretaceous extinction event affected insects, and how subsequent global events have shaped their biogeography. Here we will review the amber deposits currently available, and the preliminary results from their insect inclusions and amber chemistry.

09:15 **Delano Lewis**, Naia Holtom, Natalia Lifshitz.
Burman University; delano.lewis@gmail.com
Central Alberta butterfly count shows decreasing diversity over time and yearly abundance fluctuation explained by dominant species decline.

Butterfly counts are a very powerful tool that can be used to assess biodiversity trends, species richness, evenness, species population trends, distribution and population sizes of species, relative changes in butterfly populations, as well as effects of weather and habitat change. Long term butterfly counts have even shown climate change as a possible cause in the decline of species richness and diversity. In this study, we firstly used twenty-three years of data collected mainly from one day citizen science counts during Ellis Bird Farm Bug Jamborees to show declining butterfly diversity over time. Secondly, data from more intensive multi-day counts throughout the summer for three years (2021, 2022, and 2023) was analyzed to see what effect, if any, that climate has on butterfly diversity and evenness at Ellis Bird Farm. Additionally, butterfly species abundance for these three more intensive sampling years were compared and this shows that changes in dominant species are the largest drivers of differences in butterfly abundance.

09:30 **Rémi Hébert.**

Environment and Climate Change Canada, Canadian Wildlife Service; remi.hebert@ec.gc.ca

Wild Species 2020: The general status of species in Canada.

Canada is home to about 80 000 species (excluding viruses and bacteria). With the inclusion of 50 534 species, an increase of over 20 000 species from the previous report, the Wild Species 2020 report represents the most complete understanding we have ever had on the status and distribution of wild species in Canada. Results of our assessments at the national level indicate that 873 species are critically imperiled, 1 245 are imperiled, 2 765 are vulnerable, 9 562 are apparently secure, and 10 038 are secure. Among those species, 20% (one in five) have some level of risk in Canada. In addition, 40 species are presumed extirpated and 95 are possibly extirpated, meaning they have likely disappeared from Canada. Finally, 20 448 species are unrankable and 1 549 are unranked due to lack of sufficient data, and 3 919 are accidental or were introduced into Canada, so ranks are considered not applicable.

09:45 Paul Galpern, **Abigail Cohen**.

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How weather, climate, and landscape affect the provisioning of ecosystem services.

Native insects like bees and predatory beetles provide critical ecosystem services to both natural and agricultural ecosystems. However, climate change can destabilize these systems in both long- and short-term scales. In the short term, weather events can become more extreme, leading to rain or heat events that can influence insect dispersal. In the long term, species environmental niches shrink or shift with the climate, influencing population dynamics. Landscape composition also influences beneficial insects and has the potential to soften the impact of climate change. Here we analyze the relative importance of weather, climate, and landscape to determine occurrence of pollinator and predatory beetle functional groups. We use a machine learning method, extreme gradient boosting, to create predictive models that include all relevant variables. We found that occurrence of pollinators is most influenced by moisture and temperature-based variables, while beetle occurrence is most influenced by landscape variables.

10:00 **Stefani de Heij**, Khaldoun A. Ali, Sean M. Prager, Christian J. Willenborg.

University of Saskatchewan; sedeheij@gmail.com

Feeding behaviour and mobility of carabid beetles in response to perceived risk of predation.

Carabid beetles are common inhabitants of agricultural fields where they encounter a variety of food options, including prey and weed seeds. The feeding behaviors of carabids are often influenced by the physical and chemical traits of prey and seed species, as such traits determine prey or seed species that are suitable for consumption. However, some carabid species may prey upon other carabids, complicating their role as beneficial insects due to consumptive (direct) and non-consumptive (indirect) intra-guild predation effects. The non-consumptive effects of intra-guild predation are expected to influence prey and seed foraging behaviors of carabids because those behaviors are likely to be adapted as a function of duration and intensity of predation risk. In this study, we wanted to explore the non-consumptive effects

of the carabid intra-guild predator *Pterosticus melanarius* on mobility and feeding behavior of two carabid omnivores: *Harpalus amputatus* and *Amara* spp. Choice and no-choice feeding arenas coupled with a video system were used to study the responses of carabid beetles to the odor cues of *P. melanarius*. Odor cues left by *P. melanarius* caused *H. amputatus* to reduce its activity when canola seeds (Brassica napus) were offered in the feeding arenas. In contrast, *P. melanarius* cues did not cause *H. amputatus* to alter its mobility when freeze-killed fruit flies were offered in the feeding arenas, although this species did increase consumption of fruit flies under these cues. Amara spp. offered canola seeds increased their mobility and relative seed preferences when exposed to the odor cues of *P. melanarius*. Overall, our work shows carabid species do alter aspects of their foraging behavior under intra-guild predation risks, but this is unlikely to reduce their contributions to seed or prey biocontrol.

10:15 **Iain Phillips**[1], William Fincham[2], Stephen Paterson[3], John-Mark Davies[4], Aaron Bell[5].
1. Water Security Agency, 2. Troutreach Saskatchewan, 3. Saint Mary's University, 4. Water Quality Unit, Water Security Agency, 5. University of Saskatchewan.

Development and evaluation of artificial woody samplers for monitoring aquatic insect communities.

Artificial substrates have been used to characterize benthic macroinvertebrate assemblages since the early 20th century in response to the frustration of applying conventional nets and grabs to a wide range of aquatic habitats. The challenges of applying a single sampling technique to characterize ecosystem health continues, and the selection of substrates or methods to meet monitoring objectives requires comparison of various approaches. Here, we aim to introduce a novel freshwater sampler suitable for characterizing macroinvertebrate assemblages inhabiting course woody debris within lotic water bodies. Prototype samplers were designed and deployed alongside existing, and widely used artificial substrate samplers (cobble baskets and Hester-Dendy samplers) and D-frame net protocols to assess their suitability. We found that woody debris samplers produce an assemblage comparable to cobble baskets and Hester-Dendy samplers, but with higher diversity and abundance of aquatic insects. In a follow-up study, woody debris samplers were found to generate assemblage structures different from D-frame net protocols, with lower assemblage evenness, higher representation of Ephemeroptera/Plecoptera/Trichoptera taxa and lower composition of detritivores despite comparable diversity and abundance. Ultimately, we recommend simple woody debris samplers for assessing macroinvertebrate assemblages, especially in lotic systems that lack cobble substrate but have naturally occurring woody debris present.

10:30 Coffee Break