159th Annual General Meeting

of the

Entomological Society of Ontario

September 23-24, 2022

Virtual Meeting



Resilience in the Face of Adversity



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Schedule at a Glance

Friday, September 23 rd		
12:30-12:45pm	Welcome message and announcements	
12:45-1:30pm	Plenary talk: Dr. Jessica Gillung	
1:30-1:45pm	Break	
1:45-2:30pm	Poster presentations I	
2.:30-3:45pm	Oral presentations I	
3:45-4:00pm	Break	
4:00-5:00pm	Lightning presentations	
5:00-7:00pm	Dinner break	
7:00-9:00pm	Virtual networking and trivia	

Saturday, Sept. 24 th		
10:20-10:30am	Announcements	
10:30-12:00pm	Oral presentations II	
12:00-12:45pm	Poster presentations II	
12:45-1:30pm	Lunch	
1:30-3:00pm	Oral presentations III	
3:00-3:15pm	Break	
3:15-4:00pm	ESO Annual General Business Meeting	
4:00-4:30pm	Awards ceremony and wrap-up	



Organizing Committee

Erin Campbell, Jeremy deWaard, Kaitlyn Fleming, Marlee-Ann Lyle, Shannon McCauley, Matthew Muzzatti, Amanda Roe, Alex Smith, Laura Timms

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Plenary Speaker



Dr. Jessica Gillung

Specimen-based research in the genomics era

Abstract: Evolutionary biologists strive to understand the patterns that have shaped life in our planet and the processes that create and maintain biodiversity. Central to this scientific inquiry are phylogenies. The recently developed 'omics' approaches give us the possibility to pursue new avenues in biodiversity research and the privilege to revisit the insect Tree of Life using data that was previously unavailable. However, not all parts of the genome are equally useful for reliable phylogenetic inference, and we now require new statistical approaches to identify

genomic regions that we can adequately model and to develop rigorous protocols for robust estimation of phylogeny. Our current context of climate change and biodiversity loss now require speedy, specimen-based research more urgently than ever, with large-scale biodiversity surveys and natural history collections playing a key role in expanding our understanding of insect diversity, ecology, and natural history.



Full Schedule

Friday, September 23rd

12:30-12:45pm	Welcome message and announcements: Alex Smith, ESO President	
12:45-1:30pm	Plenary talk: Dr. Jessica Gillung	
1:30-1:45pm	Break	
1:45-2:30pm	Poster presentations I (* indicates student talks for President's Prize for Best Poster Presentation): Zoom breakout rooms	
	Joel T.L. Goodwin* , Sandy M. Smith, & Jeremy D. Allison: Characterizing the active space of pheromone traps for <i>Choristoneura fumiferana</i> and <i>Lymantria dispar</i>	
	Katie Monat*, Shannon McCauley, & Rosalind Murray: The impact of warming on the hatching success of dragonfly (<i>Celithemis elisa</i> and <i>Leucorrhinia intacta</i>) eggs	
	Sherry Du* & Rosalind L. Murray: Road salt pollution increases sex-bias in emerging mosquito population	
	Madeline Schuster* & Dr. Rosalind Murray: The impact of road salt pollution on female mosquito behaviour	
	Sophie Y. Kasdorf*, Matthew J. Muzzatti, Sue M. Bertram, & Heath A. MacMillan: Brewery Waste as a Sustainable Protein Source for Edible Crickets	
2:30-3:45pm	Oral presentations I (* indicates student talks for President's Prize for Best Oral Presentation)	
2:30	Stefane Saruhashi * & Brent J. Sinclair: Mitochondrial protection, damage, and repair in frozen crickets	
2:45	Kenneth W. Dearborn* , Sandy Smith, Chris MacQuarrie, & Daegan Inward: Temperature impacts on oviposition of the emerald ash borer, <i>Agrilus</i> <i>planipennis</i> Fairmaire (Coleoptera: Buprestidae)	
3:00	Stéphanie Gagnon* , Catherine Scott, & Chris Buddle: Tundra wolf spider abundance and phenology shift with distance from the Dempster Highway	



- 3:15 **Lamees Mohammad*** & Brent J. Sinclair: Neuroprotection in the cold: How freeze tolerant crickets survive the brain freeze
- Rosemary L. Martin* & Shannon J. McCauley: Hypoxia sensitivity and
 patterns of winterkill in larval anisopteran communities in temperate lentic ecosystems

3:45-4:00pm Break

4:00-5:00pm Lightning presentations (* indicates student talks for President's Prize for Best Lightning Presentation)

- Muzzatti, M.J.*, Ritchie, M., Froome, A., Bertram S.M., & MacMillan, H.A.: A
 thorn in the side of cricket farming do dermestid hastisetae affect *Gryllodes* sigillatus growth and calling behaviour?
- 4:05 **Caitlin Oh*,** Zainab Hassonali, Stefane Saruhashi & Brent J. Sinclair: Does freezing and thawing cause oxidative stress?

Zainab Hassonali*, Caitlin Oh, Stefane Saruhashi & Brent J. Sinclair: The 4:10 expression of antioxidant genes in the freeze tolerant spring field cricket, *Gryllus veletis*

Jacob V. Basso*, Roselyne Labbé, & Cynthia Scott-Dupree:Sterilized pepper
 4:15 weevil, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae), have decreased sperm production and mating competitiveness in laboratory tests

Alexandra H. Sauk* & Hugh G. Broders: Ectoparasite communities on little
4:20 brown myotis (*Myotis lucifugus*) and big brown bats (*Eptesicus fuscus*) in a post-White Nose Syndrome decline area

- 4:25 **Abigail Lam*,** Kaitlyn J. Fleming: A biodiversity survey of blow flies (Diptera: Calliphoridae) in Haliburton, Ontario
- 4:30 **Ruishen Zhang***, Jessica Gillung, & Morgan Jackson: A taxonomic review of Canadian bot flies (Diptera: Oestridae)
- 4:35 **Emily Forrester*,** Dr. Andrew Young, & Dr. Jonathan Schmidt: Variance Associated with Malaise Traps in Agricultural Habitats

Taylor Kerekes*, Sheila Colla, Sarah Mackell, Tiffani Harrison, & Sarah Knoerr Changes in humble bee abundance and diversity over time in souther

4:40 Knoerr:Changes in bumble bee abundance and diversity over time in southern Ontario



- 4:45 **Thomas CK Hall***: Beetles in the Media: The Good, The Bad... The Belastomatidae?
- 5:00-7:00pm Dinner break
- 7:00-9:00pm Virtual networking and trivia

Saturday, September 24th

- 10:20-10:30am Morning announcements: Alex Smith, ESO President
- 10:30-12:00pm Oral presentations II (* indicates student talks for President's Prize for Best Oral Presentation)
 - 10:30 **Chris JK MacQuarrie,** Victoria Fewster, & Meghan Gray: Detection and response to hemlock woolly adelgid in Ontario
 - Kaitlyn J. Fleming, David P. Fleming, & David V. Beresford: Range Extensions
 10:45 of Wood-Boring Beetles in Ontario's Boreal Forest and Akimiski Island, Nunavut
 - Lillian Auty* & Cynthia Scott-Dupree: An investigation of the insect pest and 11:00 beneficial insect complex for cannabis grown outdoors in Ontario and the potential of companion plants as an IPM tactic
 - 11:15 Aleksandra Dolezal* & Andrew MacDougall: Measuring drivers of insect regulation using an experimental farm system

Megan S. Reich*, Mira Kaur Kindra, Felipe Dargent, Lihai Hu, D.T. Tyler
 Flockhart, D. Ryan Norris, Gerard Talavera, Heather Kharouba & Clément P.
 Bataille: Testing the assumptions of geolocation using metals and metal isotopes in insect wings

 Nicole L. Regimbal* & Celina B. Baines: Cannibalization of parasitized
 11:45 conspecifics does not reduce dispersal propensity of healthy backswimmers (*Notonecta undulata*)



12:00-12:45pm Poster presentations II (* indicates student talks for President's Prize for Best Poster Presentation) – Zoom breakout rooms

Hadil Elsayed* & Sheila Colla: Impacts of Anthropogenic Threats on Insect Biomass in Protected Areas

Carly Demers*, Dr. Rose Labbé, & Dr. Sherah VanLaerhoven: Assessing omnivorous predators (Hemiptera: Miridae) for their potential use as biological control agents of greenhouse tomato pests

Emily Thouless*, Alexandre Loureiro, & Alex Smith: The effect of temperature on the activity and thermal tolerance of insects in an ecological gradient

Matteo Menegazzo* & Kaitlyn J. Fleming: A biodiversity survey of carrion beetles (Coleoptera: Silphidae) in terrestrial habitats

Timothy Smith*, Anthony Tay, & Dr. Janet Koprivnikar: Insect quinone secretions as an anti-parasite defence against entomopathogenic nematodes

12:45-1:30pm Lunch

1:30-3:00pm Oral presentations III (* indicates student talks for President's Prize for Best Oral Presentation)

- 1:30 **Laura Timms**: How insect-focused citizen science can facilitate biodiversity conservation
- 1:45 **Tiffani Harrison** & Sarah MacKell: A Decade of WPC's Bumble Bee Recovery Program: Annual Surveys

Samm Reynolds*, Carolyn Callaghan, Lauren des Marteaux, Jeff Skevington,
Nigel E. Raine, & Andrew Young: The buzz about native bees and flower fly populations in Norfolk County

2:15 **Lyllian Corbin*,** Lyndon Duff, & Miriam Richards: Small males are the last to establish territories in the eastern carpenter bee

Sabrina Rondeau* & Nigel E. Raine: Can bumblebee (*Bombus impatiens*)
2:30 queens avoid pesticide-contaminated soils when selecting underground hibernation sites?

2:45 **Nadejda Tsvetkov*** & Leonard J. Foster: The effects of neonicotinoids on honey bee cognition and brain proteome.



3:00-3:15pm Break

- 3:15-4:00pm ESO Annual General Business Meeting
- 4:00-4:30pm Awards ceremony and wrap-up



Presentation Abstracts

Oral Presentations

* indicates student talk for Presidents Prize for Best Oral Presentation

An investigation of the insect pest and beneficial insect complex for cannabis grown outdoors in Ontario and the potential of companion plants as an IPM tactic

Authors: Lillian Auty* & Cynthia Scott-Dupree

Affiliation: University of Guelph

Email: lauty@uoguelph.ca

Abstract: Following the 2018 legalization of recreational drug-type Cannabis sativa L. in Canada, the licensed area for outdoor cultivation has rapidly increased to meet growing demands. However, cannabis grown outdoors is threatened by economically damaging arthropod pests and pathogens that we know very little about. This project involves the first Canadian survey of economically relevant insect pests and natural enemies associated with outdoor cannabis production at two licensed operations in Ontario. This project also assessed the potential of companion plants such as borage, cosmos, marigold, sunflowers and aromatic herbs as an integrated pest management (IPM) tactic to manipulate the behavior of insect pests and beneficial insects to the advantage of the grower.

Small males are the last to establish territories in the eastern carpenter bee

Authors: Lyllian Corbin*, Lyndon Duff, & Miriam Richards

Affiliation: Brock University

Email: lc15kl@brocku.ca

Abstract: Territorial male eastern carpenter bees risk exhausting themselves, by hovering early, to gain maximum access to mates when females emerge. We tested the effects of body size on male territoriality, hypothesizing that small males exhaust themselves faster and should start hovering later to secure mates. From 2016 to 2021, we observed the hovering activity of individually marked males and measured their inter-tegular width. Size affected hover timing; larger males started hovering by mid-May while smaller males started by mid-June. Consequently, males that start hovering late may benefit by avoiding exhaustion at the cost of having limited access to receptive females.

Temperature impacts on oviposition of the emerald ash borer, *Agrilus planipennis* Fairmaire (Coleoptera: Buprestidae)

Authors: **Kenneth W. Dearborn***, Sandy Smith, Chris MacQuarrie, & Daegan Inward Email: kenneth.w.dearborn@gmail.com

Abstract: Emerald ash borers have killed millions of ash trees in North America. We were curious if temperature limits the ability of females to oviposit. Adults collected from green ash were allowed to mature for 14 days at 25 °C prior to being assigned to one of four constant



temperatures (12, 15, 18, and 21 °C). Females were evenly distributed across temperatures. We checked the enclosures for the presence of eggs every day until all the adults had died. All temperatures laid eggs. None of the eggs laid at 15 °C became viable, and none hatched when laid at 18 °C.

Measuring drivers of insect regulation using an experimental farm system

Authors: Aleksandra Dolezal* & Andrew MacDougall

Affiliation: University of Guelph

Email: adolezal@uoguelph.ca

Abstract: Arthropod populations, especially pests and predators, in agroecosytems are driven by complex interactions between plant resources, predator-prey interactions, chemical spraying and the spatial and temporal effects of these drivers. In a simple, complex, and control farm system, I measured arthropod pest and predator abundance based on the effects of the three interacting drivers (predator-prey interactions, plant resources, agrochemicals). My "simple" farm consists of an open and caged community of predators and pests that occur in a soybean field. My "complex" farm consists of an open and caged community of predators and pests but with the presence of tall-grass prairie surrounding the crop. The caged communities in each system untangle the effects of predators (inclusion/exclusion) on prey. I also sample in a "control farm", consisting of open soybean and no surrounding prairie. Within my farm systems, I will measure three core variables that are known to regulate arthropod communities: (i) plant resources: floral resources, plant structure, plant composition, connectivity, (ii) predator-prey dynamics: the abundance of predator: prey (iii) chemical spraying: rate, chemical content, timing. I sample the pest and predator community over the whole growing season (temporal dynamics) and at different sampling locations in each farm (spatial dynamics).

Ranges Extensions of Wood-Boring Beetles in Ontario's Boreal Forest and Akimiski Island, Nunavut

Authors: Kaitlyn J. Fleming, David P. Fleming, & David V. Beresford

Affiliation: Trent University

Email: kaitlynfleming@trentu.ca

Abstract: The distribution of insects is not fully known in northern regions due to their remote nature. We completed a biodiversity survey in Ontario's boreal forest from 2009 to 2015. We collected 22 specimens representing eight species of wood-boring beetles from 18 locations across Ontario's Far North and Akimiski Island, Nunavut. We found range extensions for four species in Ontario and a new territorial record in Nunavut. Our efforts provide an update on the distribution of Buprestids in Ontario's boreal forest.

Tundra wolf spider abundance and phenology shift with distance from the Dempster Highway

Authors: Stéphanie Gagnon*, Catherine Scott, & Chris Buddle

Affiliation: McGill University

Email: Stephanie.gagnon2@mail.mcgill.ca

Abstract: The Arctic is warming faster than the rest of the planet, making it particularly vulnerable to disturbances such as habitat fragmentation. The Dempster Highway is the main



road that crosses the northern Yukon, and wolf spiders are apex arthropod predators on the tundra. We investigated the effects of the Dempster on wolf spider abundance, phenology, and community structure by sampling plots near (10 m) and far (200 m) from the highway. Wolf spider abundance was lower and phenology was more advanced near the road, suggesting that the Dempster Highway impacts tundra arthropod community structure.

A Decade of WPC's Bumble Bee Recovery Program: Annual Surveys

Authors: Tiffani Harrison & Sarah MacKell

Affiliation: Wildlife Preservation Canada

Email: t.harrison@wildlifepreservation.ca

Abstract: With current declines, long-term bumble bee population monitoring is crucial. One major component of Wildlife Preservation Canada's Bumble Bee Recovery Program is conducting annual bumble bee population surveys across Ontario. These surveys focus on locating declining species, especially the Special Concern yellow-banded bumble bee and the Endangered rusty-patched bumble bee (which hasn't been found in Canada since 2009). This program has been running since 2013 and this talk will summarize WPC's decade of survey data that was collected at over 450 sites and include over 25,000 *Bombus* records and observation of 20 species.

Detection and response to hemlock woolly adelgid in Ontario

Authors: Chris JK MacQuarrie, Victoria Fewster, & Meghan Gray

Affiliation: Natural Resources Canada

Email: Christian.macquarrie@nrcan-rncan.gc.ca

Abstract: The hemlock woolly adelgid (*Adelges tsugae*) is an invasive insect detected in eastern North America in the 1950s. It causes mortality by feeding on foliage and stems of hemlock, eventually causing death. The insect has caused significant hemlock mortality in the eastern US and has been detected in Ontario a number of times over the past ten years. Earlier establishments were eradicated but since 2019 at least 4 well-established populations have been detected in Ontario. This presentation will review the status of the insect in Ontario and discuss research and management options for the insect.

Hypoxia sensitivity and patterns of winterkill in larval anisopteran communities in temperate lentic ecosystems

Authors: Rosemary L. Martin* & Shannon J. McCauley

Affiliation: University of Toronto

Email: rosemary.martin@mail.utoronto.ca

Abstract: Winterkill, large die-offs of organisms due to hypoxic under-ice conditions, is poorly documented in aquatic invertebrates. We surveyed larval dragonfly communities in 18 Michigan lakes for 6 years of pre and post winter samples. We identified dragonflies *Anax junius* and *Leuchorrhinia intacta* as winterkill candidates. We experimentally tested relative sensitivity to low oxygen conditions in odonate species. Mortality of *A. junius* in anoxic treatments was significantly higher compared with oxic treatments, but not for other dragonflies. Hypoxic conditions may contribute to patterns of overwinter declines in top invertebrate predator *A. junius*, in turn affecting food web and community dynamics.



Neuroprotection in the cold: How freeze tolerant crickets survive the brain freeze

Authors: Lamees Mohammad* & Brent J. Sinclair

Affiliation: Western University

Email:lmohamm9@uwo.ca

Abstract: Ice formation in the brain is usually harmful. Freeze tolerant insects withstand internal ice formation, but how do they protect their nervous system during and after freezing? The spring field cricket (*Gryllus veletis*) is a model to explore the mechanisms underlying insect freeze tolerance and the metathoracic ganglion contains all components of the brain including nerve cell bodies, a mass of nerve fibres and glial cells, making it an experimentally accessible system to study neuroprotection in freeze tolerance. Using live/dead staining we found most nervous tissue cells from frozen freeze tolerant crickets are viable while most cells from frozen freeze intolerant nervous tissue were dead. Histology of metathoracic ganglion sections revealed swelling of frozen freeze-intolerant metathoracic ganglia analogous to edema, while metathoracic ganglia from frozen freeze tolerant crickets were intact. These findings suggest that freeze tolerant *G. veletis* protect their nervous system from freeze damage. Ongoing work is exploring the post-thaw recovery and performance of the ganglia using electrophysiology.

Cannibalization of parasitized conspecifics does not reduce dispersal propensity of healthy backswimmers (*Notonecta undulata*)

Authors: Nicole L. Regimbal & Celina B. Baines

Affiliation: University of Toronto

Email: Nicole.regimbal@mail.utoronto.ca

Abstract: Backswimmers, *Notonecta undulata*, are semi-aquatic flight-capable insects commonly parasitized by Hydrachnidia mites. Mites can impede swimming-ability of backswimmers, which we found makes them more vulnerable to cannibalism. We hypothesized that the dispersal propensity of healthy backswimmers would decline as the number of vulnerable, infected backswimmers increased. We simulated mite parasitism in a field experiment and found that, while infected backswimmers were more likely to be cannibalized, an increasing proportion of infected backswimmers positively related to the dispersal probability of healthy conspecifics. Our results suggest that increased resource-availability in the form of infected backswimmers enables increased dispersal in healthy hosts.

Testing the assumptions of geolocation using metals and metal isotopes in insect wings Authors: **Megan S. Reich***, Mira Kaur Kindra, Felipe Dargent, Lihai Hu, D.T. Tyler Flockhart, D. Ryan Norris, Gerard Talavera, Heather Kharouba, & Clément P. Bataille Email: meganreich13@gmail.com

Abstract: Isotopes and elemental composition are effective intrinsic markers used as geolocation tools to clarify insect dispersal patterns over time and space. However, studies have had mixed success at using metals and metal isotopes for geolocation purposes, in part because only certain metals have the potential to be effective geolocation tools. Here, we test if a suite of metals and metal isotopes have the characteristics to be appropriate geolocation markers for monarch butterflies (*Danaus plexippus*). We explored the environmental and dietary sources of strontium



isotope ratios (⁸⁷Sr/⁸⁶Sr), lead isotope ratios (208Pb/206Pb, 207Pb/206Pb), and 23 metals and metalloids in monarch wings over an 8-week timespan.

The buzz about native bees and flower fly populations in Norfolk County

Authors: **Samm Reynolds***, Carolyn Callaghan, Lauren des Marteaux, Jeff Skevington, Nigel E. Raine, & Andrew Young

Affiliation: University of Guelph

Email: samm.reynolds57@hotmail.com

Abstract: Native pollinator diversity provides significant pollination services in many agroecosystems in Ontario and globally, with estimated economic valuations of hundreds of billions of dollars. My research investigates differences in pollinator diversity (in wild bees and flower flies) and abundance among three habitat types on agricultural land and aims to understand how biodiversity is affected by habitat type, patch size and connectivity. Preliminary results show an extremely high diversity of flower flies and bees in the Norfolk County region, as well as pockets of unusually high aphidophagous flower fly abundance. This novel data set can inform future policy and conservation efforts.

Can bumblebee (*Bombus impatiens*) queens avoid pesticide-contaminated soils when selecting underground hibernation sites?

Authors: Sabrina Rondeau* & Nigel E. Raine

Affiliation: University of Guelph

Email: srondeau@uoguelph.ca

Abstract: Bumblebee (*Bombus* spp.) queens can be exposed to pesticide residues when hibernating in agricultural soils. An important question is whether bees can detect and avoid pesticide-contaminated soils, or whether they might be attracted to such residues. In a multiplechoice preference experiment, we gave newly emerged *Bombus impatiens* queens access to multiple crates of soil treated with different pesticides (boscalid, chlorantraniliprole, clothianidin, cyantraniliprole, difenoconazole) in large enclosures during fall. Bumblebee queens (n=173) consistently avoided pesticide-free soil, while showing no avoidance for any pesticide-treated soils. This apparent preference for pesticide-contaminated soils increases the likelihood of exposure to pesticide residues for hibernating bumblebee queens.

Mitochondrial protection, damage, and repair in frozen crickets

Authors: Stefane Saruhashi* & Brent J. Sinclair

Affiliation: Western University

Email: ssaruhas@uwo.ca

Abstract: Freeze tolerant insects return to normal metabolism after they thaw. We measured the mitochondrial function in Malpighian tubules of *Gryllus veletis* to determine whether they protect their cellular metabolic machinery from damage from ice formation or repair damage after thawing. Crickets that had been acclimated become freeze tolerant and had lower mitochondrial respiration than their freeze-intolerant counterparts. Mitochondrial respiration increased after thawing in freeze tolerant crickets but decreased in freeze-intolerant crickets. Thus, freeze tolerant crickets appear to protect their mitochondria from damage, allowing them to fuel the



metabolic demands of recovery, whereas insects that cannot survive freezing incur mitochondrial damage.

How insect-focused citizen science can facilitate biodiversity conservation Author: **Laura Timms**

Affiliation: Credit Valley Conservation

Email: laura.le.timms@gmail.com

Abstract: Credit Valley Conservation (CVC's) Butterfly Blitz citizen science project aims to: (i) connect people with nature, and (ii) collect high-quality data on an under-surveyed group in our area. The project has run each summer since 2019. During that time, over 150 people have actively participated in the project by making butterfly observations. This effort has added new species records for the area, increased the geographical coverage of butterfly data, and contributed to an expanded knowledge of species distributions. CVC will use this data to protect, restore, and enhance natural areas in the Credit River Watershed.

The effects of neonicotinoids on honey bee cognition and brain proteome

Authors: Nadejda Tsvetkov & Leonard J. Foster

Affiliation: University of British Columbia

Email: nadia.tsvetkov@gmail.com

Abstract: It is commonly reported that neonicotinoids affect honey bees' learning and memory. However, many of the studies fail to consider the bees' sugar responsiveness: a well-documented behavior known to impact learning and memory. In our study, we exposed honey bee workers to a neonicotinoid, then measured sugar responsiveness and learning and memory using the Proboscis Extension Response. We found that neonicotinoid exposed bees had lower sugar responsiveness and the same learning and memory as unexposed bees. We then performed a proteomic analysis in order to determine the changes the bee brains underwent as a result of neonicotinoid exposure.

Lightning Presentations

* indicates student talk for Presidents Prize for Best Lightning Presentation

Sterilized pepper weevil, *Anthonomus eugenii* Cano (Coleoptera: Curculionidae), have decreased sperm production and mating competitiveness in laboratory tests

Authors: Jacob V. Basso*, Roselyne Labbé, & Cynthia Scott-Dupree

Affiliation: University of Guelph

Email: bassoj@uoguelph.ca

Abstract: The pepper weevil (PW; *Anthonomus eugenii* Cano) annually causes millions of dollars in economic losses for pepper growers in North America. Insecticide sprays are generally ineffective at managing PW because the damaging larvae develop within pepper fruit, and biocontrol agents remain uncommercialized. The sterile insect technique (SIT) is a novel approach to PW management, and PW pupae can be sterilized with a 110Gy gamma-radiation dose. For a successful PW-SIT system, sterile males must produce sterile sperm and compete



for mates. This work shows sterilized PW have decreased sperm production and competitiveness under laboratory conditions, which will inform PW-SIT system development.

Variance Associated with Malaise Traps in Agricultural Habitats

Authors: Emily Forrester*, Dr. Andrew Young, & Dr. Jonathan Schmidt

Affiliation: University of Guelph

Email: eforre01@uoguelph.ca

Abstract: Malaise Traps are a commonly used method for sampling flying insect biodiversity and are currently gaining traction for ecological studies. Because these traps have been used mostly for biodiversity surveys, the variance in species sample proportions due to stochastic processes has not been previously investigated. The variance in pollinating insects captured by Malaise traps in agricultural fields is investigated by analyzing the differences in catch of prominent pollinating families by Malaise traps deployed in a single location. The results of the study will inform decisions regarding the sample size necessary to capture a reliable estimate of the insect population present.

Beetles in the Media: The Good, The Bad... The Belastomatidae? Author: **Thomas CK Hall***

Author: **Thomas CK Hall*** Affiliation: University of Toronto

Email: Thomas.hall@mail.utoronto.ca

Abstract: Public outreach and community engagement hold crucial positions in ensuring continued public interest towards the conservation of insects. However, it remains difficult to reach those individuals without a pre-existing interest towards insects and other arthropods. The goal of my current research is to assess the ways in which Canadians perceive insects and value them. This will be done through a systematic review of online news media referring to beetles, a prominent taxon. By compiling metadata representative of the perceived value of insects by members of the Canadian public, my analysis hopes to better inform future entomological public outreach initiatives.

The expression of antioxidant genes in the freeze tolerant spring field cricket, Gryllus veletis

Authors: Zainab Hassonali*, Caitlin Oh, Stefane Saruhashi, & Brent J. Sinclair

Affiliation: Western University

Email: zhassona@uwo.ca

Abstract: Freeze tolerant insects can survive internal ice formation, which is thought to cause oxidative stress. We tested the hypothesis that freeze tolerant crickets alter the gene expression of antioxidants in response to freezing and thawing. We used RT-qPCR to measure the mRNA abundance of the transcription factor Nrf2 and the three superoxide dismutases in the Malpighian tubules. We predict that the expression of these genes will be upregulated in response to oxidative stress during thawing. This study will expand our knowledge of the oxidative stress and antioxidant environment of insect freeze tolerance.

Changes in bumble bee abundance and diversity over time in southern Ontario Authors: **Taylor Kerekes*,** Sheila Colla, Sarah Mackell, Tiffani Harrison, & Sarah Knoerr Affiliation: York University



Email: taylorkerekes@gmail.com

Abstract: Bumble bees are important pollinators in North America however, evidence of declines have been seen in many species. We are conducting a comparative study that investigates the change in bumble bee relative abundance and diversity over time in multiple sites in Southern Ontario which were previously assessed in 1971-1973 and again in 2004-2006. We are reassessing these sites from 2021 - 2023 to determine if changes in bumble bee relative abundance and diversity are observed. Preliminary analyses demonstrate that overall diversity has significantly declined since both the 1970s and the early 2000s and the relative abundance of multiple species has changed as well. These results can help us better assess the status of our bumble bee species and give insight into species that may need future conservation efforts.

A biodiversity survey of blow flies (Diptera: Calliphoridae) in Haliburton, Ontario

Authors: Abigail Lam* & Kaitlyn J. Fleming

Affiliation: Trent University

Email: abigaillam@trentu.ca

Abstract: Blow flies (Diptera: Calliphoridae) play a number of roles in ecosystems, such as pollination and decomposition. There are many species of blow flies in Ontario; however, their distribution is not fully known. We conducted a survey of Calliphoridae in Glebe Park, Haliburton from June 2022 to September 2022. We set four bottle traps in Glebe Park in an effort to update the known distributions of Calliphorids in the Haliburton region of Ontario

A thorn in the side of cricket farming – do dermestid hastisetae affect *Gryllodes sigillatus* growth and calling behaviour?

Authors: Muzzatti, M.J.*, Ritchie, M., Froome, A., Bertram S.M., & MacMillan, H.A.

Affiliation: Carleton University

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Abstract: The insects as food and feed industry is growing rapidly. Extremely low harvest yields are reported by mass reared cricket farms during heavy *Dermestes ater* (Dermestidae) infestations, but the mechanisms behind low yield are unknown. Dermestid larvae are covered in dense, detachable, barbed hastisetae, which can obstruct the digestive tracts of invertebrate predators. We tested the survival, growth, and calling behaviour of *Gryllodes sigillatus* (Gryllidae) reared on three diets differing in hastisetae concentration: 0, 1, and 2 dermestids/g of feed. Characterizing these host-pest interactions is a crucial first step towards an integrated pest management plan for dermestids in cricket farms.

Does freezing and thawing cause oxidative stress?

Authors: Caitlin Oh*, Zainab Hassonali, Stefane Saruhashi, & Brent J. Sinclair

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Abstract: The cricket *Gryllus veletis* can withstand internal ice formation (i.e. is freeze tolerant). When frozen, extracellular ice prevents gas transport, which means that oxygen rushes into the cell upon thawing, most likely increasing the production of Reactive Oxygen Species (ROS) which can damage macromolecules. We measured protein carbonyl production in Malpighian tubules using a colorimetric assay to determine whether freeze-thaw induces oxidative damage.



This study will help improve our understanding of how freeze-tolerant insects repair or protect tissues from oxidative stress.

Ectoparasite communities on little brown myotis (*Myotis lucifugus*) and big brown bats (*Eptesicus fuscus*) in a post-White Nose Syndrome decline area

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Abstract: Ectoparasites are dependent on their hosts for survival and can become extirpated when host populations decline. A diversity of ectoparasites, including bugs, mites, and fleas, parasitize bats. *Myotis lucifugus* is experiencing population declines due white-nose syndrome (WNS) while *Eptesicus fuscus* appears to be resistant to the causative fungus. Lambton County, Ontario is home to both bat species and is considered a post-WNS decline area. This study provides a baseline understanding of the ectoparasite communities on these two bat species and suggests that shared ectoparasite species may be able to persist on *E. fuscus* if *M. lucifugus* continues to decline.

A taxonomic review of Canadian bot flies (Diptera: Oestridae)

Authors: Ruishen Zhang*, Jessica Gillung, & Morgan Jackson

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Abstract: Oestridae is a widely distributed family of flies that are obligate parasites of mammals. While bot flies significant to the agricultural livestock industry have been well-researched, the biology of bot flies affecting wild mammals are less known, and the taxonomy of Canadian bot flies needs to be revisited with modern taxonomic methods. My project will review and update the taxonomy of Canadian bot flies based on adult morphology, including the production of new identification resources. After examining approximately 1400 Canadian specimens of bot flies, one potential new species in the genus *Cephenemyia* was found and will be described.

Poster Presentations

* indicates student talk for Presidents Prize for Best Poster Presentation

Assessing omnivorous predators (Hemiptera: Miridae) for their potential use as biological control agents of greenhouse tomato pests

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Abstract: Greenhouse tomatoes are a huge component of Ontario agriculture, but using predatory biocontrol agents for pest management is limited by their ability to traverse tomato trichomes. Two previously unassessed omnivorous predatory mirid species – *Dicyphus hesperus* and *Dicyphus discrepans* – are being evaluated for their ability to consume spider mites, whitefly



and thrips. Predator longevity and fecundity on three plant hosts (tomato, mullein and raspberry) in the absence of prey will be determined. Finally, predator-prey population dynamics and damage will be measured over time in a greenhouse environment. These predators may have potential to control both established greenhouse pests and impending invasives.

Road salt pollution increases sex-bias in emerging mosquito population

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Abstract: When road salts runoff into urban freshwater environments, they can promote salttolerant mosquitoes. While increased mosquito abundance can heighten disease transmission risk, mosquito sexual dimorphism means that only female mosquitoes transmit diseases. Many mosquitoes display male-biased emergence sex ratios, which may be exacerbated by prolonged aquatic pollutant exposure as juveniles. Yet, the effects of road salts on emerging mosquito sex ratios remain unknown. Using emergence traps, we compared sex ratios between low and high salt treatments. We show that salinity increases male -biased sex ratios at emergence, suggesting that salt pollution may contribute to reduced vector-borne disease transmission in cities.

Impacts of Anthropogenic Threats on Insect Biomass in Protected Areas

Authors: Hadil Elsayed* & Sheila Colla

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Abstract: Protected areas act as important habitat refugia for insects in highly human-affected landscapes. In the early 1990s, insects were collected using malaise traps in various protected areas within the Long Point World Biosphere Reserve. For a comparative analysis of changes in insect biomass between time periods, this sampling was replicated in 2021 and 2022, and will be continued in 2023. Biomass of samples of several taxonomic groups were compared for historical (1991, 1993) and current (2021, 2022) samples. In general, Trichoptera biomass increased between time periods while Lepidoptera decreased. Increased environmental stressors, mainly vegetation and climate, have been shown to negatively impact insect communities.

Characterizing the active space of pheromone traps for *Choristoneura fumiferana* and *Lymantria dispar*

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Abstract: The active space of a pheromone is described as the volume of air in which the pheromone concentration is above a threshold which elicits a behavioural reaction in the receiving individual. This is often evidenced by directed movement toward the source. This is an important concept to consider as researchers deploying pheromone-baited traps are often unsure of how far apart traps must be placed to ensure the largest area possible is sampled. Several methods have been proposed to assess active space including wingfanning assays, competitive trapping trials, mark-release-recapture experiments, and electrophysiological recordings. Here we use wingfanning assays as a simple and reliable test to assess when odour concentrations



surpass the behavioural threshold required by these organisms. We tested 2, 3, 4, and 5-day-old Spruce Budworm (*Choristoneura fumiferana*) males and 2, 3, and 4-day-old *Lymantria dispar* males to determine the distance from the trap at which the moths wingfanned. We also used walking assays to assess whether active space changes outside of the preferred daily activity period of these moths. Our results suggest that moths are equally responsive to pheromone outside of their activity periods for both species tested. For Spruce Budworm, active space ranges from 12-23m, and for *Lymantria dispar*, active space ranges from 90-112m. These findings provide a better understanding of moth olfaction and have potential applications in design of trapping programs as they may assist researchers in understanding how far pheromone-baited traps can function.

Brewery Waste as a Sustainable Protein Source for Edible Crickets

Authors: **Sophie Y. Kasdorf***, Matthew J. Muzzatti, Sue M. Bertram, & Heath A. MacMillan Affiliation: Carleton University

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Abstract: Edible crickets are capable of converting organic by-products of the food and agricultural industries. High-protein waste products such as spent grain and brewer's yeast have potential as replacements for the less sustainable primary protein source in cricket feed, fishmeal. In this study, an edible cricket species, *Gryllodes sigillatus*, was reared on experimental diets in which fishmeal was wholly or partially replaced with spent grain or brewer's yeast. Cricket survival, developmental rate, final body size and final body weight did not differ significantly between the experimental and standard diets. Therefore, both waste products are viable as replacements for fishmeal in cricket feed.

A biodiversity survey of carrion beetles (Coleoptera: Silphidae) in terrestrial habitats Authors: Matteo Menegazzo* & Kaitlyn J. Fleming

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Abstract: Carrion beetles play an important role in the physical decomposition of organic matter. We conducted a survey of Silphidae in Glebe Park, Haliburton from June 2022 to September 2022. We set four bottle traps in Glebe Park in an effort to update the known distributions of Silphids in the Haliburton region of Ontario.

The impact of warming on the hatching success of dragonfly (*Celithemis elisa* and *Leucorrhinia intacta*) eggs

Authors: Katie Monat*, Shannon McCauley, & Rosalind Murray

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Abstract: To explore the impact of climate change on dragonflies, we measured the effect of warming on egg hatching success in species that lay in spring and in mid-summer. Eggs of *Leucorrhinia intacta* and *Celithemis elisa* were collected from mated females and incubated at different temperatures to simulate the effects of climate warming. Hatching timing and success were predicted to decrease with increasing temperatures. Early spring species like *L. intacta* were predicted to be more negatively affected by warming than late summer species like



C. elisa. Our results will provide important insights into how different species may respond to climate warming.

The impact of road salt pollution on female mosquito behaviour

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Abstract: Salinity pollution is a growing threat to freshwater ecosystems. Road salt run-off is a major source of salinity pollution in Canada. Mosquitos (Diptera: Culicidae) are salt-tolerant, making salinized ponds potentially advantageous oviposition habitats due to fewer salt-intolerant competitors and predators. Using a mesocosm field experiment, we identified how salinity influences mosquito oviposition and how post-colonization dynamics impact mosquito abundance. We had high, low, and no salt treatments, and we sampled the invertebrate community. We found a positive effect of increasing salinity and collection date on mosquito number. Additionally, there was a negative effect of predator presence on mosquito number.

Insect quinone secretions as an anti-parasite defence against entomopathogenic nematodes

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Abstract: Chemical secretions are an important anti-parasite defence found in many organisms. One such example is the red flour beetle (*Tribolium castaneum*) that secretes a mix of quinones with known antimicrobial effects. While studies have shown these quinones to be effective against bacterial and fungal threats, their effectiveness against other parasitic groups is unknown. We investigated the effect of quinones against parasitic nematode *Steinernema carpocapsae*, and how exposure may impact their survival, movement, and infectivity. The role of these quinone mixes, individual components, and exposure time will be discussed, further contextualizing the role of quinones as an anti-parasite defence.

The effect of temperature on the activity and thermal tolerance of insects in an ecological gradient

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Abstract: Temperature is an important factor on the geographical distribution of species, and its signature can sometimes be seen at both physiological and behavioural levels. The Dairy Bush (Guelph, ON) is an ecological gradient (field and forest) that allows us to test hypotheses concerning the effects of temperature on the insects (Formicidae, Staphylinidae) that inhabit it. Briefly, field insects had an increased tolerance to higher temperatures whereas forest insects were more tolerant to lower temperatures, mirroring the range of temperature maximums and minimums of each habitat. Our results, therefore, indicate that insect community distribution is mediated by the effects of temperature.

