



**155<sup>th</sup> Annual General Meeting**  
of the  
**Entomological Society of Ontario**

October 19-21, 2018  
Bark Lake Leadership and Conference Centre  
Irondale, ON



The ESO 2018 Organizing Committee would like to thank its sponsor:



# Entomological Society of Ontario 155<sup>th</sup> Annual Meeting

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# Entomological Society of Ontario 155<sup>th</sup> Annual Meeting



## SCHEDULE OF EVENTS

Friday, October 19<sup>th</sup>

16:30 - 18:30

### **ESO Governing Board Meeting**

Main Office

17:00 - 18:30

### **Registration**

Main office

It is the first building on the right as you arrive (watch for the sign). Oral presenters should submit their presentation material at registration.

18:30 - 19:30

### **Dinner**

Dining Hall (next to Balsam Lakeside, cash bar 18:30-22:30)

19:30 - 22:30

### **ESO Mixer**

Dining Hall (cash bar 18:30-22:30)

20:00 - 21:00

### **Natural history quiz with Michael Runtz**

Dining Hall

This is the most popular annual event of the Macnamara Field Naturalists' Club. Michael Runtz founded the club and invented this quiz. Don't worry about your level of expertise. We will try to puzzle out what the natural history objects (and other challenges!) are. Each group will have an assigned leader, but group membership will be random. It will be a lot of fun and give us a chance to learn a few things and get to know each other.

21:30 - late

**Bonfire!** - directly below the dining hall. Also canoeing (weather dependent, see info on page 31).

# Saturday, October 20<sup>th</sup>

07:30 - 08:30

## **Breakfast and Registration**

Dining Hall

08:30 - 08:40

## **Welcome message and announcements**

Balsam Lakeside

Jeff Skevington and Michelle Locke

08:40 - 09:30

## **Plenary Talk: Colin Jones**

Balsam Lakeside

### **Ontario's Insects - Assessment, monitoring and discovery in the digital age**

Ontario has a long and rich history of entomological exploration and study. Many professional biologists and amateur naturalists have made significant contributions to our collective knowledge of Ontario's insect biodiversity. Such efforts have allowed us to begin the process of assessing the conservation status of many insect orders with some species being officially recognized as Species at Risk by the federal and/or provincial governments. Despite our long history of study and exploration, many insects are so poorly known that we have no clue as to their conservation status. With the advent of easy access digital photography, smart phone technology and natural history based social media platforms such as iNaturalist, this is all rapidly changing. Never before has it been so easy for citizen scientists of all calibers to work collectively with some of the world's leading taxonomic experts to make significant contributions to our understanding of insect distribution and status - if you haven't yet jumped on board, what are you waiting for!?!

# President's Prize Presentations

## Morning Session

Balsam Lakeside

**Moderator: Alex Smith**

09:30

### **Genomic tools for tracking invasive Africanized honey bees**

Kathleen A. Dogantzis and Amro Zayed

09:42

### **Dissecting the genetic underpinnings of pathogen loads in the honey bee (*Apis mellifera*)**

Tanushree Tiwari, Clement Kent, Alivia Dey, Stephen Rose, Harshil Patel, Kathleen Dogantzis, and Amro Zayed

09:54

### **Negative Selection in Social Insects**

Mohammad A. Imrit, K.A. Dogantzis, and A. Zayed

10:06

### **Evaluating the suitability of *Diadro muscollaris* as a biological control agent for Diamondback moth in Canada**

Christine Cock, Peter Mason, and Naomi Cappuccino

10:18 - 10:40

### **Coffee break - sponsored by Syngenta**

Dining Hall (next to Balsam Lakeside)

10:40

### **Preference and performance of *Hypena opulenta* on *Vincetoxicum rossicum* foliage from sun versus shade habitats**

Alicia Rochette and Naomi Cappuccino

10:52

### **Revision of Middle East *Tomosvaryella* Aczél species (Diptera: Pipunculidae)**

Behnam Motamedinia and Jeffrey H. Skevington

11:04	<b>Effect of landscape disturbance on bee (Apoidea) abundance and diversity in the Niagara Region</b> T. Audet and M. Richard
11:16	<b>Staphylinid diversity and community structure across a neotropical elevation gradient</b> Sarah J. Dolson, Elyssa Loewen, Winnie Hallwachs, Daniel H. Janzen, and M. Alex Smith
11:28	<b>How does oxygen availability determine fumigation success?</b> Kurtis F. Turnbull, Jessica Devitt, Adriana Najar-Rodriguez, and Brent J. Sinclair
11:40	<b>Lepidoptera Diversity of the Trent University Nature Areas</b> Basil Conlin
11:52	<b>How does the lightness of a species assemblage change across elevation?: Testing the thermal melanism hypothesis with two abundant and diverse insect families</b> Lauren Janke, Sarah J. Dolson, Daniel H. Janzen, Winnie Hallwachs, and Alex Smith
12:04- 13:00	<b>Lunch and viewing of posters</b> Dining Hall
13:00 - 14:15	<b>Poster Session</b> Dining Hall
	<b>President's Prize Poster Presentations</b>
Poster #1	<b>Not just another cute Chelicerate: De novo assembly of the Beringian pseudoscorpion (<i>Wyochernes asiaticus</i>) transcriptome reveals putative venom proteins</b> Jacqueline E. Lebenzon, Jantina Toxopeus, Susan E. Anthony, and Brent J. Sinclair

Poster #2

**A Review of Assisted Colonization Methods for Butterfly Conservation**

Linley M. Sherin, Gard W. Otis, and Jessica E. Linton

Poster #3

**Habitat suitability and dispersal capacity of a newly introduced butterfly, *Polyommatus icarus***

Stephanie A. Rivest and Heather M. Kharouba

Poster #4

**Distribution of Syrphidae (Diptera) across the Far North of Ontario**

Kathryn A. Vezensyi, David V. Beresford, William J. Crins, James A. Schaefer, and Jeffrey H. Skevington

Poster #5

**How does staphylinid abundance differ between field and forest?**

Amanda Semenuk, Ida Ostovar, Julianna Alaimo, Dan McIsaac, Kassie Belanger, Simonne Clout, and M. Alex Smith

Poster #6

**The Impact of Neonicotinoid Pesticides on Wild Bees in an Agricultural System**

Emma Gaudreault and Dr. Risa Sargent

Poster #7

**Unusual distributions of solitary bees in Ontario's Far North and Akimiski Island, Nunavut**

Kayla Vizza, David Beresford, James Schaefer, and J Scott MacIvor

Poster #8

**Do Biological and Environmental Variables Explain Rates of Molecular Evolution in Caddisflies (Trichoptera)? A Whole-Tree Approach**

Ian Thompson, Jacqueline May, and Sarah Adamowicz

**Regular Members Poster Presentations**

Poster #9

**Establishment of the moth *Hypena opulenta* in Canada: Diapause induction and mass rearing methods to enable biocontrol of *Vincetoxicum* species**

Robert S. Bouchier, Lukas M. Seehausen, Ian M. Jones, and Sandy M. Smith



<p>Poster #10</p>	<p><b>Using native congeners as ‘surrogates’ to identify false-positives in host specificity testing</b> Rhoda B. deJonge, Rob Bouchier, Hariet Hinz, Ghislaine Cortat, and Sandy M. Smith; Presented by: <b>Ian M. Jones</b></p>
<p>Poster #11</p>	<p><b>Luna ID: Mobile applications for instant insect identification using machine learning and computer vision</b> Jarrett Blair</p>
<p>Poster #12</p>	<p><b>The Contribution of Invertebrates to the Seasonal Diets of Walleye in Lake St. Joseph</b> Ayden Ricker-Held, David Beresford, Chris Wilson, and Dak de Kerckhove</p>
<p>14:15 - 15:15</p>	<p><b>Afternoon Session, Part 1</b> Balsam Lakeside <b>Moderator:</b> Joel Kits</p>
<p>14:15</p>	<p><b>Integrating lab and field data in the establishment of a pheromone-based action threshold for swede midge (<i>Contarinia nasturtii</i>) in canola (<i>Brassica napus</i> L.)</b> Matthew Muzzatti and Rebecca H. Hallett</p>
<p>14:27</p>	<p><b>Modelling the complex population dynamics of an invasive midge (<i>Contarinia nasturtii</i> Kieffer)</b> Jenny Liu, Boyd A. Mori, Ross Weiss, Owen Olfert, Jonathan A. Newman, and Rebecca H. Hallett</p>
<p>14:39</p>	<p><b>How does staphylinid abundance change along a neotropical elevation gradient?</b> Julianna Alaimo, Dan McIsaac, Daniel H. Janzen, Winnie Hallwachs, Sarah J. Dolson, and M. Alex Smith</p>
<p>14:51</p>	<p><b>Watersheds as the main factor in Carabidae distribution in Ontario’s Far North</b> K.J. Fleming, J.A. Schaefer, and D.V. Beresford</p>

15:03	<p><b>Overwintering biology of the brown marmorated stink bug, <i>Halyomorpha halys</i></b>  John J. Ciancio, Brent J. Sinclair, and Tara D. Gariepy</p>
15:15 - 16:45	<p><b>Break and Student Hike</b>  Enjoy some free time and explore the trails around Bark Lake or canoe (see info on page 31). Students can join an organized student-led hike with Student Rep. Sarah Dolson.</p>
16:45 - 17:57	<p><b>Afternoon Session, Part 2</b>  Balsam Lakeside  <b>Moderator:</b> Joel Kits</p>
16:45	<p><b>Relating performance to fitness in Western black widow spiders (<i>Latrodectus hesperus</i>)</b>  Susan E. Anthony, Catherine E. Scott, and Brent J. Sinclair</p>
16:57	<p><b>A sticky path to freedom: an assessment of pepper weevil escapes from sticky traps</b>  Cassandra Russell and Rebecca Hallett</p>
17:09	<p><b>Comparing apples and oranges: fruit type affects <i>Drosophila suzukii</i> development time and cold tolerance</b>  Yanira Jimenez Padilla, Laura Ferguson, and Brent J. Sinclair</p>
17:21	<p><b>Digging deeply into the morphology of minute flies: contrasting parallel taxonomic studies of <i>Pseudopomyza (Rhinopomyzella)</i> and <i>Bromeloecia</i></b>  T. Yau and S. A. Marshall</p>
17:33	<p><b>A multi-gene hypothesis of Eristalinae relationships (Diptera: Syrphidae)</b>  K. Moran, J.H. Skevington, X. Mengual, G. Ståhls, S. Kelso, A.D. Young, K. Jordaens, M. Reemer, S. Bot, J. van Steenis, A. Ssymank, M. van Zuijen, M. Hauser, G. Miranda, W. van Steenis, V. Mutin, M. De Meyer, M. de Groot, M. Locke, and C. Palmer</p>

17:45

**Sociality of the Sweat bee *Lasioglossum zonulum* across Canada**

A.N.M. Proulx and M.H. Richards

18:30 - 19:00

**Pre-Banquet Mingle**

Dining Hall (cash bar 18:30-22:30)

19:00 - 21:30

**Banquet**

20:00

**Banquet Speaker: Michael Runtz**

Michael has spent a large part of his natural history career getting to know the natural history of Algonquin Provincial Park. He has published a number of books on the park and its flora and fauna. Few people know the park better than Michael. This talk will present an overview of the park and should help us tie the insects that we study into the broader ecosystem in southern Ontario's flagship park. Bark Lake is a continuation of the habitats found in Algonquin so this will also give us a nice overview of where we are staying.

21:30

**Bonfire!** - directly below the dining hall. Also canoeing (weather dependent, see info on page 31).

# Sunday, October 21<sup>st</sup>

08:00 - 09:00

## **Breakfast**

Dining Hall

## **Regular Member Paper Presentations**

Balsam Lakeside

**Moderator:** Dave Beresford

09:00

### **Sunny bees live faster**

**Miriam Richards**

09:12

### **Feed me Seymour: Using DNA to identify the arthropod prey items of carnivorous plants**

**M. Alex Smith**, Sarah Adamowicz, Emily Al-Harazi, Liberty Alleston, Morgan Anderson, Sebastian Blanchett, Andrew Borrelli, Katherine Drotos, Natalie Duitschaeffer, Brandon Foy, Allannah Grant, Sarah Griffiths, Anastasia Heuvelmans, Natalie Heyblom, Jennifer Hoogenboom, Veronica Kaniewski, Hilary Lyttle, Daniel McIsaac, Brittany Moy, Gabrielle Schneider, Amanda Semenuk, Samantha Shrubsole, Adi Varsano, Emily Vellenga, Amy Virostek, Brayden Wight, and Hannah Wynen

09:24

### **Genomics for Bee Health and Conservation**

**Amro Zayed**

09:36

### **Energetic benefits of small size among flying insects**

**Meghan E. Duell** and Jon F. Harrison

09:48

### **Canada's iconic Bogbean Buckmoth: resolving the problematic taxonomy of an endangered species**

**Chris Schmidt**

10:00

### **Utilizing Citizen Science for Conservation: The success of Bumble Bee Watch in Ontario**

**Genevieve Rowe** and Sarah A. Johnson

10:12

**Does chilling elicit metabolomic changes in Asian Longhorned Beetle larvae?**

Alex S. Torson, Daniel Doucet, Amanda D. Roe, and Brent J. Sinclair

10:24

**Changes in the known Canadian Auchenorrhyncha fauna, 1979-2018**

Joel H. Kits

**Lightning Talk**

10:36

**The Frosted Elfin butterfly: a candidate for reintroduction to Canada**

Gard W. Otis and Alexys Santos

10:41 - 11:15

**Coffee break**

Dining Hall

11:15 - 12:00

**ESO Annual General Business Meeting**

Balsam Lakeside

12:00 - 12:30

**Awards Ceremony and wrap up**

Balsam Lakeside

12:30 - 17:00

**Free Time**

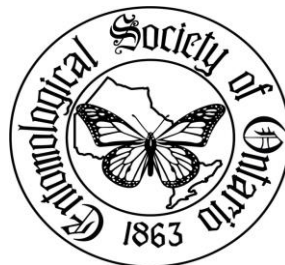
Once the conference has ended feel free to stay and explore the trails around Bark Lake or canoe (see info on page 31).

14:00

**Check-out**

17:00

**Time to go**



# Presentation Abstracts

## *Abstracts*

### **Plenary & Banquet Speakers:**

#### **Plenary Talk: Ontario's Insects - Assessment, monitoring and discovery in the digital age**

##### **Colin Jones**

Ontario's Insects- assessment, monitoring and discovery in the digital age  
Ontario has a long and rich history of entomological exploration and study. Many professional biologists and amateur naturalists have made significant contributions to our collective knowledge of Ontario's insect biodiversity. Such efforts have allowed us to begin the process of assessing the conservation status of many insect orders with some species being officially recognized as Species at Risk by the federal and/or provincial governments. Despite our long history of study and exploration, many insects are so poorly known that we have no clue as to their conservation status. With the advent of easy access digital photography, smart phone technology and natural history based social media platforms such as iNaturalist, this is all rapidly changing. Never before has it been so easy for citizen scientists of all calibers to work collectively with some of the world's leading taxonomic experts to make significant contributions to our understanding of insect distribution and status - if you haven't yet jumped on board, what are you waiting for!?!

#### **Banquet Talk: The Natural History of Algonquin**

##### **Michael Runtz**

Michael has spent a large part of his natural history career getting to know the natural history of Algonquin Provincial Park. He has published a number of books on the park and its flora and fauna. His 12th book, *Algonquin Wild*, a photographic overview of Algonquin's natural history, will be out later this fall. Few people know the park better than Michael. This talk will present an overview of the park and should help us tie the insects that we study into the broader ecosystem in southern Ontario's flagship park. Bark Lake is a continuation of the habitats found in Algonquin, so this will also give us a nice overview of where we are staying.

# Oral Presentations

## **\*\* Student President's Prize Competition**

### **\*\*ORAL: Genomic tools for tracking invasive Africanized honey bees**

**Kathleen A. Dogantzis** and Amro Zayed

Africanized honey bees (AHB) are a hybrid population considered undesirable for beekeeping due to their aggressive behaviour. Given the large-scale trade and movement of honey bees, there is concern that AHBs will spread from South America and the United States. Developing an accurate and cost effective assay to detect AHB is an important step towards restricting the accidental importation of AHB. Here, we used an extensive population genomic dataset to assess the genomic composition of native and commercial populations of *Apis mellifera*. This data was used to develop single-nucleotide polymorphism (SNP) genotyping assays that show high accuracy in differentiating bees as African or non-African.

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### **\*\*ORAL: Dissecting the genetic underpinnings of pathogen loads in the honey bee (*Apis mellifera*)**

**Tanushree Tiwari**, Clement Kent, Alivia Dey, Stephen Rose, Harshil Patel, Kathleen Dogantzis, and Amro Zayed

The honey bee *Apis mellifera* is a model organism for sociogenomics and is one of the most important managed pollinators. The recent threats to honey bee health are alarming. The honey bee lives in highly crowded nests providing favorable conditions for the spread of diseases. They have several social and individual mechanisms for protecting themselves against disease. The BeeOMICS consortium has sequenced the genomes of 1,000 colonies in Canada, evaluated for abundance of several pathogens within each colony. I will perform genome-wide association studies (GWAS) on colony pathogen loads to understand the genetics of immunity in them.

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### **\*\*ORAL: Negative Selection in Social Insects**

**Mohammad A. Imrit**, K. Dogantzis, and A. Zayed

Eusociality, characterized in part by cooperative brood care and reproductive division of labor, evolved independently several times in insects. The evolution of eusociality has been hypothesized to lead to differences in the extent of both positive

and negative selection. My research will estimate the extent of negative selection in honey bees, bumble bees, and wasps through analysis of published population genomic datasets. My study will compare the relationship between the strength of negative selection and caste-specific patterns of gene expression, and examine if the strength of negative selection correlates with the level of social complexity in this species triad.

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**\*\*ORAL: Evaluating the suitability of *Diadromus collaris* as a biological control agent for Diamondback moth in Canada**

**Christine Cock**, Peter Mason, and Naomi Cappuccino

*Diadromus collaris*, a solitary pupal endoparasitoid, has been proposed as a biological control agent for the suppression of Diamondback moth in Canada. The introduction of any new bio-control agent must be undertaken with caution; it is important to evaluate potential unintended impacts on non-target species. To determine whether any non-target lepidoptera are suitable hosts for *D. collaris* and/or whether *D. collaris* affects non-target mortality, female *D. collaris* were exposed to non-target pupae from eight lepidopteran species. The results of these host range tests will help to determine whether *D. collaris* should be considered for introduction in Canada.

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**\*\*ORAL: Preference and performance of *Hypena opulenta* on *Vincetoxicum rossicum* foliage from sun versus shade habitats**

**Alicia Rochette** and Naomi Cappuccino

Physical properties of individual plants within the same species can differ between habitats. Foliage characteristics such as leaf toughness and water content can be influenced by abiotic factors such as light intensity and temperature. These differences can also affect insect herbivores that feed on them. Here, we examine physical characteristics of *Vincetoxicum rossicum* between full-sun and shaded habitats. In addition, we determine larval performance of the biological control agent, *Hypena opulenta*, on full-sun and shaded foliage. Preliminary results suggest that *H. opulenta* preferentially feed on shaded foliage. Overall, this study will provide insight for optimal release sites for *H. opulenta*.

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**\*\*ORAL: Revision of Middle East *Tomosvaryella* Aczél species (Diptera: Pipunculidae)**

**Behnam Motamedinia** and Jeffrey H. Skevington



Pipunculidae are an inconspicuous family of brachycerous Diptera. Larvae are endoparasitoids of nymph and adult Auchenorrhyncha (leafhoppers, planthoppers and relatives), with the exception of *Nephrocerus* Zetterstedt. The latter parasitize adult Tipulidae (crane flies). To date, 1479 species of Pipunculidae are recognized.

*Tomosvaryella* is a large and cosmopolitan genus of the tribe *Tomosvaryellini* currently including 283 valid species. From the Middle East, 31 species of *Tomosvaryella* are known. In this study we revise the *Tomosvaryella* of the Middle East. Species concepts will be based on morphological and molecular characters. We will present an overview of progress on the revision to date.

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**\*\*ORAL: Effect of landscape disturbance on bee (Apoidea) abundance and diversity in the Niagara Region**

T. Audet and M. Richards

Ecosystem disturbance decreases the abundance and diversity of bees in the short term. Most research on disturbance has been on heavily disturbed or chronic disturbances, with less on moderate acute disruptions. We examined the impact of a short, moderate disturbance, mowing and shrub removal, on a bee community at Brock University. We compared bee abundance and diversity in the mowed plot to that in a contiguous, undisturbed control site. Bee abundance was significantly lower in the mowed site. Community composition also differed: in disturbed sites, there were more ground-nesting bees, while in the control site there were more twig-nesting bees.

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**\*\*ORAL: Staphylinid diversity and community structure across a neotropical elevation gradient**

Sarah J. Dolson, Elyssa Loewen, Winnie Hallwachs, Daniel H. Janzen, and M. Alex Smith

Environmental stress can act as an environmental filter on the individuals present in a given habitat. This can reduce a community's diversity and make its composition more phylogenetically clustered. We tested this prediction using Staphylinidae (Coleoptera) collected across an elevation gradient in northwestern Costa Rica. Using DNA barcodes and phylogenetic estimates of community structure, we found high species turnover across elevation and that diversity increased linearly with elevation. This diversity was negatively related to surface area and temperature and positively with precipitation. We suggest that historical biogeography, rather than contemporary environmental stress alone, has produced these diversity patterns.

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**\*\*ORAL: How does oxygen availability determine fumigation success?**

**Kurtis F. Turnbull**, Jessica Devitt, Adriana Najjar-Rodriguez, and Brent J. Sinclair

Wood exports are frequently treated with fumigants within hypoxic (i.e. low oxygen) ship holds. However, the impact of modified atmospheres on fumigant efficacy against forest pests is unclear. Here, we use the golden-haired bark beetle, *Hylurgus ligniperda* (Coleoptera: Curculionidae) to test links between oxygen availability, metabolic rate, and fumigant efficacy. We found that metabolic rate varies between life stages and declines under hypoxia. We will determine how hypoxia impacts fumigation, testing if efficacy is a function of metabolic rate and oxygen availability. We discuss applications and limitations of our results to post-harvest fumigation under modified atmospheres.

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**\*\*ORAL: Lepidoptera Diversity of the Trent University Nature Areas**

**Basil Conlin**

Trent University is unique in Ontario because its campus mostly consists of natural areas. For the last eight years I have been surveying lepidoptera on the Trent campus and have compiled a list of over 800 species. This is significant because many provincially and globally uncommon and rare species were found to occur here.

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**\*\*ORAL: How does the lightness of a species assemblage change across elevation?: Testing the thermal melanism hypothesis with two abundant and diverse insect families**

**Lauren Janke**, Sarah J. Dolson, Daniel H. Janzen, Winnie Hallwachs, and M. Alex Smith

According to the thermal melanism hypothesis, ectotherms ought to be darker in colder environments to obtain more heat and lighter in warmer environments to avoid overheating. We predicted that insect assemblages in the cloud forest at the top of a neotropical mountain would be darker than those at the bottom. To test this hypothesis, we used insects from two families (Formicidae and Staphylinidae) from a decade of collections across a 1500m elevation gradient in northwestern Costa Rica (all imaged, tissue sampled, and DNA barcoded). We found that these two insect assemblages followed a trend that supported the thermal melanism hypothesis.

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**\*\*ORAL: Integrating lab and field data in the establishment of a pheromone-based action threshold for swede midge (*Contarinia nasturtii*) in canola (*Brassica napus* L.)**

**Matthew Muzzatti** and Rebecca H. Hallett

Current management recommendations for swede midge (*Contarinia nasturtii*) in canola (*Brassica napus* L.) may not be appropriate as they rely on action thresholds developed for cole crops (*B. oleracea* L.). In pursuit of the development of pheromone-based action thresholds for swede midge in canola, four different canola growth stages were exposed to various midge densities in laboratory cage experiments. Midge damage was rated, number of racemes and pods were counted, and seed weight was calculated. These results will be used in tandem with an analysis of a 4-year data set from threshold field-plot trials to determine threshold recommendations in canola.

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**\*\*ORAL: Modelling the complex population dynamics of an invasive midge (*Contarinia nasturtii* Kieffer)**

**Jenny Liu, Boyd A. Mori, Ross Weiss, Owen Olfert, Jonathan A. Newman, and Rebecca H. Hallett**

The presence of swede midge (SM) (*Contarinia nasturtii* Kieffer), an invasive insect from Eurasia, has caused a decline of over 60% of Ontario's canola acreage since 2011. Ontario-specific SM development information was used to build a population dynamics model for reliable emergence forecasting. Iterative changes were made to model parameters in accordance with a partial set of robust pheromone trap data from Elora, Ontario. Finally, the model was validated against the remaining trap data. The model accurately predicts economically-damaging peaks of SM throughout the growing season. This information may help mitigate future economic damage caused by this invasive insect.

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**\*\*ORAL: How does staphylinid abundance change along a neotropical elevation gradient?**

**Julianna Alaimo, Dan McIsaac, Daniel H. Janzen, Winnie Hallwachs, Sarah J. Dolson, and M. Alex Smith**

The Area de Conservación Guanacaste (ACG) in northwestern Costa Rica contains a dry forest, rainforest, and cloud forest that are home to an amazing diversity of invertebrates. Across these forests, we used a decade's worth of collections to ask whether the abundance of staphylinid subfamilies changed along a 1500 m elevation gradient. Using the six most abundant staphylinid subfamilies collected, we found a

band of highest abundance from each subfamily at the start of the high elevation cloud forest. While many species appear to have limited elevational ranges, we continue to examine species-level patterns of elevation and abundance.

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**\*\*ORAL: Watersheds as the main factor in Carabidae distribution in Ontario's Far North**

**K.J. Fleming**, J.A. Schaefer, and D.V. Beresford

Large-scale geographic distributions of carabids are governed by macro-scale climatic factors. We tested five hypotheses of temperature, continentality, precipitation, elevation, and watershed to determine what factors play a role in carabid distributions across Ontario's Far North. We found that species diversity was not affected by any abiotic factor examined. However, species composition differed primarily by watershed. Our results suggest a mechanism operating at the watershed level, the downstream movement of flotsam, enhances the dispersal of carabids. This research is the first to examine how multiple abiotic factors affect present-day carabid biogeography in Ontario's Far North.

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**\*\*ORAL: Overwintering biology of the brown marmorated stink bug, *Halyomorpha halys***

**John J. Ciancio**, Brent J. Sinclair, and Tara D. Garipey

In temperate North America, insects risk exposure to several environmental stressors - including low temperatures, desiccation, and energy consumption - while overwintering. The brown marmorated stink bug (*Halyomorpha halys*) is an invasive crop pest which poses a significant threat to the Canadian agricultural landscape. Here, we investigate the tolerance of *H. halys* to low temperatures, desiccation, and energy consumption on a seasonal basis, in addition to investigating the role of diapause in enhancing stress tolerance. Moreover, we report the physiological responses seen in field-collected *H. halys* populations when exposed to environmental stress and describe potential pest management strategies based on our findings.

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**\*\*ORAL: Relating performance to fitness in Western black widow spiders  
(*Latrodectus hesperus*)**

Susan E. Anthony, Catherine E. Scott, and Brent J. Sinclair

Many researchers infer the effects of temperature acclimation on fitness in ectotherms by measuring locomotion. However, this link between performance and fitness is rare. Our study measured the effect acclimation has on both thermal performance and mating success in Western black widow spiders. We found that acclimation to either 15°C or 25°C did not yield a significant difference in thermal performance. We also noticed that those acclimated to lower temperatures were more likely to mate at high temperature than those with previous high temperature exposure, though not significantly. Therefore, performance may not be an appropriate proxy for fitness in ectotherms.

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**\*\*ORAL: A sticky path to freedom: an assessment of pepper weevil escapes from sticky traps**

Cassandra Russell and Rebecca Hallett

The pepper weevil (*Anthonomus eugenii* Cano) has become a significant pest of field and greenhouse peppers in southwestern Ontario. The efficacy of the current commercially available pepper weevil monitoring trap is under scrutiny and a more effective trap design and lure are required. As part of a larger improved monitoring and management study, five brands of sticky cards and/or adhesives were assessed for the ability of weevils to move and escape from the traps. Factors such as temperature, sex, age, and position placed on trap were analyzed. Results will be used to provide recommendations for a more effective monitoring trap.

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**\*\*ORAL: Comparing apples and oranges: fruit type affects *Drosophila suzukii* development time and cold tolerance**

Yanira Jimenez Padilla, Laura Ferguson, and Brent J. Sinclair

*Drosophila suzukii*, commonly known as spotted wing *Drosophila*, is a pest of soft-skin fruits such as cherries, grapes, and various berries. Females lay their eggs in healthy fruits, and larval feeding causes the fruit to spoil leading to low yields and economic losses. Since both larvae and adults of *D. suzukii* are chill-susceptible (killed by low temperatures before their body fluids freeze), post-harvest cold exposure can be used as a method of controlling this pest. However, the fruits the flies feed upon affect their physiology and the efficacy of the cold treatments. Therefore, to develop an

effective cold exposure control it is important to take into consideration the crop we are trying to protect.

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**\*\*ORAL: Digging deeply into the morphology of minute flies: contrasting parallel taxonomic studies of *Pseudopomyza* (*Rhinopomyzella*) and *Bromeloecia***

T. Yau and S. A. Marshall

*Pseudopomyza* (*Rhinopomyzella*) (Pseudopomyzidae) and *Bromeloecia* (Sphaeroceridae, Limosininae) are widely separated clades within the acalyptrates. These minute flies from the New World have strikingly different morphological qualities and expressions. *Pseudopomyza* (*Rhinopomyzella*) is a beautiful shiny subgenus, distinctively marked yellow and brown; however under its façade, it offers a limited and highly homoplastic character set. *Bromeloecia* alternatively is a dull-looking genus, yet species have character rich wings with striking wing interference patterns, and informatively elaborate genitalia. The comparison of these two contrasting groups suggest that the only thing they share is the remarkably high proportion of new species awaiting description and naming.

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**\*\*ORAL: A multi-gene hypothesis of Eristalinae relationships (Diptera: Syrphidae)**

K. Moran, J.H. Skevington, X. Mengual, G. Ståhls, S. Kelso, A.D. Young, K. Jordaens, M. Reemer, S. Bot, J. van Steenis, A. Ssymank, M. van Zuijen, M. Hauser, G. Miranda, W. van Steenis, V. Mutin, M. De Meyer, M. de Groot, M. Locke, and C. Palmer

Multiple analyses have recovered the subfamilies Microdontinae, Syrphinae and Pipizinae as monophyletic; however, Eristalinae is repeatedly recovered as paraphyletic. Twenty scientists from 13 countries have joined to assemble a phylogeny of Eristalinae. Nine genes form the backbone: COI, 28S D2-3, CAD1, AATS, Period along with three new loci (for a total of ~ 8kB of data). Utilizing the other three subfamilies as outgroups, taxa were chosen across Eristalinae with an effort made to include a member of every tribe and subtribe. Phylogenetic results, including evidence supporting the elevation of additional subfamilies, are presented and proposed next steps are discussed.

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**\*\*ORAL: Sociality of the Sweat bee *Lasioglossum zonulum* across Canada**

A.N.M. Proulx and M.H. Richards

Sweat bees (Halictidae) exhibit substantial diversity in social behaviour, making them prime candidates for research on social evolution. The halictid *Lasioglossum zonulum* exhibits solitary behaviour in Europe; however, pan trap collections in the Niagara region demonstrate a flight phenology consistent with eusocial species. I plan to determine the social behavior of *L. zonulum* in Niagara and across Canada. Preliminary data from dissections that score wear and ovarian development show that *L. zonulum* is either eusocial or solitary with two broods. If it is shown to be the latter, *L. zonulum* could be an evolutionary stepping stone between solitary and eusocial behavior.

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### **ORAL: Sunny bees live faster**

**Miriam Richards**

Small carpenter bees (*Ceratina calcarata*) raised in sun-exposed nests with very high daytime temperatures develop more slowly in the lab than do those from shaded nests with lower temperatures. Since developmental and metabolic rates are normally correlated, this suggests countergradient variation and thermal compensation. We set up a field experiment in which carpenter bees were raised in full sun, full shade, or semi-shade, then moved to the lab for respirometry. Contrary to prediction, bees raised in full sun had higher metabolic rates than those from shady nests, but only at high temperatures (40°C). This suggests the uncoupling of metabolic and developmental rates and thermal compensation by bees in hot nests.

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### **ORAL: Feed me Seymour: Using DNA to identify the arthropod prey items of carnivorous plants**

**M. Alex Smith**, Sarah Adamowicz, Emily Al-Harazi, Liberty Alleston, Morgan Anderson, Sebastian Blanchett, Andrew Borrelli, Katherine Drotos, Natalie Duitschaeffer, Brandon Foy, Allanah Grant, Sarah Griffiths, Anastasia Heuvelmans, Natalie Heyblom, Jennifer Hoogenboom, Veronica Kaniewski, Hilary Lyttle, Daniel McIsaac, Brittany Moy, Gabrielle Schneider, Amanda Semenuk, Samantha Shrubsole, Adi Varsano, Emily Vellenga, Amy Virostek, Brayden Wight, and Hannah Wynen

Some plant species in nutrient-poor environments are carnivorous to augment nitrogen. However, knowing what arthropod species these plants prey upon is often not possible as the characteristics necessary for identification are absent from degraded field collections. As part of undergraduate field courses in Churchill, MB, and Algonquin Provincial Park, ON, we collected and DNA barcoded prey items from the common butterwort (*Pinguicula vulgaris*), sundew (*Drosera rotundifolia*), and pitcher plant (*Sarracenia purpurea*) to identify prey items to species. We will present preliminary

findings about the species-level diversity and community overlap of the arthropod assemblages upon which each plant feeds.

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### **ORAL: Genomics for Bee Health and Conservation**

**Amro Zayed**

Can we use genomics to help us assess and improve bee health? Wild and managed bees have experienced declines in health over the past several decades. I will discuss opportunities to apply emerging genomic tools in bee conservation and management, including the identification of loci underlying adaptive and economically desirable traits, as well as identifying environmental stressors that impact bee health in the field.

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### **ORAL: Energetic benefits of small size among flying insects**

**Meghan E. Duell and Jon F. Harrison**

Allometric scaling of flight metabolic rate (FMR) in insects is nearly always hypometric. However, few small flyers have been included in these trends. We find that FMR scales hypermetrically among 13 stingless bee species ranging in body size from 1-115mg in body mass. Energy savings in smaller species are partially explained by differences in head and wing morphology that alter flight biomechanics and tradeoffs in physical forces at small size (friction vs. inertia). When compared to all flying insects, a breakpoint in FMR exists at 53mg body mass, below which flight costs are cheaper than expected.

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### **ORAL: Canada's iconic Bogbean Buckmoth: resolving the problematic taxonomy of an endangered species**

**Chris Schmidt**

The bogbean buckmoth is a charismatic saturniid moth with a highly localized occurrence in fen habitats of the eastern Lake Ontario region, and is of conservation concern in Canada and the USA. Due to pronounced ecological specialization across North American buckmoth populations that are nevertheless morphologically homogeneous, the taxonomy of bogbean buckmoths has been in limbo, hampering conservation management and a better understanding of the group. Recent research applying molecular techniques shows some promising results in elucidating the taxonomy and biogeography of this iconic species.



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**ORAL: Utilizing Citizen Science for Conservation: The success of Bumble Bee Watch in Ontario**

**Genevieve Rowe** and Sarah A. Johnson

Up to 30% of bumble bee (*Bombus*) species may be at risk of extinction. Bumble bees can often be identified to species from photographs making them an ideal group for engaging citizen scientists in population monitoring. In 2014, Bumble Bee Watch (BBW) was launched and has become a valuable tool used in Wildlife Preservation Canada's (WPC) citizen science programs. Records on BBW continue to help guide search locations for at-risk species, and an ever-expanding community of volunteers using BBW has vastly increased survey coverage across the province. BBW is an invaluable support to *Bombus* conservation across North America.

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**ORAL: Does chilling elicit metabolomic changes in Asian Longhorned Beetle larvae?**

**Alex S. Torson**, Daniel Doucet, Amanda D. Roe, and Brent J. Sinclair

Overwintering capacity can mediate an insect's range expansion in temperate climates. The Asian longhorned beetle (ALB) is an invasive species native to China and Korea. Its native range spans a large latitudinal gradient, so native populations likely experience significant variation in winter conditions. However, little is known about ALB's overwintering strategy and whether it could survive Canadian winters. Here, we use an initial characterization of ALB's overwintering physiology to inform a metabolomic analysis throughout exposure to chilled temperatures. We observed significant separation of metabolomic profiles between chilled and non-chilled time points suggesting distinct physiological changes throughout chilling.

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**ORAL: Changes in the known Canadian Auchenorrhyncha fauna, 1979-2018**

**Joel H. Kits**

The known Canadian fauna of Auchenorrhyncha was about 1060 species in 1979, and has since increased more than 40% to 1491 species as of 2018. I will discuss some of the causes of these increases, including improving taxonomic knowledge and newly introduced species. Gaps in our existing knowledge and potential for further discoveries will also be discussed.

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## **ORAL: The Frosted Elfin butterfly: a candidate for reintroduction to Canada**

**Gard W. Otis and Alexys Santos**

The Frosted Elfin (*Callophrys irus*), a specialist on wild lupine (*Lupinus perennis*), was last observed in Canada in 1988 in Norfolk County, ON. Habitat restoration undertaken by Nature Conservancy Canada and the St. Williams Conservation Reserve has created several geographically-linked lupine habitats that may be suitable for reintroduction of the butterflies. This presentation will summarize the field work undertaken in 2018 that will provide background information in support of the recovery of the Frosted Elfin in Ontario.

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## **Abstracts of Poster Presentations**

### **\*\* Student President's Prize Competition**

**\*\*POSTER: Not just another cute Chelicerate: De novo assembly of the Beringian pseudoscorpion (*Wyochernes asiaticus*) transcriptome reveals putative venom proteins.**

**Jacqueline E. Lebenzon, Jantina Toxopeus, Susan E. Anthony, and Brent J. Sinclair**

There are over 3000 described Pseudoscorpiones species, some inhabiting areas above the Arctic circle. Most research on pseudoscorpions has focused on species found at lower latitudes, and we therefore have a limited understanding of the biology of Arctic species. Here, we used RNA-seq to characterize the transcriptome of Beringian pseudoscorpions collected from the Yukon Territory. We identified hundreds of stress-related transcripts that may facilitate survival in the Arctic, and five groups of transcripts encoding arachnid and other arthropod venom proteins that have not previously been identified in pseudoscorpions. This transcriptome provides a basis for future work investigating the underlying biology of pseudoscorpions.

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**\*\*POSTER: A Review of Assisted Colonization Methods for Butterfly Conservation**

**Linley M. Sherin, Gard W. Otis, and Jessica E. Linton**

There has been a decline in worldwide butterfly populations over the past century. Due to this decline, there has been an increase in conservation-driven captive-rearing programs. However, the documentation on butterfly assisted colonization programs remains largely decentralized, so it is difficult to assess the efficacy of captive-rearing

over other colonization methods. By reviewing the literature and interviewing conservationists, we found that captive-rearing methods are expensive and often have a low success rate. We also found that the optimal life stage for butterfly release is often dependent on the species' specific life history. This information should better inform future efforts.

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**\*\*POSTER: Habitat suitability and dispersal capacity of a newly introduced butterfly, *Polyommatus icarus***

**Stephanie A. Rivest** and Heather M. Kharouba

The frequency of species introductions is on the rise globally. One newly introduced species of butterfly, the European Common Blue (*Polyommatus icarus*), is expanding its range around Montréal, QC, faster than expected. To determine the factors that will predict its range expansion in the future, we assessed the dispersal capacity of *P. icarus* and the local habitat characteristics that best predict its abundance. We found that *P. icarus* adults only rarely fly long distances (~900m) and that they are most abundant where there is less canopy cover, greater floral cover, and where their preferred larval foodplant is found.

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**\*\*POSTER: Distribution of Syrphidae (Diptera) across the far north of Ontario**

**Kathryn A. Vezensyi**, David V. Beresford, William J. Crins, James A. Schaefer, and Jeffrey H. Skevington

Hover flies (Syrphidae) are an important and diverse pollinator group whose distributions are poorly known in the north. Here, we present the first comprehensive list of syrphids found in the Far North of Ontario, a highly under-sampled region due to its remote location. Sampling was conducted from 2009 to 2016, through projects such as the Far North Biodiversity project by the OMNRF. Traps used include Malaise, Nzi, pan traps, pitfall, bottle traps, and net sweeps. A total of 1514 individuals of 120 species were collected, 7 of which are new species records for Ontario.

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**\*\*POSTER: How does staphylinid abundance differ between field and forest?**

**Amanda Semenuk**, **Ida Ostovar**, Julianna Alaimo, Dan McIsaac, Kassie Belanger, Simonne Clout, and M. Alex Smith

To answer this question we collected staphylinids from a small woodlot and adjacent field on the University of Guelph campus between 2011 and 2013 using a variety of

trapping methods. Over this small spatial scale, we expected the relative abundance of staphylinid subfamilies to be uniform across the forest, field, and edge ecotones. However, only one (Aleocharinae) fit this pattern while three of the four subfamilies (Staphylininae, Oxytelinae, and Tachyporinae) were most abundant within the forest. Species-level analyses continue and we have identified many European adventives and one example of a new locality of a relatively new species of Aleocharinae.

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**\*\*POSTER: The Impact of Neonicotinoid Pesticides on Wild Bees in an Agricultural System**

**Emma Gaudreault** and Dr. Risa Sargent

Increasing concern about the impacts of systemic pesticides on bee health has been primarily focused on honeybees, which can encounter pesticides in nectar and pollen as they forage. Most native bees nest in the ground putting them at risk of exposure to pesticides through soil. Here I describe a study of ground nesting bees on Ontario farms. I am collecting data on wild bees, soil pesticide levels, floral resources, and soil impaction. Next summer I will also conduct an experimental study on reproduction and survival of ground nesting bees exposed to field realistic levels of neonicotinoids in the soil.

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**\*\*POSTER: Unusual distributions of solitary bees in Ontario's Far North and Akimiski Island, Nunavut**

**Kayla Vizza**, David Beresford, James Schaefer, and J Scott MacIvor

Bees are valuable pollinators in environments worldwide; the North is no exception. We surveyed Akimiski Island, one of Nunavut's most southern islands, where there is limited knowledge of biodiversity. We used morphology and DNA barcoding to identify bee species, assessed species richness as a function of the number of specimens (rarefaction) and true species diversity (Chao1) and compared the island to Ontario's continental Far North. We found 17 species on Akimiski Island and 24 in the Far North. While more species and more specimens were caught in the Far North, Akimiski Island had a slightly higher true species diversity than either ecozone alone.

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**\*\*POSTER: Do Biological and Environmental Variables Explain Rates of Molecular Evolution in Caddisflies (Trichoptera)? A Whole-Tree Approach**

**Ian Thompson**, Jacqueline May, and Sarah Adamowicz

Prior research has shown that rates of molecular evolution covary with biological traits in various taxa. However, few studies have assessed multiple traits, and many taxonomic groups remain to be investigated. By adapting an analysis pipeline in the R language previously tested on fish, this study investigated rates of evolution in mitochondrial DNA in Trichoptera. A variety of biological traits and environmental factors were tested as potential correlates of molecular rates. Ultimately, rates were not significantly explained by traits in a multivariable context, supporting the usage of mitochondrial DNA in Trichoptera for dating phylogenetic trees using molecular clock methods.

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**POSTER: Establishment of the moth *Hypena opulenta* in Canada: diapause induction and mass rearing methods to enable biocontrol of *Vincetoxicum* spp.**

Robert S. Bouchier, Lukas M. Seehausen, **Ian M. Jones**, and Sandy M. Smith

*Hypena opulenta* (Lepidoptera: Erebidae) was first released in Canada in 2013 for biocontrol of dog-strangling-vine (DSV). We developed artificial diets to facilitate year-round mass-rearing of *H. opulenta*. Furthermore, we investigated the factors that induce diapause in *H. opulenta*, to inform agent release strategy. We successfully reared moths on DSV-supplemented artificial diets. Laboratory trials revealed photoperiod to be the dominant factor for diapause induction, while staggered cage releases showed that only individuals released early in spring produced more than one generation. Our results indicate a narrow window for field releases in Ontario, if released individuals are to produce multiple generations.

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**POSTER: Using native congeners as ‘surrogates’ to identify false-positives in host specificity testing**

Rhoda B. deJonge, Rob Bouchier, Harriet Hinz, Ghislaine Cortat, and Sandy M. Smith  
Presented by: **Ian M. Jones**

Insects’ fundamental host-ranges, defined by host-range testing, are usually broader than their ecological host-ranges. Comparing host-testing results with the host-range of congeneric species can help to identify true ecological hosts from suspected false-positives. We compared the host-testing results of a potential European biocontrol agent, *Chrysochus asclepiadeus*, with the host-ranges of two North American (NA) congeners. During host-testing, *C. asclepiadeus* developed successfully on NA milkweeds. However, host-range comparisons revealed that *C. asclepiadeus* aligns most closely with *C. auratus*, a species that does not use milkweeds as ecological hosts.

Therefore, additional field-testing of *C. asclepiadeus* on NA milkweeds in Europe is merited.

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**POSTER: Luna ID: Mobile applications for instant insect identification using machine learning and computer vision.**

**Jarrett Blair**

Luna ID is a University of Guelph student-operated project aiming to develop mobile apps for photo-identifying insects using machine learning and CNNs. Our apps will primarily serve agricultural, educational and medical purposes. Our objective is to provide our users with a product that is tailored to their specific need while providing accurate identifications within seconds. We already have multiple apps available on the Google Play Store and Apple App Store with photo identification accuracies of >95%. Here, we present an overview of the methods for photo recognition app development and explore future utilisation of CNNs for entomological purposes.

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**POSTER: The Contribution of Invertebrates to the Seasonal Diets of Walleye in Lake St. Joseph**

**Ayden Ricker-Held**, David Beresford, Chris Wilson, and Dak de Kerckhove

Walleye (*Sander vitreus*) are ecologically and economically significant for recreational and commercial fisheries across Ontario. Walleye are effective piscivores, but their foraging behaviour on alternative prey is largely unknown. Angler anecdotal evidence suggests that walleye target insects such as Mayflies (Ephemeroptera). My research examines the diets of walleye from May to September on Lake St. Joseph in northern Ontario, to determine the role insectivory plays in seasonal foraging. I will identify stomach contents of mature fish through morphological analysis and eDNA methods. These results will inform long-term management strategies.

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**Note about using Bark Lake canoes and kayaks:** You must wear a lifejacket and take safety kits in the boats. Both before going out and after coming in, you must also call or text Angie Grant at 705-308-2235. Canoes may only go out after dark if the group is led by Jeff Skevington or Alex Smith and no one in the boat has been drinking (Bark Lake set this rule).

# Bark Lake Site Map

