

BeeCon 2025 Program

Centre for
Bee Ecology,
Evolution &
Conservation



Virtual via Zoom Webinar: Thurs, Oct 16, 2025
In-person/Virtual at York University: Fri, Oct 17, 2025

www.yorku.ca/bees/beecon-2025

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The Vice President of Research and Innovation, York University

BeeCon 2025 Program: Location, Schedule, Abstracts, and More

Welcome!

Welcome to #BeeCon 2025! 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 2025, BeeCon returns to York University's campus as part of a two-day hybrid event. Thursday, October 16, 2025, will be a virtual-only event hosted on Zoom, while Friday, October 17, 2025, will be both virtual and in-person. We have over 40 presenters from 14 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 Faculty of 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 16 and Friday, October 17

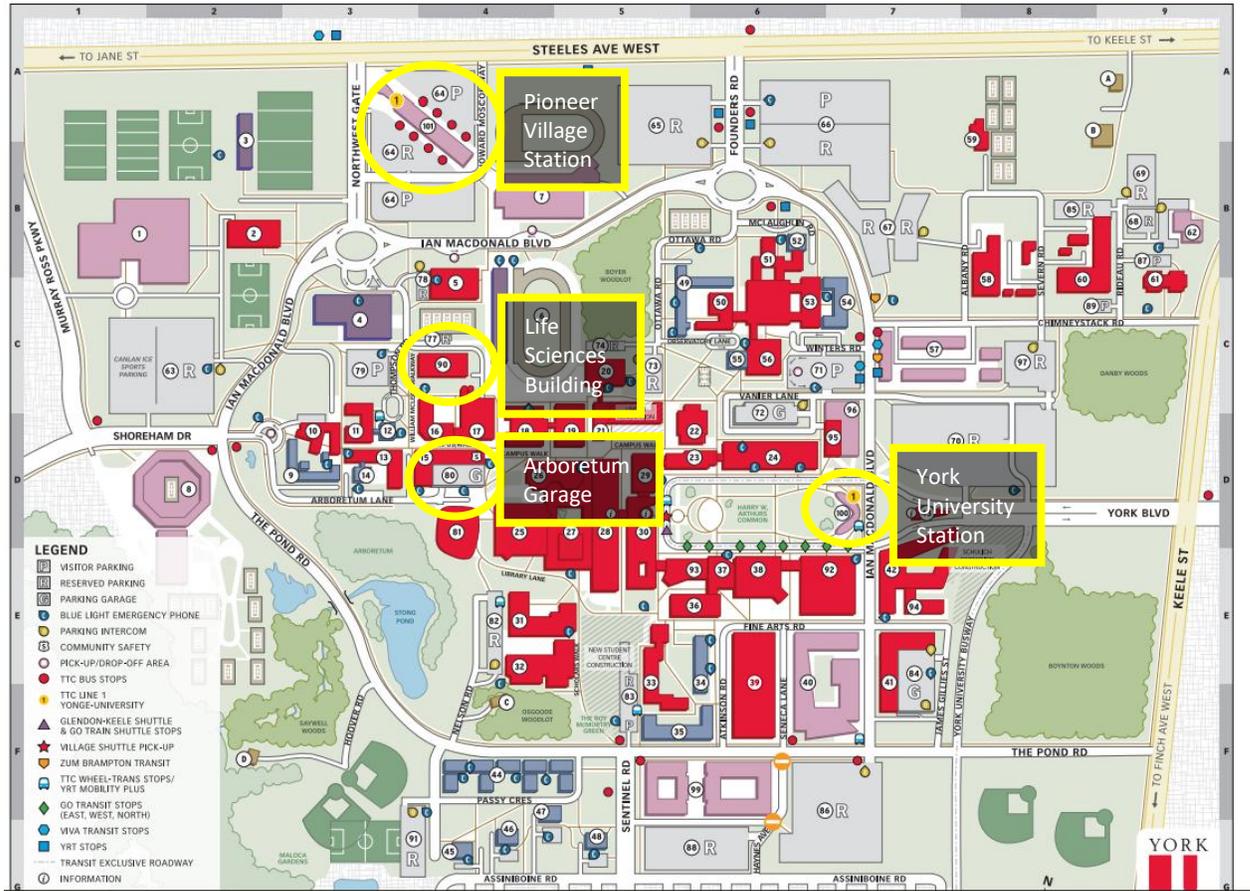
- Registered attendees should have already gotten the Zoom webinar link from beec@yorku.ca
- By joining by Zoom as an attendee, you will NOT be able to turn on your video or microphone. However, you can use the Q&A function in Zoom to ask questions of the speakers.
- You can join by telephone to hear 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 17

- **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>



BYOS! Bring your own Snacks on Friday

We will be providing a lunch for everyone who is registered for in person attendance on Friday, you will be able to enjoy lunch with your colleagues at the tables in the lobby of LSB or in the outdoor seating area. However, we will not be providing snacks during breaks this year, only coffee/tea at the beginning of the day.

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 Victoria at beec@yorku.ca. We hope that you'll enjoy BeeCon 2025 and join us again in the future.

Keep reading for the schedule and abstracts.

Schedule With Abstracts:

Day 1 – Thursday, October 16, 2025 (Virtual Presentations and Attendance Only)

Day 1 - #1: 8:30 AM. Introducing BEEc and BeeCon - Day 1

Katherine Chau, Coordinator, BEEc, Ontario, Canada

Twitter: @BeesYork Instagram: @BeesAtYork

Abstract: Welcome to day one of BeeCon 2025. 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: 8:45 AM. Remembering and sharing the impact of Dr. Sheila Colla

Amanda Liczner, Postdoctoral Fellow, York University, Ontario, Canada

Abstract: This presentation serves as a collective homage to the life and enduring professional legacy of Prof. Sheila R. Colla, a foundational figure whose work helped shape the field of bumble bee ecology and conservation. Through shared anecdotes, reflections, and summaries of her most impactful publications, this session aims to not only celebrate Prof. Colla's amazing scientific output but also honor her profound role as a mentor, colleague, and conservation champion. Her work ensures that the buzz of discovery and dedication to conservation will continue for generations to come.

If you would like to learn more about Dr. Sheila Colla, or leave some memories about her, please visit her Kudoboard: <https://www.kudoboard.com/boards/836TxxdT>

Day 1 - #3: 9:00 AM. Saving bees or sustaining industry? Challenging neoliberal narratives in North American pollinator research and conservation

Ben Iuliano, Postdoctoral Fellow, Baruch College, New York, United States

Co-Authors: Gordon Fitch, Chatura Vaidya

Abstract: Interest in and concern for insect pollinators has grown over the past two decades, alongside the rise of framework of "ecosystem services", which emphasizes biodiversity's economic value to humans. We argue that pollinator research has been shaped by the logics of neoliberal conservation and industrial agriculture. Drawing on literature review, bibliometric trends, and a survey of North American pollinator researchers, we argue that economic justifications for pollinator protection often depoliticize the structural drivers of decline (pesticide use, habitat loss, and climate change). Our survey revealed a mismatch between the scale of the crisis and the interventions proposed by researchers. We suggest this reflects the internalization of market-based ideologies that limit the field's capacity to imagine transformative change. We call for a turn toward "non-reformist reforms" that confront root causes, challenge dominant power structures, and foster alternatives to industrial agriculture. By recognizing the political dimensions of pollinator research, scientists can better align their work with efforts to support biodiversity and build more just and sustainable landscapes.

Day 1 - #4: 9:15 AM. Monitoring bumblebees in Argentina: a citizen science approach

Victoria Campopiano-Robinson, PhD student, Universidad Nacional del Comahue, Bariloche, Río Negro, Argentina

Co-Authors: Eduardo E. Zattara (Universidad Nacional del Comahue-CONICET), Carolina L. Morales (Universidad Nacional del Comahue-CONICET), Marina P. Arbetman (Universidad Nacional del Comahue-CONICET)

Abstract: A decline in pollinator species is being reported in various regions of the world, with biological invasions among the main drivers. Bumblebees (*Bombus* spp.) play a key role in terrestrial ecosystems by pollinating both wild and cultivated plants, thus sustaining biodiversity and agricultural production. Despite its ecological and economic importance, information on the 10 bumblebee species present in Argentina remains scarce and outdated. Citizen science project “Vi Un Abejorro” (“I Saw a Bumblebee”) aims to improve knowledge about their distribution and ecology, while also promoting public awareness and engagement in their conservation. Since 2021, through the project we recorded more than 2000 bumblebee occurrences from all over the country, including valuable data on the endangered native species *Bombus dahlbomii* and the invasive *Bombus terrestris*. Our records indicate that *B. terrestris* is expanding its range into areas not previously predicted by published models. These findings highlight the potential of citizen science as a tool for monitoring bumblebee populations, mapping their distributions and tracking the spread of the invasive species in large and environmentally diverse countries like Argentina. 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 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).

Day 1 - #5: 9:30 AM. Social resurrection: social interactions and restoration of disturbed bumble bee microbiota

Ravi Timsina, PhD candidate, Sadd Lab; Illinois State University, Illinois, United States

Co-Authors: none

Abstract: Eusociality represents a major evolutionary transition. Eusociality, and social living more generally, have several associated benefits but also counter costs, affecting their evolution. The ecological dominance of eusocial insects suggests advantages of group living, including reduced predation risk, better resource utilization, and increased tolerance of adverse conditions. Conversely, costs include greater likelihood of pathogen transmission due to individual proximity and high relatedness. However, little attention has been given to the transfer of beneficial microbes among group individuals as an additional benefit of sociality. Both intrinsic, including host immunity, and extrinsic factors, including infection and antibiotic exposure, can disrupt the structure and functioning of a beneficial microbiota, leading to dysbiosis. We hypothesize that sociality can maintain a healthy gut microbiota, with social interactions facilitating the spread of beneficial microbes or resurrecting beneficial microbial communities following dysbiosis. Using the bumble bee *Bombus impatiens*, we test this hypothesis by disturbing a focal individual's gut microbiota through a stimulation of host immunity or antibiotic treatment. Subsequently we expose these focal individuals to solitary or social settings, before assessing gut microbiota structure and health effects. We predict that dysbiotic gut microbial

communities will be resurrected by social interactions, accompanied by associated health benefits. This work will further our understanding of host-microbiota relationships, including how social transmission of beneficial microbes may favor the evolution of social living.

Day 1 - #6: 9:45 AM. , Detecting bumble bees in the wild using environmental DNA: development and validation of a qPCR assay for the endangered Franklin's bumble bee (*Bombus franklini*)

Michaela Grossklaus, Ecologist, U.S. Geological Survey, Idaho, United States

Co-Authors: David S. Pilliod, Stephen F. Spear, Matthew B. Laramie (Bureau of Indian Affairs), Akhil Kholwadwala (McGill University), Amanda J. Boone, Yer Lor, Marissa Kaminski, Jeffrey G. Everett (U.S. Fish and Wildlife Service)

Abstract: Environmental DNA (eDNA) sampling is a noninvasive alternative to conventional methods of surveying insects. eDNA sampling may be particularly useful for detecting pollinators, as many pollinators leave DNA behind on the flowers they visit. We developed a quantitative polymerase chain reaction (qPCR) assay to detect the DNA of Franklin's bumble bee (*Bombus franklini*) from flower samples and conducted an initial test of the assay using samples collected within and around the historic range of the species. We further analyzed all samples using metabarcoding. Our assay successfully amplified *B. franklini* DNA and exhibited no cross-reactivity with nontarget bee DNA during in silico and in vitro testing. We did not detect *B. franklini* DNA from field-collected flower samples. However, metabarcoding analysis revealed DNA of many other bumble bee species. This finding underscores the potential utility of eDNA sampling for surveying bumble bees. Nondetection of *B. franklini* from field-collected samples may be due to the extreme rarity of the species; *B. franklini* is endangered and has not been observed in the wild since 2006. Our *B. franklini* assay is among the first bee-specific qPCR assays ever developed and sets the stage for additional assays that may improve detection rates of rare and endangered bees.

Day 1: 10:00 AM. BREAK.

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

Day 1 - #7: 10:30 AM. Comparative Study of bee Pollinator Diversity in Two Contrasting Forest Types of Garhwal, Uttarakhand India

Shweta, PhD student, Uttarakhand, India

Co-Authors: Arun Pratap Singh

Abstract: Bee pollinators play a crucial role in sustaining forest ecosystems by facilitating plant reproduction and maintaining biodiversity. Understanding their diversity across different habitats is essential for effective conservation strategies. This study aimed to compare the diversity of bee pollinators in two different forest types in Garhwal, Uttarakhand: The Shiwalik Sal forest and the Ban Oak Forest. Field surveys were conducted during the three-season using transect walks, visual observations, and sweeping nets to record bee species visiting floral resources. The comparative analysis revealed significant differences in species richness, community composition, and pollination activity between the two forest types. Diversity and relative abundance were primarily assessed for bees highlighting their differing ecological roles. Results revealed a significant difference in species richness and community composition between the two forests. [Ban oak forest] exhibited higher pollinator diversity, likely due to greater floral resource availability. These findings highlight the strong influence of forest type and floral diversity on pollinator communities.

Day 1 - #8: 10:45 AM. Short Break.

Day 1 - #9: 11:00 AM. *Lacticaseibacillus paracasei* B2 isolated from water kefir exhibits probiotic potential for use in honey bee feeding

Maria Agustina Rodriguez, Postdoctoral student, Laboratorio de Estudios Apícolas, Departamento de Agronomía, Universidad Nacional del Sur, Buenos Aires, Argentina

Co-Authors: Matías Ledesma González, Elian Tourn (Cooperativa de Trabajo Apícola Pampero Ltda. (CAP), Calderón, Buenos Aires, Argentina), Francisco J. Reynaldi (Centro de Microbiología Básica y Aplicada, Facultad de Ciencias Veterinarias. Universidad Nacional de La Plata. La Plata, Buenos Aires, Argentina), Leticia A. Fernández

Abstract: *Lacticaseibacillus paracasei* B2 (GenBank PV083854), isolated from water kefir, was previously evaluated at our laboratory, and showed antimicrobial activity in vitro against the honey bee pathogens *Paenibacillus larvae* and *Ascosphaera apis*. The strain was non-toxic to bee larvae and tolerated stress conditions such as acidity, osmolarity, and temperature variations, highlighting its probiotic potential. In this study, we evaluated the effect of supplementing honey bees with *L. paracasei* B2 on their nutritional condition as well as the bacterium's survival in hive conditions. Four supplements were prepared: (1) standard product (control), (2) standard product with MRS medium, (3) with probiotic cell-free supernatant, (4) with probiotic broth culture. After one month, bees fed all supplements showed a significant increase in fat body reserves. A similar increase was observed in bees from natural control hives. The probiotic strain remained viable in the hive supplements for up to one week, as evaluated weekly over the four-week assay, although a reduction in CFU counts was observed. The probiotic supplements were well accepted and consumed by bees. These findings suggest the potential use of *L. paracasei* B2 as a probiotic supplement for honey bees. Future studies will test its use within sugar syrup commonly used by beekeepers.

Day 1 - #10: 11:15 AM. Getting salty: salt addition enhances the quality of low-quality nectar

Avery Russell, Associate Professor, Missouri State University, Missouri, United States

Co-Authors: Amanda V. da Silva, Federal University of ABC, São Bernardo do Campo, São Paulo, Brazil

Abstract: How nutrients affect food preference is a central question in foraging theory. While diet selection often depends on net energy intake, the need for specific micronutrients means that foods are not always comparable in terms of their energy content. For pollinators, salt is thought to be a limited essential nutrient and its presence in floral nectar rewards may enhance their quality. In this laboratory study we investigated how bumble bee foraging was affected by nectar sucrose concentration and salt addition. Using artificial flowers, we manipulated salt presence (0 or 0.5%) and sucrose concentration (20 or 50%). Each bee was allowed to forage on flowers with either low or high-quality nectar, with or without salt. We found that bees were more prone to land and consume nectar from flowers with salt and this preference was stronger for flowers with 20% sucrose. However, floral constancy to salt vs no-salt flowers did not differ with sucrose concentration. Our results add to a growing literature that salt is an important micronutrient affecting nectar preferences of pollinators. We discuss implications for floral trait evolution and of anthropogenic increases in soil salinity.

Day 1 - #11: 11:30 AM. Epigenetics effects involved in the expression of wing beat frequency of honeybee queens

Claudia García-Figueroa, PhD student, University of Alberta, Alberta, Canada

Co-Authors: Miguel Enrique Arechavaleta-Velasco, Francisco Javier Ramírez-Ramírez, Laura Yavarik Alvarado-Avila (Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias),

Abstract: Wing beat frequency of individuals is related to their flight ability, a higher wing beat frequency gives honeybees a better flight performance. The objective of this study was to estimate genetic and epigenetic effects for the expression of wing beat frequency of honeybee queens. Two independent crosses were generated by instrumental insemination using queens and drones from European and Africanized honeybee lines to generate virgin queens of four genetic groups: European (EE), Africanized (AA) and their reciprocal hybrids (EA and AE). The results indicate that there was an effect of the genetic group of the queen on the expression of the wing beat frequency ($P < 0.01$). Based on the phenotypes distribution of the four genetic groups, it was found that this trait fits a maternal imprinting epigenetic effects model ($r^2 = 0.96$; $P = 0.02$). These results suggest that queens with Africanized maternal origin have a higher flight capacity than queens with European maternal origin. This may be important because the queens mate during flight, in such a way that increased flight capacity could provide them with greater mating capability, which might partly explain why Africanized genotypes have been preserved more frequently than European genotypes in bee populations during the Africanization process.

Day 1 - #12: 11:45 AM. Mapping bee hotspots: Fine-scale patterns of richness and endemism in South Africa

Annalie Melin, Postdoctoral fellow, Compton Herbarium, South African National Biodiversity Institute & Nelson Mandela University, Western Cape province, South Africa

Co-Authors: Colin M. Beale (Department of Biology, University of York, York, UK), John C. Manning (Compton Herbarium, South African National Biodiversity Institute, Claremont, South Africa), and Jonathan F. Colville (Statistics in Ecology, Environment and Conservation, Department of Statistical Sciences, University of Cape Town, Cape Town, South Africa)

Abstract: Although global patterns of bee diversity have been modelled, fine-scale regional patterns remain less well understood, especially in under-sampled regions like Africa. South Africa is a notable exception: its bee fauna (approximately 1,253 species) is relatively well collected and documented, including extensive digitization of its natural history collections. Using a South African bee species distributional database (877 bee species) combined with a geospatial modelling approach, we determine fine-scale patterns of bee species richness, endemism and range-restricted species. Our analysis, based on the summed probabilities of occurrence surfaces for each species across 108,803 grid cells at 2-minute (~11 km²) resolution, identified three bee richness hotspots associated with different rainfall seasons: Winter rainfall, seasonal rainfall and summer rainfall. These hotspots also support large numbers of endemic and range-restricted species. Fynbos, Succulent Karoo, and Desert habitats within these hotspots have especially high bee densities, with the Desert habitat exhibiting 6–20 times more species per unit area than other biomes. Our findings are consistent with global species-area patterns, where Mediterranean and arid habitats contain higher densities of bee species. Identifying regional hotspots of richness and endemism for bees is an important first step towards focusing on insect conservation efforts where they are most needed.

Day 1 - #13: 12:00 PM. Unexpected Bee Visitation To Wind-Pollinated Salt Marsh Plants In Nova Scotia
Terrell Roulston, Research Associate, Acadia University, Nova Scotia, Canada

Co-Authors: none

Abstract: Wind-pollinated plants (e.g. graminoids, forbs, deciduous and coniferous trees) are generally excluded from plant-pollinator community surveys, yet observations suggest that they may play an overlooked role in pollinator foraging. In a previous survey of bee and pollinator communities in salt

marshes along the Bay of Fundy, Nova Scotia (Kings and Hants Co.), bumble bees (*Bombus* spp.) were observed visiting the wind-pollinated prairie cordgrass (*Sporobolus michauxianus*). This observation prompted an investigation of community science data from iNaturalist to determine whether similar interactions between wind-pollinated salt marsh plants and pollinators had been recorded elsewhere. Sightings of bees and other pollinators were found for all three native *Sporobolus* along with other taxa. These findings contribute to growing evidence that pollinators utilize wind-pollinated taxa and suggest that pollination services should be considered among the ecosystem services provided by salt marshes. Further research is needed to quantify the frequency and ecological significance of these interactions.

Day 1: 12:15 PM. LUNCH.

We will take a lunch break and return at 1:15 PM.

Day 1 - #14: 1:15 PM. Cuckoo for cleptos: parasitic bees in the Prairies

Jason Gibbs, Associate Professor, University of Manitoba, Manitoba, Canada

Co-Authors: none

Abstract: Cleptoparasitic bees are a diverse and fascinating group of bees. But they can be a maddeningly frustrating group to identify. Bee surveys in Manitoba, coupled with DNA barcoding, are beginning to resolve some of the regional taxonomic diversity, but these efforts often raise more questions than answers. A few highlights of recent studies include recognizing the female of the poorly known *Coelioxys nodis*, a presumed parasite of *Megachile dakotensis*, and resurrection of *Neolarra mallochi*. Attempts to make sense of regional *Sphecodes* and *Nomada* are either the product of or cause of insanity in this researcher.

Day 1 - #15: 1:30 PM. Impact of Temperature and Relative Humidity on the yield of Honeybee Venom (*Apis mellifera*) Extraction in a Sahelian Hot Semi-Arid Climate, Dutse Jigawa State, Nigeria

Danjuma Ahmad Sufi, PhD candidate, Department of Animal and Environmental Biology, Faculty of Life Sciences, Federal University Dutse, Jigawa State, Nigeria

Co-Authors: Zainab Tukur, Department of Biological Sciences, Faculty of Life Sciences, College of Pharmaceutical Sciences, Bayero University Kano

Abstract: Honeybee products include beeswax, bee pollen, honey, propolis, royal jelly, and bee venom. Bee venom is now being used alternatively to treat severe illnesses like arthritis, cancer, multiple sclerosis, osteoarthritis, Parkinson's disease, and some diseases caused by bacteria and viruses. The demand for honeybee venom has increased. Venom extraction has been affected by several factors, including climate change throughout the year. Honeybee venom was extracted from January to December 2024 using an electric stimulation device. Weather Spark, 2025, provided the temperature and relative humidity data. The highest amounts were extracted in July and August, which corresponded with high humidity and moderate temperatures. However, no venom was extracted between April and June. This is most likely caused by higher temperatures and rising humidity, which could have stressed the bees or reduced their foraging efforts. No statistically significant trends in honeybee venom production for environmental conditions were found in any of the studies. The inverse relationship with temperature indicates lower yields in warmer months, while the positive relationship with humidity indicates higher venom production in humid months. The study reveals that favorable environmental conditions, possibly brought and improved on by the colonies' increased activity and health during these times, improve the production of venom in the hot semi-arid.

Day 1 - #16: 1:45 PM. Diversity and Natural History of native bees of the western amazon (Madre de Dios, Peru)

Raider Castro-Pino, Independent researcher, Andes Amazon Fund, Lima, Perú

Co-Authors: Adrian Forsyth, Alejandro Lopera

Abstract: The Amazon forests do not usually contain many species of bees, due to the high humidity, however, the bees that inhabit these habitats specialized in surviving these harsh conditions, at the same time we are largely unaware of certain ecological and natural history aspects about these fascinating organisms. To better understand the bee community, evaluations were carried out with flight interception traps in two areas: Los Amigos Biological Station and Cosha Cashu, in different types of forest. Floodplain and high terrace forests, these in turn were complemented with manual collections, reaching a total of approximately 160 species and records of behavior and habitat specialization not yet known.

Day 1 - #18: 2:00 PM. Short Break.

Day 1 - #18: 2:15 PM. Distinctiveness between flower options and the perception of loss affects decision-making of honey bees in learning and reversal learning

Marisol Amaya-Márquez, Associate Professor, Laboratorio de Ecología Cognitiva, Instituto de Ciencias Naturales, Universidad Nacional de Colombia

Co-Authors: Wells, H. [Health & Natural Sciences: Biological Science, University of Tulsa, Oklahoma USA;

Hernández JC [Laboratorio de Ecología Cognitiva, Instituto de Ciencias Naturales, Universidad Nacional de Colombia; García, JE [School of Physiology, Monash University, Australia

Abstract: Foraging choices of honeybees were studied to understand how foragers make decisions and deal with floral landscape change. We also asked: 1.) Does the degree of flower distinctiveness affect bee's accuracy in floral choice? 2.) Do bees perceive losses differently than gains? We conducted experiments where reward quality of alternative flower options changed over time. Treatment I: equal nectar rewards in both flower-colors, Treatment II: one of the two flower-colors contained the greater reward, and Treatment III: the opposite flower-color contained the greater reward. We were interested in initial learning in the transition from Treatment I to II, and in reversal learning when transitioning between Treatments II to III. The magnitude of reward quality-difference and color distinctness were varied between experiments. Flower-color constancy was higher when flower-colors were more distinct, but it also made it more difficult for bees to abandon the flower-color in the reversal learning phase. Smaller differences in reward quality reduced flower-color fidelity and promoted reversal learning. When reward difference between flower-colors was created, a decrease in one of the flower color-rewards elicited a stronger behavioral response from foragers than an increase in reward. The mechanism underlying decision-making in honeybees' foragers includes opportunity cost and loss aversion.

Day 1 - #19: 2:30 PM. Review of the nomenclature and taxonomy of *Megachile (Litomegachile) Mitchell, 1935*

Cory Sheffield, Curator of Invertebrate Zoology and Research Scientist, Royal Saskatchewan Museum, Saskatchewan, Canada

Co-Authors: Joseph Monks, Natural History Museum, London, UK

Abstract: The nomenclature and taxonomy of species of *Megachile (Litomegachile)* Mitchell, 1934, a subgenus of bees native to North America (i.e., southern Canada south to northern Mexico) and Cuba, are reviewed. Following an extensive review of literature, examination of type materials, and use of molecular data, several new synonymies will be made and one species previously considered a junior synonym of another will be given new status. To stabilize the taxonomy of two species, there is a need to designate a lectotype and a neotype, the reasons will be discussed. In addition, one species previously known from only northern Mexico is reported from the southern United States for the first time. Based on this work, 12 species are currently recognized in *Litomegachile* from the 21 available names that have been published.

Day 1 - #20: 2:45 PM. Assessing the conservation status of Canada's bee (Apidae) fauna

Jennifer Heron,

Co-Authors: Jennifer M. Heron and Cory S. Sheffield

Abstract: Conservation status assessments are crucial to identify at-risk species, focus conservation efforts, inform policy under federal and provincial acts, and monitor the effectiveness of protection and recovery actions. These assessments also help prevent irreversible biodiversity loss by providing the probability of a species' risk of extinction or extirpation, allowing for timely intervention before species disappear entirely. As part of the General Status of Species in Canada Wild Species assessment, the conservation status assessments for Canada's complete list of bee fauna were first completed in 2015 and updated in 2020 using NatureServe methodologies. Using this prioritized list, those species deemed most at-risk are then prioritized for status report preparation and assessment by the Committee on the Status of Endangered Species in Canada (COSEWIC), which uses the International Union for the Conservation of Nature (IUCN) Red List Categories and Criteria. COSEWIC uses scientific and Indigenous knowledge to assess a species conservation status, and the recommends species to the federal government for listing under the Species At Risk Act (SARA). This talk will focus on the approach to assessing the conservation status of Canada's bee fauna, information and methods used where little data is available, knowledge gaps and challenges to applying both IUCN and NatureServe criteria, how species are recommended for national assessment, and how individuals can contribute to the national conservation status assessment process.

Day 1: 3:00 PM. BREAK.

We will take a short break and return at 3:30 PM.

Day 1 - #21: 3:30 PM. A trait-based framework to understand and predict the response of wild bee functional groups to anthropogenic landscapes

Jaco Visser, PhD student, Université Libre de Bruxelles & Charles University, Prague, Tsjechië

Co-Authors: Leon Marshall (Naturalis Biodiversity Centre), Jakub Straka, Nicolas Vereecken

Abstract: Wild bees play a vital role as pollinators in ecosystems, yet their existence is increasingly threatened amidst ongoing biodiversity declines driven by land use change. This study examined how wild bee functional traits relate to landscape composition in urban and agricultural settings across Central Europe (Czechia), aiming to understand how these traits influence patterns of abundance and occurrence. Eighteen functional groups were defined based on ecological traits related to foraging and nesting behaviours, and multivariate species distribution models were applied to analyze their associations with different land use variables. Our results showed that functional groups exhibit distinct and complex responses to landscape composition, often differing in how they respond to environmental change, even among groups with similar trait profiles. These findings underscore that the relationship

between traits and the environment cannot be generalized across functional groups, and that interpreting wild bee community patterns requires integrating multiple ecological dimensions such as nesting type, diet breadth, sociality, and seasonality. The study highlights the need for conservation strategies that are tailored to functional diversity and landscape context, as efforts that support one group may not benefit others, and may even be counterproductive. Promoting diverse functional communities is essential for sustaining pollination services and ecosystem resilience under environmental change.

Day 1 - #22: 3:45 PM. Key drivers of bee occupancy and distribution in disturbed montane landscapes in Malaysia revealed using multi-species occupancy modelling

Zoe Bird, PhD student, University of Southampton, Hampshire, United Kingdom

Co-Authors: M. Soh, Z. Soh, C. L. Puan, J. S. Ascher & K. Peh

Abstract: Wild bee communities in tropical montane forests (TMFs) remain poorly documented, despite their ecological importance and vulnerability to land-use change. We surveyed bees across a fragmented agricultural landscape in Peninsular Malaysia, sampling primary and secondary forests, tea plantations, and urban–rural habitats to identify environmental drivers of their distribution. Using Bayesian multi-species occupancy, we found that bee occupancy was shaped primarily by canopy cover, temperature, and distance from the forest edge, with responses differing among functional groups. Open ground cover was also a key factor for guilds reliant on exposed soils for nesting and foraging. These findings reveal how habitat structure influences TMF bee assemblages, highlighting the vulnerability of rare and specialist taxa, and the habitats required to sustain them. By pinpointing the factors that drive bee distributions, this study provides a critical evidence base for conserving pollinator diversity in Malaysian TMFs and other threatened montane systems.

Day 1 - #23: 4:00 PM. Coupled impacts of variable precipitation and habitat fragmentation on native bee assemblages

Jess Mullins, PhD candidate, Ecology, Behavior, & Evolution, California, United States

Co-Authors: Keng-Lou James Hung (University of Oklahoma), David A. Holway

Abstract: Insect populations, including wild bees, are in decline, though the extent and causes remain debated. Globally, habitat loss and fragmentation, along with climate change, are leading drivers. San Diego, California, provides an ideal system to study these impacts: its landscape is a mosaic of preserved habitat patches embedded in an urban matrix, and the region experiences the most variable precipitation patterns in North America, with most rainfall occurring from November to March. Because winter precipitation drives floral resource availability for the following spring and summer bee flight season, this variation is ecologically significant. Our long-term study spans 13 years (2011–2024), including seven survey years that capture both extreme drought and high-precipitation seasons. Each 1-hectare plot is located within Coastal Sage Scrub habitat and is nested within either a reserve (>500 ha) or a habitat fragment (<120 ha). We found that fragments support 31% fewer species than reserves. While both habitat types show increased species richness following wet winters, only reserves respond positively to precipitation from 18 months prior ($p < 0.001$); fragments do not. This suggests that species able to "wait out" dry years are lost from fragmented habitats and these are the species responding to previous winter precipitation.

Day 1 - #24: 4:15 PM. Oxidative Stress in Honey Bees and Small Carpenter Bees Across Landscapes with Varying Pesticide Residues

Hongmei Li-Byarlay, Research Associate Professor, Central State University, Ohio, United States

Co-Authors: Keiana Briscoe, Mia Byarlay, Reed Johnson, Sandra Rehan

Abstract: Oxidative stress (OX), a physiological condition arising from an imbalance between reactive oxygen species (ROS) and antioxidant defenses, can be influenced by environmental factors such as pesticide exposure. This study investigates OX levels in two key pollinators—honey bees (*Apis mellifera*) and small carpenter bees (*Ceratina calcarata*)—across three distinct landscape types: conventional farms, organic farms, and roadside habitats. These landscapes differ in their pesticide use and management intensity, with roadside sites serving as a low-management control. We hypothesized that bees from conventional farms would exhibit the highest OX levels due to increased pesticide exposure. Lipid peroxidation assays revealed that bees from organic and roadside landscapes experienced the lowest and highest OX levels, respectively. Protein carbonyl assays showed a significant difference between bees from conventional and organic farms (Tukey's post-hoc test, $p < 0.05$). The elevated OX observed in roadside bees may reflect an adaptive stress tolerance, consistent with patterns observed in feral populations. In contrast, reduced OX in organic farm bees likely results from limited use of synthetic chemicals and milder management practices. These findings highlight how land management strategies can influence pollinator stress physiology and underscore the potential for landscape-level interventions to support pollinator health.

Day 1 - #25: 4:30 PM. Bee-Plant Interaction Dissimilarity in the Tennessee Cedar Glades

Samuel Wilhelm, PhD Candidate, University of Tennessee, Knoxville, Tennessee, United States

Co-Authors: Laura Russo

Abstract: Biological communities connected by dispersal can be conceptualized as metacommunities. Pioneering metacommunity studies have illustrated their relevance for community assembly in a changing world; however, they have primarily focused on the dissimilarity of individual species across communities (beta-diversity). However, species interactions play a fundamental role in shaping ecosystems, and the beta-diversity framework can be extended to incorporate the dissimilarity of interactions among connected metacommunities. Interaction dissimilarity consists of turnover, where interaction partners are lost, and rewiring, where species change interaction partners. We collected data on plant-bee interactions in the Tennessee cedar glades, a globally unique ecosystem that represents a patchwork system of endemic plant communities nested in a forested matrix. We used this data to ask: how does interaction dissimilarity compare to species dissimilarity, and how do these patterns change across space and time? We found that interaction dissimilarity between spatial and temporal assemblages was consistently higher than species dissimilarity, suggesting that interactions are more variable than species composition. The relative contributions of rewiring and species turnover to overall interaction dissimilarity varied across time and space. Our results suggest that interactions are a highly dissimilar and diverse facet of metacommunities, even when species compositions are similar between patches.

Day 1 - #26: 4:45 PM. Designing Seed Production Areas for Pollinators

Kit Prendergast, Postdoctoral fellow and Ecological Consultant, Greening, Australia

Co-Authors: Melinda Pickup (Greening Australia); David Field (Macquarie University)

Abstract: Native seed production areas are increasingly important to produce high-quality seed for restoration, without depleting wild populations. Yet the ability of SPAs to fulfil this function relies on effective pollination. To date, it has been assumed that animals that serve as pollinators will be present in and around SPAs; however, this 'field of dreams' hypothesis (plant it, and they will come) may not hold, so that SPAs need to be designed in a way that boosts populations of pollen vectors and enhances pollination. This is also in the context of an ongoing pollination and pollinator crisis, with pollinator populations declining globally. Seed production areas may not only produce seed for restoration, but aid in restoring pollinator populations. To this end, we have developed a framework for designing SPAs to promote pollinators. This framework considers the knowledge of what animals visit (and pollinate) target plants, their extra food and nesting requirements, phenology, consideration of companion plants and the trade-off between facilitation and competition, and factors like landscape context and competing exotic pollinators like introduced *Apis mellifera*. This framework will allow researchers, botanists, entomologists, and restoration ecologists to achieve the dual aims of producing quality seed for ecological restoration, as well as supporting pollinator populations.

Day 1 - #27: 5:00 PM. 5:00 PM. Concluding Remarks.

Katherine Chau, Coordinator, BEEc, Ontario, Canada

Twitter: @BeesYork Instagram: @BeesAtYork

Co-Authors: NONE

Abstract: Thanks for attending day one of BeeCon 2025. Reminders will be mentioned, and sponsors and organizers thanked.

Day 2 – Friday, October 17, 2025 (In-Person Presentations, In-Person or Virtual Attendance)

Day 2 - #28: 8:30 AM. Introducing BEEc and BeeCon - Day 2

Katherine Chau, Coordinator, BEEc, Ontario, Canada

Twitter: @BeesYork Instagram: @BeesAtYork

Co-Authors: NONE

Abstract: Welcome to day two of BeeCon 2025. 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 - #29: 8:45 AM. Francois Huber: A physiologist out of time

Christopher Starr, Professor of Entomology (retired), University of the West Indies, Trinidad & Tobago

Co-Authors: NONE

Abstract: François Huber (1750-1831) of Switzerland was an experimenter of genius who dedicated his long life to understanding the workings of the honey-bee colony. His superior observation hives and sense of experimental design allowed Huber -- who was blind from an early age and relied on assistants to do the physical manipulations and take notes -- to look much more directly into the life of the colony than any predecessor. His two-volume *New Observations on Bees* (1792, 1814) presented a mass of new results in orderly fashion. Huber's best-known results concern swarming, the process by which colonies reproduce themselves. In this, he solved the persistent mystery of how queens mate and new colonies are founded. Almost entirely overlooked by historians is his examination of how the colony maintains a suitable temperature and fresh air inside the hive. Taking a highly original view, he reasoned that the colony as a whole must breathe somewhat like a single animal. He showed in systematic fashion that a) the bees ventilate their hive by fanning, b) that control of ventilation is by a negative-feedback mechanism, and c) that differing individual response thresholds allow a graded response at the colony level. This view of hive ventilation involved concepts that would not enter the mainstream of physiology for many decades.

Day 2 - #30: 9:00 AM. Morphological and DNA-based attempts to demystify *Andinopanurgus* taxonomy (Andrenidae: *Panurginae*).

Ngoc (Natalie) Do, Research Assistant, PCYU, Ontario, Canada

Co-Authors: Laurence Packer, Nora Romero

Abstract: The solitary South American bee genus *Andinopanurgus* includes ten species with a wide geographical distribution, from Venezuela to Argentina. Despite having a great potential for maintaining endemic fauna-flora interactions across the Andes Mountain and a diversity of unique metasomal characteristics in males, this genus remains understudied. This presentation aims to: 1) provide a brief overview of *Andinopanurgus*' classification history, 2) announce the discovery of new species from Peru, Argentina and Bolivia with support from morphological and mitochondrial phylogenetic trees, 3) show their geographic distribution and 4) highlight future work to gain more insights into species classification and biodiversity of the Andean region.

Day 2 - #31: 9:15 AM. New records of the American bumble bee, *Bombus pensylvanicus*, in Michigan

Sharron Miller, PhD Student, Michigan State University, Michigan, United States

Co-Authors: Logan Rowe, Lillyana Widdicombe, Robert P. Jean, and Rufus Isaacs

Abstract: We report recent detections of the American bumble bee, *Bombus pensylvanicus* (DeGeer) (Hymenoptera: Apidae), in 16 counties of Michigan, USA from reports developed by research teams and community scientists. This bee species is currently listed as state endangered in Michigan and there is concern about its status across its range. Collections made between 2020 and 2024 revealed reports from at least 20 locations in the lower peninsula, expanding the known distribution in Michigan. These samples were from four surveying programs, plus two online community science sources, providing information regarding the timing, location, and host plant associations of this bumble bee species. This study highlights the importance of high sampling effort to detect rare species, and the role of community scientists in complementing those reports.

Day 2 - #32: 9:30 AM. Shining a light on UV-fluorescent floral nectar after 50 years

Brandi Zenchyzen, Postdoctoral Fellow, York University, Ontario, Canada

Co-Authors: John H. Acorn, University of Alberta; Kian Merkosky, University of Alberta; Jocelyn C. Hall, University of Alberta

Abstract: Nature is aglow with numerous captivating examples of UV-fluorescence in the animal kingdom. Despite a putative role as a visual signal, exploration of UV-fluorescence in plants and its role in plant-animal interactions is lagging in comparison. Almost 50 years ago, UV-fluorescence of floral nectar, a crucial reward for pollinators, was reported for 23 flowering plant species. Since this intriguing discovery, UV-fluorescent nectar has only seldom been addressed in the scientific literature and has not been scrutinized in a phylogenetic or ecological context. Here, we report the prevalence of vibrant UV-fluorescent floral nectar across the family *Cleomaceae*, including the first photographic documentation in vivo colour for flowering plants. Though *Cleomaceae* flowers are morphologically diverse, varying in colour, nectary prominence, and nectar volume, UV-fluorescent floral nectar may be a ubiquitous characteristic of the family. Fluorescence spectra show that the identity and number of fluorescent compounds in floral nectar may differ among *Cleomaceae* species. As *Cleomaceae* pollinators range from insects, including bees, to bats and birds, we suggest that the UV-fluorescent floral nectar not only functions as a visual cue for the diurnal pollinators but also for the nocturnal/crepuscular pollinators in low light settings.

Day 2 - #33: 9:45 AM. How do Disease and Nutrition Stress Influence Bumblebee Foraging Selectivity in the Context of Herbivory?

Shai Lis, MSc Student, York University, Ontario, Canada

Co-Authors: Connor Sun, Hananah Kahlani, Gordon Fitch

Abstract: Pollinator behavior is known to be impacted by alterations to floral traits in host plants due to environmental conditions such as insect herbivory, a phenomenon known as phenotypic plasticity, as well as conditions experienced by pollinators themselves, such as parasitism or nutrition. In this study I manipulated herbivory for *Symphytotrichum novae-angliae* plants, as well as parasitism and nutrition in *Bombus impatiens* workers, where bees either were or were not infected with the gut parasite *Crithidia bombi*, and were fed either high (30%) or low (15%) quality sucrose diets and asked 1) how herbivory influences floral traits relevant to bumblebee pollination, 2) whether floral trait variation influences bumblebee visitation, and 3) whether bee disease and nutritional status mediate bumblebee responses to herbivory. In each trial, bees were offered a choice between one herbivorized and one non-

herbivorized plant, and foraging behavior was documented for 15 min. While I have yet to analyze our data, at the time of abstract submission, I hypothesize, based on previous literature, that insect herbivory will result in plants which are less desirable to bumblebees, while *C. bombi* infection will result in bees that are less successful at differentiating between optimal versus sub-optimal plants. I further expect bees with more nutritious diets to have higher *C. bombi* loads, which is expected to result in either bee with poorer diets being less impaired in their capacity to identify and select optimal plants while foraging due to lower parasite load. Alternatively, limited energy reserves due to food stress may instead force these bees to be less selective in their foraging, as selection may expend additional energy. Since this study is among the first to look at interactions between all of these factors, the ultimate goal of this research is to improve understanding of the effect of environmental stressors on bumblebee foraging, to inform conservation policy targeting bumblebees.

Day 2 - #34: 10:00 AM. The effects of serotonin on gene expression and behaviour within a facultatively social bee

Riya Miller, PhD Student, York University, Ontario, Canada

Co-Authors: Jesse Huisken

Abstract: The aminergic system is a key influence on the transition from solitary to social structures. The small carpenter bee *Ceratina calcarata* is an ideal model for investigating the underlying mechanisms of sociality as it can exhibit both subsocial and facultatively social behaviours. Additionally, *C. calcarata* mothers create a dominance hierarchy over their eldest by providing them with less pollen and less protein, resulting in an altruistic dwarf eldest daughter (DED). We posit that this dominance hierarchy is further modulated by biogenic amines, namely serotonin. To explore the influences of serotonin on social behaviours, serotonin was topically administered to *C. calcarata* dwarf eldest daughters (DEDs), while the mothers were topically treated with the serotonin antagonist cyproheptadine hydrochloride. Mothers and DEDs of the same nest underwent behavioural assays to assess aggressive and avoidant behaviours. We additionally compared brain gene expression profiles between mothers and DEDs across treatment groups. Our findings suggest that the supplementation of serotonin stimulates aggressive behaviours within DEDs, which may be associated with GO enrichment for metabolic processes found within this altruistic daughter.

Day 2: 10:15 AM. BREAK.

We will take a short break and return at 10:45 AM.

Day 2 - #35: 10:45 AM. Fine-scale temporal dynamics of the honeybee microbiome and foraging revealed by airborne eDNA

Elizabeth Clare, Associate Professor, York University, Ontario, Canada

Co-Authors: Oriane Tournayre (York University, McGill University), Mateus Pepinelli (York University, Laurentian University), Melissa MacLeod-Bigley (York University), Alejandro José Biganzoli-Rangel (York University), Amro Zayed (York University), Jayson Zayed (York University), Elizabeth Clare (York University)

Abstract: Environmental DNA refers to genetic material collected from the environment and not directly from an organism of interest. eDNA is best known in aquatic ecology but has been found associated with almost every substrate including soils, surfaces, and most recently from air. Here, we test whether biological material carried in air in honey bee colonies can be used to evaluate recent foraging and colony health and analyze the temporal patterns of foraging and microbial health using these data. We sampled colony air using purpose built “bee safe” filters and successfully recovered plant, fungal and

microbial DNA. We identified nearly 600 genera of plants and more than 500 genera of microbes including the core honey bee microbiome consistently detected in all samples. We also detected a number of hive associated fungi. Plant and microbial richness were consistent across the season but plant composition varied on a temporal scale matching local resource turnover and microbial composition was correlated with plant composition. While plant detections were consistent between night and day sampling, microbiome composition was higher at night. Airborne eDNA has the potential to measure ecological data on a very fine temporal scale providing novel insights into bee ecology.

Day 2 - #36: 11:00 AM. Annual, Regional, and Weather Factors Affecting the Honey Bee Gut Microbiota

Nadejda Tsvetkov, Postdoctoral Fellow, University of British Columbia, Ontario, Canada

Co-Authors: Lan Tran (Culture and Agri-Food Canada, Beaverlodge Research Farm, Beaverlodge, Alberta, Canada), Morgan Cunningham (Culture and Agri-Food Canada, Beaverlodge Research Farm, Beaverlodge, Alberta, Canada), Alison McAfee (Department of Applied Ecology, North Carolina State University, Raleigh, North Carolina, United States of America), Leonard J. Foster, BeeCSI

Abstract: The honey bee gut microbiome has emerged as a vital component of bee health. It is comprised of a relatively small group of bacterial species that contribute to digestion, immune function, and pathogen resistance. Despite growing recognition of its importance, our understanding of the factors that influence its composition remain limited. In order to provide a more comprehensive picture of the microbiome composition of honey bees in Canada, we sampled adult honey bees over two years, in 120 sites, across five provinces and conducted metagenomics on their digestive tract. We then extracted climate variables near the sites to determine which ones were associated with particular changes to the honey bees' microbiota. We found large regional differences, especially in pathogenic microbiota. British Columbia was most dissimilar to other regions, while the two most similar regions were Northern Alberta and Manitoba. Mean Temperature, Rain, and Wind Speed were associated with substantial changes to the microbiota.

Day 2 - #37: 11:15 AM. Microbial communities across social roles in small carpenter bee nests

Phuong (Cindy) Nguyen, PhD Candidate, York University, Ontario, Canada

Co-Authors: Sandra Rehan

Abstract: Bee microbiota form important symbiotic relationships with their hosts, but microbial communities vary across bee species, sociality, and environment. Comparing the microbiome of bees across social roles and foraging behaviours may uncover the ways in which microbiota are environmentally acquired and subsequently spread within the nest environment. We conducted metabarcoding of the 16S rRNA, ITS, and rbcL regions on mothers, dwarf eldest daughters, and regular daughters in nests of the facultatively social, small carpenter bee, *Ceratina calcarata*, contrasting bacteria, fungi, and plant associates. We also performed two treatments by characterizing the microbiome using whole-guts and whole-bodies. Social role in nest subtly impacted the microbial community composition, and mothers were found to demonstrate increased plant diversity compared to their daughters, highlighting the ability to determine plants that bees are visiting during foraging through DNA metabarcoding. We also found that metabarcoding of the whole-body recovered increased fungal and plant diversity compared to whole-guts, suggesting that including microbiota from beyond the gut offers an opportunity to characterize uncommon associates that bees encounter, particularly through plant-pollinator relationships. As the transmission of beneficial symbionts and pathogens between bees are studied for its impact on bee health, the microbiome offers unique biomonitoring for bee communities.

Day 2 - #38: 11:30 AM. eDNA analysis of cavity-nesting bee ecology

Katherine Lunn, PhD Candidate, York University, Ontario, Canada

Co-Authors: Elizabeth Clare

Abstract: The ecological importance of native pollinators has been the subject of many public education campaigns, which has prompted people to install man-made “bee homes” that provide sites for cavity-nesting species. They offer bees a place to reproduce, which is thought to help support their populations in urban environments. Bee homes serve as ideal study sites for the ecological role of native species as inside, mother bees provision larvae with plant material. Other taxa also co-occur, including kleptoparasites, parasitoids, fungi and microbial taxa. Traditionally, research on solitary bee ecology has relied on lethal sampling methods, like pan trapping or collection of larvae from brood tubes. However, there is increasing interest in using environmental DNA methods to study native pollinators less invasively. We tested the hypothesis that trace material within bee homes can be used for non-invasive monitoring. We deployed 100 bee homes during the 2025 flight season. We collected 550 paired samples of larva and cell content, and then sequenced DNA from insects, plants, fungi and microbial taxa. The recovered taxa show remarkable similarity in molecular signatures associated with larva and cell content. This suggests that brood tube content can be used to quantify the ecological interactions of cavity-nesting bees.

Day 2 - #39: 11:45 AM. Positive selection in the small carpenter bee, *Ceratina calcarata*

Dova Brenman, PhD Candidate, York University, Ontario, Canada

Co-Authors: NONE

Abstract: The evolution of eusocial behavior, a key question for sociobiologists, involves the transition from solitary ancestors to cooperative societies with a suite of complex behaviours. This study investigates positive selection in the genome of the incipiently social bee, *Ceratina calcarata*, using a Bayesian implementation of the McDonald-Kreitman test (SnIPRE). We identified 1,123 genes under strong positive selection, highlighting gene regulation as a crucial mechanism in the evolution of eusociality. Gene ontology enrichment analysis revealed significant annotations related to transcription and its regulation. Additionally, genes under strong positive selection were found to be evolutionarily ancient, predominantly conserved across broad taxonomic groups such as Eukaryota and Metazoa. By overlapping these genes with those showing high genetic differentiation between social and subsocial groups, we identified 20 key genes that enriched for roles in signal transduction and chromatin remodeling, supporting theories on the regulation of gene expression in early eusocial evolution. Comparisons with *Apis mellifera*, *Bombus impatiens*, and *Polistes dominula* revealed significant overlap in genes under positive selection, particularly in metabolism and its regulation as well as genes related to gene expression, emphasizing the conserved nature of social evolution mechanisms across species. These findings underscore the role of positive selection in shaping the genetic architecture of eusociality and provide insights into the evolution of social behaviour in *C. calcarata*.

Day 2: 12:00 PM. LUNCH.

We will take a 1-hour lunch break and return at 1:00 PM.

Day 2 - #40: 1:00 PM. *KEYNOTE PRESENTATION *

Is climate change driving bee population declines (and if so, how?)

Jessica Forrest, Professor, Department of Biology, University of Ottawa

Co-Authors: NONE

Abstract: Anthropogenic climate change is proceeding with a speed and ferocity that threaten natural ecosystems and many aspects of human culture. Climate affects wild bee populations, too; yet the stories that are told about climate change impacts on bees aren't always grounded in strong evidence. In this talk, I will present some results from a decade of work on pollen-specialist bees in the southwestern USA—species that we expected to be vulnerable to climate-driven shifts in phenology and floral availability—and discuss the ways in which these bees are, and are not, threatened by climate change. I'll also try to make sense of how our findings fit with research on other bee populations around the world.

Day 2 - #41: 2:00 PM. Bee-ing positive: How knowledge, perceptions, and barriers influence public actions to help bees

Anthony Ayers, PhD Candidate, York University, Ontario, Canada

Co-Authors: Sandra Rehan

Abstract: Successful bee conservation requires cooperation and support from multiple parties and community members. Science communication methods such as community outreach have helped disseminate research findings to stakeholders to garner such support. Anthropogenic stressors have facilitated declines in many bee species raising concern among researchers and initiating conservation advocacy. While bees appear generally appreciated by the public, much of lay people's knowledge is largely derived from *Apis mellifera* which is non-native to North America and varies in life history from most native species. This could lead to a misguided prioritization of honey bees over native bees. To understand the public's knowledge and perceptions of bees, identify engaged actions, and identify barriers that may prevent action, we administered an online survey to the Toronto public receiving 1,585 responses. Responses revealed that while the public holds positive attitudes towards bees and grasp their ecological necessity, knowledge is limited regarding bee diversity. Most individuals engaged in at least one, usually low-effort, action. Various barriers were identified by participants such as lack of knowledge and time, which appear to especially affect younger and degreeless individuals. By understanding public knowledge, researchers can alter approaches to community engagement that are more accessible and overcome barriers.

Day 2 - #42: 2:15 PM. Toronto urban roadside bee pollination ecology

Audrey Khani, MSc Student, York University, Ontario, Canada

Co-Authors: Gordon Fitch

Abstract: Bees and their interactions with plants have been studied in both urban and roadside settings, but little research has focused on urban roadside habitats. Previous research suggests that flower species composition and abundance are the most significant factors in determining both bee diversity and abundance, but it is not clear whether this is mediated by road proximity. Roadside flower-rich habitats may act as an ecological trap, but to an unclear and unknown extent. In this study, we obtained field bee samples to determine the impacts of flowers present and various abiotic factors across different sites on bee diversity and abundance. We conducted surveys at 3 locations across the city of

Toronto. Each location included roadside habitats with management practices that support pollinators via flower diversity and abundance (treatment site), adjacent paired sites of regularly mowed grassy roadside (negative control site), and nearby green space with abundant flowers not by a road (positive control site). Preliminary data indicates that bees are found significantly more often at treatment sites compared to the negative, and while positive controls have had the highest bee yields on average, this is largely due to how comparatively abundant flowering bodies are at positive control sites on average.

Day 2 - #43: 2:30 PM. Baby bees in the city: effects of urban land use and temperature on juvenile cavity-nesting bees

Lydia Wong, PhD Student, University of Ottawa, Ontario, Canada

Co-Authors: NONE

Abstract: Although cities are generally characterized by higher temperatures relative to naturalised areas, temperatures within a city can be variable, depending on the spatial scale of interest. Differences in land-use may generate thermal heterogeneity, with commercial and industrial areas being warmer than parks and older residential neighbourhoods. Thermal heterogeneity within a city can also be considered at even smaller spatial scales. For example, vegetation may have a cooling effect on the few metres directly around it, even if it is in an otherwise hot region of the city. Considering thermal heterogeneity at different spatial-scales may be important for holometabolous insects such as bees, since different life-stages can vary in the scales at which they are sensitive to temperature. We asked how total brood cell production and juvenile body size in cavity-nesting bees are influenced by landscape-scale and microhabitat-scale temperature in Ottawa and Toronto (Ontario, Canada). Nesting structures were established at 31 sites distributed between the two cities. We recorded temperatures within trap-nests as well as air temperatures to characterize conditions experienced by juvenile bees and by foraging females respectively. Preliminary data suggests that juvenile size (mass) generally decreased with increasing temperature, although this pattern varied across taxa.

Day 2 - #44: 2:45 PM. Beyond SNPs: Revealing honey bee genetic architecture via small InDels

Tanushree Tiwari, PhD Candidate, York University, Ontario, Canada

Co-Authors: Clement Kent, BeeOmics, Amro Zayed

Abstract: Honeybees are crucial pollinators, and scientific studies of their genetics offer valuable insights for enhancing colony health, resilience, and productivity. While much genomic research in honeybees has focused on single-nucleotide polymorphisms (SNPs), other forms of genetic variation such as insertions and deletions (indels), remain relatively unexplored, despite their potential to cause major functional changes in proteins. In this study, as part of the BeeOmics project, we analyzed whole-genome sequencing data from pooled worker samples across 1,350 managed colonies in Canada, focusing specifically on protein changing indels (PCIs). We discovered high frequencies of PCIs in genes involved in transcription regulation and neural function. Surprisingly, many of these variants were shared across numerous colonies, suggesting they are not strongly deleterious and may be tolerated or maintained due to breeding practices that promote genetic diversity. To investigate possible molecular and functional impacts, we examined the structural context of PCIs within proteins, focusing on disordered protein regions (DPRs). These are the segments of proteins that lack a stable 3D structure and are often involved in regulation, signaling, and protein-protein interactions. Although DPRs have traditionally been considered evolutionarily flexible, we found that PCIs are significantly less common in DPRs than in structured regions, indicating stronger-than-expected selective constraints. Our findings highlight the importance of including indel variation in honeybee genomics and suggest the importance of studying and understanding the DPRs in honey bees.

Day 2: 3:00 PM. BREAK.

We will take a short break and return at 3:30 PM.

Day 2 - #45: 3:30 PM. Dead bees flying: Mid-season dietary diversity predicts overwintering colony mortality in honey bees

Sarah French, Postdoctoral Fellow, York University, ON, Canada

Co-Authors: A. Zayed, BeeCSI Consortium

Abstract: Honey bees are vital components of agricultural systems and food security yet colonies in North America are suffering unprecedented death tolls, despite advancements in apiculture to manage key individual stressors. Due to honey bees' pervasive exposure to multiple stressors at once—and the synergistic effects of multiple stressors on honey bee health—a multi-stressor predictive approach is crucial to circumvent further colony deaths. Here, we carried out an extensive two-year study that applied advances in artificial intelligence to identify temporally explicit risk factors that carry over to winter periods of colony inactivity, challenging the long-standing perception that acute risk factors cause sudden death. Our research demonstrated that nutrition during honey bees' active season plays a key role in colony survival over winter. Our study has real-world ramifications for managing pollinator health. We anticipate our study will precipitate a shift in apiculture to a multi-stressor paradigm that incorporates the temporal context of stressors. Furthermore, we are optimistic that our study will incite decision-makers to adopt ecological forecasting as a proactive strategy to prepare for spatial and temporal environmental change.

Day 2 - #46: 3:45 PM. Light at the End of the Trees: Final Subgeneric Classification of *Liphanthus* (Andrenidae: *Panurginae*) Informed by Morphology and Molecules

Nora Romero, PhD Student, York University, Ontario, Canada

Co-Authors: Laurence Packer

Abstract: *Liphanthus* Reed is a morphologically diverse genus of minute to small bees endemic to South America, with many species exhibiting pronounced sexual dimorphism. Historically, its subgeneric boundaries have been poorly understood, mainly due to limited taxon sampling and reliance on variable morphological characters. In this study, I present near-final conclusions on the subgeneric classification of *Liphanthus*, informed by independent morphological analyses and molecular phylogenies derived from Ultra-Conserved Elements (UCEs). The two datasets show overall congruence for several major clades, while also revealing areas of conflict that highlight key taxonomic challenges. By integrating these lines of evidence, I propose a refined subgeneric framework, discuss diagnostic morphological characters for each lineage, and explore biogeographic patterns across the Andean and surrounding regions. These results represent the culmination of a comprehensive revision of *Liphanthus* and provide a stable, evolutionarily meaningful classification for the genus.

Day 2 - #47: 4:00 PM. Digestive Fate of Thymol, Carvacrol, and Linalool in *Bombus impatiens*

Fatemeh Shirshahi, Research Assistant, York University, Ontario, Canada

Co-Authors: Gordon Fitch

Abstract: Nectar, the sweet liquid produced by flowers to attract pollinators, often contains plant-derived chemical compounds known as secondary metabolites, which serve roles beyond basic nutrition. While these compounds are widely recognized for their toxic or medicinal properties, little is

known about how they are metabolized or modified after ingestion by pollinators. This study investigates how three such compounds (thymol, carvacrol, and linalool) found in the nectar of wild bergamot (*Monarda fistulosa*) are transformed during digestion by the common eastern bumble bee (*Bombus impatiens*). This study is comprised of two parts a field experiment which intends to compare nectar chemistry before and after ingestion, and a laboratory feeding experiment; analyzing gut segments which investigates the fate of these compounds inside the bee. Field-collected samples revealed that thymol and linalool consistently decreased in concentration from nectar to the nectar crop (the first gut compartment where traditionally was thought its main purpose is to store food), suggesting early transformation or absorption. In contrast, carvacrol showed more variable patterns. Meanwhile, results from the laboratory experiment are forthcoming and expected to provide further insight.

Day 2 - #48: 4:15 PM. Importance of a rare oil bee (*Macropis nuda*) to the pollination of *Lysimachia terrestris*

Jada Ripley, MSc Student, Mount Allison University, New Brunswick, Canada

Co-Authors: Jasmine Rose McNairn-Hart, Ashlyn Elizabeth Baillie, Gwenyth Alice Deadman-Wylie, Logan Reid, Emily Austen

Abstract: Foraging specialization is an important driver of many plant-pollinator relationships. *Lysimachia terrestris* (Primulaceae) produces specialized floral oils that are collected exclusively by *Macropis* (Melittidae) bees, which depend on the oils for reproduction. However, *L. terrestris* is also visited by generalist bees and generalist flies. This study aims to understand the relative importance of the specialist *M. nuda* versus generalist bees and flies. We documented visitation to *L. terrestris* through ~100h of observation and tagged visited flowers to track fruit set and seed set as measures of pollinator effectiveness. To estimate pollinator importance, we standardized pollinator effectiveness by visitation frequency and visitation intensity (flowers contacted per visit). We found that *Macropis nuda* is a more effective and more important pollinator than generalist bees and generalist flies, despite being the least abundant visitor. As *M. nuda* is imperiled across most of its range, this new understanding of the *Macropis-Lysimachia* relationship could help inform conservation efforts and predict shifts in the range of *L. terrestris* in the face of climate change and pollinator declines.

Day 2 - #49: 4:30 PM. Territorial and dispersal tactics displayed in male eastern carpenter bees (*Xylocopa virginica*) with observations on territorial male replacement

Lyllian Corbin, PhD Candidate, Brock University, Ontario, Canada

Co-Authors: L. Duff, M. Richards

Abstract: Males of the eastern carpenter bee (*Xylocopa virginica*) defend territories at nesting sites to maximise their mating access to females. We investigated male territorial and dispersal tactics, hypothesising that territoriality is the superior mating strategy. Thus, territorial males should be larger, have longer tenures, and should be less likely to disperse from the nesting sites than non-territorial males. Small males with lower resource-holding power might adopt non-territorial or dispersal tactics to search for females away from the nesting site or could wait near nesting sites for opportunities to replace territorial males. From 2016-2022, we individually measured and marked bees at nesting aggregations in a park and observed bee flight activity. Territorial males were about 1.5% larger, had longer tenures at nest sites, and were less likely to disperse (9%) than non-territorial males (44%). In 2020 and 2021, we removed 28 territorial males and recorded 22 replacements. Replacement males usually were known territorial males (73%), but some were previously non-territorial (14%) males from the same aggregation. These observations suggest that males prefer the territorial strategy. Those with

greater resource-holding power become territorial earlier in spring, while those with less, disperse and search for opportunities to become territorial later.

Day 2 - #51: 5:00 PM. Concluding Remarks.

Katherine Chau, Coordinator, BEEc, Ontario, Canada

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Abstract: Thanks for attending day two of BeeCon 2025. Reminders will be given and sponsors and organizers thanked.

That's It For BeeCon 2025!

If you have any feedback on this event, please contact the BEEc Coordinator at beec@yorku.ca. We hope that you enjoyed BeeCon 2025 and will join us again in the future. Visit us online at <https://www.yorku.ca/bees/>.



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