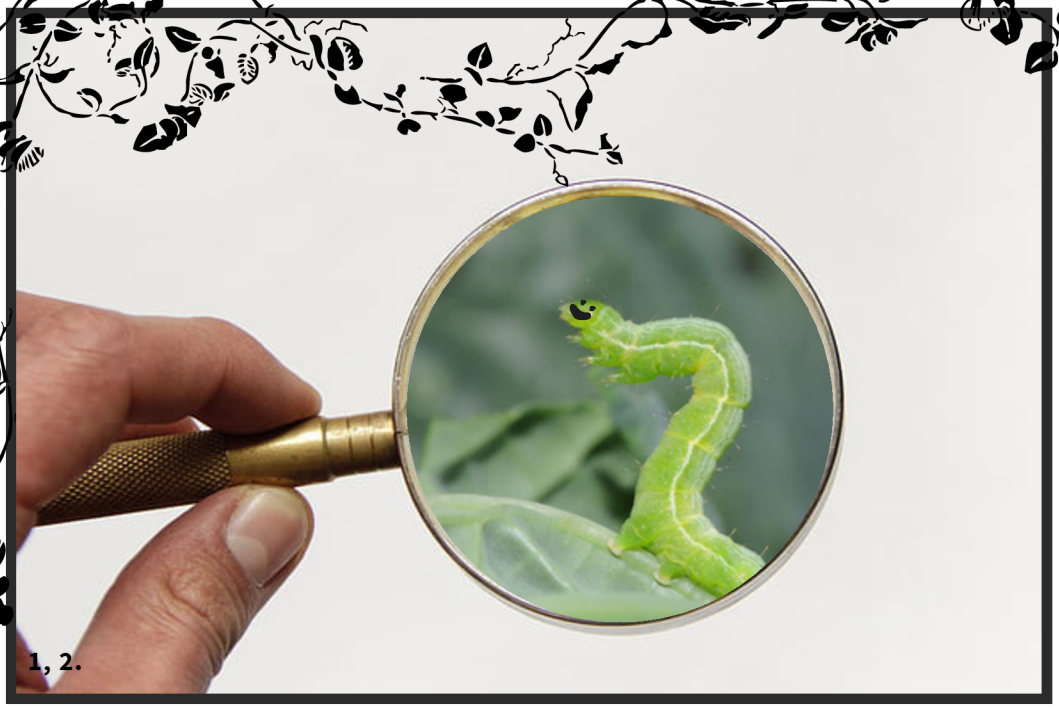
Entomological Society of British Columbia

2024 Conference and AGM

October 4 - 5, 2024
University of British Columbia
Vancouver, B.C.



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THROUGH THE LOOKING GLASS: BC ENTOMOLOGY AND BEYOND

Entomological Society of British Columbia

We acknowledge that the University of British Columbia is located on the traditional, ancestral and unceded territories of the xʷməθkʷəy̓əm, Sḵwx̱wú7mesh, and Səl̓ílwətaɬ Nations (Vancouver campuses) and the Syilx peoples (Okanagan campus).

Meeting Locations (UBC)

October 4th, 2024

8:00am-5:00pm

Ponderosa Ballroom, 6445 University Blvd, Vancouver, BC

5:15pm-8:00pm

UBC Farm, 3461 Ross Drive, Vancouver, BC

October 5th, 2024

8:00am-1:00pm

Ponderosa Ballroom, 6445 University Blvd, Vancouver, BC

Optional activities: Beaty Biodiversity Museum / Spencer Entomological Collection, 2212 Main Mall, Vancouver, BC. Free admission for conference attendees, open 10am-5pm Friday/Saturday

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THROUGH THE LOOKING GLASS: BC ENTOMOLOGY AND BEYOND

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ESBC Conference & AGM October 4 - 5, 2024

Friday, October 4th

8:00 - 8:30	**FRIDAY WELCOME & BREAKFAST/SNACKS** - Dr. Juli Carrillo, ESBC President
8:30 - 9:00	**PLENARY:** ***Through the biovigilance looking glass – an integrated approach to build long-term sustainable pest management.*** Dr. Michelle Franklin, Research Scientist, Small Fruit Entomology and IPM, Agassiz Research and Development Centre, AAFC

Abstract: Humans have been tackling insect pest problems to sustain agriculture production using multiple tactics and tools since the late 1800's. However, new challenges face pest management professionals in the 21st century, including climate change, increased pest invasions due to transborder trade, continued intensification of agriculture, and societal demands for low pesticide input foods. Biovigilance offers a multistep systems-based research approach that seeks to address pest threats proactively with holistic environmentally responsible mitigation strategies. Here, I describe using the case study of the invasive small fruit pest, strawberry blossom weevil (*Anthonomus rubi*) the development of a biovigilance programme for small fruit crops in Canada. This weevil, native to Eurasia was first detected in British Columbia in 2019. It is an economically important pest of plants from the rose family, where it lays its eggs inside of developing flower buds and clips the stem below, resulting in crop loss. Our multi-disciplinary team is working to address the first five steps in the biovigilance continuum (awareness, detection, assessment, understanding, and mitigation). Working across disciplines, we have developed predictive climate match models, detection tools (morphological and molecular), and standardized monitoring methods to facilitate a national surveillance program for this pest. Our team has also begun work to understand the crop risk based on studies of host plant associations, plant phenology, and the weevils' reproductive development. Lastly, in an effort to develop environmentally sustainable long-term mitigation strategies we have conducted exploration for natural enemies in the native and invaded range of *A. rubi* and have identified potential biocontrol agents.

BIO: Dr. Michelle Franklin's research program focuses on understanding the biology and ecology of invasive and native insect pests and natural enemies of importance to small fruit crops and wild berries in Canada. Michelle uses a biovigilance approach to address insect pest threats of small fruits and is interested in the development of reduced risk IPM strategies that include microbial and biocontrol control. (continued on next page.)

Current research projects include biovigilance studies examining the biology and potential for biocontrol solutions of the invasive strawberry blossom weevil; understanding aphid transmission of blueberry viruses; developing baculovirus-based control for blackheaded fireworm in cranberry; and studies co-developed with the Seabird Island Band to identify insect pest threats of key indigenous food plants.

9:00 - 9:15

ESBC SPECIAL PROJECTS PRESENTATION - Bonnie Zand
Native Bees in Vancouver Island Agriculture: Establishing a Baseline

9:15 - 12:00

Moderator: Juli Carrillo

PH.D. PRESENTATIONS

9:15 - 9:30 Sarah Ravoth, University of British Columbia.
Climate change and land use modification interact to affect composition of aquatic insect communities

9:30 - 9:45 Sam Meraj, Simon Fraser University.
Fate of *Trypanosoma cruzi* and *Trypanosoma rangeli* in Bed Bugs Following Oral Ingestion and Intrathoracic Injection

9:45 - 10:00 Jens Ulrich, University of British Columbia.
Habitat restorations in an urban landscape rapidly assemble diverse pollinator communities that persist

10:00 - 10:15 Emmanuel Hung, Simon Fraser University.
Paint it black: The relative importance of light intensity, colour, and polarization for stable fly attraction

10:15 - 10:30 Markus Thormeyer, University of British Columbia.
The effects of multiple environmental stressors on Daphnia and Culex competition

10:30 - 10:45 Auguste de Pennart, University of British Columbia.
The brain behind navigation behaviour in the dung beetle

10:45 - 11:00 Kate Mitchell (nee Kitchens), BC Ministry of Forests; UBC FIDELab.
Disturbance legacies over landscapes moderate population irruptions by a resource pulse-driven bark beetle

11:00 - 11:15 Lucas Peng, University of British Columbia.
After the collapse: predicting the mountain pine beetle whereabouts and assessing the change across landscapes

11:15 - 11:30 Karina Torres, University of British Columbia.
Community and network structure of leaf miner-parasitoid interactions along an elevational gradient in eastern Ecuador

PhD presentations continued	**11:30 - 11:45** Nadia Páez, University of British Columbia. Dynamics of Phylogenetic Diversity in Bromeliad Invertebrate Communities: Effects of Habitat Size and Predator Presence
	11:45 - 12:00 Matt Tsuruda, University of British Columbia. A multi-taxon bioindicator approach to evaluating agro-ecosystem restoration success
12:00 - 12:30	**BREAK - LUNCH/SNACKS**
12:30 - 1:00	**PLENARY:** ***Resource subsidies for increasing parasitism rates: Are parasitoids sugar limited?*** Dr. Blas Lavandero Icaza, Associate Professor, Universidad de Talca, Instituto de Ciencias Biológicas.

Abstract: Parasitoids are important natural enemies of insect pests in agriculture, and much research effort has been devoted to understanding the factors that might limit their effectiveness as natural pest control agents. One of the most often tested hypotheses states that agroecosystems are deficient in sugar resources (e.g., nectar-producing flowers) that parasitoids need to support their activity and reproduction, and that adding resource subsidies could improve natural pest control. But how often is this true? The current state of the evidence of whether sugar limitation of parasitoids is common and could be addressed by conservation strategies that add resource subsidies to agricultural landscapes is reviewed. Examples of studies where this has been found, as well as counterexamples are discussed as well as possible explanations for one result or the other. The need for more studies identifying key resources for parasitoids is highlighted, including the explicit need for proof of limitation in the field. Technical and statistical aspects of determining if parasitoids are fed or unfed in the field must also be taken into account when carrying out these types of studies, as well as the possible interactions with landscape parameters.

BIO: Dr. Blas Lavendero carried out his PhD in ecology at Lincoln University, New Zealand under the supervision of Steve Wratten, Dr. Blas Lavandero is a Asoc. Professor at the University of Talca, Chile, at his lab (Laboratorio de Control Biológico) the main research interest relates to the ecology of parasitoid wasps, conservation biological control and natural enemy movement, between crops, between crop-associated habitats and natural environments, at different scales. Using a combination of chemical and molecular tools, he seeks to understand the links between natural enemies, pests and other hosts/pests, as well as the related vegetation around agricultural systems, to contribute knowledge to design management strategies for sustainable pest control.

Friday, October 4th - Cont.

1:00 - 2:30

Moderator: Michelle Tseng

M.SC. PRESENTATIONS

1:00 - 1:15 Mikhaela Ong, Simon Fraser University.
Rice Root Aphids Exhibit Preference for Monocot Rye over Dicot Cannabis

1:15 - 1:30 Genavieve Desjardin, Simon Fraser University.
Egg size the forgotten life history trait: Zooming in on Harmonia axyridis

1:30 - 1:45 Hannah Anderson, University of British Columbia.
Shedding some moonlight: Unsung moth pollinators in berry agroecosystems

1:45 - 2:00 Sarah Knoerr, University of British Columbia.
Grassland set-asides provide suitable nesting habitat for bumble bees in agroecosystems

2:00 - 2:15 Eva Burghardt, University of British Columbia.
Into the Sarcophagus: Opening the crypt on aphid-parasitoid dynamics and biodiversity in highbush blueberries

2:15 - 2:30 Daphne Chevalier, University of British Columbia.
Lights, camera, attraction! Changes in arthropod activity due to artificial light at night

2:30 - 3:00

Moderator: Michelle Franklin

UNDERGRADUATE PRESENTATIONS

2:30 - 2:45 Jacob McPherson, University of British Columbia; Agriculture and Agri-Food Canada.
Detection of two novel aphid-transmitted plant viruses in highbush blueberry in British Columbia

2:45 - 3:00 Wenwen Wang, University of British Columbia.
Impacts of Scotch Broom (*Cytisus scoparius*) on Pollinator Network of Cultivated Camas Landscapes: Characterizing Interaction Webs and Restoration Needs

3:00 - 3:15 **BREAK**

3:15 - 5:00

UNDERGRADUATE PRESENTATIONS CONT.

3:15 - 3:30 Oliver McDermott, University of British Columbia.
Effects of trees on insect diversity on golf courses

3:30 - 3:45 Jenelle Breen, Simon Fraser University; AAFC
Examining the efficacy and optimal conditions for production of a novel betabaculovirus for control of blackheaded fireworm, Rhopobota naevana in Canadian cranberry.

3:15 - 5:00

UNDERGRADUATE PRESENTATIONS - CONT.

3:45 - 4:00 Shayden Younker, University of Victoria.
The effect of parasitoid egg load on survival of Forest Tent Caterpillar (*Malacosoma disstria*).

4:00 - 4:15 Paula Mali, University of Victoria.
Your friendly neighbourhood spider-jumpers: Social and physical conspecific cues influence nest-site preference in the intertidal jumping spider (*Terralonus californicus*).

4:15 - 4:30 Fina VanderPloeg, Simon Fraser University; Agriculture and Agri-Food Canada.
Being kept in the dark decreases locomotor activity and extends longevity of the egg parasitoid *Trissolcus japonicus*.

4:30 - 4:45 Jessie Moon, Simon Fraser University.
From the lab to the field: Field validation of the predicted host range of two accidentally introduced larval parasitoids of spotted-wing Drosophila in British Columbia.

4:45 - 5:00 Kihan Yoon-Henderson, British Columbia Conservation Foundation
Our search for the elusive Morrison's Bumble Bee (*Bombus morrisoni*) in British Columbia.

5:00 - 8:00

UBC FARM MIXER

Located at 3461 Ross Dr (30 min walk, 12 min bus).

We will have the delicious BistrotVan food truck on site, serving Parisian street style French crêpes. **Dinner tickets provided to student attendees**.

One drink ticket provided and additional drinks will be available for purchase.

Dress warmly!

THROUGH THE LOOKING GLASS: BC ENTOMOLOGY AND BEYOND

ESBC Conference & AGM **October 4 - 5, 2024**

Saturday, October 5th

8:00 - 8:15	**SATURDAY WELCOME & BREAKFAST/SNACKS** - Dr. Juli Carrillo, ESBC President
8:15 - 12:00	**PROFESSIONAL PRESENTATIONS**
8:15 - 8:30	Chandra Moffat, Agriculture and Agri-Food Canada. Potential for indirect biocontrol for the invasive insect, Spotted lanternfly, via direct biocontrol of the weed Tree of Heaven
8:30 - 8:45	Jason Thiessen, Agriculture and Agri-Food Canada. Introducing biological control as part of an eradication program for an urban pest at low densities
8:45 - 9:00	Wim van Herk, Agriculture and Agri-food Canada. Isocycloseram, a Novel Isoxazoline Insecticide Seed Treatment for Management of Wireworms (Coleoptera: Elateridae) in Cereal Crops
9:00 - 9:15	Diane Srivastava, University of British Columbia. Environmental drivers control food web size and shape across the Neotropics
9:15 - 9:30	Richard Trudel, GDG Environment . FraxiProtec, a biological control tool for controlling emerald ash borer populations
9:30 - 9:45	Jean-François (Jeff) Doherty, University of British Columbia. Apple-bobbing crickets: parasitic hairworms induce erratic behaviours in their terrestrial hosts
9:45 - 10:00	Pablo Sandoval Acuña, University of British Columbia. Disentangling the effects of cities on aquatic micro-ecosystems.
10:00 - 10:15	Grace Wang, University of British Columbia. Real and perceived parasitism risk delays the development of Drosophila suzukii
10:15 - 10:30	Siena Achal, British Columbia Conservation Foundation. Nt'ąya kwàta naye uyennjia: Bioblitz of Tatshenshini-Alsek Provincial Park

Saturday, October 5th - Cont.

	PROFESSIONAL PRESENTATIONS - CONT. **10:30 - 10:45** Jorge Marcias, Synergy Semiochemicals. Ongoing efforts to evaluate the need for fluon on funnels with Synergy Multitrap System
10:45 - 11:00	**COFFEE BREAK**
	11:00- 11:15 Paul Fisher, University of British Columbia. Parasitoid diversity and richness found in two types of habitat amendments in agricultural land in the Lower Mainland of BC
	11:15 - 11:30 Sandra Gillespie, University of the Fraser Valley. Long-term patterns in pathogen prevalence and *Bombus impatiens* spread in the Fraser Valley, British Columbia.
	11:30 - 11:45 Bridget White, University of British Columbia. Establishing a laboratory colony of Aedes togoi, the coastal rock pool mosquito
	11:45 - 12:00 Adam Blake, University of Washington. The spectral sensitivity of mosquito photoreceptors can explain behavioral preferences for colored stimuli
12:00 - 1:00	**Lunch and AGM & Presentation of Student Awards**
1:00	**Adjourn - Safe travels!**

4, 5.

Entomological Society of British Columbia Awards

STUDENT ORAL PRESENTATION AWARDS

The Entomological Society of British Columbia presents awards ($1000) for the best student (BSc, MSc, or PhD) oral presentations. For consideration, students must be registered at a post-secondary institution and give a presentation at the Annual General Meeting (AGM). Prizes are awarded at the AGM. The MSc presentation award is known as the James Grant Award. This award is sponsored by the North Okanagan Naturalist Club and memorializes their founder and first president.

GRADUATE STUDENT SCHOLARSHIP COMPETITION

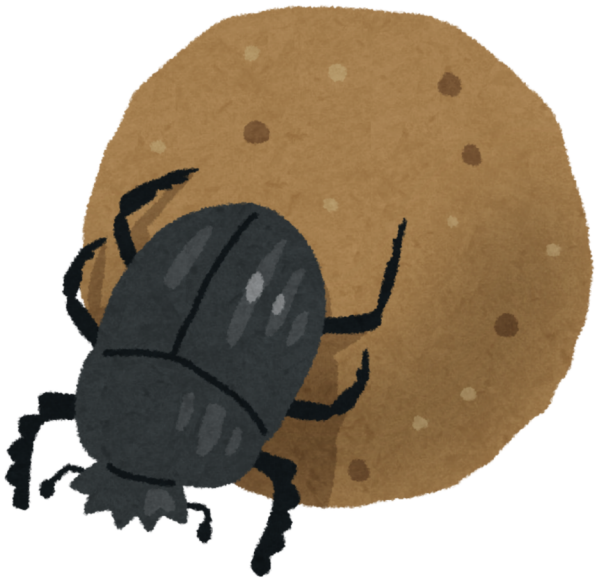
The Entomological Society of British Columbia awards annually a scholarship of $1000 to up to two postgraduate students to encourage students engaged in entomological research in BC.

DEXTER JOHNSON AWARD IN INSECT SCIENCE

This is a $1000 annual award recognizes the best manuscript submitted in any peer-reviewed journal by a student in the field of insect ecology. The award is open to all students (membership in the ESBC is not necessary).

EQUITY, DIVERSITY & INCLUSION AWARD

The Entomological Society of British Columbia annually awards a scholarship of $1000 to support the participation of one graduate student from a group currently underrepresented within the ESBC. Funds may be used at the student's discretion.



List of presenter, coauthors, and abstracts

PLENARY SPEAKERS

Dr. Michelle Franklin, Research Scientist, Small Fruit Entomology and IPM, Agassiz Research and Development Centre, AAFC.
Title: Through the biovigilance looking glass – an integrated approach to build long-term sustainable pest management
Abstract: Abstract: Humans have been tackling insect pest problems to sustain agriculture production using multiple tactics and tools since the late 1800's. However, new challenges face pest management professionals in the 21st century, including climate change, increased pest invasions due to transborder trade, continued intensification of agriculture, and societal demands for low pesticide input foods. Biovigilance offers a multistep systems-based research approach that seeks to address pest threats proactively with holistic environmentally responsible mitigation strategies. Here, I describe using the case study of the invasive small fruit pest, strawberry blossom weevil (*Anthonomus rubi*) the development of a biovigilance programme for small fruit crops in Canada. This weevil, native to Eurasia was first detected in British Columbia in 2019. It is an economically important pest of plants from the rose family, where it lays its eggs inside of developing flower buds and clips the stem below, resulting in crop loss. Our multi-disciplinary team is working to address the first five steps in the biovigilance continuum (awareness, detection, assessment, understanding, and mitigation). Working across disciplines, we have developed predictive climate match models, detection tools (morphological and molecular), and standardized monitoring methods to facilitate a national surveillance program for this pest. Our team has also begun work to understand the crop risk based on studies of host plant associations, plant phenology, and the weevils' reproductive development. Lastly, in an effort to develop environmentally sustainable long-term mitigation strategies we have conducted exploration for natural enemies in the native and invaded range of A. rubi and have identified potential biocontrol agents.

Dr. Blas Lavandero Icaza, Associate Professor, Universidad de Talca, Instituto de Ciencias Biológicas.
Title: Resource subsidies for increasing parasitism rates: Are parasitoids sugar limited?
Abstract: Parasitoids are important natural enemies of insect pests in agriculture, and much research effort has been devoted to understanding the factors that might limit their effectiveness as natural pest control agents. One of the most often tested hypotheses states that agroecosystems are deficient in sugar resources (e.g., nectar-producing flowers) that parasitoids need to support their activity and reproduction, and that adding resource subsidies could improve natural pest control. But how often is this true? The current state of the evidence of whether sugar limitation of parasitoids is common and could be addressed by conservation strategies that add resource subsidies to agricultural landscapes is reviewed. (continued on next page)

Examples of studies where this has been found, as well as counterexamples are discussed as well as possible explanations for one result or the other. The need for more studies identifying key resources for parasitoids is highlighted, including the explicit need for proof of limitation in the field. Technical and statistical aspects of determining if parasitoids are fed or unfed in the field must also be taken into account when carrying out these types of studies, as well as the possible interactions with landscape parameters.

SPECIAL SPEAKER

Bonnie Zand, ESBC
Title: Native Bees in Vancouver Island Agriculture: Establishing a Baseline
Abstract: Wild bee species play a crucial role in providing ecological services within agricultural systems and the broader ecosystem. However, information about bee communities in Vancouver Island's agricultural landscapes is lacking. This study presents a checklist of bee species collected from 19 farms across Vancouver Island during the 2021 and 2022 seasons. A total of 7517 specimens were examined, resulting in a checklist of 59 species and morpho-species from 5 families and 22 genera. Notably, only 5 species were found on all farms, while 12 species were unique to individual farms. Bumble bees were the most frequently detected, with *Bombus vosnesenskii* present on every farm, making up 23% of the total specimens. The threatened Bombus occidentalis was identified on 9 farms, accounting for just 0.37% of the specimens collected. We also found a single individual of the introduced Bombus impatiens and 6 individuals of the non-native *Hylaeus punctatus*. This research establishes a vital baseline for detecting future changes, including invasions and species loss in bee communities in agricultural environments. Additionally, it aims to raise awareness among growers about the diversity and conservation needs of native pollinators.

PHD PRESENTATIONS

Sarah Ravoth, University of British Columbia; Diane Srivastava (UBC).
Title: Climate change and land use modification interact to affect composition of aquatic insect communities.
Abstract: Climate change and land use modification are two principal drivers of biodiversity declines, both presently and putatively in the future. Identifying the underlying proximate variables and generating a mechanistic understanding of their roles in driving ecological changes can support successful and efficient management strategies. Using an aquatic insect system found inside epiphytic bromeliad plants, we evaluate the interactive forces of drought intensification (climate change) and deforestation for agriculture (land use modification) in northern Costa Rica. Local aridity depends both on climate (i.e., site along a spatial drought intensity gradient) and habitat (forest vs pasture). Habitat availability (i.e., bromeliad density) decreases with both land use modification and climate, suggesting synergistic action of climate and land use change. However, land use and climate also act antagonistically, because reductions to canopy cover allow bromeliads to grow larger and have higher water holding capacity, thereby offsetting desiccation risk and increasing habitat suitability to aquatic insects. In this study, we resolve these two opposing circumstances to map ecological responses at the community and species level.

Sam Meradj, Simon Fraser University; Phillip Phung; Kelvin Lau; Carl Lowenberger; Gerhard Gries (SFU).
Title: Fate of *Trypanosoma cruzi* and *Trypanosoma rangeli* in Bed Bugs Following Oral Ingestion and Intrathoracic Injection
Abstract: *Trypanosoma rangeli* and *Trypanosoma cruzi*, hemoflagellate parasites transmitted by triatomine kissing bugs, are closely related species with different impacts on human health. *T. rangeli* co-infects humans alongside *T. cruzi*, the causative agent of Chagas disease. This study investigates the ability of common bed bugs (*Cimex lectularius*) to serve as vectors for these parasites. Using microscopy, RT-qPCR and antimicrobial assays, we tracked the temporal and spatial distribution of *T. rangeli* and *T. cruzi* in bed bugs after artificial infection. We also examined immune responses prompted by these infections. In both cases, bed bugs showed strong immune responses, notably upregulating the antimicrobial peptide CL-defensin. Live *T. rangeli* were not detected in bed bugs, while T. cruzi persisted only in feces and posterior midgut after ingestion. Despite *T. cruzi* surviving in high concentrations when injected into the hemocoel, neither parasite breached the gut barrier or salivary glands. While bed bugs do not seem capable of transmitting *T. rangeli*, *T. cruzi* transmission may occur through fecal contamination. These findings offer valuable insights into bed bug-parasite interactions and their potential role in Chagas disease transmission dynamics.

Jens Ulrich, University of British Columbia; Risa Sargent (UBC).
Title: Habitat restorations in an urban landscape rapidly assemble diverse pollinator communities that persist.
Abstract: Ecological restoration is a leading approach to mitigating biodiversity decline. While restoration often leads to an immediate increase in abundance or diversity, it is rarely clear whether it supports longer term biodiversity gains at the landscape scale. To examine the impacts of urban restoration on pollinator biodiversity, we conducted a three-year natural experiment in 18 parks across a large metropolitan area. We applied an occupancy model to our survey data to determine how restoration, woody plant density and pollinator specialization impacted interannual pollinator metacommunity dynamics. Restoration drove a rapid increase in pollinator species occurrence that was maintained through a positive balance between colonization and persistence, resulting in pollinator species richness gains that are retained. We conclude that urban restoration can effectively conserve pollinator biodiversity by influencing the processes that underlie long-term population stability. Our results highlight the need to study the long-term effects of restoration in different landscape contexts.

Emmanuel Hung, Simon Fraser University; Sophie Hennig (SFU); Miele McGowan (SFU); Christina Li (SFU); Rachel Wong (SFU); Sonali Timmath (SFU); Michelle Roach (SFU); Adam J. Blake, University of Washington, Gerhard Gries (SFU).
Title: Paint it black: The relative importance of light intensity, colour, and polarization for stable fly attraction.

Abstract: In previous studies, stable flies, *Stomoxys calcitrans*, were attracted to the visual cues of blue and black fabric, Alsynite panels, and white coroplast cards. Thisvariety of attractive materials, and their seemingly context-dependent efficacy, have rendered the underlying mechanisms by which stable flies seek visual targets largely inconclusive. Multiple visual cues, such as radiance (intensity), wavelength (color), degree of linear polarization (DoLP), and angle of polarization (AoP) of reflected light, can each contribute to long-range attraction of foraging flies. The objective of our study was to identify the key visual characteristics which mediate stable fly host-foraging responses. In laboratory bioassays, we presented flies with test stimuli (filter stacks consisting of UV-visible light polarizers, light-diffusing cheesecloth, and light-absorbing black screens, transmitting specific LED-emitted wavebands) that differed in intensity, wavelength, DoLP, and AoP. Independent adjustments of single visual elements in a series of experiments, and comparisons of fly landing rates on test stimuli across experiments, allowed us to determine the relative effect size that each visual element contributed to the flies‘ foraging responses. All characteristics of visual targets play some role in host location and/or recognition but light intensity plays an essential role.

Markus Thormeyer, University of British Columbia; Sean Chung (UBC); Michelle Tseng (UBC).
Title: The effects of multiple environmental stressors on Daphnia and Culex competition.
Abstract: Daphnia and Culex mosquitoes occupy similar niches in freshwater aquatic ecosystems leading to interspecific competition. Previous work suggests Daphnia outcompete culex mosquitoes in ideal conditions. Still, both of these invertebrates can be found in urban water bodies where they are also exposed to many different types of environmental stressors. We explored how environmental stressors found in urban areas could modulate interspecific competition between these two invertebrates. We ran a factorial experiment exposing beakers containing Daphnia and Culex mosquitoes by themselves and together to assess how environmental stressors can modulate interspecific competition. Our stressors included high temperature, the presence of microplastics, and the presence of tap water. We evaluated Daphnia population size over time, and the survival, development time, and growth rate of mosquitoes to assess their competitive abilities across the stressful environments. Daphnia populations increased in the presence of Culex competitors, regardless of the combinations of environmental stress. Our findings have help us understand the role of interspecific competition in the shaping of natural populations and ecosystems. Understanding the relationship between environmental stress and interspecific competition can help us predict community composition in the face of global change.

Auguste de Pennart, University of British Columbia; Elin Dirlik, Lund University; Valentin Gillet (LU); Marcel Sayre (LU); Stanley Heinze (LU); Marie Dacke (LU).
Title: The brain behind navigation behaviour in the dung beetle.
Abstract: The ball-rolling dung beetle *Kheper lamarcki* (MacLeay, 1821) is one of many dung beetle species found at a dung pile. To avoid competition for food, the ball-rolling beetle demonstrates an evasive behaviour where it shapes a dung ball and rolls it away along (Continue next page)

a straight line. The ability to steer straight along a given bearing is called straight-line orientation and serves to maximize the beetle's distance from the competition at the dung pile with each step. The neural computations underlying straight-line orientation take place in a central, well-conserved region of the insect brain termed the central complex (CX). The CX is made up of four parts called neuropils, all of which have been identified in the ball-rolling beetle. However, many details of the beetle's CX have yet to be described and raises certain questions: What are the CX neural circuits for computing straight-line orientation in the ball-rolling beetle? And how does the CX circuitry of the brain of the dung beetle compare to that of other insects? A novel microscopy technique, serial block-face electron microscopy, permitted us to image the entire CX in the ball-rolling beetle. Within the CX, we further focused in the regions at the extremities of the neuropils. These regions are known to be areas of variation in neuron projections and essential for navigational computation amongst insects. In the ball-rolling beetle we found a completely novel projection pattern amongst insects in these regions. Despite these regions being anatomically different in the dung beetle to other insects, we hypothesized them to present an alternative solution to the same functional task within the CX. Further functional experiments are needed to support these findings and to further explain our hypothesized beetle's CX functional neural circuits for computing straight-line orientation.

Kate Mitchell (nee Kitchens), BC Ministry of Forests, UBC FIDELab; Michael Howe, US Forest Service; Lori Daniels (UBC); Allan Carroll (UBC).
Title: Disturbance legacies over landscapes moderate population irruptions by a resource pulse-driven bark beetle.
Abstract: Dry conifer forests are increasingly at risk to novel outcomes by the interactions arising from climate-mediated disturbances, particularly between bark beetles and wildfires. Douglas-fir beetle (*Dendroctonus pseudotsugae*; DFB) is a pulse-driven irruptive bark beetle which outbreaks 1-5 years after mixed-severity wildfires in Douglas-fir forests. Given that woodborers are generalist feeders and are known to regulate DFB outbreak likelihood at fine scales (i.e. tree, stand), I proposed the increased levels of disturbance across the landscape which have occurred in recent decades could have increased interspecific competition between woodborers and DFB at broader spatial scales. To evaluate this hypothesis, I used an ensemble machine learning approach to determine whether woodborer populations have affected DFB outbreak likelihood in British Columbia, Canada between 2004-2017. Contrary to our original prediction, DFB was positively associated with disturbance, however, DFB outbreak likelihood notably decreased over the temporal extent of the analysis. This suggests that woodborers do moderate DFB outbreaks following fires, but their response to disturbance occurred on the order of decades and across the entire Douglas-fir biome, rather than on annual or regional scales. Results will be discussed in the context of changing disturbance regimes, interspecific interactions and pest management for disturbed forests.

Lucas Peng, University of British Columbia; Michael Howe, US Forest Service; Allan Carroll (UBC).
Title: After the collapse: predicting the mountain pine beetle whereabouts and assessing the change across landscapes
Abstract: Intermittent mountain pine beetle outbreaks (*Dendroctonus ponderosae*; MPB) cause extensive mortality across mature pine forests in western North America. During the most recent outbreak, MPB has caused significant tree mortality in BC and has spread eastward across the boreal forest in Alberta. As the outbreak finally collapsed, MPB returned to its endemic phase where populations are low, and beetles are restricted to low vigor trees. However, it is unknown whether the current pine forests in BC are suitable to support endemic MPB populations long term for future outbreaks. Recent research suggests that stand density index (SDI), an index of inter-tree competition within stands, can be used to predict the likelihood that endemic MPB can persist following outbreak collapse. To accurately project suitable endemic MPB habitat across landscapes, we developed models predicting SDI based on conventional inventory data. Results will be discussed within the context of data collection, processing, and predictive capacity.

Karina Torres, University of British Columbia; Leticia Aviles; Jill Jankowski; Diane Srivastava (UBC); Carlos Lopez-Vaamonde, INRAE Centre Val de Loire, Orleans, France.
Title: Community and network structure of leaf miner-parasitoid interactions along an elevational gradient in eastern Ecuador
Abstract: Insect groups are a crucial component of tropical biodiversity and biomass, performing essential functions in ecosystems. Despite their significance, our understanding of their ecology remains limited. This project aims to elucidate the community and network structure of leaf-mining insect herbivores, their host plants and parasitoids along a ~2,700 m elevational gradient in the tropical Andes. Leaf-mining insects have unique life histories that make them particularly tractable for ecological studies. As they feed between the outermost layers of a leaf, they create visible tunnels (‘mines’), which makes them relatively easy to sample. Moreover, their low mobility and high susceptibility to parasitoids facilitate the quantitative estimates of host abundance and parasitism rates. Therefore, these antagonistic relationships represent ideal systems to study the dynamic processes that shape communities. Considering that most leaf miners and their parasitoids in the Neotropics are still largely undescribed, DNA barcoding will enable us to characterize these insect communities and their interactions. Because parasitoids play a key role in regulating herbivorous insect populations, it is imperative to uncover the patterns of these interactions along elevational gradients to evaluate how they may respond to climate change and mitigate the risk of potential future outbreaks.

Nadia Páez, University of British Columbia; Diane Srivastava (UBC).
Title: Dynamics of Phylogenetic Diversity in Bromeliad Invertebrate Communities: Effects of Habitat Size and Predator Presence.
Abstract: In this study, we used phylogenetic information to understand how environmental factors regulate community diversity. To unravel community assembly mechanisms, we analyzed natural and experimental communities separating colonization and extinction (Continue next page)

processes. Focusing on the aquatic invertebrate community of bromeliads, we investigated the roles of habitat size and predator presence in shaping the phylogenetic diversity of the community, and how species richness and relatedness mediated these patterns. In natural communities, we found a positive correlation between phylogenetic diversity and habitat size across taxonomic scopes which mainly mirrored patterns in species richness despite variable trends in relatedness. Predator effects were less predictable. By separating colonization and extinction processes, we found that the phylogenetic diversity/habitat size relation was driven primarily by species preferences during colonization, while predator presence predominantly influenced extinction processes, reducing richness and total phylogenetic diversity while having varying effects on relatedness. Environmental factors' effects on relatedness metrics were highly dependent on the taxonomic scope. Our findings highlight the complex interplay between environmental factors and community assembly processes in structuring biodiversity patterns.

Matt Tsuruda, University of British Columbia; Juli Carrillo (UBC).
Title: A multi-taxon bioindicator approach to evaluating agro-ecosystem restoration success
Abstract: The rapid expansion of the agricultural industry has led to landscape simplification, declines in biodiversity, and reductions in ecosystems services around the world. A potential method mitigating the damage caused by agricultural expansion is inclusion of semi-natural habitat in agricultural landscapes, which provides resources for beneficial organisms performing vital ecosystem services. However, direct measurements of ecosystem services are often time/labour-intensive, expensive, or coarse in resolution, leading to challenges in measuring the success of these restored habitats. We propose the use of a multi-taxon suite of insect bioindicators that reflect the success of agricultural restorations. We hypothesize that using multiple taxa as bioindicators would give a more holistic measurement of ecosystem health than any one taxon alone due to variance in sensitivity to environmental changes across insect groups. We sampled insects carabids, staphylinids, parasitoid wasps, and necrophagous insects in addition to different metrics of ecosystem functioning (aphid parasitism, pest control, carrion decomposition rates, soil bulk density) in both barley fields and grassland set-asides in Delta, British Columbia to determine which insects may be effective bioindicators of restoration success. Initial results indicate that carabids and parasitoids communities vary significantly between field types and may prove valuable as indicators of agroecosystem restoration success.

MSC PRESENTATIONS

Mikhaela Ong, Simon Fraser University; Calla Pickett (SFU); Anita Feng (SFU); Audrey Lau (SFU); Liam Buirs (Pure Sunfarms), Regine Gries (SFU), and Gerhard Gries (SFU)
Title: Rice Root Aphids Exhibit Preference for Monocot Rye over Dicot Cannabis
Abstract: Rice root aphids (RRAs), Rhopalosiphum rufiabdominale, are emerging pests of commercial cannabis. As RRAs preferentially colonize monocotyledonous plants such as rice, rye and barley, we investigated whether rye could be utilized as a trap crop in commercial cannabis production to divert RRAs from dicotyledonous cannabis to monocotyledonous rye. When RRAs in bioassay cages were offered a choice between potted rye and a potted dicotyledonous plant, such coriander, cannabis, celery, lettuce, marigold, pepper, squash or tomato, they preferentially colonized rye. Moreover, when RRAs in no-choice cage bioassays were offered a single plant, they colonized and multiplied very well on rye but did poorly on coriander, cannabis, celery, lettuce, marigold, pepper, squash and tomato. When RRAs in Y-tube olfactometer bioassays were offered a choice between a potted rye plant and potting soil, or between rye and dicotyledonous celery or tomato, they exhibited no preference, indicating that plant location and selection are based not solely on plant olfactory cues. Together, our data indicate that rye could be used as trap crop to help control RRAs in commercial cannabis production greenhouses.

Genavieve Desjardin, Simon Fraser University; Tony Williams (SFU)
Title: Egg size the forgotten life history trait: Zooming in on *Harmonia axyridis*
Abstract: Future climate predictions suggest that insects will be at risk of extinction or population outbreaks. A closer look at how individual females react to warming temperatures could expand the knowledge on the cost of reproduction. We focus on individual quality, specifically females and their egg size variation within a population. Exploring individual quality in *Harmonia axyridis*, the Asian ladybird beetle, a globally introduced predatory generalist, allows us to study a system without post-hatching care. We predict females will invest in a number of smaller eggs under higher temperatures, and small eggs will have the same survival as eggs under current temperatures. Our findings for individual egg size variability will provide base knowledge that can project population trends under warming temperatures. Further, it will contribute to a better understanding of the trade-offs and the mechanisms behind egg size variation within a species.

Hannah Anderson, University of British Columbia, Eva Burghardt (UBC), Juli Carrillo (UBC).
Title: Shedding some moonlight: Unsung moth pollinators in berry agroecosystems
Abstract: Agricultural crops are facing a pollination crisis, yet current research focuses on daytime pollinators. Moths are important pollinators for wild plants, but their pollination services for horticultural crops are underrecognized. Emerging research suggests the critical, unsung contributions of nocturnal pollinators and stresses the urgency of investigating nocturnal pollination in agroecosystems. We sampled moths during peak flowering season in fields of cultivated blueberry crops. We analysed pollen carried on each moth as an indication to the flowering plant species they had potentially pollinated and found a wide range of pollen loads (0 to 18184 grains). We identified moths to species and found an assemblage previously unknown to be pollinators carrying pollen from a variety of plant species including blueberry crops. (Continued)

We identified 7 new species of potential pollinators belonging to two families (Geometridae: 1 species, and Noctuidae: 6 species). We confirmed that previously reported pollinating species of moths such as those in the family Sphingidae also occurred and collected pollen in berry agroecosytems in BC. We also recorded multiple species carrying berry pollen for the first time. We provide further support to the importance of moths as pollinators and stress the need to include nocturnal insects in future pollination studies.

Sarah Knoerr, University of British Columbia, Risa Sargent (UBC).
Title: Grassland set-asides provide suitable nesting habitat for bumble bees in agroecosystems
Abstract: To preserve the pollination services provided by declining wild bees, we must prioritize management practices that incorporate floral and nesting resources for pollinators within intensely farmed areas. Grassland set-asides (GLSAs), agricultural fields periodically removed from production, have the potential to provide nesting sites for wild ground-nesting bees, such as bumble bees (genus Bombus), due to their low disturbance and minimal pesticide exposure. To assess the capacity of GLSAs to provide quality nesting sites for bumble bees, surveys were conducted throughout the agricultural areas where these GLSAs are found. We recorded nest-searching queens to determine habitat type preferences and collected tarsal samples from workers to estimate colony density via microsatellite analysis. Nest-searching queens exhibit a strong preference for GLSAs, comparable to other similarly undisturbed habitats such as protected areas and unused grassy spaces, and significantly surpassing crop fields and roadsides. The presence of GLSAs in intensely farmed areas is a strong predictor of wild bumble bee worker abundance, and these areas show higher Bombus mixtus nest densities, suggesting that these habitat amendments support bumble bee populations in agroecosystems beyond the colony establishment stage.

Eva Burghardt, University of British Columbia; Dr. Juli Carrillo (UBC); Dr. Bryan Brunet, Agriculture and Agri-Food Canada; Dr. Michelle Franklin (AAFC).
Title: Into the Sarcophagus: Opening the crypt on aphid-parasitoid dynamics and biodiversity in highbush blueberries.
Abstract: Highbush blueberry production in British Columbia continues to face challenged to manage aphid-vectored blueberry scorch virus. Over the past decade, the BC Blueberry Industry has seen many developments; with increased blueberry acreage, establishment of new invasive insect pests, and weather extremes. To determine the best aphid management practices, investigation is needed on the changes in biodiversity of aphid species and their parasitoids in blueberry fields. Drawing from a study conducted in 2000 by Raworth et al. (2000) within the same geographic region, in 2024 we collected alate aphid samples from five blueberry fields using suction and pan traps placed in-field and in surrounding hedgerows. Sample sites included two organic fields, two conventional fields, and one field with no-spray rows. Aphids will be identified to species level, and abundance and biodiversity compared to the populations identified in previous literature. In addition to trap sampling, we collected blueberry plant tips with live aphids and aphid mummies attached. Blueberry tips were kept in the laboratory for one month to collect emerging parasitoids, which were collected and will be identified to species level. (Continue next page)

Data analysis is ongoing, and we hope to relate parasitism rates from collected samples to the management practices in fields, as well as outlining the parasitoid and aphid population biodiversity within sampled fields.

Daphne Chevalier, University of British Columbia; Quentin Geissmann (UBC); Nisa Chavez (UBC); Juli Carrillo (UBC).
Title: Lights, camera, attraction! Changes in arthropod activity due to artificial light at night
Abstract: Over the past few centuries, human activity has introduced astoundingly bright light to the environment at a rapidly accelerating pace. Artificial light at night (ALAN) has detrimental effects on a wide range of organisms, including arthropods. To minimise impact, we must understand whether some taxa are more sensitive than others and whether certain lights are less perturbing. We designed and tested a novel tool for introducing and monitoring ALAN, called ALANizer. We then installed 12 ALANizers in hedgerows and monitored arthropod activity using pitfall traps. Our analysis found that both white and amber light treatments influenced arthropod activity.

UNDERGRADUATE PRESENTATIONS

Jacob McPherson, University of British Columbia, Agriculture and Agri-Food Canada; Yonathan Uriel (AAFC); Jim Mattsson, Simon Fraser University; Sachithrani Kannangara (SFU), Bryan Brunet (AAFC), Michelle Franklin (AAFC).
Title: Detection of two novel aphid-transmitted plant viruses in highbush blueberry in British Columbia
Abstract: Aphids present a dual threat to agricultural crops, both as phloem-feeding pests and as vectors of plant viruses. Plant viruses from the genus *Luteovirus* include many economically important viruses transmitted by aphids that cause disease in agricultural crops around the globe. Two novel blueberry Luteoviruses with unknown symptomology, Blueberry Virus N (BlVN), and Blueberry Virus M2 (BlVM2), have recently been detected in British Columbia (BC) highbush blueberry (*Vaccinium corymbosum* L.). Here, we developed molecular assays to detect these novel Luteoviruses in aphids and used these assays to determine the presence of BIVN and BIVM2 in two aphid species feeding on highbush blueberry in BC. All aphids collected from blueberry fields in the Fraser Valley of BC tested positive for the novel viruses. Based on morphology and COI barcoding, aphids were identified as *Ericaphis fimbriata* (Richards) and *Illinoia azaleae* (Mason). An in-lab transmission assay is currently underway to determine if BIVN and BIVM2 can be transmitted among blueberry plants by these two aphid species. This work provides the foundation for future research to understand the occurrence of these viruses in blueberry-feeding aphids and the role of aphids in the transmission of the novel Luteoviruses.

Wenwen Wang, University of British Columbia; Faye Coldwell (UBC); Laila Noksana (UBC).
Title: Impacts of Scotch Broom (*Cytisus scoparius*) on Pollinator Network of Cultivated Camas Landscapes: Characterizing Interaction Webs and Restoration Needs.
Abstract: The edible bulb of the camas lilies (*Camassia quamash*) is a culturally important staple food to the Coast Salish Peoples of Vancouver Island. With the health of camas gardens dependent on Garry oak ecosystems, the invasion of exotic species like the Scotch broom (*Cytisus scoparius*) threatens the strength of mutualistic interaction between camas, local pollinators, and the plant community at large. This research proposal seeks to characterize how the invasion of *C.scoparius* influences and modifies the plant-pollinator web of *C.quamash* by examining their network architecture. A field experiment will be conducted on two natural camas sites in the presence and absence of Scotch broom in Southern Vancouver Island. Pollinators will be monitored at various times of day and their pollen will be examined by amount and character. Our findings will help inform recent efforts to restore and conserve camas habitats for the process of reclaiming camas cultivation amongst Coastal Salish people.

Oliver McDermott, University of British Columbia; Michelle Tseng (UBC).
Title: Effects of trees on insect diversity on golf courses
Abstract: Cities like Vancouver must efficiently utilize limited greenspaces to preserve biodiversity. Eight golf courses in the city represent significant greenspaces in an increasingly urbanized area (Oyunkhishig, 2020). Thus, golf courses play a crucial role in maintaining urban biodiversity. (Cont.)

Understanding the relationship between management decisions and their effects on species populations is essential. To assess how tree-shaded areas within a golf course influence species diversity, we analyzed insect richness and abundance, focusing on ground beetles (Coleoptera, Carabidae) at McCleary Golf Course. We deployed ten pitfall traps—five in open areas and five in shaded regions—during peak activity hours (10 AM to 5 PM). Our results indicated that shaded areas supported higher abundance and diversity of insects compared to open grass. This trend was particularly evident in ground beetle populations. Non-metric multidimensional scaling (NMDS) plots showed distinct insect communities between shaded and open areas, suggesting that tree shading creates unique habitats conducive to diverse insect populations. Overall, our findings highlight that tree shading on golf courses is beneficial for enhancing biodiversity and supporting a greater abundance of ground-dwelling insects.

Kihan Yoon-Henderson, British Columbia Conservation Foundation; Jennifer Heron (British Columbia Ministry of Water, Land and Resource Stewardship)
Title: Our search for the elusive Morrison's Bumble Bee (*Bombus morrisoni*) in British Columbia.
Abstract: Morrison's Bumble Bee (*Bombus morrisoni*) was last recorded in B.C. in 1939 in an observation from Logan Lake. In Canada, it is known from records restricted to the Western Interior Basin ecozone within the Kamloops to Lillooet and Ashcroft areas. The species has been declining in other parts of its North American range. More data is needed to determine the conservation status of the species in the province. Surveys for Morrison's Bumble Bee have been ongoing since 2023. In our second field season we have intensively surveyed for the species within open grassland and sage-brush habitat in the Thompson-Nicola region. Methods included hand netting bumble bees during roadside plots, as well as blue vane trap collection. BC Parks in the region were targeted as part of the search effort. This presentation will cover a background of the project, some results from 2023 surveys, as well as experiences in the field, from the perspective of an invertebrate conservation technician.

Shayden Younker, University of Victoria; David Punzalan (UVic)
Title: The effect of parasitoid egg load on survival of Forest Tent Caterpillar (*Malacosoma disstria*).
Abstract: Despite the obvious conflict between parasitoid and host, the fate of both is expected to depend on parasitoid egg-load. With increasing number of parasitoid eggs, naturally, comes greater risk to the host—but parasitoids, too, can suffer because of competition for limited larval resources. Forest tent caterpillars, *Malacasoma disstria*, are frequently observed with externally attached parasitoid eggs, and egg load in nature can vary considerably. I collected 98 caterpillars, categorized them into four classes of apparent egg load (AEL) based on the number of externally visible parasitoid eggs (0, 1, 2, or 3), and then monitored their survival and development. Although some caterpillars had parasitoids emerge despite having no visible eggs at the time of collection, I found that this class (AEL = 0) had the highest survival rates, while those with AEL > 0 experienced increased mortality and reduced rates of emergence as adult moths. Regardless of AEL class, no more than a single parasitoid emerged, consistent with an upper limit on the number of parasitoid larvae that can survive in a single host. (Continued on next page)

AEL was not significantly associated with the weight of caterpillars, the length of successfully emerged adult moths, or parasitoid pupal weight.

Paula Mali, University of Victoria; David Punzalan (UVic).
Title: Your friendly neighbourhood spider-jumpers: Social and physical conspecific cues influence nest-site preference in the intertidal jumping spider (*Terralonus californicus*).
Abstract: Jumping spiders are solitary and territorial creatures, but can be motivated to social tolerance and cohabitation. The intertidal jumping spider (Terralonus californicus) is an exclusively beach-dwelling spider on the west coast of North America. We investigated the impact of conspecific social factors on the nest-site selection behaviour of *T. californicus*. First, we studied the effects of conspecific residence and egg-laying on adult female attraction-repulsion. Simulated 'intruders' were introduced to the nests of resident spiders with or without egg clutches. Both spiders generally displayed low rates of aggression and repulsion regardless of egg presence/absence. Over time, intruder and resident females were shown to nest and lay eggs together. Secondly, we tested the effects of physical conspecific nesting cues on juvenile and adult spider nest choice. Individuals were presented with a compartment containing a conspecific egg sac, conspecific silk, or an empty compartment, and allowed to choose a nest site. Juvenile spiders strongly preferred the egg sac, whereas adults showed some preference for conspecific structures without differentiating between egg sacs and silk. We propose that *T. californicus* may receive benefits from socially informed nest choice, though identifying what those might be is still a mystery and the subject of ongoing work.

Fina VanderPloeg, Simon Fraser University, Agriculture and Agri-Food Canada; Paul Abram (AAFC).
Title: Being kept in the dark decreases locomotor activity and extends longevity of the egg parasitoid *Trissolcus japonicus*.
Abstract: Circadian rhythms determine daily periods of activity and inactivity, with diurnal insects usually active during lit periods of the day. When insects are placed in constant darkness, they continue being active at the same time of day, but are less active overall; these are known as "free-running" rhythms. Arthropod natural enemies used in biological control are often stockpiled under cool and dark conditions, but it is unknown how much darkness contributes to extending their shelf life. We wanted to know whether constant darkness alone could extend longevity by decreasing locomotor activity and therefore energy expenditure. As a model system, we used the egg parasitoid *Trissolcus japonicus*, which is being tested as a biological control agent of the brown marmorated stink bug in greenhouse vegetables. In the laboratory, we measured the locomotor activity and longevity of the parasitoids under three light treatments: constant light, constant dark, and 16h light:8h dark. As predicted, locomotor activity and mortality was highest in constant light and was lowest in constant darkness. Moving forward we are interested in two things: whether reduced energy expenditure is the reason for increased longevity in constant darkness, and more broadly whether storage in constant darkness may be a useful method of stockpiling some biological agents.

Jessie Moon, Simon Fraser University, Tara D. Gariepy (AAFC London), Paul K. Abram (AAFC Agassiz)

Title: From the lab to the field: Field validation of the predicted host range of two accidentally introduced larval parasitoids of spotted-wing Drosophila in British Columbia.
Abstract: Biological control agents are intentionally released to manage pest populations; however, some releases are pre-empted by unintentional introductions to new continents. Unintentional introductions can provide an opportunity to validate predictions about host specificity generated by prior laboratory studies. *Ganaspis kimorum* and *Leptopilina japonica*, both native to Asia, are larval parasitoids of the invasive fruit pest *Drosophila suzukii*. Shortly before the intentional introductions of *G. kimorum* in North America and Europe, both parasitoid species were found to be already established in British Columbia. We asked whether these two parasitoids have a similar host range under natural conditions as was predicted by prior laboratory studies. In 2022 and 2023, we reared parasitoids of native, invasive, and cosmopolitan Drosophilidae from naturally-occurring and sentinel fresh and decaying fruit to document the web of host-parasitoid associations in different habitats. The host range of the two parasitoid species in the field that we observed is remarkably similar to what was predicted from laboratory host range testing studies, and attack of native non-target Drosophilidae was absent (*G. kimorum*) or rare (*L. japonica*). Our results form part of the rationale to intentionally re-distribute *G. kimorum* from British Columbia to Ontario for biological control of *D. suzukii*.

Jenelle Breen, Simon Fraser University, Agriculture and Agri-Food Canada; Yonathan Uriel (AAFC), Nadia Sokal (AAFC), David Theilmann (AAFC), Michelle Franklin (AAFC).
Title: Examining the efficacy and optimal conditions for production of a novel betabaculovirus for control of blackheaded fireworm, *Rhopobota naevana* in Canadian cranberry.
Abstract: Blackheaded fireworm, *Rhopobota naevana* (Hubner) is a major pest of cranberry, *Vaccinium macrocarpon* (Aiton) in Canada. Chemical insecticides are the main method currently used for management of *R. naevana*, however products are limited and these insecticides can have negative impacts on environment, biodiversity, and human health. Baculovirus-based biopesticides can provide viable safe alternatives to chemical insecticides for pest management, due to their high target specificity, low risk to non-target species, and compatibility with diverse farming practices. A betabaculovirus causing high mortality of *R. naevana* in cranberry was discovered in the Fraser Valley of British Columbia in 1992 and remains a viable management option. Here as a first step towards the development of a biopesticide product for *R. naevana*, we examined the efficacy of the novel baculovirus through laboratory dose mortality assays. Second, we examined the relationship between larval stage and virus inoculation dose to determine the optimal parameters for mass in vivo baculovirus production. We quantify viral yield using a unique quantitative PCR based method and report on the relationship between mortality, time to death, and virus production.

PROFESSIONAL PRESENTATION

Chandra Moffat, Agriculture and Agri-Food Canada; Hester Williams (AAFC, Landcare Research New Zealand), Sonja Stutz (Centre for Agriculture and Bioscience International), Phil Weyl (CABI), Francesca Marini (Biotechnology and Biological Control Agency, Italy)
Title: Potential for indirect biocontrol for the invasive insect, Spotted lanternfly, via direct biocontrol of the weed Tree of Heaven.
Abstract: Biological control programmes generally target one or a few closely related organisms to provide direct control of invasive species. However, opportunities exist for indirect biocontrol by reducing populations of an organism relied upon or used heavily by the target invasive species. Spotted lanternfly (*Lycorma delicatula*, SLF) is an highly invasive insect that established in the USA in 2014. Feeding on over 70 plant species, SLF presents a high risk to Canadian agriculture, forestry, ornamental and natural resource sectors. SLF has been directly targeted for biocontrol, but to date no suitably host-specific candidate agents have been identified.
SLF has a strong association with the highly invasive Tree of Heaven (*Ailanthus altissima*, ToH), which has reached high densities in some parts of Canada. ToH has a number of severe environmental impacts in grassland, riparian, foreshore and urban environments. In 2019 we began investigating the feasibility of a biocontrol program for ToH in Canada. To date, two candidate agents are being considered for release. If approved and successful in reducing the spread density of ToH, this weed biocontrol programme could indirectly serve as biocontrol for SLF, by limiting its establishment and spread in Canada.

Jason Thiessen, Agriculture and Agri-Food Canada; Victoria Makovetski (AAFC, CABI); Paul K. Abram (AAFC).
Title: Introducing biological control as part of an eradication program for an urban pest at low densities.
Abstract: Importation biological control releases are traditionally done when an invasive pest's population is already widespread and at high densities in the invaded area. But what if introductions of biological control agents were made more pro-actively, when pest densities are still low and their spatial distribution is highly restricted? In 2023, we first experimentally introduced a host-specific parasitoid, the winsome fly (*Istocheta aldrichi*), to an area of Port Coquitlam that had low densities of Japanese Beetle (*Popillia japonica*) as part of a comprehensive eradication strategy implemented by a collaborative team including municipal, provincial and federal authorities. Traps in the vicinity of the releases revealed low levels of parasitism by fall of the same year and again in the following spring of 2024 indicating a successful overwintering by the parasitoids offspring. The promising results of our first proof-of-concept experiment were encouraging. This year, we repeated winsome fly releases in the summer of 2024 in other areas where beetles were caught and will continue to monitor their development.

Wim van Herk, Agriculture and Agri-food Canada; Bob Vernon, Sentinel IPM Services.
Title: Isocycloseram, a Novel Isoxazoline Insecticide Seed Treatment for Management of Wireworms (Coleoptera: Elateridae) in Cereal Crops.

Abstract: Populations of several pest species of wireworms are increasing in the key cereal crop production areas of Canada and the United States. To address this problem, a number of new seed treatments are being developed. To be effective, these need to both provide crop protection and significantly reduce populations. We evaluated isocycloseram, the first of a new class of agricultural insecticides known as isoxazolines, as a seed treatment for protection of both wheat and barley crops from the sugarbeet wireworm, *Limonius californicus*, in Alberta, and for the dusky wireworm, *Agriotes obscurus*, in British Columbia. In field trials conducted over four years under extreme wireworm pressure in Alberta, and under moderate-high pressure in BC, isocycloseram applied as a seed treatment at 5.0-7.5 g AI/100 kg seed was effective in protecting crop stand and yield, and significantly reduced wireworm populations. Registration of this new insecticide, expected for the spring of 2025, will provide growers with a new, much needed management tool for the wireworm pest complex.

Adam Blake, University of Washington; Gregor Belušič, University of Ljubljana; Jeffrey A. Riffell (UW).
Title: The spectral sensitivity of mosquito photoreceptors can explain behavioral preferences for colored stimuli.
Abstract: Vision underlies many important mosquito behaviors such as floral foraging, seeking out vertebrate hosts, and the location of oviposition sites. Despite the medical importance of mosquito born illness and the prominent role of vision in their behavior, the spectral sensitivities of their photoreceptors have until now remained uncharacterized. Using intracellular recording methods in Aedes aegypti, we report the spectral sensitivity of mosquito photoreceptors present in the ventral compound eye of females. These recordings demonstrate conclusively that the majority of mosquito photoreceptors (R1-6) are green sensitive and gain UV sensitivity through a sensitising pigment. The central photoreceptors, which are thought to play a role in color vision, show peak sensitivities in the UV, green, or show a dual peak in the blue and green. Complementing the electrophysiological data, we also investigated mosquito responses to visual stimuli through wind tunnel bioassays using visual stimuli created with a pair of novel LED spectral arrays capable of generating stimuli in the range of 390-740 nm. These visual stimuli were also paired with different odors allowing us to investigate the effect of odor on visual responses. In the presence of CO2 only, the observed spectral preferences can be largely explained through an achromatic intensity response from the outer photoreceptors. However, in the presence of other odors, these preferences are influenced by input from the central photoreceptors.

Richard Trudel, GDG Environment; Joël Boudreault (GDG); Jean-François Houde (GDG); Erika Gauthier (GDG).
Title: FraxiProtec, a biological control tool for controlling emerald ash borer populations
Abstract: The emerald ash borer, Agrilus planipennis Fairmaire (Coleoptera: Buprestidae), is a beetle native to Asia that attacks healthy ash trees (Fraxinus Linnaeus; Oleaceae) by feeding on phloem. It was detected in 2001 in Detroit, Michigan and the following year in Windsor, Ontario, where the emerald ash borer continued its expension. (Continued next page)

In Quebec, it was observed for the first time in 2008 in Carignan and since then, it has expanded its distribution to several regions of Quebec. Unfortunately, tactics for managing the emerald ash borer are limited and difficult to evaluate, mainly because of the difficulty of detecting new infestations. However, several management strategies against EAB have been deployed in North America, which mainly focus on classical biological control and systemic protection of high-value trees. FraxiProtec, an autodissemination device using the fungal isolate *Beauveria bassiana* CFL-A, was developed to infect EAB adults and thus reduce their populations. Over several years of field studies, it was possible to observe the capacity of the pathogen to spread beyond the treated areas as well as a significant decrease in the population growth of this pest. Following these studies, exploratory analyses were performed on parameters such as area to be treated, ash density and FraxiProtec density to document potential relationships for determining a prescription. Following these field trials and many laboratory studies, FraxiProtec has been registered in 2022 and now it contributes to control the population of this pest.

Jean-François (Jeff) Doherty, University of British Columbia; Bingzong Liu (UBC); Ben Hanelt, University of New Mexico; Eddy J. Dowle, University of Otago; Neil J. Gemmell (UO); Robert Poulin (UO); Leonard J. Foster (UBC); Benjamin J. Matthews (UBC).
Title: Apple-bobbing crickets: parasitic hairworms induce erratic behaviours in their terrestrial hosts
Abstract: Many parasites have the adaptive ability to modify the phenotype of their host to complete their life cycle, a trait known as host manipulation. Here, we expect to observe differences in the responses of infected animals toward certain cues, especially if a cue ultimately favours parasite transmission. In freshwater hairworms (Nematomorpha: Gordiida), mature individuals somehow “drive” their terrestrial insect hosts into water, where the hairworm exits to mate. Infected insects appear more active at night and respond to environmental cues differently than uninfected ones, however, we do not know how these differences evolve throughout hairworm development. Using *Acheta domesticus* crickets experimentally infected with *Paragordius varius* hairworms in a time series of behavioural assays, we tested multiple stimuli to determine how hairworms modulate host behaviour, and whether these behaviours correlate with hairworm development. Humidity, horizontally polarised light, and direct contact with water were tested in isolated behavioural assays. We noticed a remarkable behaviour reminiscent of apple bobbing in the water assay. Also, hairworms apparently needed to contact water to egress, otherwise they would retreat back into the host. We discuss these behaviours along with the responses of infected crickets to humidity and light, and link these to the broader sensory landscape.

Pablo Sandoval Acuña, University of British Columbia; Diane S. Srivastava (UBC).
Title: Disentangling the effects of cities on aquatic micro-ecosystems.
Abstract: Urbanization and the accompanying creation of dense, human-built environments with different socioeconomic characteristics can shape ecological communities. However, the causal relationships linking urban land use, socioeconomic factors, and ecological communities are not fully understood. (Continued next page)

We hypothesized that land use and socioeconomic factors influence local environments, affecting colonizing species and individual survival. To test this, we installed 250 artificial tree holes and ground containers across the Lower Mainland of British Columbia, Canada. After three months, 31 macroinvertebrate species, including 9 introduced species, colonized the containers. We analyzed the direct and indirect effects of urban land use (e.g., impervious surfaces, building density) and socioeconomic factors (e.g., income level, age of residents) on aquatic invertebrates. Piecewise structural equation models showed that urban land use affected the invertebrate community through local factors like water chemistry, quantity, and temperature. Socioeconomic factors influenced species richness, particularly in ground containers. Tree holes had more diverse communities, including taxa typical of forested habitats. Understanding these pathways can help improve biodiversity in urban areas.

Grace Wang, University of British Columbia; Juli Carrillo (UBC).
Title: Real and perceived parasitism risk delays the development of *Drosophila suzukii*
Abstract: Host-parasitoid interactions involve a complex interplay of behaviours across trophic levels that must be exquisitely timed. Understanding the ecology of these interactions requires characterising both the direct and indirect effects of parasitoids on their hosts, both of which may change the developmental timeline and survival likelihood of their hosts. Non-consumptive effects, including fear-induced behaviour, may reduce foraging and delay pupation even when parasitism attempts fail. We explored if olfactory and visual cues from parasitoids, in addition to simulated parasitization attempts, alter the timing of pupation of their hosts. Using the invasive fruit fly, *Drosophila suzukii*, and its natural enemy, *Leptopilina japonica*, we investigated two specific questions: whether parasitism delays the pupation of *D. suzukii* and whether the perceived risks of parasitism negatively impacts the timing of pupation. We further explored specific cues and mechanisms of indirect effects. We found that parasitized *D. suzukii* larvae took longer to pupate under laboratory conditions. Similarly, the perception of parasitism risk delayed pupation and reduced the survival rate of *D. suzukii* even in the absence of successful parasitism. These findings may benefit future research on host-parasitoid dynamics of *D. suzukii* and inform field sampling methods.

Siena Achal, British Columbia Conservation Foundation; Jennifer Heron, BC Ministry of Water, Land and Resource Stewardship.
Title: Nt’ąya kwàta naye uyennjia: Bioblitz of Tatshenshini-Alsek Provincial Park
Abstract: In the far northwestern corner of BC you’ll find the isolated and picturesque Tatshenshini-Alsek Provincial Park. This remote region is known for its complex river system for which the park is named and its highly variable habitat conditions. The limited access into the park has posed as a barrier to creating a thorough inventory of the biodiversity in the region. In July 2024, BC Parks host a bioblitz in Tatshenshini-Alsek Provincial Park. The goal was to build our knowledge base in lesser-known insect taxa, as well as other focal invertebrate and plant taxa. Participants of the bioblitz comprised of biologist specializing in these areas and members of Champagne and Aishihik First Nations. (Continued next page)

The Kluane Bumblebee was one taxa of note, as it is newly described and the only known specimens from BC have come from within Tatshenshini-Alsek Provincial Park. This presentation will detail the main highlights of the bioblitz, lessons learned and future implications of the findings.

Jorge Marcias, Synergy Semiochemicals; Nicole Jeans-Williams (SS); Robert Setter (SS).
Title: On going testing of the efficacy of multiple funnel traps coated with or without fluon
Abstract: Monitoring local woodboring beetle populations allows the assessment of population fluctuations and their potential to cause an impact on stored wood product inventory. This year, a total of 30 baited multiple funnel traps were set up at the Gorman Bros. Lumber Ltd. mill and log storage facility in West Kelowna, BC. The set up contained 10 replicates each of the following 3 baited multiple funnel trap treatments: 1) 6-unit Synergy Multitrap with fluon; 2) 6-unit Synergy Multitrap without fluon; and 3) 12-unit Synergy Funnel Trap II with fluon. A commercial bait was deployed in each trap containing semiochemicals regularly use to catch wood borer insects. The trapping occurred from June 25 -August 7, collecting large numbers of individual belonging to the genus *Monochamus*, and in less quantities bark beetle predators and some Buprestids. An additional 2 collections were made late in the summer and are still being processed.

Paul Fisher, University of British Columbia; Matthew Tsuruda (UBC); Martina Clausen (UBC); Claire Kremen (UBC); Juli Carrillo (UBC).
Title: Parasitoid diversity and richness found in two types of habitat amendments in agricultural land in the Lower Mainland of BC.
Abstract: Parasitoid wasps may have important pest control functions in agroecosystems, however, their diversity is underreported, and few resources exist characterizing natural parasitoid communities. We conducted biodiversity surveys over two growing seasons in distinct agroecosystem types in Delta, British Columbia, Canada. We sampled different hedgerow types along field margins of various crop fields, and fields converted to grassland set-asides. We isolated 2,635 parasitoid wasps from those surveys and identified specimens to genus level, using published keys, museum collections, and other online resources such as Bug Guide and iNaturalist. We excluded the family Ichneumonidae from analysis due to a lack of identification expertise and resources. We found that diversity and genus richness were greater in grassland set-asides compared to conventional farms, and similar in hedgerows compared to standard edges. These findings may indicate that the diversity of agriculturally important parasitoid taxa responds to the restoration of natural habitat elements in agroecosystems.

Sandra Gillespie, University of the Fraser Valley.
Title: Long-term patterns in pathogen prevalence and *Bombus impatiens* spread in the Fraser Valley, British Columbia.
Abstract: In the past decade, North America has seen range contractions and declines of many previously common bumblebee species. Our understanding of the mechanisms behind declines has been hampered by a lack of monitoring data. Within the Fraser Valley bumblebees face multiple potential threats including land use change, pathogens, along with the naturalization and spread of the eastern bumblebee *Bombus impatiens*. (Continued next page)

To address this, we monitored bumblebee populations across seven locations for seven years, documenting community composition and prevalence of the two most common bumblebee pathogens: the microsporidian *Nosema* (or *Varimorpha*) *bombi* and the trypanosome *Crithidia bombi*. We find that (1) *Bombus impatiens* prevalence and abundance has increased over time; (2) prevalence of both the pathogen *N. bombi* and *C. bombi* were high and (3) infection rates varied significantly across species, time and locations, with *Bombus impatiens* showing significantly higher infection of *C. bombi*. These patterns have implications for the potential future impacts of Bombus impatiens on native bumblebees and raise questions about the health and stability of native bumblebee populations in our region.

Bridget White, University of British Columbia; Jonathan Chiang (UBC); Benjamin Matthews (UBC).
Title: Establishing a laboratory colony of *Aedes togoi*, the coastal rock pool mosquito
Abstract: The larvae of *Aedes togoi* are found in rock pools along the coast of the Pacific Northwest in North America and east Asia. Salinity in these coastal rock pools is highly variable and unwelcoming to most mosquito species; however, *Ae. togoi* are unhindered by even extreme salinity levels. This tolerance can be studied and compared to better-studied freshwater mosquitoes, such as *Ae. aegypti*. To research this species in the laboratory, we aim to establish a rearing protocol for *Ae. togoi* by testing field-collected individuals under various conditions. Pupae were collected in June and July 2024 at Lighthouse Park in West Vancouver and emerged in cages in the lab (27°C, 80% RH). Different water types (salt, tap and rock pool) were tested for oviposition preference, larval development time and survival. Preliminary results suggest that rock pool water is preferred for oviposition, however eggs are still laid in tap and saltwater. All water types had high larval survival (>75%). Future work aims to assess larval diet, adult environmental requirements, blood feeding timing and hatching conditions. Figuring out the various conditions needed to establish a colony will enable consistent research on this species, supporting genomic and physiological studies of their environmental tolerances.

Diane Srivastava, University of British Columbia; The Bromeliad Working Group.
Title: Environmental drivers control food web size and shape across the Neotropics
Abstract: Food webs summarize how trophic relationships connect species. The structure of food webs can be affected by energy availability, ecosystem size, temperature or disturbance. Yet, there is no consensus on the relative importance of these four drivers, nor how they may be causally related. In part, this reflects the paucity of datasets where the same system is sampled with the same methods across broad geographic and environmental gradients. We analyze 1046 aquatic food webs from bromeliad phytotelmata in 26 sites throughout the Neotropics. Using structural equation models, we show that food web size (i.e. the number of species and links) increases with local energy inputs and ecosystem size, but decreases in arid climates prone to drought disturbance. Warmer sites also have larger food webs, mediated by host plant size. By contrast, the shape of food webs is strongly affected by regional bioclimates, becoming flatter (i.e. many species distributed among few trophic levels) under low net primary productivity, high temperatures and drought-enhancing climates. (Continued next page)

Thus, the size and shape of food webs are affected by different combinations of environmental drivers at different scales. Understanding these relationships is critical for forecasting how food webs will restructure under global environmental change.

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TAKE OUR COMMUNICATION SURVEY!

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