BeeCon 2023 Program

Hosted by:

Centre for Bee Ecology, Evolution & Conservation | YORK UNIVERSITÉ UNIVERSITY

Virtual via Zoom Webinar: Thurs, Oct 12, 2023
In-person at York University or Virtual: Fri, Oct 13, 2023

www.yorku.ca/bees/beecon-2023

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BeeCon 2023 Program: Location, Schedule, Abstracts, and More

Welcome!

Welcome to #BeeCon 2023! BeeCon was originally the Southern Ontario Bee Researchers' Symposium, an event organized and hosted by York University researchers usually annually since 2011. The Centre for Bee Ecology, Evolution and Conservation at York University (BEEc) is now the host, and has helped grow BeeCon from a small, local symposium, aimed at sharing the recent findings of southern Ontario bee researchers, to an international one, connecting melittologists (bee biologists), industry professionals, and other researchers on a global scale!

In 2023, BeeCon returns to York University's campus as part of a two-day hybrid event. Thursday, October 12, 2023 will be a virtual-only event hosted on Zoom, while Friday, October 13, 2023 will be both virtual and in-person. We have over 30 presenters from 8 countries scheduled to participate, and we look forward to being able to network in-person over the breaks and the post-conference social!

We would like to give a big thank-you to our funders, the Faculties of Science and Environmental and Urban Change and the Office of the VPRI, at York University. We would also like to thank the many volunteers who will help make the event run smoothly, from moderating sessions both virtually and in-person to handling the registration table and food for the in-person aspect of the event.

Are you on social media? We encourage you to share notable quotes, interesting findings, or general comments about the event with your followers, to help us achieve an even greater impact. Follow and tag us on Twitter @BeesYork or on Instagram @BeesAtYork. Use #BeeCon.

About BEEc

BEEc (pronounced bee-see) is an initiative that strives to advance research in the fields of bee ecology, evolution and conservation. The mission of BEEc is to foster interdisciplinary, innovative, collaborative, and cutting-edge research. This research is used for the advancement of knowledge and implementation of policy changes to help sustain pollinators globally. Ultimately, our goal is to apply our collaborative efforts to the development of policies and environmental management for the long-term sustainability of bees and the vital ecosystem services they provide.

Interested in joining us? There are numerous ways in which researchers, students and community members can be part of the work that we do. Visit https://www.yorku.ca/bees/about-us/membership/ for more information or to apply to become an Associate.

If you are not currently working or collaborating with someone in BEEc at York University, but want to stay informed on BEEc's research activities and events, you can also join our Global listserv. Send an email to LISTSERV@YORKU.CA with the following command in the body of the email:
SUBSCRIBE BEES YourFirstName YourLastName. Note you do not need a subject line and please do not include any other text in your message (e.g. signature line).

Check out our website at https://www.yorku.ca/bees/ for more information and resources, such as upcoming events, publications, and projects. Don't forget to follow our YouTube Channel at https://www.youtube.com/c/BeeEcologyEvolutionandConservation/, and engage with us on Twitter (aka X) @BeesYork or on Instagram @BeesAtYork.

Land acknowledgement

We recognize that many Indigenous nations have longstanding relationships with the territories upon which York University campuses are located that precede the establishment of York University. York University acknowledges its presence on the traditional territory of many Indigenous Nations. The area known as Tkaronto has been care taken by the Anishinabek Nation, the Haudenosaunee Confederacy, the Huron-Wendat, and the Métis. It is now home to many Indigenous Peoples. We acknowledge the current treaty holders, the Mississaugas of the Credit First Nation. This territory is subject of the Dish with One Spoon Wampum Belt Covenant, an agreement to peaceably share and care for the Great Lakes region.

This statement was written for the areas occupied by York University, in Toronto, Ontario. We encourage everyone to watch the following video that gives more background to this land acknowledgement, including a brief history of the traditional territory of the Indigenous Peoples who called this area home, the treaty involved, definitions and pronunciations, and suggestions on how to listen and reflect on what these teachings mean to you and how they can apply to your life and work. Associated article and video at https://yfile.news.yorku.ca/2019/01/14/new-video-explores-the-importance-of-understanding-the-land-acknowledgement/.

Not in Toronto? It is important for all of us, particularly those who are colonists/settlers, to understand our connections to the land we work and live on. To find out the Indigenous Peoples in your area of the world, visit www.native-land.ca.

Webinar Access Details – Thursday, October 12 and Friday, October 13

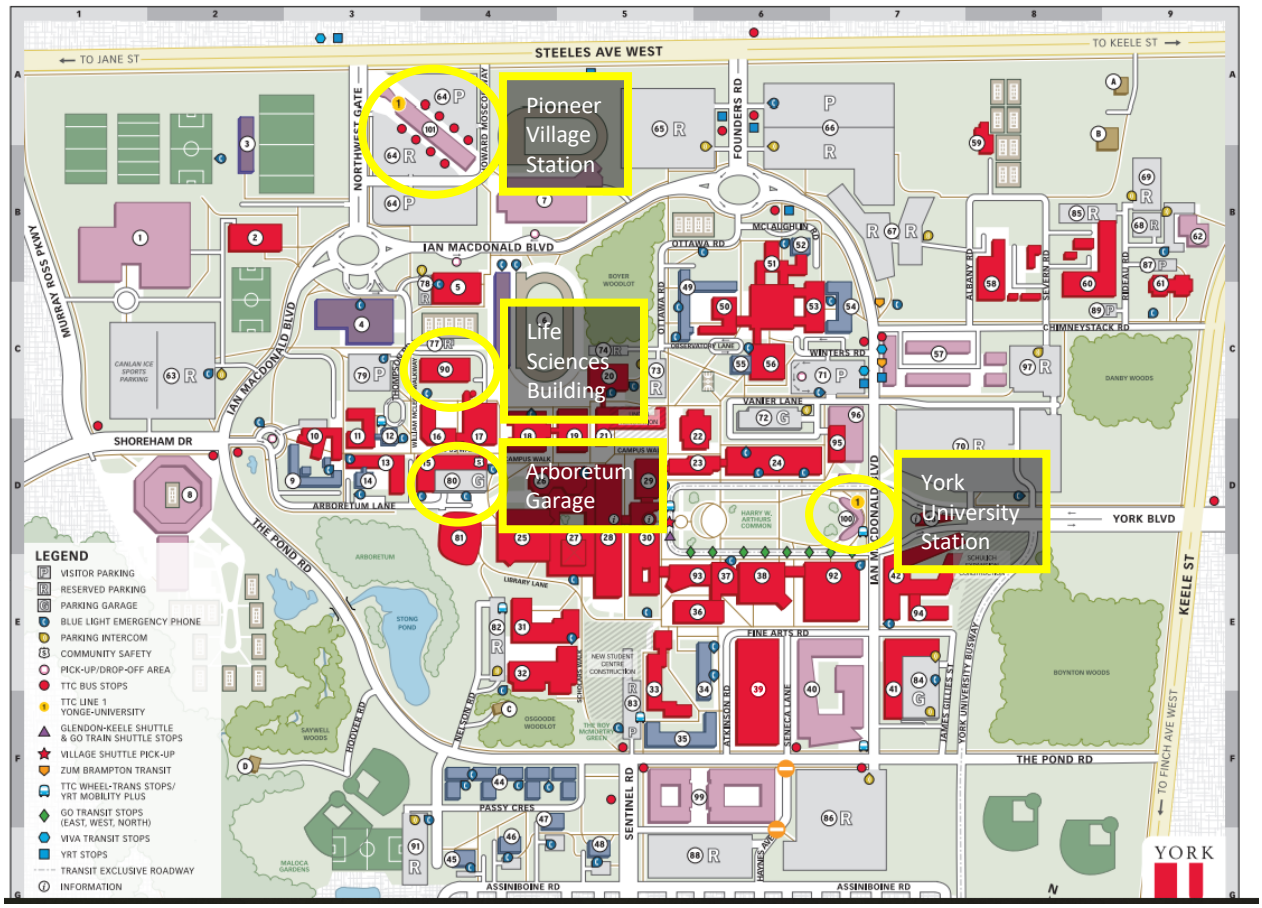
- Registered attendees should have already gotten the Zoom webinar link from beec@yorku.ca (sent October 11) It will also be sent out potentially at other times as well.
- By joining by Zoom as an attendee, you will NOT be able to turn on your video or microphone. However, you can use the Q&A function in Zoom to ask questions of the speakers.
- You can join by telephone to hear audio only, or by the Internet to see the presentation slides as well as the presenter. See the e-mail noted above for these connection details.

Directions to In-Person Venue at York University - Friday, October 13

- **Building & Room:** The in-person portion of BeeCon will be held in the Life Sciences Building at York University's Keele Campus (#90 on the map below). Specifically, the first-floor foyer and room 105 (LSB 105).
- **Public Transit directions** can be found online at https://maps.info.yorku.ca/transit-driving-directions/
    - For the majority of guests taking the Subway to York University Station (#100 on the map below) is the best option. TTC has two new subway stations at the Keele campus – York University (#100 on the map) and Pioneer Village Subway Stations (#101 on the map). All local TTC transit buses now service the Pioneer Village Station.
- **Driving directions** can be found at https://maps.info.yorku.ca/transit-driving-directions/ or use your favourite mapping app.
    - **Parking:** The Arboretum Parking Garage (#80 on the map below) would be the best lot to park in. From Pond Rd/Ian MacDonald Blvd, turn east onto Arboretum Lane. The parking garage will be on your left. Parking in this location is $2.50/half-hour ($20.00 max).
    - Note that you must pay using the app – there is no attendant on site.

- For other parking locations and information on campus visit http://www.yorku.ca/parking/ or see the interactive map linked below; prices vary.

- **Interactive Campus Map**
  - The online interactive map linked below can show you parking locations (including EV charging stations), building names/locations, and other campus locations. It also has a wayfinding option, where you can enter your start and end locations and it'll give you a walking route: https://map.concept3d.com/?id=1200#!ce/34557?s/?ct/29101,29093



BYOL! Bring your own Brown Bag Lunch on Friday

We will not providing a lunch this year. Please bring a brown-bag lunch with you to enjoy with your colleagues at the tables in the lobby of LSB or in the outdoor seating area. There are several restaurants on campus but remember you only have an hour or less before you need to be back for the keynote presentation. Note also that this is fall reading week so some places are closed.

BYOB! - Bring Your Own Bottle for Water and Coffee

- Please bring your own water bottle/coffee mug to help reduce waste.
- We will not be providing bottled water but there are water bottle refill stations in the building near the conference room.
- Paper cups will be provided for coffee but why not show off your favourite insect mug!

COVID Precautions

- York University has paused its vaccination, screening, and masking requirement BUT you are welcome to wear a mask personally if you desire. Food can be eaten outside if the weather permits.
- There are hand sanitizing stations and washrooms inside the building.
- If you are feeling unwell, please do not come to campus, and instead join us virtually.
- Visit https://www.yorku.ca/bettertogether/ for more information on COVID-19 at York University.

Free Wi-Fi Access on Campus

- There are three options for accessing wi-fi on campus, depending on your status: see https://www.yorku.ca/uit/faculty-staff-services/internet-access/wireless-access/
    - *YorkU Students/Staff/Faculty* – select the AirYorkPlus wireless network and login with your Passport York credentials
    - *Eduroam participating institutions* (e.g. Universities of Guelph, Toronto, Western, many others – see https://www.canarie.ca/identity/eduroam/): select the Eduoroam wireless network and log in with the credentials provided by your institution
    - *Anyone:* select the AirYorkGuest wireless network, complete the free registration form on the splash page, receive and confirm the verification message by e-mail, and then proceed with using the internet: https://www.yorku.ca/uit/faculty-staff-services/internet-access/wireless-access/airyork-guest/

Questions? Concerns? Feedback? Ideas for Future Events?

If you have any questions, concerns, feedback, or ideas for future BEEc events, please contact Laura at beec@yorku.ca. We hope that you'll enjoy BeeCon 2023 and join us again in the future.

Keep reading for the schedule and abstracts.

Schedule With Abstracts:

Day 1 – Thursday, October 12, 2023 (Virtual Presentations and Attendance Only)

Day 1 - #1: 8:45 AM. Introducing BEEc and BeeCon - Day 1
Laura Newburn (she/her), Coordinator, BEEc, Ontario, Canada
Twitter: @BeesYork Instagram: @BeesAtYork
Co-Authors: none

Abstract: Welcome to day one of BeeCon 2023. I'll give a brief background to the Centre for Bee Ecology, Evolution and Ecology (BEEc) and the BeeCon conferences, thank our sponsors, and go over logistics for the day.

Day 1 - #2: 9:00 AM. Visual Learning Between Novel Stimuli in the Australian Stingless Bee (*Tetragonula carbonaria*).
Faelan Mourmourakis (he/they), PhD candidate, Macquarie University, NSW, Australia
Twitter: @FumblebeeFae Instagram: @FumblebeeFae
Co-Authors: Andrew Barron

Abstract: 100 years ago, Karl von Frisch's ground-breaking research demonstrated visual learning in bees. This information is foundational to current research, in studying the complex cognition of bees. However, little is still known about the cognitive abilities of bees in our backyard: Australia's stingless bees, *Tetragonula carbonaria*. Here we presented simple visual discrimination learning tasks to these stingless bees. We examined the capacity of *T.carbonaria* to learn to associate either colours (blue or yellow), oriented gratings (horizontal or vertical) or patterns (radial or concentric) with a sugar reward. In each task one stimulus was rewarded with a 50% sucrose solution, while the other offered water. Provisional analyses suggest rapid learning in all tasks. Across 10 training trials, the bees demonstrated a significant learned preference for the rewarded stimulus, and displayed a preference for the rewarded stimulus in an unrewarded choice test. This suggests *T. carbonaria* are capable of rapid visual learning. Further study could build upon these results, and effectively broaden the field, by focusing on complex learning within *T. carbonaria*.

Day 1 - #3: 9:15 AM. Honey bee element accumulation: Workers Vs Drones
Nenad Zarić (), Research Associate, University of Belgrade - Faculty of Biology, Belgrade, Serbia
Twitter: n/a Instagram: n/a
Co-Authors: Ljubisa Stanisavljevic; Ratko Pavlovic, University of Belgrade - Faculty of Chemistry; Robert Brodschneider, University of Graz, Institute of Biology, Austria; Walter Goessler, Analytical Chemistry for Health and Environment, Institute of Chemistry, Unive

Abstract: Honey bees have been used for monitoring of metal pollution for a couple of decades. Most of these studies used homogenized samples of bees. Until now elemental composition of individual bees was studied only once. Although drones were also studied as potential biomonitors, elemental composition of worker bees and drones was never compared. The aim of our study was to evaluate differences in elemental concentrations in worker bees and drones. The average dry weight of the drones (63 ± 4 mg) was higher compared to worker bees (49 ± 14 mg). Elements that had significantly higher concentrations in drones were: Na, Mg, P, S, K, Cu, Zn, and Se. All of these elements can be considered essential for insects. Higher concentrations detected in worker bees were for Al, Ca, V, Mn, Fe, Co, Ni, As, Rb, Sr, Mo, Ag, Cd, Sb, Ba and Pb. These differences could be attributed to different

lifecycles: environmental exposure and mostly the food workers and drones eat. Worker bees feed mostly pollen, which is rich in minerals. Drones are fed food prepared by worker bees, that is filtered of all non-essential elements.

Day 1 - #4: 9:30 AM. Bee species diversity (Hymenoptera: Apoidea) and their floral resources in Northwestern Egypt

Fatma Ramadan (), Ph student, Faculty of Agriculture, Alexandria University, Alexandria, Egypt
Twitter: n/a Instagram: n/a
Co-Authors: Mohamed A. Shebl, Mohamed E. M. Esmael, Nabil S. El-Barbary

Abstract: The bee fauna in the Mediterranean region is highly diverse, which could be due to variations in size, local vegetation, temperature, rainfall, edaphic, and topographic conditions. Few studies were targeting non Apis-bees in the last two decades in Egypt comparing with honeybees. So, it is expected that the country still has undiscovered species and many unknown information of solitary bees nesting biology and floral interactions.
The present study was conducted to investigate species composition of solitary bee species in El Hawaria Region (30 57’ 13” N 29 40’27” E) on some uncultivated and cultivated plants. The total number of species found in the region was 50 species (25 of Apidae, 16 of Megachilidae, 5 of Andrenidae, 3 of Halictidae and one species of Colletidae). The preference of plant families was varied between different bee genera. The most visited plant families by solitary bees were Aizoaceae, Labiatae, Asteraceae, Brassicaceae, followed by Tamaricaceae. A palynological analysis of some portions of collected pollen grains was done for both solitary bees and their floral resources. The obtained data showed 32 flowering plant species pollen grains belonging to 19 plant families. The most represented families were Asteraceae, Brassicaceae and Fabaceae. The pollen spectrum in the study nest of *Xylocopa pubescens* was composed of two pollen types *Chenopodium murale* (Chenopodiaceae) and *Phragmites* sp (Poaceae), while the nest of *Osmia* sp was composed of one type of pollen grains (Brassicaceae).
Key words: Solitary bees, pollination, diversity. Pollen grains

Day 1 - #5: 9:45 AM. Hive-mine: how representative are current bee genomic resources?

Dean Hodapp (he/they), MSc student, Colgan group at iomE, JGU Mainz, Rhineland-Palatinate, Germany
Twitter: @solitary_dean Instagram: n/a
Co-Authors: Thomas J. Colgan

Abstract: Insect pollinators face severe impacts from anthropogenic ecosystem disturbances globally. Concurrently, the rapid expansion of genomic databases presents a unique opportunity to assist in understanding the repercussions and capacity of species to respond to these disruptions. However, issues may arise due to absence of data, incorrect archiving, or biases in species representation. This is especially problematic for threatened taxa, which require conservation efforts but are often highly underrepresented in current research. Therefore, we investigated data availability and biodiversity in publicly available genomic databases both within, as well as across bee families, compared to other insects. For this, we applied standard ecological metrics to assess the biodiversity found therein. In comparison to other insect groups, bee datasets are relatively poorer in terms of species diversity measures, largely driven by a disproportionate focus on a few overrepresented taxa. Furthermore, most current data are provided by only a limited number of institutions representing only a few countries, further constraining the utility of these data for use in conservation genomic analyses. These findings underscore the need for renewed efforts to increase diversity in terms of dataset generation to help improve current understanding of species health and assist in the development of effective conservation strategies.

Day 1 - #6: 10:00 AM. Break.
We will take a short break and return at 10:45am.

Day 1 - #7: 10:45 AM. Two different pollinator species *Apis mellifera* and *Bombus terrestris* as indicators of heavy metal pollution near the mining complex in Bor, Serbia
Slobodan Davidović (), Research associate, Institute for Biological Research "Siniša Stanković" National Institute of the Republic of Serbia, University of Belgrade, Serbia, Serbia
Twitter: @serbhiwe Instagram: @serbhiwe
Co-Authors: Aleksandra Patenković, Katarina Erić, Pavle Erić, Marija Tanasković

Abstract: Honey bees (*Apis mellifera*) and bumblebees (*Bombus terrestris*) are pollinators that cover large areas during their foraging activities. As a result, they encounter various environments and pollutants, making them an ideal choice as bioindicators for environmental pollution. The town of Bor in eastern Serbia houses the largest mine for copper, gold, and silver extraction, and is crucial to regularly monitor the environmental impact of mining activities. The presence and concentration of heavy metals (Fe, Cu, Zn, Cd, Li, Pb, Au, Ni) were measured using the ICP OES method for samples of both species at six locations in the basin of the Bor mining facility and one in the remote region. Results indicate that both species accumulate heavy metals in their bodies during foraging activities in similar manner. Elevated concentrations of Fe, Zn, Cd and Pb were detected in both species in the same localities while Cu, Li and Ni were variable depending on the locality. Interestingly the Cu concentration in *A. mellifera* was less variable than in *B. terrestris* indicating different accumulation pattern, possibly species specific. Both pollinator species serve as potential bioindicators for environmental pollution in the area, reflecting ecosystem health and heavy metal infiltration in the food chain.

Day 1 - #8: 11:00 AM. Alternative forage for shea (*Vitellaria paradoxa*) flower visitors in northern Ghana
Latif Iddrisu Nasare (), Lecturer, University for Development Studies, Northern Region, Ghana
Twitter: n/a Instagram: n/a
Co-Authors: Peter Kofi Kwapong, University of Cape Coast, Rofela Combey, University of Cape Coast, and Jane C. Stout, Trinity College Dublin.

Abstract: Shea is a high insect pollinator-dependent plant endemic to Sub-Saharan Africa. It blooms for a short period (3-4 months) but literature has focused extensively on the pollination ecology of shea without identifying the alternative forage resources for pollinators in shea growing areas. The present study examined the floral calendar of plants foraged by shea pollinators through monthly surveys of flowering plants and insect visitors from January to December 2021. A total of 32 plant species belonging to 13 plant families were visited by florivorous insects. The month of May had the highest number of plants in flower. Over two-thirds of flowering plants in the shea parkland were visited by the primary pollinators (bees) of shea. Considering the high diversity of melliferous plants, bee flora should be incorporated into shea parkland restoration programmes for holistic pollinator conservation.

Day 1 - #9: 11:15 PM. Lunch
We'll take a break for lunch and return at 1pm.

Day 1 - #10: 1:00 PM. Why did the bee cross the road? Examining the influence of roads on solitary bee foraging movements.

Chloé Markovits (she/her), Research Scholar, Tufts University, Massachussetts, United States
Twitter: n/a Instagram: n/a
Co-Authors: Nicholas Dorian (Phd Candidate, Tufts University); Dr. Elizabeth Crone (Principle Investigator, Tufts University and UC Davis)

Abstract: Roads are prominent features in human-dominated landscapes, yet little is known about how they influence the movement of foraging insects. In summer 2022, we studied whether roads posed barriers to movement of the solitary bee, Agapostemon virescens, in Medford, Massachusetts using a mark-recapture experiment. We established three study sites: 25x25m lawn squares bisected by an active road with a pot of flowering Echinacea purpurea at each corner. Over two weeks, we uniquely marked foraging bees and recorded the pot where initial capture and subsequent recaptures occurred. A bee recaptured at a different pot than the previous capture was recorded as either an along-road or an across-road movement. We estimated the proportion of across-road movements out of all orthogonal movements using a binomial generalized linear model (GLM). If roads were not barriers, we expected a null proportion of 50%. We marked 90 bees, 68 of the marked bees were recaptured at least once, and 54 were recaptured at least twice. On average, each bee was captured 5 times. We found that roads were partial barriers to movement. A. virescens was twice as likely to move along the same side of the road than across it, with 35% (CI95 = 0.25,0.46) of bees making road crosses. Our results provide compelling evidence that roads impede but do not completely block foraging bees. This study demonstrates that small patches of habitat serve as foraging resources for bees in cities and underscores the strength of population level experiments.

Day 1 - #11: 1:15 PM. Abundance of bee groups is affected by landscape factors in residential landscapes

Zia Williamson (she/her), Doctoral Student, The University of Georgia, Georgia, United States
Twitter: n/a Instagram: n/a
Co-Authors: Shimat V. Joseph

Abstract: As cities continue to expand, residential areas are becoming more abundant, and could influence bees and other pollinators. As more land is utilized for housing development, understanding how anthropogenically affected factors such as degree of landscape management, floral availability, and other landscape-based characteristics impact bees is increasingly important. Despite this, few studies focusing on bees in Georgia's residential landscapes have been conducted. Thus, the objective of this study was to determine the role of anthropogenic factors on the abundance of bees in Georgia residential areas. In 2022 and 2023, a study exploring the abundance of bee groups was conducted, where blue vane traps were deployed from March 2022 to October 2023 in ~50 residential sites. Factors such as land use classification within sites, flowering plant species, age of the residence, and density of surrounding residences were explored. In 2022, a negative relationship was observed between overall bee abundance and age of residences, the proportion of developed areas, and flowering plant species. The implications of the results will be discussed for bee conservation efforts and urban policy-making and planning of newer residential developments.

Day 1 - #12: 1:30 PM. Pollinate Now: Bioregional Strategy for Habitat Restoration in the Hudson River Estuary Watershed

Evan Abramson (), Principal, Landscape Interactions, Massachusetts, United States
Twitter: @land_interact Instagram: @landscapeinteractions
Co-Authors: NONE

Abstract: Pollinate Now is a comprehensive plan for creating and maintaining habitat on a wide range of landscapes, to support at-risk bees, butterflies and moths in the Hudson River Estuary watershed of New York. While the designs, plant lists and management guidelines are based on the prevalent landscape conditions in the Hudson Valley, their relevance stretches far beyond the boundaries of a single property, town or watershed. The product of a year-long collaboration between designers, planners, scientists, activists, educators and citizens, this project endeavors to make pollinator habitat creation easy, exciting and aesthetically pleasing — and inspire landowners to view their properties as integral parts of a network of ecosystems that stretches throughout the watershed and beyond, into surrounding communities and across the wider bioregion.

Day 1 - #13: 1:45 PM. British Columbia's Community Bumble Bee Project

Jennifer Heron (she/her), Invertebrate Conservation Specialist, British Columbia Ministry of Water, Land and Resource Stewardship, British Columbia, Canada
Twitter: @jennyheron4 Instagram: n/a
Co-Authors: Cory S. Sheffield, Royal Saskatchewan Museum, Regina, SK

Abstract: There are approximately 37-39 bumble bee species in British Columbia, and most are wide-ranging and live in a variety of habitats across the vast provincial landscape. Five of these species have been assessed nationally at risk by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and at least three additional species are potentially at risk. Data on bumble bee species population trends is lacking, making it difficult to monitor trends and assess a species conservation status. This presentation will be a summary of a pilot project to establish long term (> 10 years) bumble bee monitoring routes throughout the province, and concurrently build a community of trained volunteers who survey one or two of these routes each year, within the areas they live and work. Survey routes include some of the same routes monitored as part of the North American Breeding Bird Survey program, as well as new routes; and routes travel through all the provinces ecozones. Ultimately, the data collected over the ten-year assessment time-frame will be used to determine long-term trends in bumble bee distribution and abundance and update conservation status assessments and range maps for the province's bumble bees. In 2022, we completed over 60 routes with the help of over 65 government staff volunteers, totaled 300 hours of survey time and collected over 5000 bumble bees. 2023 is the third year of the pilot (the project started in 2021), challenges and successes to date will be briefly summarized.

Day 1 - #14: 2:00 PM. Break

We will take a break and return at 3pm.

Day 1 - #15: 3:00 PM. Development of Bumblebees on Centipedegrass Pollen
Daniel Ibiyemi (he/him), Research Assistant, Department of Entomology, University of Georgia, Griffin, GA, Griffin, GA, United States
Twitter: n/a Instagram: n/a
Co-Authors: Author 2: Karen-Harris Shultz, Affiliation: Crop Genetics and Breeding Research Unit, USDA-ARS, Tifton, GA; Author 3: David Jespersen, Affiliation: Department of Crop and Soil Science, University of Georgia, Griffin, GA; Author 4: Shimat Joseph, Affiliat

Abstract: Turfgrass has been traditionally regarded as an inadequate pollen source for foraging pollinators. Among turfgrass species, centipedegrass (*Eremochloa ophiuroides*) is commonly found in suburban and rural landscapes. Despite being wind-pollinated and not typically considered a valuable resource for foraging pollinators, recent studies have shown that bumblebees, honey bees, and sweat bees do indeed forage and collect pollen from centipedegrass racemes. However, the question remains whether these foraging pollinators utilize the collected centipedegrass pollen for their development.

To address this, we conducted an experiment with two treatments involving bumblebee (*Bombus impatiens*) colonies. In one setting, the colonies were provided with flowering butterfly bush (*Buddleja* spp.), while in the other, they were given centipedegrass in a no-choice scenario. Each treatment was replicated four times. The plants and colonies were enclosed in cages and maintained under 50% screened benches for one month from September to October 2022.

After four weeks, we evaluated the colonies for the number of larvae, pupae, colony weight gain, and nectar consumed. Surprisingly, we found no significant differences between the two treatments in terms of the numbers of larvae, pupae, colony weight gain, or nectar consumption. These data strongly suggest that centipedegrass pollen can indeed support the development of immatures in bumblebee colonies. This discovery challenges the perception that centipedegrass is an insignificant resource for foraging pollinators and highlights its potential value in contributing to their reproductive success.

Day 1 - #16: 3:15 PM. Introducing the Hex Condo: the all-in-one habitat for solitary bees
Kimball Clark (), Owner, NativeBees.com, Utah, United States of America
Twitter: @nativebees Instagram: n/a
Co-Authors: NONE

Abstract: After 15 years of managing *Osmia* and caring more for them than his children (or so they say), Kimball Clark of NativeBees.com unveils their recently-patented “Hex Condo”. Just as Langstroth made the keeping of *Apis* practical, moveable, and timeless, Clark believes the Hex Condo will do the same for many *Osmia*. Clark will also present three obscure *Osmia* species that are soon to become viable pollinators for certain crops.

Day 1 - #17: 3:30 PM. From Functional to Literal to Positively Metaphorical: The Role of Age and Engagement in Understanding Bee Perceptions
Zaheer Munshi (he/him), Student, Hopkins School New Haven, Connecticut, USA
Twitter: n/a Instagram: n/a
Co-Authors: NONE

Abstract: The main objective of the research study was to explore the thematic representation of bees by individuals of varying age groups, backgrounds, and bee-related activities engagement. Bee knowledge was tested for teenagers and young adults who have nil or minimal exposure to bees, and

they were asked a metaphorical question regarding word associations for honeybees. This was followed by in-depth interviews of adults who are actively engaged with bees and psychologically proximal to bees. The teenagers focused on tangible and concrete positive associations like honey, intangible negative associations that were symbolic like 'sting', and intangible positive associations that were hedonic like 'cuteness' or experiential like 'fuzzy'. There were several functional associations referring to the usefulness aspect of bees like 'pollination'. The young adults, on the other hand, made a significantly greater number of positive tangible associations, and comparatively lower intangible associations with minimal functional associations. Finally, the in-depth interviews of adults closely engaged with bees yielded associations that were overwhelmingly abstract and symbolic (e.g., complex, synergism, future, wealth), positive as expected. Functional and hedonic associations were nil. Increasing age and a higher level of engagement resulting in psychological proximity with bees lead to increased creativity and abstractness of metaphorical associations.

Day 1 - #18: 3:45 PM. Genome-wide DNA methylation patterns in populations from spatial-environmental range extremes of the bumble bee *Bombus vosnesenskii*

Sarthok Rasique Rahman (he/him), Postdoctoral Researcher, Lozier Lab, Department of Biological Sciences, The University of Alabama, Tuscaloosa, Alabama, United States of America
Twitter: @SarthokR Instagram: n/a
Co-Authors: Jeffrey D. Lozier

Abstract: Unraveling molecular adaptation mechanisms to complex environments is crucial to understanding tolerance of abiotic pressures and responses to climatic change. Epigenetic variation is increasingly recognized to facilitate rapid responses to changing environmental cues. To investigate genetic and epigenetic diversity variation at spatial and thermal extremes, we utilized whole-genome and methylome sequencing to generate a high-resolution map of DNA methylation in the bumble bee *Bombus vosnesenskii*. We sampled two populations representing spatial and environmental range extremes (a warm southern low-elevation site and a cold northern high-elevation site) previously shown to exhibit differences in thermal tolerance and determined genome-wide constitutively and variably methylated CpGs across samples. Bisulfite sequencing revealed methylation characteristics similar to other arthropods, with low global CpG methylation but high methylation concentrated in gene bodies and genome regions with low nucleotide diversity. Differentially methylated sites (n = 2,066) were largely hypomethylated in the northern high-elevation population but unrelated to local sequence differentiation. The proportion of methylated and differentially methylated sites in exons and putative promoter regions suggests a possible role in gene regulation, and this novel high-resolution analysis of intraspecific epigenetic variation in wild *Bombus* suggests that the function of methylation in niche adaptation would be worth further investigation.

Day 1 - #19: 4:00 PM. Body size nor sex influence critical thermal limits in a solitary spring bee

Natalie Herbison (she/her, they/them), Undergraduate Researcher, University of Kansas, Kansas, United States
Twitter: n/a Instagram: @beast_of_a_nerd
Co-Authors: Dr. Victor H Gonzalez, Dr. Deborah R Smith

Abstract: *Colletes inaequalis* is a common, ground-nesting solitary species that is among the first bees to emerge during North American springtime. The species is univoltine and, as in most solitary bees, males emerge first and are smaller than the females. Despite its value as a wild pollinator of early spring wild plants and potential crop pollinator, key aspects of the thermal ecology of *C. inaequalis* remain unexplored. We addressed this knowledge gap by assessing the lower (CTMin) and upper (CTMax)

critical thermal limits and chill coma recovery. In addition, we examined the influence of body size (fresh weight and intertegular distance, ITD) and sex on these thermal traits. To provide context, we compared these thermal traits with those of the European honey bee, a similarly sized species frequently foraging during early spring at our locale. We found that critical thermal limits did not differ between sexes and that neither CTMin nor CTMax increased with increasing ITD. Fresh body weight did not impact chill coma recovery time. *Colletes inaequalis* tolerated lower temperatures and recovered much faster from chill coma compared to honey bees, which highlights its ability to withstand lower temperatures.

Day 1 - #20: 4:15 PM. Effects of phytochemical diet supplementation on honey bee hives
Richard Martinez (), MSc Student, Department of Entomology and Nematology , University of California Davis, Davis, CA, USA, California, United States
Twitter: n/a Instagram: n/a
Co-Authors: Elina L. Nino, University of California ANR, Davis, CA, USA; Arathi Seshadri, Pollinator Health in Southern Crops Ecosystem Research Unit (PHSCERU)- USDA/ARS, Stoneville, MS, USA

Abstract: Honey bee health has been declining for decades, impacting the efficiency of pollination services and hence the yield of economically important pollination-dependent crops. One important stressor driving these declines is poor nutrition resulting from lack of access to diverse natural habitats, prompting researchers to seek beneficial dietary supplementation. Controlled laboratory studies have demonstrated benefits of enhancing honey bee diet with phytochemicals and/or plant secondary metabolites, which bees derive naturally from diverse plant species. Developing guidelines for targeted dietary supplementation with these phytochemicals could address some of the challenges faced by honey bees. We report results from a pilot study, evaluating the effects of colony level supplementation with two phytochemicals, caffeine and p-coumaric acid, provided separately or in combination, at 25 ppm concentration over 8 weeks. While the hives that received a mixture of p-coumaric acid and caffeine exhibited increased longevity, we did not observe any impact on colony strength, varroa mite infestation or expression of hygienic behavior. Our preliminary findings lend support to the benefits of combined supplementation with p-coumaric acid and caffeine, for colony survival. We discuss our findings within the scope of effective colony management strategies with focus on developing safe and cost-effective supplementation guidelines for beekeepers.

Day 1 - #21: 4:30 PM. Dietary carbohydrates increase heat stress resistance of honey bees' foragers
Trisha Panganiban (she/they), Undergraduate Researcher, National Science Foundation REU, California, United States
Twitter: n/a Instagram: n/a
Co-Authors: Dr. Victor Hugo-Gonzalez (Lead Scientist, University of Kansas); Laura Haefner (Undergraduate Researcher, Waynesburg University); Gabriela Robles Peréz (Undergraduate Researcher, University of Puerto Rico, Mayaguez Campus); Natalie Herbison (Unde

Abstract: Nutrition is known to influence several aspects of an organisms' life, from development to temperature fluctuation tolerance. Dietary carbohydrates are linked to higher heat and cold tolerances in many insect species. Controlled laboratory studies with bumble bees and honey bees indicate that the upper thermal limit, a metric of heat tolerance that estimates the temperature at which individuals lose muscle control, is not influenced by access to food or short-term starvation. Using a static protocol (constant temperature), we explored how short-term nutritional stress (limited access to nectar and access to low-sugar concentration nectar) influences the heat tolerance of honey bee foragers. In addition, we compared the heat tolerance of bees fed with two commercially available honey bee candies used by local beekeepers, which differ in their sugar composition. We found that heat stress

tolerance decreases in unfed bees and in bees provided with water, while sugar concentration increases bees' heat tolerance. Our findings suggest that although dietary carbohydrates might not directly impact bees' upper thermal limit, they do appear to influence their capacity to endure prolonged heat stress exposure. Thus, carbohydrate availability in bees' diets might play a key role in enhancing their resilience during extended periods of elevated temperatures.

Day 1 - #22: 4:45 PM. Concluding Remarks.
Laura Newburn (she/her), Coordinator, BEEc, Ontario, Canada
Twitter: @BeesYork Instagram: @BeesAtYork
Co-Authors: none

Abstract: Thanks for attending day one of BeeCon 2023. Reminders will be and sponsors and organizers thanked.

Day 2 – Friday, October 13, 2023 (In-Person Presentations, In-Person or Virtual Attendance)

In Person Registration - 8:00 AM - 8:30 AM.
LSB 105, Foyer

Day 2 - #23: 8:30 AM. Introducing BEEc and BeeCon - Day 2
Laura Newburn (she/her), Coordinator, BEEc, Ontario, Canada
Twitter: @BeesYork Instagram: @BeesAtYork
Co-Authors: none

Abstract: Welcome to day two of BeeCon 2023. I'll give a brief background to the Centre for Bee Ecology, Evolution and Ecology (BEEc) and the BeeCon conferences, thank our sponsors, and go over logistics for the day.

Day 2 - #24: 8:45 AM. Phylogeography of the cleptoparasitic bee *Nomada articulata* (Smith, 1854)
Katherine Odanaka (she/her), PhD Candidate, York University, ON, Canada
Twitter: @Kodanakabees Instagram: n/a
Co-Authors: Farida Samad-Zada, Michael Branstetter, and Sandra Rehan

Abstract: The genus *Nomada* is considered the largest and most diverse of the cleptoparasitic bees, however, very little is known about their population dynamics. Studying *Nomada* populations can be difficult due to their solitary and parasitic nature; often only occurring in small numbers and in passive traps. Despite their semi-rarity, some *Nomada* species can occur in enough numbers such that studying their populations can be possible. The spring flying species *Nomada articulata* (Smith, 1854) is a common nest parasite of *Agapostemon virescens* (Fabricius, 1775) and *Agapostemon sericeus* (Forster, 1771) and is found throughout the US and Canada. Owing to its large geographic range and common status, we selected *N. articulata* as a model to examine and gain an insight into the phylogeography of *Nomada*. Using Ultraconserved elements (UCEs) we 1) detected the genetic variation within *N. articulata* populations across it range, 2) identified if their population structure was a result of landscape modification, and 3) determined if *N. articulata* is one species or a complex of species across its range. We constructed UCE and mitochondrial trees to test the relationship between 75 different *N. articulata* individuals, each representing one of four regions in the US or Canada: South, West, Midwest, Northeast. Our data suggests that *N. articulata* may be a species complex as half of the specimens from the southern US fell outside the *N. articulata* clade. We present here the first phylogeography for a North American *Nomada* species and provide a foundation for understanding how *Nomada* populations have responded to environmental changes over time.

Day 2 - #25: 9:00 AM. Morphological phylogeny and insights on subgeneric classification of the bee genus *Liphanthus* (Andrenidae: Panurginae)
Nora Romero (she/her), PhD Candidate, York University, ON, Canada
Twitter: @noraorganic Instagram: @noraorganic
Co-Authors: Nora Romero

Abstract: The bee genus *Liphanthus* includes 49 described species and over 30 more recently discovered ones. The subgeneric placement has been unknown for a large portion of both described and undescribed species. A preliminary phylogeny based on male morphological characters and a partial taxon sampling suggested that essential changes needed to be made to the original subgeneric classification. Here I present the most up-to-date morphological phylogeny of *Liphanthus* based on a

more thorough taxon sampling and including females in the parsimony analysis. This phylogenetic analysis has been critical to formulating initial hypotheses for generic and subgeneric changes that will be tested through ultraconserved element (UCE) phylogenomics.

Day 2 - #26: 9:15 AM. Patterns of Global and Local Admixture in *Apis mellifera intermissa*
Caroline Ritchie (she/her), Msc Student, York University - Amro Zayed Lab, Ontario, Canada
Twitter: n/a Instagram: n/a
Co-Authors: Caroline Ritchie, Kathleen Dogantzis, Amro Zayed

Abstract: Admixture is a common and evolutionary significant event between and among species that can increase genetic diversity and produce novel genotype combinations. When admixture occurs, it can leave distinct patterns across the genome that can provide insights into ancestry segregation and maintenance within a population. *Apis mellifera intermissa* is a highly admixed subspecies of honey bee composed of European and African ancestry. Here, we plan to investigate the ancestral complexity of the subspecies, and potentially isolate the effects of ancestry on genes of interest. To achieve this we will use a curated dataset of 171 whole genome sequences, representing the seven honey bee lineages, and 16 A. m. Intermissa samples. First, we will determine the proportion of ancestry contributed by each genetically distinct lineage. We will then identify patterns of local ancestry across the genome to determine if ancestry segregates non-randomly and is enriched among genic regions. Finally, we will determine how admixture inferences the genetic diversity of the subspecies relative to other African populations. This study aims to illustrate the role of admixture in shaping the genetic diversity and the potential adaptive effects in a honey bee subspecies.

Day 2 - #27: 9:30 AM. Nesting resource limitation: Determinants of upper-elevation range limits in cavity-nesting bees?
Lydia Wong (she/her), PhD student, University of Ottawa, Ontario, Canada
Twitter: n/a Instagram: n/a
Co-Authors:

Abstract: Range shifts, in which organisms alter their distributions to track areas of climatically suitable habitat are one of the most common biological responses to climate change. This study examines the potential for upslope range-shifts in cavity-nesting bees. Specifically, we ask whether upward range shifts in cavity-nesting bees are limited by the lack of nesting cavities at high elevations sites in the Colorado Rocky Mountains. We tracked cavity-nesting bee occupancy in artificial wooden nesting structures set up at increasing elevations from treeline. We also conducted insect surveys at these sites to characterize the relative abundance of cavity- vs. ground-nesting bees. Preliminary data indicate a significant negative relationship between elevation and trap-nest occupancy, but no relationship between elevation and abundance of cavity- and ground-nesting bees in surveys thus far. Understanding whether and how species will respond adaptively to rapidly changing climate conditions is an increasingly pressing challenge. Species ranges may be limited not only by their climatic niches as often assumed, but also by habitat requirements which may be differentially impacted by changing climates. This study provides field-based insight as to whether range shifts are limited by habitat variables in an ecologically-significant group of insects.

Day 2 - #28: 9:45 AM. Effects of lactic acid-producing bacteria supplementation on the hygienic behaviour of Western honey bees

Sophie Killam (she/her), MSc Student, Western University, Ontario, Canada
Twitter: n/a Instagram: n/a
Co-Authors: Graham J. Thompson

Abstract: Honey bees live in densely populated colonies of closely related individuals and, as such, are vulnerable to the spread of contagion. One behaviour that bees have evolved to reduce this threat is hygiene: a social tendency for nurse bees to uncap and remove dead or diseased brood from their cells and dispose of them. Despite the potential to artificially select for this trait, there is no short-term solution that can stimulate a hygienic response within apiaries. In this study, we supplemented a set of hives with either or two strains of lactic acid-producing bacteria (*Bifidobacterium asteroides* and *Lactobacillus plantarum*), which may help prompt an early hygiene response through their production of GABA, an olfactory-associated neurotransmitter. Preliminary results from a 9-colony field assay revealed a slight increasing trend in the average proportion of brood removed at each time point; however, this result was not found to be statistically significant and effect sizes were small. Average hygiene scores ranged from 59% ±17% before treatment, 61% ±22% after the first treatment, and 66% ±19% after the second treatment. In line with previous studies, these colonies are not considered hygienic as they did not remove ≤95% of diseased brood in 48 hours.

Day 2 - #29: 10:00 AM. Break

We will take a break and return at 10:30am.

Day 2 - #30: 10:30 AM. Developing a symbiome analysis method for the analysis of solitary bees ecological interactions

Katherine Lunn (she/her), PhD student, York Unversity, Clare Lab, Ontario, Canada
Twitter: n/a Instagram: n/a
Co-Authors: Elizabeth Clare, Dirk Steinke (Guelph University, Steinke Lab)

Abstract: No individual lives in isolation. All organisms represent communities of interacting species from hosts and their parasites to their symbiotic microbes, commensal and mutualistic microorganisms and even the foods they consumed. The “symbiome” refers to all these ecological interactions which can be measured simultaneously from an individual at the genetic level. In practice, the symbiome approach uses multiple genetic loci which preferentially amplify the DNA from target taxonomic groups to measure the simultaneous interaction of individuals within a population. This multi-gene approach can then be used as an assay in the analysis of species’ ecological interactions. I am using this approach to analyse the way symbiomes from bees of Ontario with differing degrees of sociality change over the flight season. In this first phase, I am using individuals from *Osmia* and *Megachile* species to develop a generalised symbiome protocol. Using DNA extracted from larva, I am comparing the interactions recovered from individual vs pooled PCR protocols to measure species’ interactions between individual larva and the plants, fungi, microorganisms and microbiome. Here, I will contrast these two molecular approaches including a comparison of taxonomic groups recovered and the risks and benefits of pooled PCR protocols.

Day 2 - #31: 10:45 AM. Heritability of the gut microbiome in western honey bees (*Apis mellifera*)
Aishwarya Subramanian (she/her), MSc Student, York University, Ontario, Canada
Twitter: @acipdesign Instagram: n/a
Co-Authors: NONE

Abstract: The gut microbiome is an important indicator of honey bee health and may be influenced by both environmental and genetic factors. Although differences in the gut microbiome exist between genetically distinct subspecies of honey bees, it remains unclear whether genetic variation within the same population contributes to variations in the gut microbiome. The haplodiploid characteristic of honey bees allows for paternal lineage to be a good indicator of genetic variation. This study investigates the contribution of host genetics to gut microbiome variation within colonies of *A. mellifera* by estimating broad-sense heritability of the gut microbiome, a quantitative genetics tool that examines the degree to which genetics influences phenotypic variance. To achieve this, newly emerged worker honey bees will be marked and recaptured after a six-day period from two colonies. Microsatellite genotyping at 11 loci will be used to determine patriline assignment. The gut microbiome of workers will be extracted, and taxonomic classification of the gut microbiome will be performed using 16S rRNA gene metabarcoding. Broad-sense heritability calculations will then indicate if paternal lineage can significantly influence gut microbiome variation with a population. Our findings will improve our scientific knowledge in the area of the genetics basis of honeybee gut health.

Day 2 - #32: 11:00 AM. Targeted Nutrition: Evaluating the Chemical and Microbiomic Profiles of Larval Drone Food
Jonathan Nixon (he/him), PhD Student, Purdue University, Indiana, USA
Twitter: n/a Instagram: n/a
Co-Authors: Brock Harpur

Abstract: Nutrition during development can contribute to variability in adult phenotypes. Some eusocial species control the diet of their female larvae to dictate development into reproductive or non-reproductive roles: queens or workers. Nutrition, in this case, clearly impacts the reproductive potential of the larvae. However, the role of nutritional variability has largely been overlooked in male reproductive eusocial species. This is an especially important question because male eusocial species generally only produce sperm during larval development, so variation in nutrition may impact their ability to reproduce. Here, we use male (drone) honey bees to document the chemical and microbiomic profiles of the food they are provided during larval development. We then manipulate these profiles to assess their impact on adult phenotype. Our study employs Nuclear Magnetic Resonance (NMR) to construct chemical profiles of the food and conducted genomic analyses to identify key microbiota present in the samples collected from colonies across Indiana at distinct developmental periods. We find drones have a unique chemical and microbial profile when compared to workers. Our findings shed light on the significance of drone nutrition for maintaining drone health and provide a solid foundation for future research on this understudied caste member, contributing to a comprehensive understanding of honey bee colony dynamics.

Day 2 - #33: 11:15 AM. Do bumble bees self-medicate? Infection-induced changes in foraging preferences and consequences for pollination

Gordon Fitch (he/him), Assistant Professor, York University, BEEc, ON, Canada
Twitter: n/a Instagram: n/a
Co-Authors: Brooke Donzelli (Department of Biology, University of Massachusetts Amherst; Department of Entomology, Ohio State University), Rebecca E. Irwin (Department of Applied Ecology, North Carolina State University), Ken Keefover-Ring (Departments of Botany and

Abstract: Phytochemicals found in floral rewards can reduce parasite infection in bees. Yet little work has addressed whether infected bees preferentially visit flowers with antiparasitic properties, or the effects of infection on pollination. We investigated these questions using lab-reared bumble bees (*Bombus impatiens*), the parasite *Crithidia bombi*, and *Monarda fistulosa*, a wildflower with multiple chemotypes, each producing nectar with a different dominant monoterpene.

In a lab assay, we found that dominant monoterpenes in two *M. fistulosa* chemotypes, thymol and carvacrol, significantly reduced *C. bombi* infection (i.e., were 'medicinal'), while a third, linalool, did not. We then conducted an experiment where either infected or uninfected bees were allowed to forage in tents containing one 'medicinal' and one non-'medicinal' *M. fistulosa* individual, to answer whether 1) infected and uninfected bees differ in their preference for each chemotype, and 2) preference differences affect pollination across chemotypes?

Infected bees were more likely to visit 'medicinal' plants, while uninfected bees visited plants equally. This affected pollination services: non-'medicinal' plants had higher pollen loads in tents with uninfected bees, but lower pollen loads than 'medicinal' neighbors in tents with infected bees. These results suggest that parasites indirectly influence pollination services via effects on pollinator behavior.

Day 2 - #34: 11:30 AM. Why diversity matters: fitness benefits of genetic variation at individual and social scales

Dylan Ryals (), Doctoral Student, Purdue University, Indiana, United States of America
Twitter: n/a Instagram: n/a
Co-Authors: Brock A. Harpur

Abstract: Polyandry in eusocial organisms presents a paradox: it decreases relatedness among nestmates, introducing potential conflicts of interest within the colony. Fitness benefits due to increased genetic diversity could explain the persistence of polyandry. While evidence exists to support this, previous experiments cannot separate genetic diversity at the individual (worker) level from that at the social (colony) level. Fitness impacts of individual heterozygosity (i.e., heterosis) are already well-known in animal systems, while those of social diversity would be unique to social organisms. Through controlled breeding and brood mixing using two genetically distinct honey bee populations, I created an array of experimental colonies that range from high to low levels of social diversity and contain individuals ranging from high and low levels of heterozygosity. This allows the fitness effect of each diversity component to be analyzed and quantified independently. I tested how each diversity component influences immunity to infection in a laboratory setting and variance in brood nest temperature in a field setting. Following the hypothesis above, I predicted immunity would positively correlate with heterozygosity and social diversity, while temperature variance would decrease with social diversity. Results from this work are pertinent to social evolutionary theory and honey bee health.

Day 2 - #35: 11:45 AM. To house or to oust: how honey bee workers evaluate male quality
Izaak Gilchrist (she/her), Undergraduate student, Harpur lab at Purdue University, IN, United States
Twitter: n/a Instagram: n/a
Co-Authors: Brock Harpur, Matthew Ginzel, Jonathan Nixon

Abstract: Across the animal kingdom, male animals advertise their quality to potential mates. In eusocial species, however, the vast majority of individuals are nonreproductive workers. In honey bees, *Apis mellifera*, these nonreproductive workers assess the female reproductive (queen) and replace low-quality queens. Much less is known about whether or how workers evaluate the quality of male reproductives (drones). Here, I show that workers evict small or immune-stressed drones. I produced low-quality drones using lipopolysaccharide injection to cause immune stress. I compared control and immune-stressed drones in their acceptance rates when introduced to a colony, their body mass, and their cuticular hydrocarbon profiles. My experiments revealed that workers selectively evict small or immune-stressed drones. Immune stress alters drone cuticular hydrocarbon profiles and reduces body mass, which indicates that both size and cuticular hydrocarbons are feasible cues for workers to detect low-quality drones. This work shows that in addition to competing for access to the queen, males of eusocial species must advertise their health and size to workers in order to remain in the colony, revealing a new layer of sexual selection mediated by the nonreproductive worker caste.

Day 2 - #36: 12:00 PM. Lunch
We will take a break for lunch and return at 1pm.

Day 2 - #37: 1:00 PM. Supporting Pollinator Conservation in Cities *KEYNOTE PRESENTATION*
Kevin Matteson (he/him), Associate Director of Master's Programs for Project Dragonfly, Miami University, Ohio, United States
Twitter: @PrjDragonfly Instagram: @projectdragonfly
Co-Authors:

Abstract: As urbanization increases and more humans live in cities, it is important to determine what pollinators exist in urban areas and how we can support them. Drawing on over two decades of research in New York City and Chicago, Kevin will share research insights on what plants benefit urban pollinators, how the developed landscape of cities can be optimized to increase bees and other beneficial insects, the role of citizen science, and more. Ultimately, cities provide a fascinating opportunity to conserve wild bees and other pollinators while also increasing ecological exposure to these amazing species with which we share the urban landscape.

Day 2 - #38: 2:00 PM. Urban processes and urban pollinators: A political ecological answer to the luxury effect framework
Austin Martin (he/him), PhD candidate, Temple University Department of Geography and Urban Studies, Pennsylvania, United States
Twitter: @_austin_martin Instagram: @austin_mar
Co-Authors: NONE

Abstract: Urban ecology is an inherently interdisciplinary field, but its theoretical scope remains limited to reductive understandings of urban processes. Here, I examine the concept of the luxury effect in urban ecology, or the observed tendency for urban biodiversity to exhibit positive correlations with household income in a given area. Using my own empirical data from sampling of wild bees in the City of Detroit, Michigan, USA and its suburbs, which display a negative correlation between bee genus

diversity and household income, I provide a counter-example to the luxury effect and outline alternative theoretical foundations in the sub-field of urban political ecology. Wild bees were sampled in 24 lawns throughout the city and suburbs of Detroit, MI, USA, each sampled throughout the summer months. Both pan traps and netting were used at each site, and bee specimens were then identified to the genus level. US Census Bureau American Community Survey (ACS) 5-year estimates were used to aggregate median household income data within 1-kilometer foraging diameter ranges extending from each sampling site, and a linear mixed model was used to analyze the correlation between bee diversity indices and aggregated median household income data.

Results from the Detroit wild bee study show a strong negative correlation between median household income and bee diversity. This runs counter to the luxury effect hypothesis, and along with a number of other studies showing similarly anomalous results, it begs for a more robust theoretical foundation towards a better understanding of urban socio-ecological systems. One possible reason for this current lack in explanatory power is that urban ecology's reductive understanding of urban processes do not adequately account for the dimensions of urban land cover change and uneven urban development, which are major components in the socio-ecological makeup of cities. Urban political ecology's framing of political economic drivers would offer a more robust and complete framework for interpreting urban ecological empirical data. In this case, studies that stand as anomalies to the luxury effect concept are better understood when taking into account how the urban political economy drives urban land cover change. Urban ecology and urban political ecology would mutually benefit as academic disciplines if channels of communication were more deliberately opened between the fields.

Day 2 - #39: 2:15 PM. Conservation in Captivity: Lessons in breeding declining bumble bee species *Bombus terricola*

Parker Smale (he/him), Bumble Bee Lab Biologist, Wildlife Preservation Canada, ON, Canada
Twitter: n/a Instagram: n/a
Co-Authors: Taylor Kerekes, Cole Blair

Abstract: Captive breeding and release is a recognized, effective conservation method for at-risk species, and one that depends on the development of effective rearing techniques before populations reach a critical low. Wildlife Preservation Canada (WPC) has been breeding the Special Concern yellow-banded bumble bee *Bombus terricola* since 2014 in order to perfect rearing techniques and facilitate future releases in Southern Ontario, Canada. After varying levels of success breeding both *Bombus terricola* and other, more common bumble bee species, this year stands out as one of unexpected advancement. This talk will discuss methods and preliminary results of our 2023 breeding program, comparing and contrasting with our past season's outcomes.

Day 2 - #40: 2:30 PM. Break
We will take a break and return at 3:15pm.

Day 2 - #41: 3:15 PM. Bee responses to vineyard management practices

Briann Dorin (she/her), PhD Student, York University, Ontario, Canada
Twitter: n/a Instagram: n/a
Co-Authors:

Abstract: Bees are exposed to several threats in intensive agricultural landscapes including habitat loss, pesticides, and non-native or invasive species. Research is needed to determine methods of pollinator conservation in these lands through collaboration with the land managers responsible for their

implementation. This is especially needed in crops that are understudied and underutilized for their potential pollinator conservation capacity, such as those that are pollinator-independent like the European wine grape (*Vitis vinifera*). I will discuss a research project that aims to determine how wild bees can be best supported in Canadian vineyards. Twenty-four commercial vineyards across the Niagara Region, ON were surveyed to determine the impact of various vineyard management practices on wild bee abundance and diversity. Bee communities were sampled monthly using pan traps and netting over two years. The vineyard management practices under investigation included cover-cropping, mowing frequencies, organic management, and certified sustainable management. Preliminary results and future directions will be discussed including engaging farmers in pollinator conservation and important policy implications.

Day 2 - #42: 3:30 PM. Impacts of forest cover in crop field margins to wild bees and wasps
Roisin Kierstead (she/her), MSc Student, University of Ottawa (1) and Environment Climate Change Canada (2), Ontario, Canada
Twitter: @rowsheen14 Instagram: @roisinkierstead
Co-Authors:

Abstract: Extreme temperatures can harm organisms by disrupting their reproduction, development or causing death. Forests can buffer temperatures to create cooler, more stable thermal habitat. Even small forest patches, such as forested margins in crop fields, may serve as beneficial habitat for organisms, like insects. Several species of bees and wasps occur in field margins, and also provide crucial ecosystem services (pollination, pest control) that increase crop yield and plant diversity. More work is needed to understand how wild bees and wasps in crop fields are impacted by forest thermal buffering. My research addresses the following questions: How does forest cover, at the landscape-scale and margin-scale, affect temperature in field margins? And, how does forest cover affect diversity and nesting of wild bees and wasps? At 17 Ottawa crop fields with varying landscape-scale forest cover, I installed trap nests with temperature loggers in two distinct field margins: open (no trees or shrubs) and forested margins (dense canopy). At each margin, I also sampled bees and wasps with pan-traps. This work will yield useful knowledge on impacts of forest cover loss in farmland, and inform conservation efforts to support bees and wasps.

Day 2 - #43: 3:45 PM. The brain of a subsocial bee (*Ceratina calcarata*) reflects the neuroanatomical demands of social life
Benjamin Pyenson (he/him), Postdoctoral Fellow, York University, Department of Biology, Sandra Rehan Lab, Ontario, Canada
Twitter: @BPyenson Instagram: @bpyenson
Co-Authors: Jesse Huisken, Nandini Gupta, Sandra M. Rehan

Abstract: While the architecture of the brain may be influenced by the cognitive demands of social life, it may also be affected by other factors like the size of the group or of the individual's body. Brain structure in a subsocial period when an insect forages, reproduces, and cares for immature offspring may then illuminate the neuroanatomy that underlies social life. Here, we describe a single-nucleus transcriptomic brain atlas of adult Ceratina calcarata females integrated from those undergoing diapause in Winter and those that reproduce, forage, and nurse offspring in Summer. Like other insects, we find evidence of hemocytes, five types of glia, and various types of neurons. Genes upregulated in Winter show evidence of diapause across many cell types. In Summer, the neurons are enriched for processes related to foraging, whereas glia are enriched for reproduction. The neuroarchitecture of eusociality may be evident in groups of Kenyon cells and astrocyte glia that are more transcriptionally

similar to obligately eusocial than to solitary species. Future comparisons of the insect brains from other species across levels of social organization will clarify the relative roles of phylogeny and life history trait evolution on neurodevelopment and gene expression at the cellular level.

Day 2 - #44: 4:00 PM. Concluding Remarks.
Laura Newburn (she/her), Coordinator, BEEc, Ontario, Canada
Twitter: @BeesYork Instagram: @BeesAtYork
Co-Authors: none

Abstract: Thanks for attending day two of BeeCon 2023. Reminders will be given and sponsors and organizers thanked.

That's It For BeeCon 2023!
If you have any feedback on this event, please contact the BEEc Coordinator at beec@yorku.ca. We hope that you enjoyed BeeCon 2023 and will join us again in the future. Visit us online at https://www.yorku.ca/bees/.

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