December 2022 Vol. 42 (2)

Boreus

Newsletter of the Entomological Society of British Columbia

Table of Contents

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The Entomological Society of British Columbia is a scientific Society founded in 1902 for the advancement of entomological knowledge in the province.

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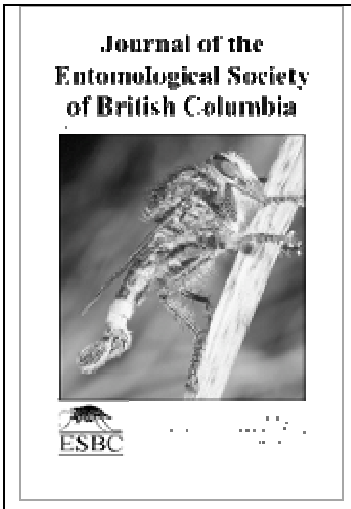
Publications of ESBC

Journal of the Entomological Society of British Columbia

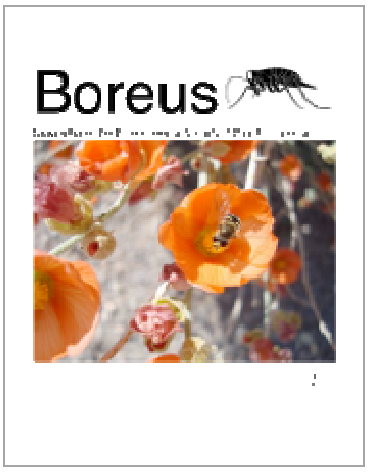


The Journal of the Entomological Society of BC is a peer reviewed, open-access journal. Manuscripts dealing with all facets of the study of arthropods will be considered for publication. Submissions may be from regions beyond British Columbia and the surrounding jurisdictions provided that content is applicable or of interest to a regional audience. Authors are invited to submit ideas for review and forum articles as well. Line drawings or photographs as candidates for the cover are also accepted.

For more information please contact Dr. Kathy Bleiker, Editor-in-Chief at journal@entsocbc.ca.

The deadline for submissions to be included in the 2020 issue is 1 September, 2020. Please submit articles at the JESBC website: http://journal.entsocbc.ca/.

Boreus



Boreus, the Newsletter of the Society is published in June and December. It contains entomological news, comments, reports, reviews and notices of meetings and other events. While emphasizing the Society's affairs, *Boreus* provides members with a forum for their views and news of British Columbia entomology, as well as informal articles, notes regarding research projects, and anything else that may be of interest to entomologists.

Please submit any entomological photograph, article, event or informational tidbit to the Editor!

Please send correspondence concerning Boreus to Dr. Gabriella (Riella) Zilahi-Balogh at boreus@entsocbc.ca.

The deadline for submissions to be included in the June issue is June 1, and the December issue is December 1. Submission dates are flexible. Submit before the end of the month.

ESBC Website

Main Webpage: http://entsocbc.ca

Update your bookmarks, and save our new URL to your browser favorites. Our website provides all the information you need, in one place: ESBC announcements, meeting info, publications, contact information, and other useful links.

Facebook

Find us on Facebook

Join us on Facebook:
https://www.facebook.com/groups/13552445022/

Keep in touch with students, colleagues, and friends! Stay up to date with the latest entomological happenings in BC, upcoming conferences, education and employment opportunities.

Twitter

@EntSocBC

Follow us on Twitter: https://twitter.com/EntSocBC

Join the conversation and connect with thousands of other entomologists and insect enthusiasts from all over the world. Stay up to date with insect news, announcements, conferences and job opportunities.

Membership

Membership of the Entomological Society of B.C. is available to anyone interested in entomology. Annual dues are:

- Regular Member (Canadian Resident):
  - **BEFORE** MARCH 30 = $20.00 (CDN)
  - **AFTER** MARCH 30 = $30.00 (CDN)
- Regular Member (International):
  - **BEFORE** MARCH 30 = $30.00 (CDN)
  - **AFTER** MARCH 30 = $40.00 (CDN)
- Student Member:
  - **BEFORE** MARCH 30 = $10.00 (CDN)
  - **AFTER** MARCH 30 = $15.00 (CDN)
- Honorary Members renew at no charge.

Join or renew your membership online via the Society's website http://entsocbc.ca/membership/.

Inquiries concerning membership and back issues should be sent to the Treasurer, Marcus Clodius, E-mail: treasurer@entsocbc.ca

Cover Sketch: *Boreus elegans* (Mecoptera: Boreidae), one of the more conspicuous snow scorpionflies in B.C. Larvae and flightless adults live in, and feed on, moss and clubmoss. Adults appear in the fall and are active on snow on warm winter days. Cover sketch credit Ward Strong and Robert A. Cannings.

Cover Photographs:

Greater Night-stalking Tiger Beetle (*Omus dejeani*), taken on Denman Island, B.C. Photograph by Jennifer Heron.	Helliwell Provincial Park, May 2012. Photograph by Jennifer Heron
Photographs taken in the Peace Region, BC. Photographs by Jennifer Heron	

British Columbia's Mantids

Rob Cannings, Curator Emeritus of Entomology, Royal BC Museum

Perhaps we're curious about mantids because, more than other insects, they look a little human. Their upright stance, mobile head and staring eyes (with those irresistible "pupils"), and the prominent front legs that look like arms, all grab our attention (Figure 1). The rapacious predatory habits of mantids also fascinate us.

There are about 2400 species of mantids worldwide -- most live in the tropics. Their closest insect relatives are cockroaches -- think of mantids as predatory roaches. Mantids typically ambush their prey, perching motionless and grabbing passing insects or other small animals with their raptorial, spiny front legs.

Mantids develop without a pupal stage. When they emerge from the egg they look like tiny versions of the adult and grow as they molt seven or more times. Wings are fully formed in the adult, although, in some species, especially in females, even the adult wings are only stubs. These short-winged mantids can't fly.

Two species live in British Columbia (BC): the native Ground Mantis, *Litaneutria minor*, (Figure 2) and the introduced European Mantis, *Mantis religiosa* (Figure 3). Females lay eggs in a foamy mass that hardens into a protective papery egg-case (ootheca) (Figure 4). These are glued to plant stems, rocks, fences, and other places, where they overwinter. Eggs hatch in the spring and nymphs grow to adults by late summer and early fall. They die before winter.

In Canada, the Ground Mantis lives only in the southern Okanagan Valley, where it is rare in sandy grasslands (Cannings 1987) (Figure 5). There, it represents the northernmost of a complex of *Litaneutria* populations that ranges across western North America. These insects are usually treated as one species, but a recent study has split them into 11 (Anderson 2021). For now, I prefer to call these populations a single species, *L. minor*. Our BC Ground Mantis is grey-brown, adults are less than 35 mm long, and the male's hind wings have a large brown spot. Only adult males have fully developed wings; females and some males are short-winged, although the few male specimens collected in BC all have long wings. As its name suggests, the species spends much of the time on the ground and can run quickly.

The European Mantis is larger, growing to about 75 mm long, and is either green or light brown. Both sexes are winged. A black spot (usually with a white centre) in the "armpits" of the front legs is a distinctive field mark.

Until recently, the thought of seeing a mantid hardly crossed the minds of most BC residents – the Ground Mantis is rare and the European Mantis was uncommon and hard to find. But in the last few years, observations of the European Mantis have skyrocketed. The online *iNaturalist* site shows about 500 photographic records across southern BC made from 2007 to 2022, with most of them later than 2020 (Observations · iNaturalist Canada). Much of this large increase is due to the ease of reporting sightings – the introduction of digital photography and the popularity of *iNaturalist* have made a huge difference. Nevertheless, there has been a true increase in the insect's population and distribution. For decades, I have tracked records and, when I

summarized them about the time of the first observations reported on *iNaturalist*, I had gathered only about 55 (Cannings 2007).

The European Mantis appeared in New York in 1899, evidently arriving on nursery stock from Europe, and is now widespread in northeastern North America. Subsequently, it has spread into the western US and BC. In 1937 and 1938 it was introduced from Ontario to the Okanagan Valley and Kamloops-Shuswap region of BC to control the grasshoppers that were then plaguing the region. By the 1960s the mantid was found only in the South Okanagan but, by the late 1990s, it was on the move – east to the Nelson area (2004) and north to Kamloops (2006). During this time, there were no records on the coastal mainland, but on Vancouver Island there were two: Port Alberni (1991) and Duncan (1999).

Today, based on *iNaturalist* observations, it ranges across the southern part of BC from Vancouver Island east to Invermere and Cranbrook, north to Kamloops and Shuswap Lake. On Vancouver Island it is reported from Victoria north to Parksville.

Some people, trying to avoid using chemical pesticides in their gardens or green houses, release mantids to control pests. However, mantids are a poor solution because they do not specialize in pest insects and do not multiply rapidly. They kill whatever they can catch – both beneficial and harmful species. Apparently, the only mantid commercially available in BC for pest control and the pet trade is the Chinese Mantis, *Tenodera sinensis* (Cannings 2007). It is larger than the European Mantis, reaching a length of 110 mm. It is established in southern Ontario and Quebec and in much of the US. *Tenodera* has probably often been released in BC but apparently cannot survive in the local climate (Cannings 2007). Perhaps climate warming will allow it to live here in the future.

Although the increase in European Mantis numbers probably will not significantly harm native insect populations, it's a bad idea to release alien, non-native species into the wild. No one can really predict what will happen. So, I recommend that people don't buy them or move them around – they really don't control pests and, as pets, they have short lives and frequently escape captivity.

Literature Cited

Anderson, K. 2021. Revision of the Nearctic genus *Litaneutria* Saussure, 1892. Soothsayer, Journal of Mantodea Research 2(1): 3-85.

Cannings, R.A. 1987. The Ground Mantis, *Litaneutria minor* (Dictuoptera: Mantidae), in British Columbia. Journal of the Entomological Society of British Columbia 84: 64-65.

Cannings, R.A. 2007. Recent range expansion of the Praying Mantis, *Mantis religiosa* Linnaeus (Mantodea: Mantidae), in British Columbia. Journal of the Entomological Society of British Columbia 104:73-80.

Figure 1. *Mantis religiosa* (European Mantis), brown form. Photo: Steve Mlodinow

Figure 2. *Litaneutria minor* (Ground Mantis), female. Photo: Rob Cannings

Figure 3. *Mantis religiosa* (European Mantis), female, green form. Photo: Werner Eigelsreiter

Figure 4. *Mantis religiosa* (European Mantis), ootheca. Photo: Gord French

Figure 5. *Litaneutria minor* (Ground Mantis), habitat, Osoyoos Lake, BC. Photo: Rob Cannings

Entomology in the News

Sunflower-Associated Reductions in Varroa Mite Infestation of Honeybee Colonies

Evan C Palmer-Young, Rosemary Malfi, Yujun Zhou, Bryanna Joyce, Hannah Whitehead, Jennifer I Van Wyk, Kathy Baylis, Kyle Grubbs, Dawn L Boncristiani, Jay D Evans, Rebecca E Irwin, Lynn S Adler
Journal of Economic Entomology, toac196, https://doi.org/10.1093/jee/toac196

Published:
27 December 2022

Abstract

Landscapes can affect parasite epidemiology in wild and agricultural animals. Honey bees are threatened by loss of floral resources and by parasites, principally the mite *Varroa destructor* and the viruses it vectors. Existing mite control relies heavily on chemical treatments that can adversely affect bees. Alternative, pesticide-free control methods are needed to mitigate infestation with these ectoparasites. Many flowering plants provide nectar and pollen that confer resistance to parasites. Enrichment of landscapes with antiparasitic floral resources could therefore provide a sustainable means of parasite control in pollinators. Floral rewards of Asteraceae plants can reduce parasitic infection in diverse bee species, including honey and bumble bees. Here, we tested the effects of sunflower (*Helianthus annuus*) cropland and pollen supplementation on honey bee resistance to macro- and microparasites. Although sunflower had nonsignificant effects on microparasites, We found that increased sunflower pollen availability correlated with reduced *Varroa* mite infestation in landscapes and pollen-supplemented colonies. At the landscape level, each doubling of sunflower crop area was associated with a 28% reduction in mite infestation. In field trials, late-summer supplementation of colonies with sunflower pollen reduced mite infestation by 2.75-fold relative to artificial pollen. United States sunflower crop acreage

has declined by 2% per year since 1980, however, suggesting reduced availability of this floral resource. Although further research is needed to determine whether the observed effects represent direct inhibition of mite fecundity or mite-limiting reductions in honey bee brood-rearing, our findings suggest the potential for sunflower plantings or pollen supplements to counteract a major driver of honey bee losses worldwide.

Using Red Panel Traps to Detect Spotted-Wing Drosophila and its Infestation in US Berry and Cherry Crops

Babu Panthi, Kevin R Cloonan, Cesar Rodriguez-Saona, Brent D Short, Danielle M Kirkpatrick, Gregory M Loeb, Nicholas C Aflitto, Nik Wiman, Heather Andrews, Frank A Drummond, Philip D Fanning, Elissa Ballman, Benjamin Johnson, Dylan J Beal, Elizabeth H Beers, Hannah J Burrack, Rufus Isaacs, Jacquelyn Perkins, Oscar E Liburd, Arden R Lambert, Vaughn M Walton, Edwin T Harris, Serhan Mermer, Dean Polk, Anna K Wallingford, Rosan Adhikari, Ashfaq A Sial

Journal of Economic Entomology, Volume 115, Issue 6, December 2022, Pages 1995–2003

Abstract

Spotted-wing drosophila (SWD), *Drosophila suzukii* Matsumura (Diptera: Drosophilidae), is an invasive pest of thin-skinned fruits in the United States. Monitoring traps are an integral part of SWD integrated pest management, allowing early detection and timely management of this pest. An ideal monitoring trap should be easy to use, effective in capturing SWD, sensitive and selective to male SWD which are easy to identify due to their spotted wings, and able to predict fruit infestation from trap captures. Deli-cup-based liquid traps (grower standard), which make in-situ observations difficult, were compared with red-panel sticky traps, both baited with commercial lures (Scentry, Trécé Broad-Spectrum (BS), and Trécé High-Specificity (HS)), across several US states in blueberries (lowbush and highbush), blackberry,

raspberry, and cherry crops during 2018 and 2021. Results showed that red-panel traps effectively captured SWD, were able to detect male SWD early in the season while also being selective to male SWD all season-long, and in some cases linearly related male SWD trap captures with fruit infestation. Scentry and Trécé BS lures captured similar numbers of SWD, though Trécé BS and Trécé HS were more selective for male SWD in red panel traps than liquid traps in some cases. In conclusion, due to its ease of use with less processing time, red-panel traps are promising tools for detecting and identifying male SWD in-situ and for predicting fruit infestation. However, further research is needed to refine the trap captures and fruit infestation relationship and elucidate the trap-lure interactions in berry and cherry crops.

The 50th anniversary of the Masters of Pest Management (MPM) program at Simon Fraser University is at a cross-roads

This past November 2022 at the Entomological Society of America Annual General Meeting, the Master of Pest Management program at Simon Fraser University celebrated its fifty years of success and transformation into a unique global program.

The concept of the program began in 1967, when the newly established Simon Fraser University opened its Pestology Centre, later renamed the Centre for Pest Management, one of the first of its kind. When the Belleville Research Institute for Biological Control closed, Entomologist Bryan Beirne left the Belleville Research Institute to help expand SFU's Centre for Pest Management, along with seven of his colleagues, including Thelma Finlayson, Peter Belton, John Webster, Manfred Mackauer, Jack Barlow, Albert Turnbull and Karun Nair. Additional faculty included John H. Borden, Peter C. Oloffs, and Richard M.P.S. Sadlier. Full-time course work began at the Centre in the fall of 1968.

Consistently each year, from 1968 to 2003, twelve research faculty members have been active at the Centre for Pest Management. Later faculty additions

included Raoul Robinson, Mark Winston, Alton Harestad, Bernie Roitberg, Norbert Haunerland, Zamir Punja, Stephan Lee, Russel Nicholson, Gail Anderson, Gerhard Gries, Jenny Cory, Carl Lowenberger and Tammy McMullan as teaching faculty.

Former Directors of the Pest Management Program were Bryan Beirne, Manfred Mackauer, Raoul Robinson, Zamir Punja, and Jenny Cory.

The Master of Pest Management program was designed as a professional program which requires mandatory summer courses in five disciplines: urban and industrial pest management, forest pest management, field, forage and specialty crop pest management, orchard and berry pest management, and livestock pest management. In addition to the required curriculum, students complete a thesis based on original research. Many students with an MPM carry on to do a PhD.

This program is unique globally because of its field courses within the program. Field courses combine classroom lectures, field demonstrations and problem-based learning. They provide an overview of pest control methods as they are currently practiced in agriculture, forestry, and urban environments, and include visits to working farms, commercial forest operations, grain elevators, and research laboratories.

Teaching is also supported by specialists from government agencies, extension services, industry, and pest control companies. When feasible, participation in pest management activities, such as field sampling, diagnosis of pest problems, and calibration and use of equipment is included.

The MPM research-based program is distinct from an M.Sc. program because of its strongly applied context and its interaction with practitioners and producers. The aim of the program is to combine research with applied skills for professionals dealing with pests and diseases.

Since its inception, the Master of Pest Management program has trained 374 Integrated Pest Management (IPM) professionals from thirty countries, including Argentina, Australia, Burkina Faso, Canada, Chile, China, England, Germany, Ghana, India, Iran, Ivory Coast, Kenya, Malaysia, Mexico, Nigeria, Papua New Guinea, Philippines, Romania, Scotland, Sri Lanka, Sweden, Tanzania, Togo, Uganda, United States, Venezuela, West Samoa, and Yugoslavia. That is almost 8 per year.

Many of the MPM students from Africa received scholarships from the Food and Agriculture Organization of the United Nations, funding which demonstrates its international reputation.

Integrated Pest Management (IPM) is a broad-based approach for addressing pests that negatively affect agriculture, horticulture, forestry, animal husbandry, and urban systems. Worldwide, IPM has become the accepted strategy for plant protection.

As world trade increases, the movement of invasive pests has increased. Negative impacts on food, fibre, and biodiversity has therefore increased the need for IPM.

To address these challenges, the MPM program trains practitioners and researchers to develop technologies to manage pests in an effective, economical, and environmentally sustainable way. IPM techniques range from preventative and cultural measures to the use of biological, physical, behavioural and chemical controls.

Overall, research within the MPM program is wide-ranging, including: biological control, chemical ecology and animal communication ecology, pest ecology and dynamics of disease vectors, plant pathology and biotechnology.

The hope is that all of this continues. And expands even more as we move into the 2020's and beyond where challenges from pest pressures and food insecurity issues are globally omni-present.

But there is a concern. Currently, the Master of Pest Management program has just three research faculty and one teaching faculty active, a far cry from two decades ago when the numbers were twelve. There has been a reduction in field courses as a result. The program is at cross-roads and faces extinction.

Support from the pest management community and MPM alumni is needed to explore ideas on how the program could be invigorated.

Gabriella Zilahi-Balogh MPM, PhD
Jorge Macias-Samano MPM, PhD
Tammy McMullan MPM

Figure 1. Peter Belton Photo Credit: April Ingraham

Figure 2. Picture at Mt Robson Photo Credit: Dave Holden

BioBlitz at Stanley Park

On 12 November 2022, the Stanley Park Ecology Society (SPES) along with the Biological Survey of Canada (BSC) and the Entomological Society of British Columbia (ESBC), hosted a BioBlitz event within Stanley Park. The event drew a wide variety of participants, ranging from entomologists, bird researchers, citizen scientists, Park visitors, and various other individuals. A total of 260 species were recorded across 570 observations, including various species that were not previously recorded within the Park. The success of this event would not have been possible without the generous efforts of the ESBC and BSC. Thanks to their efforts, we were able to bring together a wide range of participants who were able to learn more about the types of species present within Stanley Park. This event was a resounding success in terms of helping to foster an environment that promotes education of local ecology, the importance of citizen science and its intersection with research, and ultimately increases people's participation within our local natural world. A big thank you to ESBC and BSC!

Dacyn Holinda
Conservation Project Manager
SPES

Due to how well the event was received when we did it pre-COVID, as well as the opportunity presented by having so many experts present for the ESA/ESC/ESBC JAM in Vancouver, the ESBC teamed up with the Biological Survey of Canada (BSC) and the Stanley Park Ecology Society (SPES) to host a bioblitz in Stanley Park. The idea was received very well and the bioblitz took place on November 12th. While November is not a typical time of year to host an event like this, our hope was that this would allow us to detect some species that may not be present during the summer months. The weather cooperated, and we had excellent attendance during a nice sunny Saturday afternoon, with approximately 50 experts and 50 members of the public participating. Our main recording tool was iNaturalist, with which 571 observations, representing 260 different species, were reported. This is approximately 2% of the total observations and approximately 10% of the total species *EVER* recorded in the park on iNaturalist. Not bad! We also have additional identifications coming in from those who collected specimens, so this number is still growing. We don't yet have the total number of observations that were new to the park, but a quick look reveals it to be significant. Of note is that we made such a good impression with SPES that they are interested in making this an annual event, so stay tuned! Special thanks to Joyce Leung for her work in planning the event and its logistics, as well as Jaime Chalissery, Pauline Deschodt, Catherine Scott, Seann McCann, and everyone else who helped staff our table or participated! Also, a BIG thanks to SPES, as without them this event wouldn't have been possible!

Dan Peach
Director, ESBC

BioBlitz 2022

Awards and ESBC Initiatives

Student Oral Presentation Award

Each year the Entomological Society of British Columbia presents awards (**$1000**) for the best student (BSc, MSc, or PhD) oral presentations. For consideration, students must be registered at a post-secondary institution and give a presentation at the Annual General Meeting (AGM). Prizes are awarded at the AGM. The MSc presentation award is known as the James Grant Award. This award is sponsored by the North Okanagan Naturalist Club and memorializes their founder and first president.

Graduate Student Scholarship Competition

Award information:

The Entomological Society of British Columbia awards annually a **scholarship of $1000** to up to two postgraduate students to encourage students engaged in entomological research in BC. Funds are to be used at the student's discretion.

Eligibility:

- Applicant must be a full-time postgraduate student at a registered institution in British Columbia at the time of application.
- Applicant must be partaking in entomological research as part of their degree program.

How to apply:

For consideration, applicants must submit a single PDF file containing:

- An outline of current research (no more than 300 words). Applicants may also choose to include other contributions to the field of entomology outside of their research.
- A curriculum vitae
- A post-secondary transcript (unofficial transcripts are accepted!)

In addition, the applicant must arrange for **two letters of reference** to be submitted on behalf of the applicant.

Deadline:
Applications and letters of reference should be submitted to the ESBC Secretary at secretary@entsocbc.ca by **September 21st** of each year. Competition results will be announced at the annual general meeting which is typically held in October each year.
Judging Criteria:
Applications will be judged on the basis of contributions to the field of entomology, scientific importance of their research, and the qualifications of the applicant.

Dexter Johnson Award in Insect Science
This is a **$1000 annual award** recognizes the best manuscript submitted in any peer-reviewed journal by a student in the field of insect ecology. The award is open to all students (membership in the ESBC is not necessary). Submitted manuscripts must have been published or accepted for publication since the previous year's submission deadline (usually September 1st of the previous year). Please submit a covering letter and the manuscript to secretary@entsocbc.ca by **September 21** of each year.

Equity, Diversity, & Inclusion Award
The Entomological Society of British Columbia annually awards a **scholarship of $1000** to support the participation of one graduate student from a group currently underrepresented within the ESBC. Funds may be used at the student's discretion.
Eligibility:

- The applicant can be a full- or part-time graduate student at a registered institution in British Columbia at the time of application (note: applicants do not need to be a Canadian citizen or permanent resident of Canada).
- The applicant must be conducting entomological research as part of their M.Sc. or Ph.D. program.
- Applicants must identify as belonging to a group currently underrepresented in our Society, including but not limited to racial, ethnic, sexual orientation, gender, or other minorities, first generation college/university students, residents of northern or rural British Columbia who face barriers, those with financial needs, and/or coming from a background not traditional to academia.

How to apply:
By applying for this award, applicants are acknowledging they self-identify as an underrepresented group in our Society. Applications should be submitted to the ESBC Secretary at secretary@entsocbc.ca by **September 21st** of each year. For consideration, applicants must submit a single PDF file containing:

- An outline of their graduate current or planned research (no more than 300 words). Applicants may also choose to include other contributions to the field of entomology outside of their research, such as education, extension, or science communication.
- An outline (no more than 500 words) of how this award will benefit them as a scientist.
- A curriculum vitae.
- Proof of enrollment in their graduate program

ESA, ESC and ESBC Joint Annual Meeting, ESBC Student Competition Winners

Student Competition, Poster

Grad P-IE: Biodiversity and Behavior 1
2nd place: Mackenzie Howse, University of Northern British Columbia

Grad P-IE: IPM
2nd place: Sasha Tuttle, University of British Columbia

Student Competition, 10-Minute Paper

Grad MUVE and PBT: Behavior and Ecology
1st place: Claire Gooding, Simon Fraser University

Grad MUVE and P-IE: Pollinators
2nd place: Genevieve van der Voort, University of Northern British Columbia

Grad MUVE: Vector Biology and Management 2
1st place: Emmanuel Hung, Simon Fraser University

Grad P-IE: Behavior and Chemical Ecology
1st place: Asim Renyard, Simon Fraser University

Grad P-IE: Vectors of Plant Disease and Plant Pests
1st place: Debra Wertman, University of British Columbia

Undergrad MUVE: Behavior and Ecology

1st place: Eve Meyer, Simon Fraser University

2nd place: Miele McGowan, Simon Fraser University

Undergrad P-IE: Behavior and Ecology
1st place: Jenelle Breen, Simon Fraser University

Undergrade P-IE: IPM
2nd place: Grace Wang, University of British Columbia

Undergrad SysEB: Biodiversity
2nd place: Laura-Anne Browning, University of Northern British Columbia

Graduate Students Graduating

Defended or planning to defend? Why not present your work in the Boreus? This is an excellent opportunity for graduate students to share their research. Send submissions to boreus@esbc.ca.

Nicolas Salcedo, PhD

Title - How do insects fight pathogens? Molecular and functional characterization of the immune deficiency pathway in *Rhodnius prolixus,* a vector of parasites that cause Chagas disease.

Supervisors - Dr. Carl Lowenberger, Simon Fraser University
Dr. Norbert Haunerland, Simon Fraser University
Dr. Christopher Beh, Simon Fraser University
Dr. Ryan Morin, Simon Fraser University
Dr. Julian Christians, Simon Fraser University

Abstract - *Rhodnius prolixus* is a triatomine insect that has been used for >80 years as a model organism to study many aspects of insect physiology. It is also a vector of *Trypanosoma cruzi*, the causal agent of human Chagas disease. Triatomines interact through their immune systems with myriad microorganisms including trypanosomes and other pathogens that must be tolerated or eliminated, and beneficial symbionts that must be nourished. Pioneering studies on insect immunity were described in holometabolous insects, and it was assumed that that the innate immune system was conserved in all insects. The publication of the *R. prolixus* genome, however, revealed that one of the main immune pathways, the Immune-deficiency pathway (IMD), was fragmented, with many missing genes, and probably was non-functional. To investigate whether the IMD pathway exists and is functional in *R. prolixus* we used a combination of bioinformatics and molecular analyses. We used sequence homology searches, 3D protein modeling, phylogenetic analyses, and RNA sequencing to identify most of the missing genes of the IMD pathway in *R. prolixus*. We used RNA Interference (RNAi) mediated silencing, to functionally characterize the transcription factor Relish, the negative regulator Caspar, and the Peptidoglycan Recognition Receptors, and confirmed that these genes regulate the production of antimicrobial peptides in the fat body. We used RNA-sequencing to generate a transcriptome of all genes up- or down-regulated in the fat body tissues after infections with bacteria. We demonstrate that the IMD pathway in *R. prolixus* responds principally to Gram-negative bacteria and to a

lesser degree to Gram-positive bacteria, which deviates from the classical holometabolous insect model. We also found an IMD candidate gene which, in other insects, is essential for the IMD pathway to function. Our RNAi approaches, however, failed to confirm its role in immunity. Our results confirm that the IMD pathway is present and functional in *R. prolixus*, albeit with important variations compared with other insects. Altogether, these findings have added to the foundation of knowledge on the immune systems of triatomines and other hemimetabolous insects, allowing us to better understand the evolution of insect immunity. This knowledge will allow us to explore in more detail the interactions among triatomines, trypanosomes, and beneficial symbionts with the hope of developing new control strategies for Chagas disease.

Official completion date – Defended October 18, 2021

Muscoid feeding on honeydew. Photo Credits: Bob Lalonde

Entomological Society of Canada Student Awards

Details of Awards at https://esc-sec.ca/student/student-awards/ . Deadline for all awards is **March 1** of each year. Look on the website for eligibility for each award.

- Entomological Society of Canada Danks Scholarships
- Entomological Society of Canada Graduate Research Travel Scholarships
- Entomological Society of Canada Postgraduate Awards
- Entomological Society of Canada John H. Borden Scholarship
- Entomological Society of Canada Dr Lloyd M Dosdall Memorial Scholarship
- Biological Survey of Canada Scholarship
- Keith Kevan Scholarship

- Entomological Society of Canada Ed Becker Conference Travel Awards

Entomology Educational Opportunities in Canada

The Entomological Society of Canada publishes a Directory of **Entomological Education in Canada.** Available at: **https://esc-sec.ca/student/student-awards/**

Employment and Research Postings

details on ESC website https://esc-sec.ca/opportunities/

Permanent Opportunities

Position: Scientific Evaluation Officer (BI-02)
The Pest Management Regulatory Agency (PMRA) is currently seeking candidates to fill a Scientific Evaluation Officer position (BI-02) to conduct value assessments of insecticides for a one-year term, beginning as early as January 2023, with a starting salary of $65,662 per year. Ideal candidates would have completed (or be about to complete) their M.Sc. or Ph.D. in a field of study related to insecticides, with experience conducting and summarizing field trials evaluating efficacy and crop safety of insecticides.
Interested candidates are requested to forward their CV to David Courcelles (david.courcelles@hc-sc.gc.ca), Section Head of the Insecticides Section of the PMRA.

Position: Entomologist
We are seeking an entomologist preferably with experience in black fly larvae. This is a unique opportunity for a company that is going to change the food supply and compost chain methodology. The company is a Canadian-based company with plans to expand into the US and Europe. The company is headquartered In Toronto with secondary offices in Miami.
For information contact: Rene Bharti at Rene@suomiholdings.com or 647-965-2173

Laboratory Manager – Nematology
Natural Insect Control
Natural Insect Control is a family owned and operated business since 1989. NIC specializes in biocontrol for commercial growers, wholesalers, distributors and the consumer market. As the only Canadian producer of Beneficial Nematodes, NIC is in a unique position to lead the Canadian industry towards more sustainable and environmentally sound practices and offer products and services that are an alternative to chemicals for home, garden and commercial growers.

Details: Laboratory Manager Posting
For information, contact:
Susan Cavey,Managing Director / Owner
susan@naturalinsectcontrol.com
www.naturalinsectcontrol.com

Temporary/Contract Opportunities

Position: Stagiaire végétalisation minière et insectes pollinisateurs
Université du Québec en Abitibi-Témiscamingue (UQAT) en collaboration avec :
Insectarium de Montréal
Duration: 8 mai, 2023 – 30 juillet 2023
La personne recrutée travaillera principalement sur un projet de recherche comparant les communautés d'insectes pollinisateurs dans des habitats sur sites forestiers après coupe et des habitats sur sites miniers végétalisés avec des plantes à fleurs.
Contact marie.guittonny@uqat.ca
Closing date: 28th February 2023

Position: Butterfly Conservation Field Assistant (4 positions) at Rice Lake, ONT
Norris Lab, College of Biological Science, University of Guelph
Duration: 8 weeks (2 positions May 1 – July 6 and 2 positions May 18 – July 13)
Assistants will work closely with a graduate student from the Norris Lab, conduct butterfly mark-resighting surveys in the Rice Lake Plains area. Accommodations will be provided.
Contact trendose@uoguelph.ca
Closing date: 28th February, 2023

Position: Butterfly Conservation Field Assistant (2 positions) at Burlington, ONT
Norris Lab, College of Biological Science, University of Guelph
Duration: 8 weeks (May to July)
Assistants will conduct butterfly mark-resighting surveys in the Burlington area.
Contact trendose@uoguelph.ca
Closing date: 28th February, 2023

Position: Mottled Duskywing Field Assistant (5 positions)
Native Pollinator Initiative
Duration: 3 positions – 16 weeks (May 8 – Aug 25, 2023)
2 positions – 7 weeks (July 17 – Sept 1, 2023)
Assistants will work closely with Dr. Ryan Norris (University of Guelph) and biologists at Wildlife Preservation Canada and Natural Resource Solutions Inc. to conduct releases and post-release monitoring of captive-reared Mottled Duskywing, butterfly mark-resighting and vegetation surveys.
Contact: jobopportunities@wildlifepreservation.ca
For details click here. and to apply, click here.
Closing date: 26th February 2023, 12:00 midnight (EST)

Trap Monitoring Technician (Part-time), Semios
(Vancouver.) As a Trap Monitoring Technician, you will be responsible for labeling our image data set that will be used to deliver reliable and high quality outputs for our growers.
Application Deadline: Not Listed
Details / Apply Online

Graduate Research Opportunities

PhD opportunities in the UK

Go to the ESC website.

MSc opportunities in the UK

Details go to the ESC website.

Global opportunities

Go to the ESC website.

ESBC Special Projects Grant

Purpose

The purpose of the grant is to fund projects that advance and promote entomological knowledge in the province of British Columbia. Projects should address one of the following goals:

- Contribute to the understanding of insects and relatives in British Columbia
- Raise appreciation of insects and relatives in British Columbia
- Contribute to insects and relatives' conservation in British Columbia

Available funds

The amount and number of projects funded annually will depend on available funds. Up to a total of $5000 CAD across all projects will be awarded annually. Requests for funds that exceed this amount will be considered on a case-by-case basis.

Eligibility

- We welcome applications from, but not limited to, non-for-profit organizations, government agencies, research institutions, educational institutions, businesses and independent citizens.
- Applicants must demonstrate how their project fulfills at least one of the listed grant goals.
- Projects must either take place wholly or partially within BC **OR** for projects that take place outside of BC, the applying organization or individual must be based in BC.
- Applicants must demonstrate how equity, diversity, and inclusion are considered in their project design and practices.
- If data is collected as part of the project, data must be freely available to the public unless it pertains to personal information of individuals

Eligible Expenses

Eligible expenses include but are not limited to:

- Contractor salaries
- Equipment
- Travel costs
- Venue rental

Ineligible expenses include but are not limited to:

- Program maintenance
- Retroactive funding

How to apply

To apply, fill in form (see below)

Timelines

Applications are reviewed twice a year. Successful applicants will be notified by email.

Deadline	**Successful applicants notified by**
March 1st	June 1st
September 1st	December 1st

Application Review

Applications will be reviewed by the ESBC president, Treasurer, and one other member of the ESBC executive. The following criteria will be used:

- Does the project meet the purpose of the grant?
    - Does the project contribute to understanding of insects and relatives in British Columbia?
    - AND/OR Does the project raise appreciation of insects in British Columbia?
        - To the general public?
        - To other entomologists?
        - To professionals (growers, pest management professionals etc)
    - AND/OR Does the project contribute to insect conservation in British Columbia?
- What proportion of the total budget will the ESBC be funding? Preference will be for projects that will be mostly funded by the society.
- How much of the total budget is already funded? If the ESBC is funding a portion of the project, preference will be given to projects where other funding sources are confirmed.
- Is the budget and timeline realistic for completion?
- Does the project take equity, diversity and inclusion-related considerations into the project design and practices?
- Does the project have equitable and inclusive participation in the project?
- Is the ESBC supporting equitable access to funding opportunities for all members of the community?

Follow-up after receiving grant

Successful applicants will be required to submit a report to the society newsletter Boreus and may be asked to present project outcomes at the annual symposium in the fall.

APPLICATION QUESTIONS (to be converted to google form after feedback from ESBC exec)

- Name of the applying organization/individual
- Address of applying individual/organization
- Primary contact person for the application
- How is the primary contact person affiliated with the applying organization?
- Phone number of primary contact person
- Email address of primary contact person
- Description of the applying individual/organization (50 words max)

- Description of project (200 words max)
- Amount requested
- Please give a brief budget for how these funds will be used (bullet points are preferred)
- Please give a brief project timeline (bullet points are preferred)
- The ESBC is looking fund projects that will fulfill one or more of the following goals:
    - Contribute to understanding of insects and relatives in British Columbia
    - Raise appreciation of insects in British Columbia
    - Contribute to insect conservation in British Columbia

  How does the project fulfill one or more of these goals? (300 words max)
- Do you have other sources of funding that will be helping fund this project? (YES/NO)
- If applicable, list other sources of funding that will be used to fund the project, and state whether the funding is pending or confirmed (150 words max)
- What percentage of the project will the ESBC be funding?
- How does your organization/group contribute/promote diversity/equality/ underrepresented groups? (100 words max)
- How have you taken into account equity, diversity, and inclusion considerations in your project design and practices? (150 words max)
- If successful, will you be willing to submit a project report to the society newsletter Boreus? (YES/NO)
- If successful, will you be willing to present the outcomes of your project at the ESBC Annual Symposium? (YES/NO)

Student Awards – administered by Entomological Society of America

There are numerous awards. Check them out for eligibility.
http://www.entsoc.org/about/awards-honors

DNA Barcoding Website

There is a new blog exclusively on the topic of DNA barcoding with the aim to have newsworthy information posted a few times per week. The blog is lead by Dirk Steinke, Lead Scientist Barcoding of Marine Life Biodiversity Institute of Ontario University of

Guelph, Ontario, EMail: dsteinke@uoguelph.ca and blog website http://dna-barcoding.blogspot.ca/

Entomological Society of Canada

Blog Available at http://esc-sec.ca/blog/

December 2022 Vol: 54 No. 4 Bulletin available online at:
http://esc-sec.ca/publications/bulletin/

Some International Entomological Societies

Royal Entomological Society www.royensoc.co.uk/

Entomological Society of Southern Africa www.entsocsa.co.za/

Egyptian Entomological Society www.ees.eg.net/

Australian Entomological Society http://www.austentsoc.org.au/

Xerces Society for Invertebrate Conservation www.xerces.org

Japan Coleopterists Society http://www.mus-nh.city.osaka.jp/shiyake/j-coleopt-soc.html

Chilean Society of Entomology http://www2.udec.cl/~insectos/

Butterfly Conservation http://butterfly-conservation.org/

Croatian Entomological Society http://www.agr.unizg.hr/hed/index.htm

European Association of Coleopterology http://www.ub.edu/aec/

Dutch Butterfly Conservation http://www.vlinderstichting.nl/

Butterfly Conservation of the Republic of China http://butterfly.kingnet.com.tw/

Kelowna Museum request

Linda Digby of the Kelowna Museum Society is requesting help acquiring insect specimens for the natural history museum. Their interest is the south Okanagan region. They are seeking donations of identified, labelled specimens and photographs from members or students. Contact Linda directly at the museum, www.kelownamuseums.ca.

Executive contact information

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