

160th Annual General Meeting of the Entomological Society of Ontario

October 27–29, 2023
University of Guelph
Guelph, Ontario



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Entomological Society of Ontario 160th Annual Meeting



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Entomological Society of Ontario 160th Annual Meeting



Conference Schedule

Friday, October 27th

- 5:00–7:00 PM** **ESO Board Meeting**
E.C. Bovey Building room 1118
- 5:00–6:30 PM** **Registration table, poster set-up, and oral presentation file submission**
OAC Centennial Arboretum Centre, University of Guelph Arboretum
- 7:30–10:00 PM** **ESO Mixer and registration table**
The Lookout, University Centre 5th Floor

Saturday, October 28th

All events will be held in the OAC Centennial Arboretum Centre

- 7:30–8:50 AM** **Registration, poster set-up, and oral presentation file submission**
- 8:50–9:00 AM** **Welcome message and announcements**
- 9:00–9:30 AM** **Plenary speaker—Dr. Thomas Hossie, Trent University**

Engaging entomology—Making connections to hidden biodiversity

Whether we notice them or not, insects surround us. In many ways, insects are the most accessible form of biodiversity that people can engage with. Indeed, much of their beauty, diversity, and fascinating biology remains hidden from people who don't know when, where, or how to look for them. Through community outreach events, we can destigmatize these animals, showcase their hidden diversity and beauty, and secure prolonged engagement in conservation and community science initiatives. In my talk, I will explore some of the insect-related events and tools we have been using to reignite curiosity and promote engagement with community science.

- 9:30–10:30 AM Student President’s Prize Session: Ecology 1**
Moderator: Joel Kits
- 9:30 Community science supporting novel flower fly research: A case study at the University of Guelph Arboretum
Alice Dabrowski and Andrew D. Young
- 9:45 Variance in malaise trap capture in agroecosystems
Emily Forrester, Andrew D. Young, and Jonathan Schmidt
- 10:00 Past and present *Trichoptera* community structure in the Credit River watershed
Krista Dede Kueviakoe, Kelly Murray-Stoker, and Shannon McCauley
- 10:15 New Jersey tea (*Ceanothus americanus*) range shifts: Implications for mottled duskywing butterfly (*Erynnis martialis*) conservation amidst climate change
Emily Trendos and Ryan Norris
- 10:30–10:45 AM Coffee break and poster viewing**
- 10:45–12:00 PM Student President’s Prize Session: IPM**
Moderator: Cassie Russell
- 10:45 Along came RNAi: Evaluating the effects of lethal lepidopteran dsRNA on a non-target coleopteran insect
Kaitlyn Ludba, Brent J. Sinclair, and Cam Donly
- 11:00 Investigating the efficacy of male aggregation pheromone and volatile organic compound combinations for attraction of adult Colorado potato beetle
Andrew Colton, Angela E. Gradish, and Rebecca H. Hallett
- 11:15 Validating degree day (DD) models for predicting European corn borer (*Ostrinia nubilalis* Hübner) phenology and voltinism
Jenna Straughan, Yasmine Farhan, Rebecca Hallett, and Jocelyn Smith
- 11:30 Validation of the degree day prediction models for the flight patterns of western bean cutworm, *Striacosta albicosta* (Smith; Lepidoptera: Noctuidae), in Ontario, Canada
Josée Kelly, Chris Gillard, Jocelyn Smith, and Yasmine Farhan
- 11:45 Modernizing the economic threshold for true armyworm, *Mythimna unipuncta*, in wheat in Ontario, Canada
Natasha Weppeler, Yasmine Farhan, David Hooker, and Jocelyn L. Smith
- 12:00–1:00 PM Lunch**

- 1:00–2:30 PM Student President’s Prize Session: Ecology 2**
Moderator: Rebecca Hallett
- 1:00 Cannibalism facilitated by parasite infection induces dispersal in a semi-aquatic insect
Nicole Regimbal and Celina Baines
- 1:15 A thorn in the side of cricket farming – how do dermestid beetles (*Dermestes ater* DeGeer) affect tropical house crickets (*Gryllobates sigillatus* Walker)?
Matthew J. Muzzatti, Marshall W. Ritchie, Emilie C. Bess, Sue M. Bertram, and Heath A. MacMillan
- 1:30 How do frozen crickets maintain mitochondrial function?
Stefane Saruhashi, Soren Z. Coulson, James F. Staples, and Brent J. Sinclair
- 1:45 Upper lethal temperature of the world’s most destructive locust *Schistocerca gregaria*, across three life stages
Arani Y. Cuevas-Sanchez, Sarah Hilal, Taylor Simons, Spencer T. Behmer, and Gregory A. Sword
- 2:00 Examining the effect of road salt on mosquito oviposition choice across an urban-rural gradient
Sherry Du, Sydney Chong-King, and Rosalind L. Murray
- 2:15 The impacts of two commonly used road salts on the colonization of aquatic ecosystems by backswimmers (Notonectidae) and other macroinvertebrates
Silas L. Peters, Shannon J. McCauley, and Rosalind L. Murray
- 2:30–2:45 PM Coffee break and poster viewing**
- 2:45–4:00 PM Student President’s Prize Session: Behaviour and feeding ecology**
Moderator: Sabrina Rondeau
- 2:45 Mating pool return rates and direction of sexual selection in a role reversed dance fly
Tolulope Babalola and Rosalind Murray
- 3:00 Chironomidae (Diptera) show predictable behaviour patterns associated with aging and mortality
Hannah Bodmer, Corrie Nyquist, Bruce Vondracek, and Leonard C. Ferrington Jr.
- 3:15 Newly reported behaviour: Direct kleptoparasitism in yellowjackets (Vespidae: *Vespula*)
Savannah Lindsay Burroughs, Morgan Douglas Jackson, and Jessica Paula Gillung

3:30 Beyond growth: The impact of diet on full-body composition in the tropical house cricket *Gryllobates sigillatus*
Cassandra C. Stabile, Fouzia Haider, Matthew J. Muzzatti, Sue M. Bertram, and Heath A. MacMillan

3:45 Eating yeasts makes flies wake up faster
Yanira Jiménez-Padilla, Marc-André Lachance, and Brent J. Sinclair

4:00–4:45 PM ESO Annual General Meeting

4:45–6:30 PM Poster session and break

Student President's Prize Posters (P1–P14)

P1 Documenting arthropod diversity in a new Land Trust in southern Quebec
Savannah Lindsay Burroughs, Catherine Scott, and Christopher Buddle

P2 Predatory and pest mites in Ontario and Quebec hops
Jason Carter, Fred Beaulieu, Melanie Filotas, Evan Elford, Julien Venne, and Justin Renkema

P3 The influence of environmental factors on predatory mite (Mesostigmata) communities in Ontario's peatlands.
Pedro Conceição and Zoë Lindo

P4 Investigating relationships between edge proximity, light availability and herbivory in *Monarda fistulosa*
Naveen David and Benjamin Gilbert

P5 Utilizing entomopathogenic nematodes with Bt corn hybrids to control corn rootworm, *Diabrotica* spp.
Tuesday Kristiansen, Yasmine Farhan, David Hooker, and Jocelyn Smith

P6 Landscape-level variation in the diversity of insect pollinators across the cranberry agro-ecosystem in Québec
Catherine Woo-Durand, Morgan Jackson, Jessica Gillung, Jade Savage, and Chris Buddle

P7 It's a bug-eat-bug world: Preliminary assessment of two *Dicyphus* species (Hemiptera: Miridae) for their potential use as biological control agents on greenhouse crops
Carly Demers, Sherah VanLaerhoven, and Rose Labbé

P8 Pyrochroidae (Coleoptera) of Ontario: A photographic key and new records
Dawson Skelton and Andrew Young

- P9 The effects of urbanization on *Rhamphomyia longicauda* nuptial gifts and operational sex ratio across an urban gradient
Dominik Jaworski, Gurmukh Gidda, and Rosalind Murray
- P10 Exploring the diversification of an exotic ant species across the Galápagos Islands
Fangming Teng, María C. Tocora, Gianpiero Fiorentino, Henri W. Herrera, and Megan E. Frederickson
- P11 Spatial and temporal dynamics of soybean gall midge in infested field soil
Mikaelison da Silva Lima, Taynara Possebom, Debora Goulart Montezano, Julie Peterson, Robert Wright, Thomas Hunt, and Anthony Justin McMechan
- P12 Prioritizing Indigenous knowledge, values and community outreach in species-at-risk plant-pollinator surveying
Natasha Hirt, Theodore Flamand, Andrew Young, and Jesse Popp
- P13 Assessing risk: Locusts hear birds
Romy Chu, Emma MJ McAllister, and Jeff W. Dawson
- P14 *Solidago canadensis* host density, fragmentation, and composition of herbivorous arthropods
Shahd Daoud and Benjamin Gilbert

Regular Posters (P15–P22)

- P15 Myriapods of the Lyman Entomological Museum: New centipede records for British Columbia and Quebec
Claire Dominici-Tiranti, Morgan D. Jackson, Christopher M. Buddle, and Jessica P. Gillung
- P16 Assessing the ecological interactions between invasive and endemic species of gall midge pests of canola
Rebecca H. Hallett, Graham R. Ansell, and Angela E. Gradish
- P17 How oxidative stress impacts the relationship between Canada goldenrod (*Solidago canadensis*) and its parasite, the goldenrod gall fly (*Eurosta solidaginis*)
Su Hyun (Elizabeth) Ko
- P18 Efficacy of miticides against cyclamen mite (*Phytonemus pallidus*) in strawberry
Tara Preston and Justin Renkema
- P19 Who where and when? Reproductive biology and field activity of members of the seedcorn maggot complex in Québec
Jade Savage, Allen Bush-Beaupré, Anne-Marie Fortier, François Fournier, Hervé Van der Heyden, and Marc Bélisle

P20 Ecology of introduced candy-striped spiders in North America: Contributions from community scientists
Catherine Scott and Sean McCann

P21 Susceptibility of short-day strawberry cultivars to cyclamen mite (*Phytonemus pallidus*)
Erica Pate, Justin Renkema, Rebecca Hallett, and Valérie Fournier

P22 Diversity of electroretinogram responses in insects: A measure of visual performance
Angelique Bernard, Emma MJ McAllister, Aisha Modibbo, Falisha Para, Madena Sherzad, and Jeff W. Dawson

6:00–7:00 PM **Cash bar**

7:00–10:00 PM **Banquet**

8:00–8:45 PM **Banquet speakers—Dave K.B. Cheung and Marvin Gunderman, Bugdex**

Bugdex unveiled: An exclusive behind-the-scenes glimpse into the ultimate interactive beginners' guide to insects

Bugdex is a captivating fusion of photography, graphic design, interactivity, and the fascinating world of entomology, all seamlessly blended to create a cutting-edge educational tool. Embrace the future of education in entomology with this incredible free mobile app! At its core lies a meticulously illustrated dichotomous key, enriched with interactive components that are set to revolutionize the way introductory entomology courses are taught. Join us on this exclusive behind-the-scenes tour and discover the story behind Bugdex. Get an up-close look at the novel animation techniques and alluring user-friendly designs that are bringing Bugdex to life.

8:45–9:15 PM **Awards**

Sunday, October 29th

All events will be held in the OAC Centennial Arboretum Centre

8:30–9:45 AM **Regular Talks: Community Science Session**
Moderator: Aleksandra Dolezal

8:30 Beyond surveillance: Exploring the full potential of the eTick platform
Jade Savage

8:45 Mystical Manitoulin monarchs
Joseph D. Shorthouse and Marilyn R. Shorthouse

- 9:00 Benthic macroinvertebrates as bioindicators: Harnessing community science for ecosystem monitoring
Kaitlyn Fleming
- 9:15 Mission Monarch—Expert, a new component of the Mission Monarch program
Julia Meyer, Charles-Étienne Ferland, André-Philippe Drapeau Picard, Alessandro Dieni, Sonya Charest, Michel Saint-Germain, Elisabeth Shapiro, Maxim Larrivée
- 9:30 Leveraging community science for large-scale monitoring of insect pollinators: Insights from *Abeilles citoyennes*
Sabrina Rondeau, Amélie Gervais, Anne Leboeuf, Frédéric McCune, and Valérie Fournier
- 9:45–10:00 AM Coffee break**
- 10:00–12:00 PM Regular Member Talks**
Moderator: Graham Ansell
- 10:00 Shift in climate, shift in selection: Experimentally elevated temperatures intensify directional selection on gall size in the goldenrod gallfly system
Colin Bonner, Thomas Powell, and **Arthur E. Weis**
- 10:15 *Vespa tropica* in Guam: An unfolding invasion
Gard W. Otis, Heather R. Mattila, and Christopher Rosario
- 10:30 The tip of the taxonomic iceberg in your backyard: From *sordipes* in your compost heap to 57 new species
Gregory K. Kuwahara and Stephen A. Marshall
- 10:45 Honey bee stressors everywhere all at once
Sarah French, Mateus Pepinelli, Ida M. Conflitti, Heather Higo, Julia Common, Miriam Bixby, Elizabeth Walsh, Marta Guarna, Stephen Pernal, Shelley Hoover, Robert Currie, Pierre Giovenazzo, Ernesto Guzmán-Novoa, Daniel Borges, Leonard Foster, and Amro Zayed
- 11:00 Are fleas truly scorpionflies: Advances in bioinformatics facilitate a new phylogenetic hypothesis of Siphonapteran and Mecopteran relationships
Kevin Michael Moran, Ashton Pooley, Michael Valentine, Christoph Mayer, and Jeffrey Skevington
- 11:15 A hypothesis-driven approach to understanding insect freeze tolerance
Brent J. Sinclair
- 11:30 Leafhoppers (Hemiptera: Cicadellidae) of Ontario's far north
Joel H. Kits and David V. Beresford
- 11:45 A revision of the genus *Latheticomyia* (Cypselosomatidae, Diptera)
Tiffany Yau and Stephen A. Marshall

12:00–12:15 PM Closing remarks

Conference Abstracts

Alphabetical by presenting author

Mating pool return rates and direction of sexual selection in a role reversed dance fly

Tolulope Babalola* and Rosalind Murray

*University of Toronto, tolu.babalola@mail.utoronto.ca

Operational sex ratios (OSR) can be utilized in predicting the direction of mating competition. In gonochoric species, time spent in the mating pool also indicates mate competition. Past work has shown that the sex that spends less time waiting to mate in the mating pool should be the sex with lower competition for access to mates, experiencing less pre-copulatory sexual selection. *Rhamphomyia longicauda*, a dance fly with female-biased OSR, relies on male-provided nuptial gifts for egg maturation. We conducted a capture–mark–recapture study to assess return times to the mating pool. Females returned every 3.31 days, 38% faster than males (4.58 days). Despite a sex-role-reversed mating system, our findings align with mating pool theory. Females, under stronger selection pressure, return sooner, which is consistent with stronger mate competition. Our results show how theories developed for conventional mating systems apply to unconventional systems.

Diversity of electroretinogram responses in insects: A measure of visual performance

Angelique Bernard*, Emma MJ McAllister, Aisha Modibbo, Falisha Para, Madena Sherzad, and Jeff W. Dawson

*Carleton University, angeliqueBernard@cmail.carleton.ca

Vision is a critical sensory ability for many terrestrial and volant insect species. Visual performance, such as how rapidly, and how much, an eye responds to changes in light intensity are reflective of the behavioural ecology of an insect and are easily characterized using electroretinography. Electroretinograms are an extracellular physiological recording capturing the collective electrical response of several photoreceptors in the vicinity of a recording electrode. Our objective was to use this relatively simple technique to characterize responses of African migratory locusts, in solitary and gregarious phases, to different light intensities, after different periods of dark-adaptation, and at different instars of development. We also measured the critical flicker fusion frequency of the eyes of select wild-caught insect species. Critical flicker fusion frequency is the minimum frequency at which a flickering stimulus is perceived as continuous and is used to evaluate visual temporal processing.

Chironomidae (Diptera) show predictable behaviour patterns associated with aging and mortality

Hannah Bodmer*, Corrie Nyquist, Bruce Vondracek, and Leonard C. Ferrington Jr.

*University of Toronto, hannah.bodmer@mail.utoronto.ca

Chironomidae are one of the most abundant aquatic insects in freshwater habitats and play key roles in aquatic ecosystems. Many studies have measured chironomid longevity under varying conditions to estimate the impacts of climate change. However, these studies have failed to account for fitness losses that may occur in the wild, such as an inability to find a mate or return to the water to oviposit. Longevity estimates may therefore underestimate the effects of climate change on chironomids by neglecting behaviour-related fitness losses. We used previously identified chironomid behaviours to determine how behaviour patterns changed as chironomids aged. We found that chironomids exhibited age-related behaviours that correlated with a decrease in mobility over time. These findings improve our understanding of how climate change impacts chironomids and their ability to survive and reproduce, which has broad ramifications for the aquatic ecosystems where they are abundant.

Newly reported behaviour: Direct kleptoparasitism in yellowjackets (Vespidae: *Vespula*)

Savannah Lindsay Burroughs*, Morgan Douglas Jackson, and Jessica Paula Gillung

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Yellowjacket wasps are known opportunistic scavengers, they feed from anthropogenic and natural sources alike, generally in search of carbohydrates and protein. As predators of honey bees, their habits and behaviours are well documented. However, we present a newly documented scavenging behaviour: kleptoparasitism, the theft of a resource that requires energy to collect. Though yellowjackets have demonstrated kleptoparasitism by stealing unattended prey from a spider-web and thieving honey from bees, no such records show yellowjackets kleptoparasitising by its classic definition: directly and forcefully stealing prey. We present the theft and dismemberment of a honey bee by a German yellowjacket from an assassin bug. Photographic evidence of a similar instance of kleptoparasitism by a western yellowjacket posted on iNaturalist suggests that direct kleptoparasitism may be more common than currently understood and potentially conserved across the genus *Vespula*. These records highlight the value of making natural history observations for making new discoveries.

Documenting arthropod diversity in a new Land Trust in southern Quebec

Savannah Lindsay Burroughs*, Catherine Scott, and Christopher Buddle

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Insects and spiders are critical components of nearly every terrestrial ecosystem on earth; they are predators, prey, pollinators, decomposers, and more. Establishing an insect and spider biodiversity baseline in a new area is a crucial step in informing land management and conservation efforts. Here, we aim to document the biodiversity of ground-dwelling arthropods and pollinating insects using active and passive sampling in three major habitats in the newly established Creek 53 Conservancy Trust, located in the town of Hudson, Quebec. Some surveys of the vegetation and animals in the area have been conducted (birds, some plants, some reptiles). We add to that information showing a first glimpse into the arthropod biodiversity of this largely undocumented 250 hectare watershed, focusing on old field, deciduous and mixed forest habitats. The biodiversity inventory we create will facilitate the conservation of vulnerable species and provide a foundation for future research in this conservation area.

Predatory and pest mites in Ontario and Quebec hops

Jason Carter*, Fred Beaulieu, Melanie Filotas, Evan Elford, Julien Venne, and Justin Renkema

*Agriculture and Agri-Food Canada, London Research and Development Centre–Vineland Campus, jason.carter@agr.gc.ca

Hops are grown commercially on 81 ha in Ontario and 59 ha in Quebec. Spider mites are pests of hops, feeding on leaves and cones and lowering harvest quality. Naturally occurring predatory mites may control spider mites, but species occurring in hopyards are not well-known. Leaf (basal and 2m height) and cone samples were collected on 3 dates in 2022 from 20 locations in 9 hopyards in Ontario and Quebec and mites recovered for identification. Spider mites were *Tetranychus urticae* (97%) and *T. schoenei* (3%). *Neoseiulus fallacis* and *Galendromus occidentalis* were the most abundant of 7 predatory mite species. There were more spider mites in samples collected from hopyard interiors than edges in June and July but vice versa in August. There were more predatory mites in edge than interior samples in August. In June, there were more spider mites in basal than 2m samples, but in July and August there were more spider mites on 2m. There were more predatory mites on 2m than cone samples in August.

Assessing risk: Locusts hear birds

Romy Chu*, Emma MJ McAllister, and Jeff W. Dawson

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There is a lack of empirical evidence supporting the hypothesis that insects use hearing to eavesdrop on the calling sounds of avian predators. Using electrophysiological recordings from the auditory nerve of African migratory locusts, and high-speed cinematographic observations of locusts in tethered flight, we show that

locusts are able to hear the calling sounds of both sympatric and allopatric insectivorous bird species, and sympatric non-insectivorous bird species. Neurophysiological recordings showed robust responses to the calling songs of birds, and kinematic analyses showed postural and wing-kinematic adjustments consistent with avoidance flight behaviour. We show that the ears of both solitary and gregarious phase locusts are broadly tuned to frequencies below 20 kHz. These observations are consistent with the hypothesis that locusts may use their ears to assess potential risk of predation from birds.

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

Andrew Colton^{*}, Angela E. Gradish, Rebecca H. Hallett

^{*}School of Environmental Sciences, University of Guelph; coltona@uoguelph.ca

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.

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

Pedro Conceição^{*} and Zoë Lindo

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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 Mesostigmata 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.

Upper lethal temperature of the world's most destructive locust *Schistocerca gregaria*, across three life stages

Arani Y. Cuevas-Sanchez^{*}, Sarah Hilal, Taylor Simons, Spencer T. Behmer, and Gregory A. Sword

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The desert locusts *Schistocerca gregaria*, are one of the world's most destructive insect pests. When their numbers are low, they display solitary behaviour and are considered harmless. However, when conditions are right, rapid population increases can drive a density-dependent transition to gregarious swarming behaviour. Currently, very little is known about the thermal physiological limitations of the desert locust even though they often exist in extreme thermal environments. This study determined the upper lethal temperature of 50% of a population across three different life stages: second instar nymphs, final instar nymphs, and reproductively mature adults. In this study we demonstrate the importance of conducting assays that take into consideration physiological limitations across ontogeny.

Spatial and temporal dynamics of soybean gall midge in infested field soil

Mikaelison da Silva Lima^{*}, Taynara Possebom, Debora Goulart Montezano, Julie Peterson, Robert Wright, Thomas Hunt, and Anthony Justin McMechan

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Soybean gall midge (SGM), a newly identified species in 2019, poses a significant threat to soybean crops across four midwestern U.S. states, causing dark discoloration and necrosis in affected plants. Severe infestations near field edges can result in a staggering 100% yield loss within 30 meters. To address critical knowledge gaps in SGM biology and ecology we conducted comprehensive field studies to assess its temporal and spatial abundance within infested field soil. The results revealed that immature SGM, comprising 96.2% of specimens, predominantly inhabited the top six centimeters of soil, with a majority (75.5%) concentrated in the top two centimeters. Temporal assessments showcased variations in SGM population dynamics among fields and collection dates throughout each growing season. These findings provide essential insights into the spatiotemporal dynamics of SGM in soil, laying the groundwork for future research and aiding the development of management strategies to mitigate SGM-induced damage to soybean crops.

Community science supporting novel flower fly research: A case study at the University of Guelph Arboretum

Alice Dabrowski^{*} and Andrew D. Young

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Community science programs strengthen biodiversity data collection. Flower flies (Diptera, Syrphidae), or syrphids, are a charismatic family of bee and wasp mimicking flies best known for their pollination services. As demonstrated in the UK, flower flies are an ideal model insect for ongoing and future community science efforts. We use the University of Guelph Arboretum as a case study to examine the benefits of including a community science approach in syrphid biodiversity studies. Analysis comparing institutional datasets to iNaturalist observations, as well as independent collections, reveals significant potential for public-led knowledge generation of syrphid ecology in the region. Unlike passive trapping methods used in formal studies (i.e., Malaise traps), community science images are capable of documenting floral associations, key tri-trophic interactions, and multiple syrphid life-stages throughout the active season. Including community science data generates critical knowledge for understudied larvae, contributes to identification resources, and enhances syrphid ecology data.

***Solidago canadensis* host density, fragmentation, and composition of herbivorous arthropods**

Shahd Daoud^{*} and Benjamin Gilbert

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Understanding the intricate relationships between host plant characteristics, habitat fragmentation, and herbivorous arthropod communities is crucial for ecosystem management and conservation efforts. This study investigates how variations in *Solidago canadensis* (Canadian Goldenrod) plant density and habitat fragmentation influence the abundance, ecological impact, and species composition of herbivorous arthropods. Field surveys were conducted in research fields to assess these dynamics. Impacts were assessed through various herbivory and insect population dynamics measures. Findings will contribute to a more comprehensive understanding of the impacts of anthropogenic landscape alterations on terrestrial ecosystems and can inform strategies for effective biodiversity conservation and ecosystem management.

Investigating relationships between edge proximity, light availability and herbivory in *Monarda fistulosa*

Naveen David^{*} and Benjamin Gilbert

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As human activity drives habitat fragmentation, the exact mechanisms through which edge formation drives increased insect herbivory remain somewhat unclear. One potential mechanism is that increased light availability at habitat edges results in increased herbivory, which can impair plant reproductive abilities. This may have deleterious subsequent ecological effects in the common flowering plant *Monarda fistulosa*, which is

known to be important to native pollinators. This study aimed to investigate whether *Monarda fistulosa* herbivory increased closer to edges, and whether this potential increase could be explained by differences in light availability. Herbivory, light availability, and edge proximity data were collected in a previously established, highly fragmented tallgrass prairie environment and analysed in R to determine associations. While insect herbivory increased with proximity to the edge, light availability was not determined to be a causal mechanism. Further research is needed to explore other causal mechanisms and whether they vary across different ecosystems.

It's a bug-eat-bug world: Preliminary assessment of two *Dicyphus* species (Hemiptera: Miridae) for their potential use as biological control agents on greenhouse crops

Carly Demers*, Sherah VanLaerhoven, and Rose Labbé

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Greenhouse production in Canada faces challenges from established and introduced pests. Traditional chemical control methods are often unsuccessful due to insecticide resistance and the use of beneficial insects, therefore diversifying pest control tools is crucial. *Dicyphus hesperus*, a native biological control agent (BCA), is already used in Canadian greenhouses. Recently, two unexplored species, *Dicyphus discrepans* and *Dicyphus famelicus*, were collected locally and bred for research at Agriculture and Agri-Food Canada's Harrow Research and Development Centre. This study examines their potential to control greenhouse whiteflies, green peach aphids, and two-spotted spider mites. It also assesses how supplemental plant and insect prey affect the longevity and fecundity of these predators. This research, alongside large-scale greenhouse trials, aims to establish the effectiveness of these predators in pest management for tomatoes and strawberries. Implementing these *Dicyphus* species as BCAs will expand the arsenal of natural enemies for controlling economically significant pests.

Myriapods of the Lyman Entomological Museum: New centipede records for British Columbia and Quebec

Claire Dominici-Tiranti*, Morgan D. Jackson, Christopher M. Buddle, and Jessica P. Gillung

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Myriapod research in Canada has stalled over the past 50 years, and very little progress is being made to develop knowledge of the subphylum. Recent studies suggest that half of the Canadian myriapod fauna remains to be documented, several branches of the taxonomy need revision, and research linked to their behaviour is still lacking. A review of myriapod knowledge reveals that information about myriapod fauna is still lacking for several Canadian provinces, and general knowledge about them in Canada is missing. The curation of the myriapod collection hosted in the Lyman Entomological Museum yields new records for Quebec and British Columbia. The use of community science for improving knowledge of myriapods in Canada is limited, however can prove insightful for future directions into Canadian myriapodology.

Examining the effect of road salt on mosquito oviposition choice across an urban-rural gradient

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While road salt is vital for maintaining road safety, salinization promotes salt-tolerant taxa, like disease vector-carrying *Culex* sp. mosquitoes. To maximize offspring survival, female mosquitoes must choose suitable habitats to lay their eggs (i.e. oviposition site choice). Experts suggest that females may prefer salinized areas due to a lack of competitors/predators. However, because salt use varies depending on road density, whether all mosquito populations will respond the same way to salt remains unclear. We manipulated mesocosm salt concentrations (0 g/L or 4.5 g/L) across an urban-rural gradient in the Greater Toronto Area. We measured oviposition behaviour by counting the number of *Culex* sp. egg rafts. We hypothesize that urban mosquitoes will show a greater preference to salt than rural mosquitoes since the high salinity treatment may mimic their natal environment. Understanding how salinization influences female investment strategies will help guide road salt management and urban pest control.

Benthic macroinvertebrates as bioindicators: Harnessing community science for ecosystem monitoring

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Community-based research is pivotal in fostering a deeper understanding of the natural world. In the realm of entomology, community science, applied to the study of benthic macroinvertebrates, exemplifies the significance of engaging local communities in scientific exploration. Community-based research leverages the expertise and knowledge of local residents, bridging the gap between scientific inquiry and on-the-ground observations. This collaborative approach empowers communities to participate in scientific discovery and yields valuable data for monitoring water quality and ecological integrity of lakes. Community-based research of benthic macroinvertebrates offers a multifaceted benefit. It fosters environmental stewardship among citizens and lake associations, enhances scientific investigations, and ultimately contributes to preserving and restoring aquatic ecosystems.

Variance in malaise trap capture in agroecosystems

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Malaise traps are a commonly used method for sampling flying insect biodiversity and are becoming more prominent in ecological research. These traps catch a large amount of the insect population present, but they are a costly option and produce large amounts of bycatch when studying only specific groups. Due to these considerations, common practice has been to set up a single trap to sample insect populations per location. When the traps are used to study population abundances for ecological purposes, understanding the variance among Malaise traps when placed at a site would inform decisions regarding the sample size necessary to capture a reliable estimate of the insect population present. My study investigates the variance in pollinating insects captured by multiple Malaise traps placed along a single agricultural field margin using pollinating Diptera and Hymenoptera families. This is replicated across multiple crop types in Southern Ontario.

Honey bee stressors everywhere all at once

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Honey bees are valuable pollinators of crops but can be exposed to a deadly array of stressors. To tease apart the drivers of colony loss, we used network approaches to model the complex stressor environments that colonies experience in the field. Experimental colonies were placed near 8 focal crops across Canada and sampled for multiple stressors across 2 seasons. We found 53 stressors in total, including parasites, pathogens, and pesticides. More stressors were found in colonies after exposure to crops, which resulted in more complex networks of stressors. Stressor networks diverged substantially among focal crops, with pesticides tending to be the most influential and important stressors in each network. Our study highlights the differential risks that honey bees are exposed to among crop types, as well as the growing need to manage multiple stressors at once to improve honey bee health.

Assessing the ecological interactions between invasive and endemic species of gall midge pests of canola

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The swede midge (SM), *Contarinia nasturtii*, is an invasive pest of brassicaceous crops established throughout eastern Canada. The canola flower midge (CFM), *Contarinia brassicola*, is an apparently endemic species first detected in 2016 and distributed throughout the canola-growing regions of western Canada. In 2021, CFM was first detected in Ontario and is found throughout the province. Galled flowers are the only observed damage symptom of CFM infestation of canola, while SM causes a variety of damage symptoms depending on plant

stage. The co-occurrence of these two species in Ontario and their ecological interactions have implications for pest management. Our objectives are to determine the phenology and abundance of CFM in Ontario canola, and to determine the abundance and location of CFM and SM larvae on canola plants. If these congeners co-occur in canola fields and on individual plants, further research will investigate the specific nature of interactions between these species.

Prioritizing Indigenous knowledge, values and community outreach in species-at-risk plant-pollinator surveying

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My research seeks to understand pollinator relationships with medicinal, rare, and species-at-risk plants within Wiikwemkoong Unceded Territory (WUT), working in collaboration with Anishinaabe Elders and knowledge holders from the community Species-at-Risk Committee. The project is in the process of developing a minimally invasive and culturally appropriate plant-pollinator monitoring protocol that will allow the community to monitor pollinator diversity beyond the duration of this project. A primary goal of the research is to evaluate methods of engaging Indigenous youth in pollinator research through land-based learning, and participation in reflective activities such as photography and journaling. Fostering meaningful connections between youth and the land and encouraging their understanding of interconnectedness from an Indigenous worldview is an essential step toward Truth and Reconciliation. The project has completed its first field season, which primarily consisted of relationship building with knowledge holders, consultation with the community Species-at-Risk Committee, and leading community engagement initiatives with youth.

The effects of urbanization on *Rhamphomyia longicauda* nuptial gifts and operational sex ratio across an urban gradient

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Rapid city expansion can change biodiversity. The sex role reversed dance fly species *Rhamphomyia longicauda* is distributed across an urban gradient. *R. longicauda* females are ornamented and swarm at dusk and dawn, where males present prey (nuptial gifts) to females at the time of copulation. Mating in this species is strictly seen within the context of mating swarms, allowing for easy measurement of the operational sex ratio (OSR; the proportion of males and females available to mate at a given time). Females compete for access to these nutritious nuptial gifts, whereas males are the choosy sex. We aimed to measure the OSR of swarms and biodiversity of nuptial gifts across three sites of varying urbanization. We observed female biased OSRs, greater diversity, and lower mass of prey in rural and semi-urban sites. Whereas in the urban site, the OSR was male biased, had less prey diversity, and high mass prey.

Eating yeasts makes flies wake up faster

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The insect gut is host to a diverse community of microbes, including bacteria, fungi, archaea, and protists. This gut microbiota affects host development, immune responses, metabolism, and even behaviour. *Drosophila melanogaster* possesses a relatively simple gut microbial community mainly composed of bacteria and yeast. Yeasts are often provided to flies as nutrients, but their role in the gut microbiota is not well understood. I rear axenic (free of microbes) and gnotobiotic (with a known yeast species) flies to characterize the effects of single yeast species on host cold tolerance. Using four species of yeasts (*Saccharomyces cerevisiae*, *Pichia kluyveri*, *Lachancea kluyveri*, and *Pichia nakasei*), I showed that female flies (but not males) that eat yeast 'wake up' faster from cold-induced paralysis (chill coma) compared to axenic flies. This effect is yeast-species specific and only when the yeasts are alive, suggesting an interaction with the host that is not purely nutritional.

Validation of the degree day prediction models for the flight patterns of western bean cutworm, *Striacosta albicosta* (Smith; Lepidoptera: Noctuidae), in Ontario, Canada

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Western bean cutworm (WBC; *Striacosta albicosta* (Smith; Lepidoptera: Noctuidae)) is a univoltine Arizona pest that has expanded its range into Canada over the past decades resulting in injury in corn (*Zea mays* L.) and dry beans (*Phaseolus* spp. L.). Existing degree day (DD) models are available to predict WBC moth flight but have consistently predicted peak flight too late in Ontario. Weekly catch and daily temperature data was collected from 978 pheromone traps and 23 weather stations across Ontario from 2019–2022. Data were used to compare two existing and three revised DD models to predict first and peak WBC flight. The best approximating model in Ontario was found to have a 1 Mar start date, 3.3°C and 23.9°C lower and upper thresholds, respectively, and incorporated region, crop, year, and Julian date into the model. Predictions for first and peak catch in five corn and dry bean regions were calculated.

Leafhoppers (Hemiptera: Cicadellidae) of Ontario's Far North

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Ontario's Far North is a vast region with very little historical survey effort for insects. The diversity and distribution of leafhoppers in this area is almost entirely unknown. To begin filling this gap, we examined over 2400 leafhopper specimens from the Far North, mostly collected as part of the Ontario Ministry of Natural Resources and Forestry's Far North Biodiversity Project. From this material we identified 117 species or morphospecies, the majority of which were not previously known from the Far North. Important records include apparent new species, new Ontario records, large range extensions, and specimens of rarely collected species. All species recorded are considered native to North America, in contrast to southern Ontario where many of the most frequently encountered leafhopper species are adventive. This data provides a valuable baseline inventory for a poorly known area with little anthropogenic impact.

How oxidative stress impacts the relationship between Canada goldenrod (*Solidago canadensis*) and its parasite, the goldenrod gall fly (*Eurosta solidaginis*)

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Previous studies have investigated oxidative stress and its impacts on a healthy plant; however, there are limited studies on how goldenrod gall fly (*Eurosta solidaginis*) can cause changes to the oxidative stress of their host plant, Canadian Goldenrod (*Solidago Canadensis*). This paper investigates catalase in plant leaves, benefactor of the catalase, chlorophyll levels and salicylic acid (SA). Moreover, how different time and alternating temperatures affects the oxidative stress of the larvae. The results did not present significant difference of catalase, cell death, SA levels between leaves that were collected at infected site and the adjacent site from an uninfected plant. Total chlorophyll levels were nearly different between the infected and uninfected plants. The plant induces mechanisms to protect from damaging effects of Reactive Oxygen Species (ROS) however, decreases the plant defense mechanism of using SA. Longer time (one week rather than two days) exposed in -18°C to interchangeably sub-zero temperatures spiked the catalase activity.

Utilizing entomopathogenic nematodes with Bt corn hybrids to control corn rootworm, *Diabrotica* spp.

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The Ontario corn (*Zea mays* L.) industry needs an additional tactic to manage corn rootworm (CRW; *Diabrotica* spp. (Coleoptera: Chrysomelidae)). Entomopathogenic nematodes (EPNs) are an appealing biological control method due to the prevalence of resistance to *Bacillus thuringiensis* (Bt) toxins in transgenic corn, and the impracticality of crop rotation and soil-applied insecticides for some growers. It was hypothesized that

inoculation of soil with three EPN species would reduce CRW root injury in continuous corn situations. The objective was to evaluate the efficacy of EPNs at controlling CRW in conjunction with Bt corn hybrids and to determine the economic return for a grower. EPN efficacy was determined by an analysis of nodal root injury, and nematode persistence in the soil during years of study. Utilizing EPNs as a novel mode of action for CRW will lengthen the viability of Bt events and provide sustainable yield protection for the Canadian corn industry.

Past and present Trichoptera community structure in the credit river watershed

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This study tests how the diversity of the primarily aquatic insect order Trichoptera (Caddisfly) varies across the Credit River Watershed in the 1950s up until the present decade. Diversity was assessed using raw species richness, as well as the Shannon-Wiener index for species richness and evenness. Due to the varying levels of urbanization over the last seven decades and that exist between sites, it was possible to test how caddisfly communities have changed: whether they showed resilience or were negatively affected by these changes. Caddisflies are an ideal study organism because they have been shown to have varying sensitivities to pollution. The ethanol-preserved caddisfly samples for this study were taken from the Royal Ontario Museum Entomology collection, collected by Glen B. Wiggins in the 1950s. The samples from 2019 were collected by Kelly Murray-Stoker from the same collection sites. Data from between 1999 and 2022 used for this study were collected by the Credit Valley Conservation. This paper will help characterize the past and present Credit River Caddisfly community which can be used to develop the knowledge we have about long-term community change in Trichoptera of the same community in the present.

The tip of the taxonomic iceberg in your backyard: From *sordipes* in your compost heap to 57 new species

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The sphaerocerid genus *Sclerocoelus* Marshall was originally described for one very common species, *Sclerocoelus sordipes* (Adams) found throughout eastern North America. In Canada, this species has been found from Manitoba to Nova Scotia, usually associating with dead plant material such as leaf piles on the forest floor or even lawn clippings in the suburbs. In 1997, Marshall described six new species from Central and South America. In this project, some thirty years since *Sclerocoelus* was first described, we add 48 new Nearctic and Neotropical species to the group and provide three new combinations, bringing the total number of species to 58. In this presentation, we will discuss the story of *Sclerocoelus*, how a monotypic North American genus ballooned into one of the largest genera of Sphaeroceridae in the world, and how Canadian species can influence the study of biodiversity around the globe.

Along came RNAi; Evaluating the effects of lethal lepidopteran dsRNA on a non-target coleopteran insect

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RNA interference (RNAi) is a promising alternative to conventional chemical insecticides. While this technology has previously boasted to be pollinator safe due to high sequence specificity, assumed to be integral to RNAi's function, testing on off-target insects has generally focused on mortality and gene expression effects. However, I believe this strategy may be too broad and overlooks some potential issues posed by this technology. By feeding the RNAi susceptible Colorado potato beetle (*L. decemlineata*) double-stranded RNA designed from the tobacco hornworm (*M. sexta*), I have shown there are adverse effects to the beetle, despite no effect on mortality. Physiological measurements such as mass, water, lipid, and protein content were all measured, as well as fecundity and gene expression. These results will hopefully aid in policy decisions going forwards as this implies RNAi may act more as a broad-spectrum insecticide, and thus needs to be treated as such.

Mission Monarch–Expert, a new component of the Mission Monarch program

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The endangered migratory Monarch butterfly, *Danaus plexippus* (L.), is well known for its unique annual migration pathways. Community science programs such as Mission Monarch (MM) help gather data of significant ecological importance to support efficient conservation actions. However, the data is spatially biased. Therefore, Mission Monarch – Expert (MMx) was created to provide a standardized monitoring program that can be used by conservation professionals and skilled community scientists to collect geographically and ecologically representative data that integrates monarch habitat. The MMx protocol consists of three monitoring activities: a milkweed and blooming plant survey, an immature monarch survey, and an adult monarch survey. The first year of data collection took place in 2023. The successful implementation of this program should provide an accurate picture of Monarch population size and trends, as well as milkweed and nectar resource availability on a national scale. This will allow for effective science-based decision making.

Are fleas truly scorpionflies: Advances in bioinformatics facilitate a new phylogenetic hypothesis of Siphonapteran and Mecopteran relationships

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We present SAPPHYRE, an all-in-one dataset preparation package. Using data from Dietz et al. 2023 we compare the output of SAPPHYRE against PHYLUCe, HybPiper, Orthograph, BWA mapping, IBA, and the combined approaches of Orthograph + Phyluce and Orthograph + Phyluce + Trinity. Taken against the medians of all seven approaches, SAPPHYRE, compared to the next best approach, returns 2.17x longer gapped alignments, 1.5x additional gapped parsimoniously informative sites, 1.57x longer un-gapped alignments and 1.54x additional un-gapped parsimoniously informative sites. Overall, SAPPHYRE placed first in 41 of 42 of these measured metrics and second in one. Molecular phylogenetics inconsistently recovers the position of Siphonaptera (fleas) with regards to Mecoptera (scorpionflies). Using SAPPHYRE, we mine 3643 USCOs found across Holometabola, to assemble a dataset constructed from twelve fleas and fourteen scorpionflies. We analyze the resulting amino-acid and 1+2 position nucleotide datasets using IQTREE2 and reassess these relationships.

A thorn in the side of cricket farming – how do dermestid beetles (*Dermestes ater* DeGeer) affect tropical house crickets (*Gryllodes sigillatus* Walker)?

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During heavy *Dermestes ater* infestations, cricket farms report extremely low harvest yields. Dermestid larvae are covered in dense, detachable, barbed hastisetæ that are used 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. Best pest management practices in mass reared insect facilities are not well documented, partly because we do not know how reared and pest species interact. Therefore, we asked: how do dermestids affect crickets? We hypothesized that dermestids may be directly impacting crickets through physical effects of hastisetæ ingestion or indirectly through competition. We designed experiments that tested 1) the effect of feeding crickets diets infested with hastisetæ 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.

***Vespa tropica* in Guam: An unfolding invasion**

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Hornets (genus *Vespa*) are predominantly inhabitants of Asia. However, they can be transported long distances while in winter diapause, and consequently 9 of the 22 *Vespa* species have been detected outside of their natural ranges and 5 species have established exotic populations. *Vespa tropica*, a specialist species that preys on other species of social wasps and honey bees, was detected on the island of Guam in 2016. It has subsequently become a significant predator on paper wasp and honey bee colonies. We view the situation on Guam as a case study for the study of hornet invasions. Preliminary analyses suggest a low level of genetic diversity among the invasive population. We will present preliminary information on its phenology, population changes, and previously unreported group hunting behaviour.

Susceptibility of short-day strawberry cultivars to cyclamen mite (*Phytonemus pallidus*)

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Cyclamen mite is a challenging pest of strawberry with few management options, but cultivars may differ in their susceptibility to cyclamen mite. Eight common, short-day strawberry cultivars were infested with cyclamen mite and grown in the field or greenhouse. Leaf trichome density, leaf thickness, and petiole growth rate were measured and related to cyclamen mite population levels. In the first greenhouse experiment the cultivar 'Malwina' had more mites than 'Evelyn' and 'Jewel'. In the second greenhouse experiment there were no significant differences among cultivars. One year after infesting field plots, the cultivar 'St. Laurent' had more mites than 'Mira', 'Valley Sunset', 'Wendy', 'Lila', 'Evelyn', and 'Jewel'. There was a significant negative relationship between trichome density and the number of cyclamen mite ($r=-0.35$, $p=0.0418$). 'St. Laurent' and 'Wendy' had more damaged berries than 'Valley Sunset' and 'Jewel'. Choosing less susceptible cultivars could be part of an integrated pest management strategy to improve cyclamen mite control.

The impacts of two commonly used road salts on the colonization of aquatic ecosystems by backswimmers (Notonectidae) and other macroinvertebrates

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De-icing salts have been shown to damage vegetation, birds, and other wildlife. These salts often run off roads, accumulate in freshwater, and negatively impact organisms in these habitats that are not adapted to higher levels of salinity. While these salts are applied to mitigate winter ice conditions, Toronto waterways have been shown to exceed the federal chronic limit for chloride even in the summer. Our research contrasted how two common road salts, (NaCl and CaCl₂), impact the colonization of aquatic ecosystems by macroinvertebrates. We compared mesocosms with no added salts, added NaCl, and added CaCl₂ (6 tanks each) that were left undisturbed for a month. We found extensive evidence of macroinvertebrate colonization of salted and unsalted tanks, particularly by Notonectidae. From this research, we are able to gain an understanding of how salinization influences colonization and community structure in Ontario freshwater aquatic ecosystems.

Efficacy of miticides against cyclamen mite (*Phytonemus pallidus*) in strawberry.

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Cyclamen mite (*Phytonemus pallidus*) is a pest of strawberry that is difficult to manage because of its small size (0.1-0.3 mm), preference for inhabiting new, wrapped leaves emerging from strawberry plant crowns, and due to registration of one miticide (Agri-Mek) in Canada. In 2023, Magister was registered in strawberry for mites, and other miticides may also control cyclamen mite. Agri-Mek, Magister, and Nexter resulted in 92-98% reductions in cyclamen mite in new leaves sampled 2-weeks-after-spraying in 2 greenhouse experiments. In a field experiment, Agri-Mek, Magister, Nexter, Pylon and Oberon resulted in 92-99% control of cyclamen mite in

new leaves at 2 and 6 weeks after foliar application on 2 Aug 2022. Miticide-treated plots produced 25-45% more marketable and 25-75% fewer cyclamen mite-damaged strawberries in June and July 2023. In conclusion, Magister and Nexter may be particularly suitable options for diversifying the miticide toolbox for cyclamen mite in strawberry.

Cannibalism facilitated by parasite infection induces dispersal in a semi-aquatic insect

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Parasites are known to have direct impacts on host dispersal ability and motivation. Yet parasites have a variety of impacts on host populations and may also have indirect effects on host dispersal; these indirect pathways have not been studied. We explored this in the backswimmer (*Notonecta undulata*) and Hydrachnidia freshwater mite system. Mite parasitism impedes swimming in backswimmers, which we found increased their vulnerability to cannibalism. We simulated parasitism on variable subsets of backswimmer populations to study the indirect effects of parasite infection on host dispersal without introducing the direct impact of infection risk. Our results suggest that cannibalism was used as an energy source for healthy backswimmer dispersal, while the risk of being eaten motivated dispersal for infected individuals. These results elucidate the complex ways that parasites impact host populations and can be used to strengthen our understanding of host-parasite interactions, including host and parasite population stability and spread.

Leveraging community science for large-scale monitoring of insect pollinators: Insights from *Abeilles citoyennes*

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Despite growing concerns over insect pollinator declines, identifying vulnerable pollinator communities remains challenging due to the time, cost, and expertise required for the collection and identification of wild insect pollinators, particularly bees. This presentation seeks to describe the *Abeilles citoyennes* (abeillescitoyennes.ca) project, a pollinator monitoring initiative launched in Quebec in 2019, as a case study leveraging the complementarity of community science and taxonomist expertise for large-scale monitoring of insect pollinators. The main objective of this community science project is to monitor the diversity of wild bees and hover flies within the province of Quebec. From 2019 to 2021, 131 volunteers collected insects at 161 sites across the province. A total of 13,558 bees and 2,486 hover flies were collected and identified to species. In addition to presenting the project protocol and potential data uses, we will discuss the benefits and challenges of the *Abeilles citoyennes* approach and opportunities for improvement.

How do frozen crickets maintain mitochondrial function?

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Freeze-tolerant insects return to a normal metabolism after they thaw. We measured the mitochondrial function in the Malpighian tubules of *Gryllus veletis* to determine whether they protect their cellular metabolic machinery from damage caused by ice formation or repair damage after thawing. Crickets that have been acclimated are freeze-tolerant and have lower mitochondrial respiration than their freeze-intolerant counterparts. Freeze-tolerant crickets maintained their mitochondrial respiration performance and preserved mitochondrial ultrastructure. Freeze-intolerant crickets had a decrease in their mitochondrial respiration performance, and their inner mitochondrial membranes were fragmented. Thus, freeze-tolerant crickets appear to protect their inner mitochondrial membrane from damage, allowing them to fuel the metabolic demands of recovery.

Beyond surveillance: Exploring the full potential of the eTick platform

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Since launching its public interface in Quebec in 2017, the eTick citizen science web platform has extended its coverage across Canada and accumulated nearly fifty thousand submissions of identified, georeferenced, and photographed ticks in its public database. As with most monitoring programs, the scientific value of the eTick surveillance data increases over time, and it is now mature enough to be integrated into regional and national research initiatives studying the rapidly changing distribution of ticks and tick-borne diseases in Canada. The platform's usefulness, however, is not limited to a large set of data points updated in real time. A selection of research, training, and public service initiatives linked to the eTick platform will be highlighted, along with a summary of all the data collected in Ontario and the rest of Canada.

Who where and when? Reproductive biology and field activity of members of the seedcorn maggot complex in Québec

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Members of the seedcorn root-maggot complex (SMC) are generalist pests of a wide range of field and vegetable crops. In Québec, the SMC is represented by *Delia florilega*, *D. platura* biotype H, and *D. platura* biotype N (Diptera: Anthomyiidae). The management of these pests is complex, in part because field damage attributable to the CMS is sporadic in both time and space, but also because all three members are identical in the immature stages, resulting in a lack of information on the relative contribution of each species or biotype to the observed damage. New data on the reproductive compatibility of the two biotypes of *D. platura* will be presented, along with occurrence profiles of all members of the SMC in cultivated Allium in Québec between 2017 and 2022.

Ecology of introduced candy-striped spiders in North America: Contributions from community scientists

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The candy-striped spider *Enoplognatha ovata* (Theridiidae) was introduced to North America sometime around 1900 and is now present across much of the United States and in all Canadian provinces except Saskatchewan. Despite being widespread and often extremely locally abundant, very little is known about its behaviour or ecology. We recently found that candy-striped spiders in coastal BC have a broad diet dominated by flower-visiting flying insects, which may result in negative impacts on native pollinator abundance and behaviour. Here we combine data from iNaturalist and museum collections to document the historical and current range and phenology of candy-striped spiders in North America. Community scientists' contributions to the 'Spider Hunters' iNaturalist project provide valuable insights into plant associations and prey across North America. We highlight the benefits of collaborating with community scientists for both data collection and increasing public engagement with entomology and biodiversity.

Mystical Manitoulin monarchs

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The monarch butterfly (*Danaus plexippus*) is the most well-known and charismatic insect in Ontario. It is an ideal model for stimulating interest in natural history and has been used for decades by teachers to explain metamorphosis, zoogeography, host-specificity, migration, and coevolution. Here we share some of our experiences on Manitoulin Island, known for its spiritual significance, as we use monarchs to connect people with the natural world via articles and photographs in the media, and in person at campgrounds, schools, nature clubs, and on cruise ships.

A hypothesis-driven approach to understanding insect freeze tolerance

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Some insects can withstand internal ice formation, but although we know many of the biochemical and other factors that are associated with freeze tolerance, we do not yet have a comprehensive understanding of the underlying mechanisms. I will introduce *Gryllus veletis*, the spring field cricket, as a model system for investigating insect freeze tolerance. *G. veletis* becomes freeze tolerant after acclimation in the laboratory, which allows us to employ an experimental design that separates and controls for the effects of cold and ice in freeze tolerance. This allows us to move beyond a phenomenological description of freeze tolerance to a hypothesis-driven approach. I will describe two non-mutually exclusive hypotheses ('protection' and repair') and use preliminary data to show how we can use these hypotheses as a framework to move beyond correlations and into mechanism.

Pyrochroidae (Coleoptera) of Ontario: A photographic key and new records

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Pyrochroidae (Coleoptera) has a long history of taxonomic instability, with many changes over time to the taxa included in the family. Therefore, many keys are outdated and inaccessible for amateur identifiers to use. This project will produce the first photographic key to the pyrochroids of Ontario Canada, and a checklist for the province in hopes of updating records. This key was adapted from the systematic keys by Young (1973; 1981), and uses specimens and collection data from the Guelph Insect Collection (DEBU). The key uses morphological characteristics for identification and is accompanied with photos taken by the author. After analysis of the specimen data in the DEBU collection, a new record for Ontario was found for the species *Pedilus labiatus* (Say). Additionally, the first photo key to Ontario Pyrochroids was produced including range maps. This key and species checklist will be a useful tool for pyrochroid identification in Ontario for future research.

Beyond Growth: The Impact of Diet on Full-Body Composition in the Tropical House Cricket *Gryllodes sigillatus*

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Diet strongly impacts insect life history traits. Growth and body size are two important traits for mass production of edible insect species, such as crickets. The relative availability of protein and carbohydrates influences growth and body size in crickets, and our lab has demonstrated that a 3:1 P:C can produce larger crickets quickly. However, there is little knowledge of the effects how diet composition influences full-body nutritional composition after growth and development are complete. To test this, we reared *Gryllodes sigillatus* on two diets of vastly different P:C (5:1, 1:5) and tested for macromolecular composition of the adult crickets in two ways: full-body composition and gut dissection to account for gut loading. Our results will contribute towards the cultivation of *G. sigillatus* as a product with optimal nutritional value.

Validating degree day (DD) models for predicting European corn borer (*Ostrinia nubilalis* Hübner) phenology and voltinism

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European corn borer (ECB; *Ostrinia nubilalis* Hübner (Lepidoptera: Crambidae)) poses a threat to >200 crops and has inhabited the majority of Canada's corn-growing regions for >100 years. Currently, understanding of ECB phenology is limited, particularly in the Maritime provinces, due to outdated research. This study will use pheromone trap catch data to improve the accuracy of degree day (DD) modeling for ECB in Eastern Canada by generating and comparing three DD models predicting the onset and duration of ECB flight activity. The study will identify optimal starting dates for accumulating DDs to predict ECB phenology in regions where ECB is

established. Developing and implementing an accurate DD model will provide a reliable method of predicting ECB emergence and flight activity, enabling precise and timely intervention.

Exploring the diversification of an exotic ant species across the Galápagos Islands

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The management of invasive species is pivotal for wildlife conservation as they are considered a major threat to biodiversity. The exotic ant species, *Camponotus zonatus*, was introduced to the Galápagos Islands from Central and South America and is now widely distributed in the archipelago, potentially replacing endemic species. To explore the variation of *C. zonatus*'s populations across geographically isolated islands, we employed a combination of morphological and genetic characterizations. Firstly, we measured 19 morphological traits and conducted principal components analysis to compare morphospace among populations. Secondly, we compared CO1 sequences of *C. zonatus* to closely related species for phylogenetic analysis. We found that there is a high similarity in *C. zonatus*'s morphology and genetics across the Galápagos, suggesting panmixia across the archipelago. This pioneering study sheds light on the evolutionary dynamics of *C. zonatus* in the Galapagos Islands, offering essential baseline information for effective invasive species control.

New Jersey tea (*Ceanothus americanus*) range shifts: Implications for Mottled duskywing butterfly (*Erynnis martialis*) conservation amidst climate change

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Many plant species are expected to experience altered geographical distributions as climate change progresses. The consequences of these range shifts likely include disruptions of the structure and function of ecosystems. In the context of insect conservation, these changes in vegetation and habitat conditions can pose challenges. In Ontario the endangered Mottled duskywing butterfly (*Erynnis martialis*) is reliant on New Jersey tea (*Ceanothus americanus*) as a host plant, which is mainly associated with tallgrass prairie ecosystems. With *E. martialis* populations already decreasing, predicting future changes to their habitats and host plants are important to conservation planning. Estimating current habitat suitability for *C. americanus* using community observations will aid in the identification of potential conservation and restoration areas where efforts can be made to improve species' resilience to future stressors.

Shift in Climate, Shift in Selection: Experimentally elevated temperatures intensify directional selection on gall size in the goldenrod gallfly system.

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The goldenrod gall fly, *Eurosta sloidaginis*, provides a textbook example of stabilizing selection. Insects inducing smaller galls are vulnerable to parasitoid penetration, while those in larger galls attract woodpecker attack. Climate warming could alter this selection regime in two non-exclusive ways. First, higher temperatures could alter plant reactivity to the gall induction stimulus, shifting the distribution of gall diameters relative to the enemies' preferred size classes. Second, parasitoid and avian size preferences could change. We grew a generation of *Eurosta* on its goldenrod host plant in the outdoor Experimental Climate Warming Array at the University of Toronto's Koffler Scientific Reserve. Experimental plots were warmed by 2 degrees C relative to controls. The selection differential on gall size was mildly downward in ambient plots, but significantly upward under warming. Selection shifted because elevated temperatures reduced mean gall size by over 2 mm, but had no effect on patterns of size-dependent attack.

Modernizing the economic threshold for true armyworm, *Mythimna unipuncta*, in wheat in Ontario, Canada

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True armyworm (TAW; *Mythimna unipuncta* (Haworth; Lepidoptera: Noctuidae)) is a sporadic pest that causes significant injury in cereal crops including wheat (*Triticum aestivum* L.). TAW management in Ontario is based on research conducted >50 years ago; thus, this study aims to develop modern economic thresholds. Field experiments were conducted in 2022 and 2023 to assess insecticide efficacy and application timing in response to TAW infestation densities in wheat in Ridgetown, ON Canada. Plots were infested with TAW at the boot, flowering, or milk growth stage and treated 24 h post-infestation with insecticide. Feeding incidence observed for eight and 16 larvae per 30 cm² were over two times greater than four larvae per 30 cm² at the boot and flowering stage; however, at the milk stage there was no significant difference. Revised economic thresholds for TAW relating to crop growth stages provides more precise application timing and reduces unnecessary insecticide applications.

Landscape-level variation in the diversity of insect pollinators across the cranberry agro-ecosystem in Québec

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Commercial cranberry farming is a rapidly growing industry in Canada, with Québec leading the production of organic cranberry worldwide. Each year, Québec cranberry growers rely on renting managed colonies of bees for their pollination services. However, increasing rental costs are making this practice economically unsustainable. Our objective is to determine the relationship between wild pollinator community composition, habitat type (forest, meadow, bog, conventional or organic farm), and cranberry fruit yield. Over two summers, we deployed 33 Malaise traps across the cranberry agroecosystem in Centre-du-Québec. We collected and identified over 5100 wild bee and fly pollinators from natural and managed habitats. Preliminary results suggest that cranberry farm sites support a higher richness of insect pollinators than wild sites. This work will ultimately inform efforts to minimize the dependence on bee rentals by encouraging the presence of more wild pollinators on Québec cranberry farms while maintaining maximum fruit yields.

A revision of the genus *Latheticomyia* (Cypselosomatidae, Diptera)

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Cypselosomatidae (Nerioidea, Diptera) are relatively uncommon but charismatic flies, and *Latheticomyia* is definitely one of the more beautiful genera where flies have unique black and white variegated patterns. There are seven described species, but upon close inspection of the two hundred specimens available at the University of Guelph Insect Collection and the Canadian National Collection, 20 undescribed species are recognized. Almost every unique location presents one or more new species, demonstrating the potential diversity within the genus and the limited extent of current knowledge. This revision expands the species count, provides a phylogeny of the genus, and contributes an additional piece to the puzzle of resolving the phylogeny of the family Cypselosomatidae.

