Entomological Society of Ontario

Newsletter

Inside the Issue:

Volume 20; Issue II
July 30, 2015

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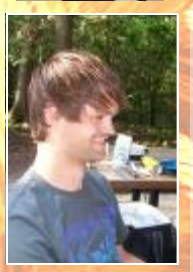

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Entomological Society of Ontario

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The ESO Newsletter

Aug 3, 2015 • Volume 20 • Issue II

Become an ESO Member

Do you often forget to pay your yearly ESO membership dues (hint, hint, the start of 2015 and a new membership season will soon be upon us)? Are you a long-time devoted member of the ESO? Based on member feedback, we've created a NEW membership dues option that has been available since 2013:

A one-time payment of $150 to secure a 5 year membership!

The ESO registration form is available on the **ESO website: *entsocont.ca***

For all membership and payment options, including to pay via ***PayPal,*** please visit **www.entsocont.ca , or** mail your invoice and payment to:

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Student, amateur and retired memberships in Canada are free but **must be renewed each year**! Free memberships may be renewed electronically by sending an email to **Michelle** at:
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Trevor studies the Family Conopidae (Diptera) of the Nearctic region and is attempting to revise the group by identifying unique characteristics to develop strong species concepts. He works under Jeff Skevington (CU & AAFI/CNC Diptera Unit) and Jeff Dawson (CU Biology Dept.) at the Diptera Unit of the CNC.

Trevor has been a **Student Member** of the **ESO** since 2008, and along with Amanda, took over as **Newsletter Editor** in the fall of 2013. In the spring of 2014 he replaced **Morgan Jackson** as **Webmaster**.

Amanda studies the acoustic communication in a highly destructive group of bark beetles – *Dendroctonus* – from characterizing the acoustic properties of male and female signals, to determining how they are produced and what information they convey. She works under Jayne Yack at Carleton University.

Amanda has been a **Student Member** of the **ESO** since 2012, and, along with Trevor took over as **Newsletter Editor** in the fall of 2013.

Associate Editors

Kruti Shukla

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Kruti completed a M.Sc at the University of Guelph where she was interested in the effect an invasive grass-endophytic mutualism had on interacting con- and hetero-specifics. Currently, she is enrolled into a PhD program at Ryerson University looking at global change and it's effect on plant mating systems.

Lauren completed a Master's in insect ecology at the University of Guelph and is currently studying insect physiology for her PhD at Western University. Her research focuses on understanding why insects lose ion and water homeostasis at low temperatures, and the mechanisms by which prior cold acclimation protects against loss of homeostasis in the cold.

Kruti, along with Lauren, will be taking over as **Newsletter Editor** in the fall of 2015

Lauren, along with Kruit, will be taking over as **Newsletter Editor** in the fall of 2015

President's Address

Dear Colleagues,

As I write this message the weather outside could not be nicer, hence I will make it brief so that I can get out and enjoy it while it lasts. First I want to update you on what has been happening in "Your ESO" since the last newsletter in January (thank you again co-editors, Amanda and Trevor).

In April we had an interim ESO board meeting with attendees grouped in Guelph, London, Ottawa, Sault Ste. Marie and far-flung Washington DC. Items of interest included the location and theme of this year's AGM. One of the new directors, Dr. David Beresford, and ESO member Jay Fitzsimmons, have agreed to organize the annual meeting at the Queens University Biological Field Station (QUBS) located on a beautiful lake setting north of Kingston. The meeting date is September 18th to 20th, and the theme is "Outreach and Engagement". Thanks for organizing Jay and David - more details will become available on the ESO website soon. The location for the 2016 meeting may be in northern Ontario as ESO folks from Sault Ste. Marie are considering a bid to host the AGM. Stay tuned. An important issue that will be raised at this year's AGM will be necessary amendments to the ESO constitutional by-laws. In part this is due to the need to make changes to antiquated language and by-laws no longer required by the society, but also because not-for-profit corporations in Ontario must be compliant with new best practices under the Ontario Not-for-Profit Corporations Act (ONCA). Some of the changes to the by-laws will be introduced at the AGM to allow the members to comment.

"Stay tuned. An important issue that will be raised at this year's AGM will be necessary amendments to the ESO constitutional by-laws."

The ESO board learned that two positions may soon be vacated. Jim Brett, the ESO librarian at the University of Guelph, suggested to the board that the ESO librarian position could be made redundant if the society decides to develop a new memorandum of understanding with the U of G library to make the technical services group responsible for

President's Address

archives and journal circulation instead. This should have no impact on those wishing to access the ESO archives and soon older issues of the journal may be made available on the website.

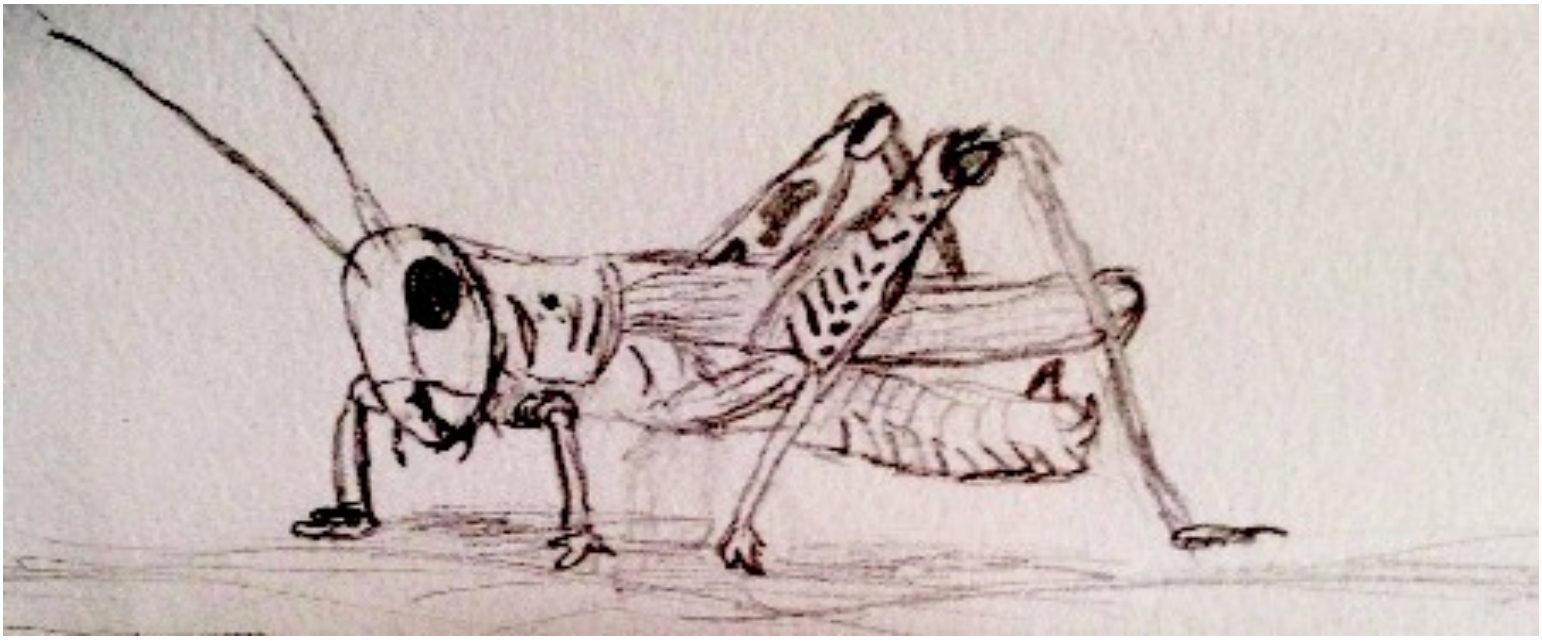
The second vacancy is at the newsletter where Amanda will soon be retiring from editorial duties. We thank her for the great contributions to the style and content of the articles. Best of luck in your next challenge! On that note, we would like to call on all interested folks who have some creative ideas they would like to share with other entomologists – please contact Trevor if you are interested in joining the team. Speaking of new blood, it is also time to vote on the next round of ESO board executives. Make sure you have your say in the next president, 2 directors and student representatives.

"Amanda will soon be retiring from editorial duties. We thank her for the great contributions to the style and content of the articles. Best of luck in your next challenge!

The technology that connected those attending the interim board meeting was Google Hangout, which for the most part allowed us to see and hear fairly well. I won't go into details here but the planning of future board meetings will be modified to reduce the length of time required. A few suggestions have been made to streamline minutes including more pre-meeting reading and agreement on the straightforward issues that would allow the face-to-face (or face-to-screen) time for focusing on important issues that the board needs to discuss and vote on. At the AGM in September further discussion and decisions will be made to improve this process (hopefully over beers or cocktails of choice).

I would like to remind everyone to please renew your membership (now possible for up to 5 years). Best wishes to everyone for the field season. I hope to see you all at the AGM!

Ian Scott
AAFI
ESO President



Meet Julian Meale:
An Entomologist, Naturalist and Illustrator in the making

My name is Julian.

I turn 8 years old on June 14. I have loved insects since I was two. I first discovered snails and ants while walking with my family in the neighbourhood. I remember thinking how interesting they looked.

I still think insects are really cool. I like to watch insects in the wild, and I especially like finding them and keeping them in a bug habitat for a little while. Beetles are my favourite.

Julian Meale

OUTREACH

Besides insects, I really love to draw. Since first loving bugs, I've also loved to draw them. I hope you like some of my drawings. I also have grown to love crustaceans, and other ocean animals. I once had a pet Blue Rainbow crayfish. I learned that crustaceans and insects are related since they are both Arthropods! I have read about Darwin drawing insects, and the animals he studied. I think all kinds of scientists are awesome.

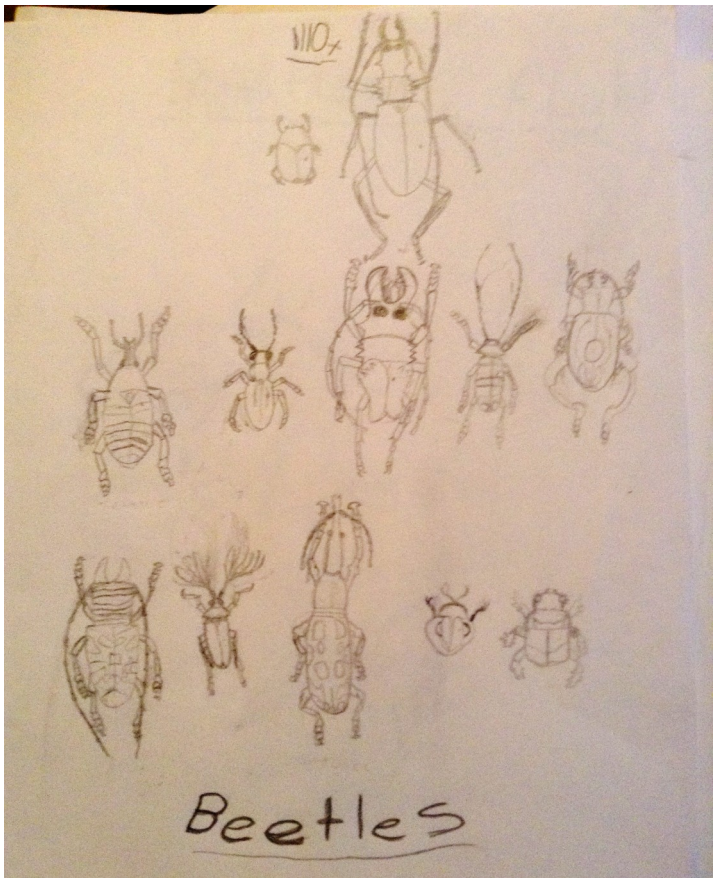
One day I would like to travel and find different kinds of beetles, like Stag beetles, Rhinoceros beetles and different Long-Horned beetles. For the last few years, I have been able to go to an insect camp called Bugs Without Borders in Toronto. I like it because all the kids there like bugs, too. At the camp, I have learned to label parts of insects and to pin them, too. My mom bought dried insects for me to pin, but I like to pin dead insects that I find in the wild. This summer I hope to do lots of bug watching, studying them under a microscope and pinning, too. Recently, I went to the **ROM BioBlitz** at the Humber Arboretum, and I found a few Stag beetles under logs!

I am happy to be a member of the **Entomological Society of Ontario**.

Thank you,

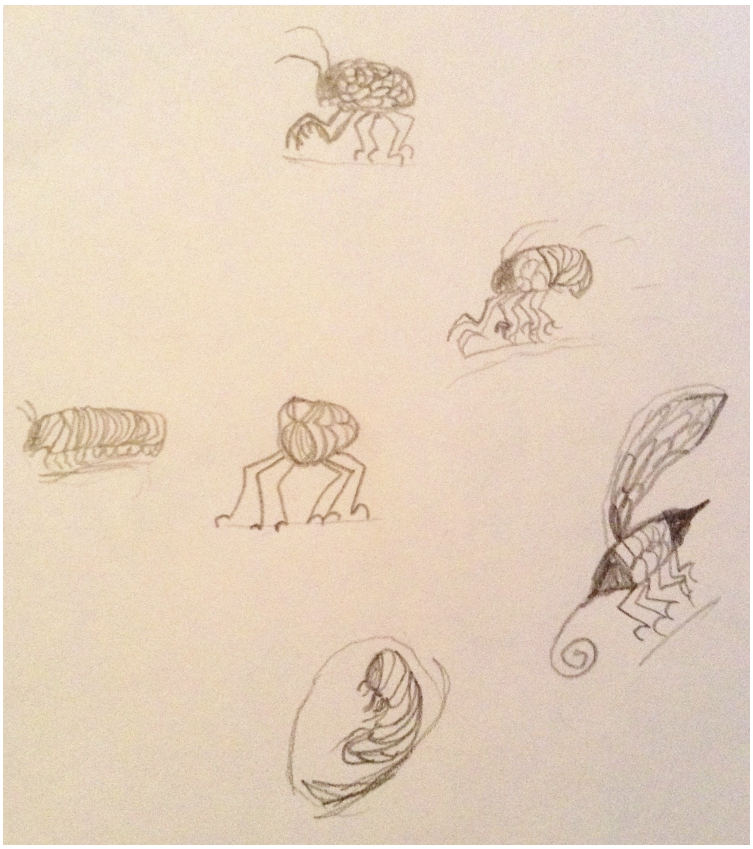
-Julian

Below are some samples of Julian's artwork



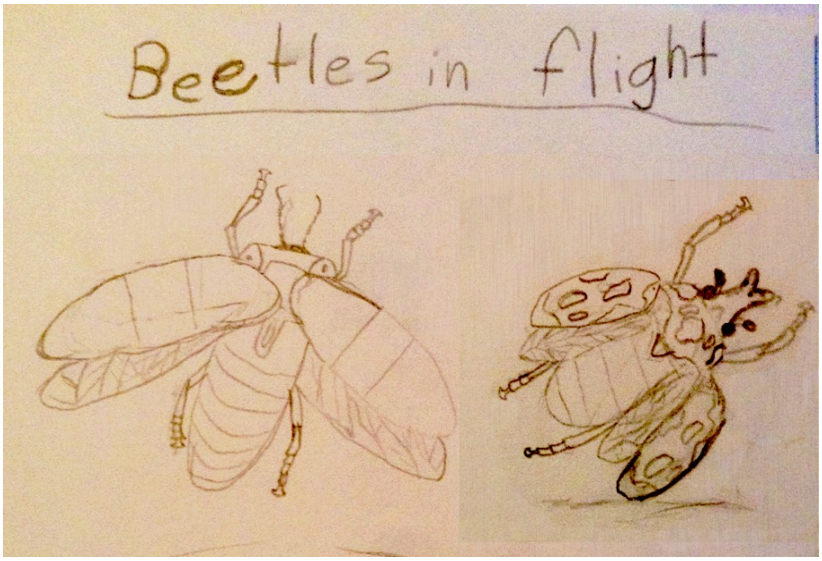
Magnified beetles

Lowtide, Julian's pet crayfish

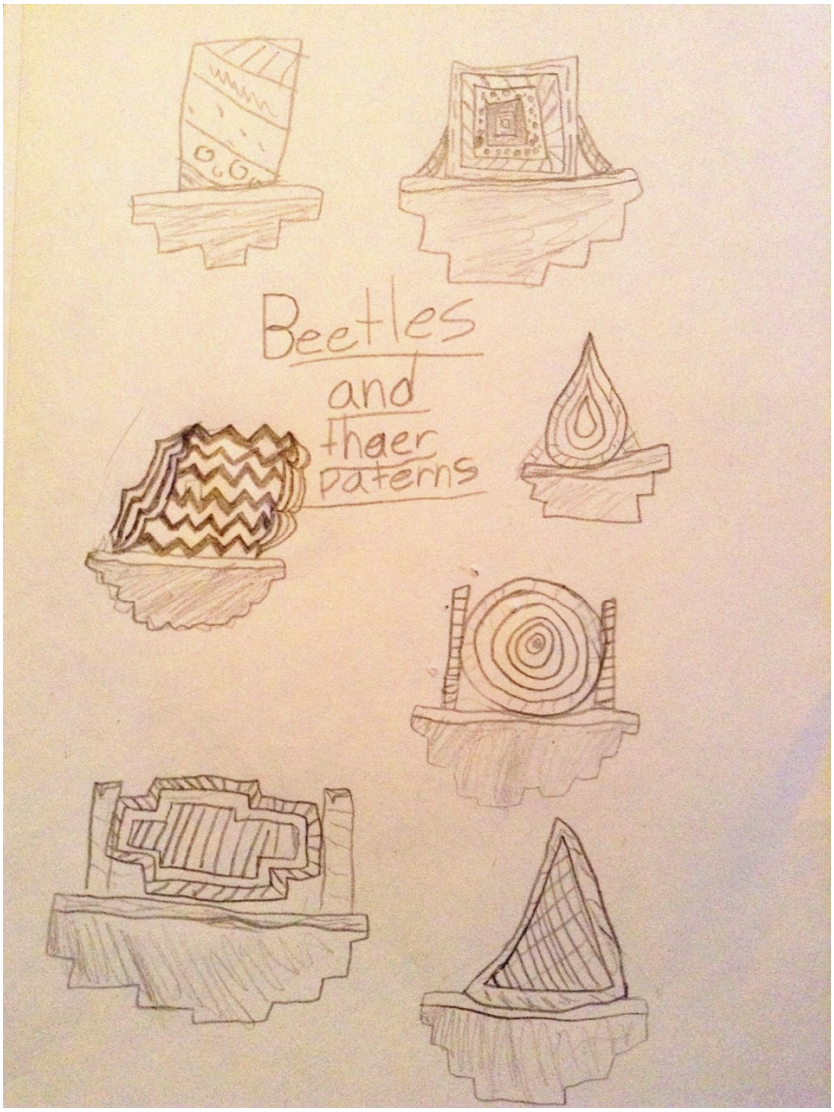


Insects

The ocean


Beetles in flight


Cross Purposes


Beetles
and
thaer
paterns


Colourful
Beetle


Frog Beetle

Featured Research

On the Diversity and ecology of the Canadian Arctic *Rhamphomyia* (Diptera: Empididae)

Élodie A. Vajda

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Photo & fly art: Magnus Muhr

Introduction and context

The Arctic is a hostile environment for most organisms. Prolonged, cold winters are briefly interrupted by brisk, cool summers. Precipitation is rare, especially at the higher latitudes, and only lightly occurs during the warmer months. The average winter temperatures span from -37ºC in the northern regions to -18ºC in the southern regions. Summers are slightly warmer, with average temperatures spanning from +6ºC in the north to +16ºC in the south (Strathdee and Bale 1998). However, through their impressive species-richness, insects demonstrate yet again their outstanding abilities to adapt to extreme environments, and the avid entomologist can spend his or her life in the arctic chasing after beetles, butterflies, moths, bees, wasps, arachnids, and flies.

Studies of the Canadian arthropod diversity demonstrate that as arthropod diversity drops with increasing latitude, Diptera diversity rises, placing Diptera in the frontline of arthropod diversity of the High Arctic (Danks 1981; Brodo 2000). Global climate change impacts are particularly pronounced in the arctic (Strathdee and Bale 1998; Nielsen and Wall 2013), and include notable increases in mean annual temperature and mean annual precipitation (Comiso 2006). Such increases are causing the northward displacement of the tree line, enhanced primary production, and the melt of vital insulating snow, therefore affecting the arctic arthropod community composition and distribution (Strathdee and Bale 1998; Nielsen and Wall 2013).

"The* Empididae, *commonly referred to as the dance flies, is a widespread, species rich, and dominant* Diptera *family in the Arctic."

Female *Rhamphomyia* nectar feeding on *Dryas* flower (Photo: NBP)

Studying arctic arthropod community structure and distribution is key to assess the extent and consequences of arctic ecosystem changes (Timms et al. 2013) because arthropods quickly adapt to environmental changes and are therefore excellent indicators of environmental change (Nielsen and Wall 2013). Understanding the impacts of climate change in the arctic may contribute to forecasting climate change impacts in various other ecosystem types by, for instance, enabling researchers to discern which processes initiate climate change feedbacks (Nielsen and Wall 2013).

The Empididae, commonly referred to as the dance flies, is a widespread, species rich, and dominant Diptera family in the Arctic (Collins and Wiegmann 2002). Little is known about its species richness, and its spatial distribution across the Nearctic. The dominance of the empidid genus *Rhamphomyia* Meigen in arctic ecosystems indicates that this group plays an important role in arctic food web dynamics. However, there is no baseline data with which to assess this.

Thesis

My Master's thesis explores two ways of examining species diversity in *Rhamphomyia*: 1) taxonomy (e.g. species richness), and 2) functional diversity (e.g. body size). The data used for this project consist primarily of specimens collected from the twelve Northern Biodiversity Program (NBP) sites, spanning the boreal, low arctic, and high arctic biomes. Specimens from the Canadian Archipelago, Greenland, and Iceland housed at the Canadian National Collection in Ottawa are also recorded. Only males are considered in this study because females are not readily identified to species/morphospecies and because *Rhamphomyia* exhibit pronounced sexual dimorphism.

The first chapter of my thesis begins with the establishment of an inventory of all collected male *Rhamphomyia* sorted to "morphospecies." We use the term "morphospecies" to designate specimens sorted based on their distinguishing morphological traits. Species from the Canadian Archipelago, Greenland, and Iceland are described or redescribed, and a key to these species is written. The inventory brings to light two ecological patterns in *Rhamphomyia*: 1) their geographic distribution across the Nearctic, and 2) their body size distribution pattern.

Indeed, *Rhamphomyia* species show a wide variation in body size among species across the Nearctic, ranging from 3 to 13 mm long (pers comm: Saigusa). Body size has a direct impact on every aspect of an organism's life (Lawton 1990) such as its relationship with the environment, and the pace of its physiological processes (Cushman et al. 1983; Entling et al. 2010). Hence, studying body size of poorly known taxa, such as *Rhamphomyia* might bring information about this taxon's life history (McGill et al., 2006; Ho et al., 2010; Yates et al. 2014).

Dempster Hwy, YT (Photo: Élodie Vajda)

To attempt making sense of the relationship of Nearctic *Rhamphomyia* body size patterns with the Nearctic, we examine latitudinal effects and other spatial effects. We then suggest and discuss possible environmental factorsthat could explain the distribution pattern of *Rhamphomyia* body size in the Nearctic.

Morphosorting

There are no keys to the Nearctic *Rhamphomyia* species, hence "morphosorting" my specimens to morphospecies was a necessary step. Morphosorting *Rhamphomyia* males was effective because genitalia are highly species-specific and distinctly modified (Downes 1970). Chaetotaxy and leg ornamentations were also useful to distinguish morphospecies from one another. When external morphology wasn't sufficient, genitalia were dissected to examine hidden organs, notably aedeagus curvature and lamellae lobes. Most Nearctic *Rhamphomyia* species are undescribed. However, unpublished notes by H. Saigusa, the CNC *Rhamphomyia* collection, and the subgenus *Megacyttarus* key to species (Barták 2002)allowed for several species to be named or assigned to species groups.

In addition, DNA barcoding of a subsample representative of all *Rhamphomyia* male morphospecies was performedat the Canadian Center for DNA Barcoding housed at the Biodiversity Institute of Ontario. The BOLD Identification System (Barcode of Life Database) takes in the 5' region of the mitochondrial Cytochrome c oxidase subunit I gene (i.e. COI gene) of 658 base pairs and puts forth a species-level identification when this is possible (BOLD Systems, 2014).

The inventory

For a total of 3920 male specimens, there are 79 morphospecies, 53 of which were matched to CNC specimens that had been previously assigned a species names, species group, species number, or subgenus, by H. Saigusa or M. Barták. The remaining 26 morphospecies are without any matches and retain their attributed letter morphospecies name for the time being.

Dempster Highway has the highest species richness than any other site. This is likely due to the pastexistence of Beringia, the unglaciated portion of land stretching from Alaska to the Yukon during the last glaciation. Not surprisingly, the high arctic has the lowest species-richness.

Species rarely occur across all three biomes. Instead, species are usually restricted to either the boreal-low arctic, or to the low arctic-high arctic biomes. Moreover, species are rarely constrained to a single biome.

Body size patterns in Nearctic *Rhamphomyia*

Specimen measurement and statistical analyses

Dried up *Rhamphomyia* are often shriveled, there-

fore measuring full body lengths of each specimen would be inaccurate. We chose to use fore tibia length as a proxy for body size because the linear regression we conducted demonstrates that fore tibia length is significantly correlated to full body length in *Rhamphomyia* (Adj-R^2=0.88).

To test for latitudinal effects on tibia length, we ran a linear mixed-effects model in RStudio. We modeled tibia length as a function of latitude, where tibia length is the response variable. We specified the sampling localities as our grouping structure (i.e. the random effect). We ran this model a second time, adding species as a "fixed-effect", while site remained a random effect. By doing so, tibia length became a function of latitude and of species.

In order to determine if mean tibia length significantly differed between sampling localities, we tested an ANOVA model, where tibia length was the response variable and sampling locality was the explanatory variable. Next, we assigned the sampling localities a designation of "mainland" or "island", depending on whether the sampling locality is found on the Canadian Arctic Archipelago ("island") or on the Canadian mainland ("mainland"). We ran a linear mixed-effects model, where tibia length is the response variable, the grouping (mainland versus island) is the fixed-effect, and the random effect is specified as the sampling sites.

Finally, we extracted climate normals (computed by using 15 years of data recorded from 1981 to 2010) documented at the nearest weather station to each of the twelve sampling localities to acquire mean annual temperature, mean annual precipitation (mm), and mean growing degree days above 5ºC. To test whether these three factors significantly decrease as latitude increases, we then ran three linear regressions, in which mean temperature, mean precipitation or mean growing degree days, are a function of mean latitude.

Body size distribution pattern

Body size significantly increases along with latitude increase (Figure 1). Yet, when species identity is included in the mixed effects model, latitude no longer has a significant effect on body size. This demonstrates that the latitudinal increase of *Rhamphomyia* body size is not intraspecific because it is due to a shift in the community composition as latitude increases: smaller species are knocked out of the community assemblages as latitude increases.

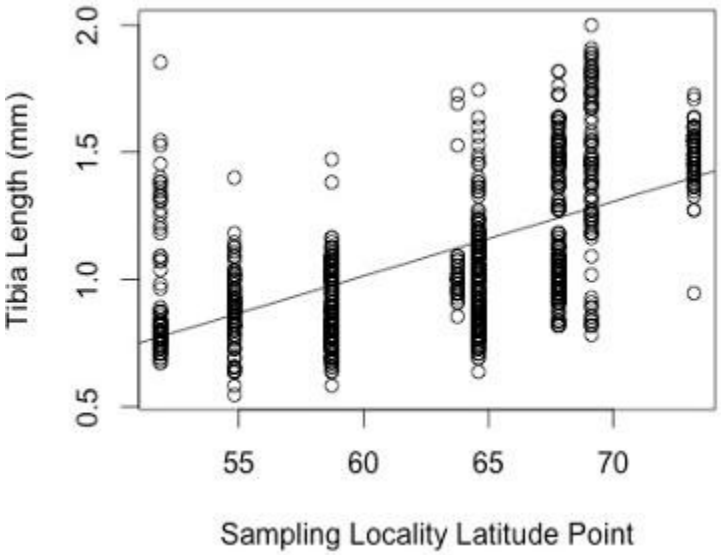

Figure 1. Relationship between Nearctic *Rhamphomyia* species mean tibiae lengths and sampling locality latitude point

Body size is significantly larger on the islands (high arctic) than on the mainland (sub-arctic) (Figure 2). Finally, we also found that mean annual temperature, mean annual precipitation and mean growing degree days significantly decrease as latitude increases.

The results suggest that the body size distribution pattern of the Nearctic *Rhamphomyia* might be the result of a combination of environmental factors. First, the Northwestern Passages separating the Canadian Arctic Archipelago from the Canadian

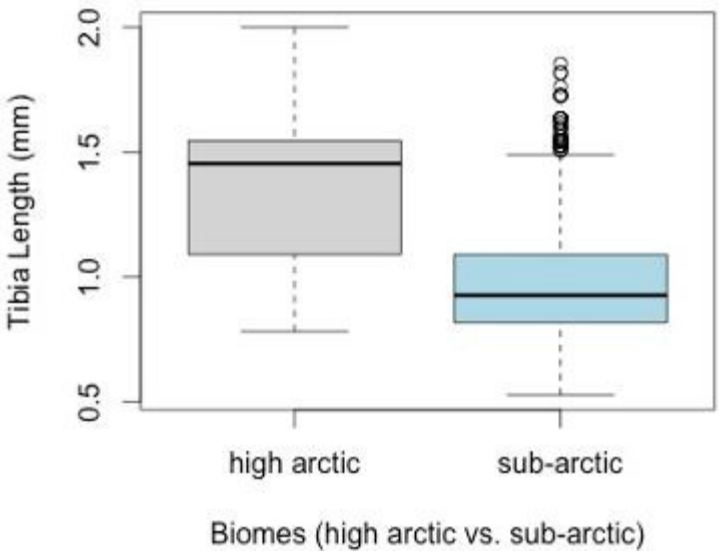

Figure 2. Mean tibia length larger in the high arctic than in the sub-arctic.

mainland might be a physical barrier hindering the smaller *Rhamphomyia* species from colonizing the islands post-glaciation. Bigger Diptera are better flyers than smaller Diptera because larger flies have a more substantial energy reserve to power flight activity, and hence, larger flies can endure longer travel time (Coulson et al. 2002).

In addition, the dryness of the air masses in the high arctic (Maxwell 1981; Coulson et al. 2002) might also contribute hindering smaller *Rhamphomyia*from successfully crossing the Northwest Passage.Larger insects are more desiccation-resistant than smaller insects, because their larger bodies harbor a higher initial water content than smaller bodies (Chown 1993; Renault and Coray 2004; Gray and Bradley 2005).Therefore, smaller *Rhamphomyia* must feed more often than larger *Rhamphomyia* to replenish energy reserves for flight activity, and to avoid fatal desiccation (Renault and Coray 2004; Gray and Bradley 2005). However, because the Northwest Passage does not offer any "rest stops", smaller *Rhamphomyia* are not likely to survive through the long travel time across the Northwestern Passages (Coulson et al. 2002).

In the unlikely event of smaller-bodied *Rhamphomyia* species surviving dispersal across the Northwester Passage, the next challenge for these individuals is to successfully reproduce on these new grounds (Coulson et al. 2002).

The Canadian Archipelago is the driest region in Canada (Maxwell 1981). As mentioned above, small *Rhamphomyia* species must feed frequently to replenish their body water content. However, food is extremely scarce and sporadic in the high arctic (Strathdee and Bale 1998).

In addition, the arctic islands are an exceptionally

dynamic, and unpredictable environment. Temperatures can drop considerably in a matter of a few hours or less, and winds can rise up to dangerous speeds.). A study conducted by Homburg et al (2013) found that larger carabids have higher dispersal abilities, enabling them to thrive in highly dynamic regions because they are more efficient at escaping from unfavorable, dryer conditions to find a more suitable habitat. Thus, we can reasonably speculate that larger *Rhamphomyia* (i.e. better flyers), are likely to be better adapted to the dynamism of the arctic islands as they can efficiently search for more favorable living conditions and for food (Prince and Parsons 1977).

Larger *Rhamphomyia* species not only imply higher fasting-endurance (Cushman et al. 1993), but also larger larvae (Chakir et al. 2002). Larger larvae can take advantage of a wider range of prey size than smaller larvae because they are more likely to successfully capture and kill increasingly large prey (Warren and Lawton 1987), which is especially important for insects inhabiting nutrient-poor environments. All *Rhamphomyia* larvae are predaceous (Bartak and Kubik 2009). Therefore, we suggest-that, given the scarcity of food in the high arctic andthe assumption that the high arctic hosts predominantly larger arthropods (and prey), it is advantageous for *Rhamphomyia* larvae to be larger in order to most efficiently consume prey.

Sabrina Rochefort (right) and I on our collecting trip to the Yukon (Photo: T. Wheeler)

Linking taxonomy and ecology

Morphosorting these thousands of *Rhamphomyia* specimens allowed me to construct an inventory of the Nearctic *Rhamphomyia* that revealed spatial patterns of species distribution across the Nearctic, and trends in *Rhamphomyia* body size distribution. Had I left these specimens to genus, there would be no story to tell, other than the bland account that *Rhamphomyia* occurs across the Canadian arctic.

Also, ensuring that these morphospecies be named and (re)described will allow me to connect my work to the literature.

I would like to dedicate this little article to Dr. Brad Sinclair as a small thank you for his continuous support and for taking the time to teach me about taxonomic research; his enthusiasm for taxonomy and attention to detail has inspired to me to always work towards producing high-quality work, and has helped make this Master's a valuable experience.

References

Bartak M. 2002. Nearctic species of *Rhamphomyia* subgenus *Megacyttarus* (Diptera: Empididae). Biologica. 46(1-2):3-215.

Bartak M, Kubik S. 2009. Two new east Palaearctic *Rhamphomyia* (*Pararhamphomyia*) (Diptera: Empididae). The American Entomological Society. 120(1):76-86.

Brodo F. 2000. The insects, mites, and spiders of Hot Weather Creek, Ellesmere Island, Nunavut. GSC Bulletin. 529:145-173.

Chakir M, Chafik A, Moreteau B, Gibert P, David JR. 2002. Male sterility thermal thresholds in *Drosophila*: *D.simulans* appears more cold-adapted than its sibling *D. melanogaster*. Genetica. 114:195-205.

Chown SL. 1993. Desiccation resistance in six sub-antarctic weevils (Coleoptera: Curculionidae): humidity as an abiotic factor influencing assemblage structure. 7(3):318-325.

Cushman JH, Lawton JH, Manly BFJ. 1993. Latitudinal patterns in European ant assemblages: variation in species richness and body size. Oecologia. 95:30-37.

Coulson Sj, Hodkinson ID, Webb NR, MIkkola K, Harrison JA, Pedgley DE. 2002. Aerial colonization of high Arctic islands by invertebrates: the diamondback moth *Plutella xylostella* (Lepidoptera: Yponomeutidae) as a potential indicator species. Diversity and Distributions. 8:327-334.

Collins KP, Wiegmann BM. 2002. Phylogenetic relationships and placement of the Empidoidea (Diptera: Brachycera) based on 28S rDNA and EF-1alpha sequences. Inset Syst. Evol. 33(4):421-444.

Comiso JC. 2006. Arctic warming signals from satellite observations. Weather. 61(3):70-76.

Danks HV. 1981. Arctic arthropods: a review of systematics and ecology with particular reference to the North American fauna. Ottawa (ON): Entomological Society of Canada.

Downes JA. 1970. The feeding and mating behavior of the specialized Empidinae (Diptera); observations on four species of *Rhamphomyia* in the high arctic and a general discussion. The Canadian Entomologist. 102(7): 769-691.

Entling W, Schmidt-Entling MH, Bacher S, Brandl R, Nentwig W. 2010. Body size-climate relationships of Europeand spiders. Journal of Biogeography. 37:477-485.

Gray EM, Bradley TJ. 2005. Physiology of desiccation resistance in *Anopheles gambiae* and *Anopheles arabiensis*. Am. J. Trop. Med. Hyg. 73(3):553-559.

Ho CK, Pennings SC, Carefoot TH. 2010. Is diet quality an overlooked mechanism for Bergmann's Rule? The American Naturalist. 175(2):269-276.

Homburg K, Schuldt A, Drees C, Assmann T. 2013. Broad-scale geographic patterns in body size and hind wing development of western Palaearctic carabids beetles (Coleoptera: Carbidae). Ecography. 36:166-177.

Strathdee AT, Bale JS. 1998. Life on the edge: insect ecology in arctic environments. Annu. Rev. Entomol. 43: 85-106.

Timms LL, Bowden JJ, Summerville KS, Buddle Cm. 2013. Does species-level resolution matter? Taxonomic sufficiency in terrestrial arthropod biodiversity studies. Insect Conservation and Diversity. 6(4):453-462.

Lawton JH. 1990. Species richness and population dynamics of animal assemblages. Patterns in body size: abundance space. Phil. Trans. R. Soc. Lond. 330:283-291.

Maxwell JB. 1981. Climatic regions of the Canadian Arctic Islands. Arctic Institute of North America. 34(3):225-240.

McGill BJ, Enquist BJ, Weiher E, Westoby M. 2006. Rebuilding community ecology from functional traits. Trends in Ecology and Evolution. 21:178-185.

Unravelling the North American species of *Callomyia* (Diptera: Platypezidae)

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For my Master's thesis, under the supervision of Dr. Terry Wheeler at McGill University, I studied the genus *Callomyia*, which belongs in the Diptera family Platypezidae (flat-footed flies). These flies are quite attractive, often displaying distinctive colour patterns of silvery blue, slivery gray, yellow and orange on a velvety black body (Fig. 1). Their alluring appearance caught my interest and made me want to investigate this group further. Once I began studying the literature on this genus and examining current species concepts, I realized there were many taxonomic problems associated with the

Figure 1. Female of *Callomyia venusta* showing distinctive colour patterns. Photo: Andrew Young.

ten species of *Callomyia* in North America. One of the major taxonomic problems found within this group is that eight of the ten North American species were described from one sex only (five species only from males and three species only from females). This is largely due to the prevalence of sexual dimorphism in the group, making it difficult to associate the sexes of these species (Fig. 2). In addition, species of *Callomyia*, like many other flat-footed flies, are rarely collected and are poorly represented in collections. Most of the North American specimens available for study were collected over many years by a single collector (E.L. Kessel), and many species are known from just a few specimens.

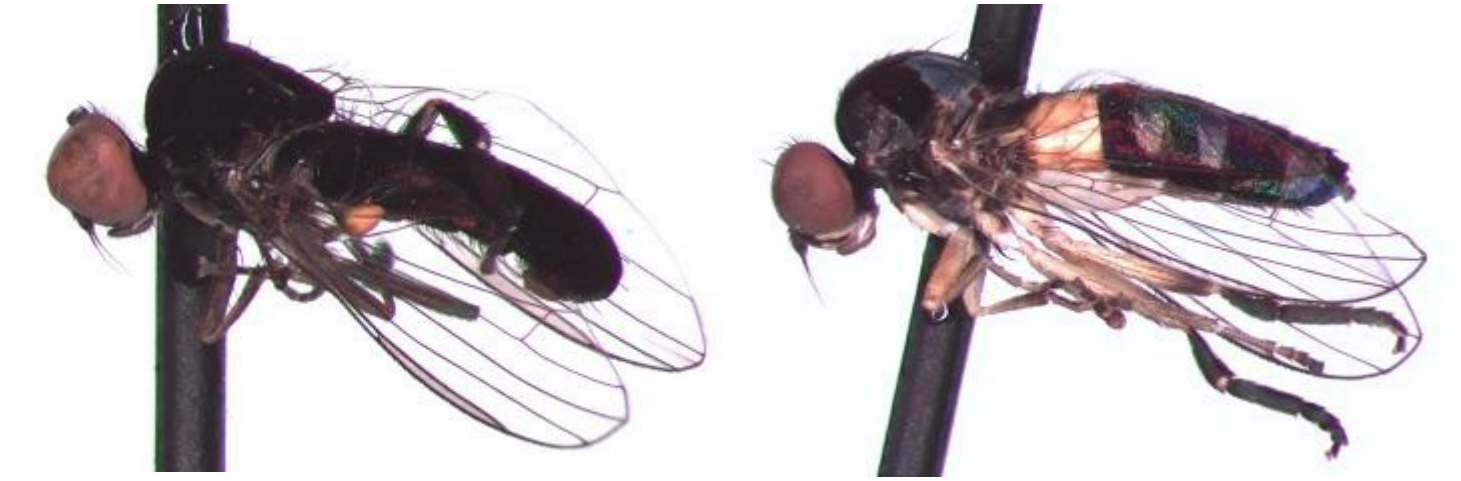

Figure 2. A North American species of *Callomyia* exhibiting sexual dimorphism; male (left), female (right).

To overcome these challenges, I set out to do field work in an attempt to obtain fresh material of *Callomyia*. This was important because in order to determine possible synonymies of the many species that were known from one sex only, I needed to provide records of species collected together in the same series. Freshly collected material was also needed to acquire DNA barcodes of the species, another form of evidence that would help me associate sexes. My field work was local, mainly in hardwood forests around the Ottawa and Montreal area, with an extra excursion to the Bruce Peninsula. Initially, I was having good luck finding other platypezid species, usually by looking for small flies running around erratically (a behaviour associated with the family) on understory vegetation. This method, however, was not helping me find species of *Callomyia*, because as I discovered later, members of this genus do not exhibit this behaviour. They instead stand motionless on leaves or can be seen hovering in the air. It was in the Gatineau Hills, Quebec (Fig. 3), that after continuous sweeping of the understory vegetation, I was able to collect my first specimen of *Callomyia* (*C. liardia*, known from males only)! This was a very exciting day – I know, nerd alert! – and it helped me discover successful methods for collecting these elusive flies. I continued to go back to this location where I swept the vegetation and was able to fortunately collect a few specimens of *C. proxima* (known from females only) and another male of *C. liardia*, on the same day. Because these

species were collected together in the same series, and the specimens I collected produced successful barcodes that support their conspecificity, I will be able to synonymize them when I publish my revision of *Callomyia*.

Figure 3. Successfully collecting flat-footed flies in the Gatineau Hills.

Along with the synonymy mentioned above, my Masters will result in the synonymy of two more species (associating four species that were known from one sex only). In addition, I discovered three new species of *Callomyia* based on morphological evidence (Fig. 4). Two of these new species are currently known from males only. Therefore, further collecting of this genus is needed in North America to discover the missing females of these new species, provide fresh material for further DNA sequencing, and provide additional records of males and females collected together in the same series. For that reason, I plan to continue collecting this fascinating group of flies across North America, and to hopefully make more interesting discoveries! For more information on my findings on *Callomyia*, check out my upcoming publication (by Cumming and Wheeler), which has been submitted to the journal Zootaxa.

Figure 4. One of the new species of *Callomyia* that I will be describing.

Let's Get Together: Vibratory Recruitment Signals in Group-living Caterpillars

Group-living is an interesting phenomenon that we observe in large number of insects in nature. This is quite a common phenomenon observed either in adults or juveniles or both. Group-living is observed in many larval Lepidoptera at some stage of their development.

Several studies have reported various benefits associated with group-living including feeding facilitation (1), predator defence (2), and thermoregulation (3). Surprisingly, there aren't many studies to answer how group-formation occurs. Relatively less is known about the proximate mechanisms that mediate group formation and group maintenance than the adaptive significance of group-living. How do caterpillars find each other, and stay together? Mechanisms could potentially involve one or more of the following- hormones, genes, chemicals/ pheromones, vibro-acoustics, visual cues, and physical contact. Most studies have focused on chemicals as proximate mechanisms of grouping in caterpillars (e.g. 3,4).

My research in Yack laboratory explores the role of vibro-acoustics in group-living (recruitment and/or maintenance using masked birch caterpillar *Drepana arcuata* (Drepanidae).

This is a novel approach to understanding group-

Fig. 1 Group of early instar *Drepana arcuata* resting in a silk shelter on the tip of a birch leaf. Photo credit: Jayne Yack

living in caterpillars given there are no studies to my knowledge that have reported the role of acoustics in facilitating group-living in caterpillars. As we unravel the proximate mechanisms of grouping observed in caterpillars we are observing their fascinating communication system comprised of complex vibratory signals. *Drepana arcuata* is a holometabolous insect commonly found on birch trees (*Betula* sp.) throughout northeastern North America. It has two broods per year (May-July and August-September). Life history reports indicate that adults lay eggs in rows on leaves and newly hatched caterpillars form groups of 2 to 5 individuals within silk shelters for their first and second instars and late instars live solitarily on individual leaves.

The early instar *D. arcuata* caterpillars have been found to produce four types of complex vibratory signals- buzz scrape, mandible scrape, anal scrape and mandible drum. This observation is intriguing as the caterpillars producing these complex signals are just a few mm long (1.5mm -6mm).

Our study explores the role of these complex signals in recruitment. We propose that these signals are used to "advertise" a feeding site. The solitary individual that has founded a shelter is observed to produce primarily buzz scrape and anal scrape, and these signals are correlated with shelter construction and feeding. It is also observed that when a potential recruit approaches a founder, the signalling rate of founder increases and it produces buzz scrape, mandible scrape and mandible drumming. We propose that these signals function to entice a wanderer into the shelter. Our results so far indicate that these vibratory signals assist these caterpillars in group formation.

As we all know there are many caterpillar species

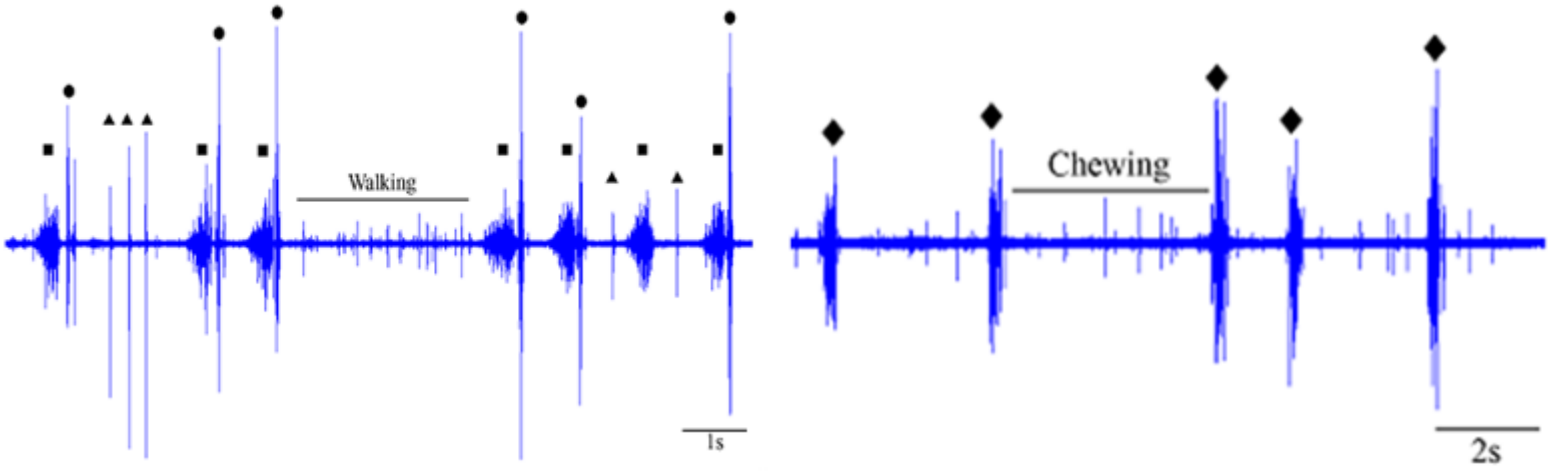

Fig. 2 The vibratory repertoire of early instar *Drepana arcuata*. (a) Waveform of three vibratory signals produced while walking (b) Waveform of signals produced while feeding. Signals and corresponding signals are: mandible scrape, circle; mandible drum, triangle; buzz scrape, square; anal scrape, diamond. Photo credit: Jayne Yack.

that are major food crop pests and grouping is key to their survival. They are observed to cause maximum damages when in groups. Understanding the mechanisms underlying their grouping could actually help us devise better methods to control them.

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References

Breuer, M. & Devkota, B. 1990. Studies on the importance of nest temperature of *Thaumetopoea pityocampa* (Den. & Schiff.)(Lepidoptera: Thaumetopoeidae). *Journal of Applied Entomology.* **109:** 331-335.

Clark, B.R. & Faeth, S.H. 1997. The consequences of larval aggregation in the butterfly *Chlosyne lacinia*. *Ecological Entomology.* **22:** 408-415.

Colasurdo, N. & Despland, E. 2004. Social cues and following behaviour in the forest tent caterpillar. *Journal of Insect Behaviour.* **18:** 77-87.

Cornell, J.C., Stamp, N.E. & Bowers, M.D. 1987. Developmental change in aggregation, defense and escape behaviour of buckmoth caterpillars. *Hemileuca lucina. Behavioral Ecology and Sociobiology.* **20:** 383-388.

Denno, R.F. & Benrey, B. 1997. Aggregation facilitates larval growth in the Neotropical nymphalid butterfly *Chlosyne janais*. *EcologicalEntomology.* **22:**133–14.

Lawrence, W.S. 1990. The effects of group size and host species on development and survivorship of a gregarious caterpillar *Halisdota caryae* (Lepidoptera: Arctiidae). *Ecological Entomology.* **15:** 53-62.

Matsumoto, K. 1989. Effects of aggregation on the survival and development on different host plants in a Papilionid butterfly*Luehdorfia japonica. Japanese Journal of Entomology.* **47:**853–860.

Pescador-Rubio, A., Stanford-Camargo, S.G., Páez -Gerardo, L.E., Ramírez-Reyes, A.J., Ibarra Jiménez, R.A., & Fitzgerald, T.D. 2011. Trail marking by caterpillars of the silverspot butterfly *Dione junohuascuma. Journal of Insect Science.* **11**:55.

Sillen-Tullberg, B. 1990. Do predators avoid groups of aposematic prey? An experimental test. *Animal Behaviour.* **40:** 856-860.

How live birth in flesh flies changed Canadian Law: The Steven Truscott case

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The final decision for Steven Truscott, who had been convicted of the 1959 rape and murder of 12 year old Lynn Harper, was based on an interpretation of the entomological field notes made during the investigation and autopsy. In 2007, four forensic entomologists reviewed this evidence, and in the end this evidence exonerated Mr. Truscott, contributing to a decision of miscarriage of justice.

Steven Truscott, was 14 years old in 1959, when he was declared guilty and sentenced to death by hanging. The Truscott Case polarized the county at the time, and again during his appeal in 2007. The horrific nature of the crime created an appetite in the press that the criminal be found and punished, and Steven Truscott appeared to be that person. Forty seven years later, the horrific ordeal of being wrongly convicted and imprisoned captured the public imagination, and many Canadians demanded that reparation be made.

The mandatory death penalty given to the teenaged Truscott for his original conviction added impetus to the movement to abolish the death penalty in Canada. His acquittal 47 years later continues to act as a potent argument against the death penalty for many in Canada, an acquittal largely based on expert interpretations of the descriptive entomological evidence contained in the investigator's field books.

The Crime

June 9, 1959 Lynne Harper disappeared near RCAF base Station Clinton, near Clinton, Ontario. Truscott and Lynn Harper were grade 7 students at a local school. Early in the evening of June 9, 1959, Truscott gave Lynn Harper a ride on the crossbar of his bicycle from their school along a county road. He later claimed he took Lynn Harper to an intersection and left her there unharmed, and that as he rode away he looked back and saw her

enter a vehicle. Truscott then returned to the school at 8 PM and was seen at this time. At 11:20 PM Lynne Harper's father reported her as missing. Her body was found on June 11 in a farm woodlot.

During the original investigation, the time of death was determined using stomach contents and rigor mortis. From the Transcript (Ontario Court of Appeal2007), Dr. John Penistan determined that Lynn Harper died between 7:00pm and 7:45pm on June 9th, 1959. Dr. Penistan collected maggots and eggs from a variety of locations on the body at the crime scene and during the autopsy. These were given to Mr. Elgin Brown, a biologist working at the Ontario attorney general's crime lab at the time of the murder. Mr. Brown reared the maggots to adulthood, and identified the adults to family *Sarcophagidae,* flesh flies, and *Calliphoridae*genus C*alliphora,* blue bottle flies.

". . . if Lynne Harper died before 8PM, then Truscott has no alibi whereas if she was murdered after 8PM, then Truscott is innocent."

The gist of the matter is that if Lynne Harper died before 8PM, then Truscott has no alibi whereas if she was murdered after 8PM, then Truscott is innocent. The case hinges on the time of death, and the entomological evidence of time of death depends on the kind of maggots found on Lynne Harper's body. Flesh flies are viviparous, whereas blow flies lay eggs. Flesh flies are larger when deposited, meaning that for maggots of the same length, blow flies would be older than flesh flies. If the largest maggots were blow flies it is evidence of death and oviposition in the waning hours of daylight on the evening of June 9. However, if the largest maggots were flesh flies, it provides evidence for larvae being deposited on the morning of June 10th, with death occurring after dark on June 9th, long after Truscott was seen back at school.

"Entomologists cannot pinpoint with absolute precision the PMI. "

These arguments are based on two assumptions: that adult flesh flies and blow flies give birth or lay eggs soon after death, and that neither does so at night. From the trial transcript:

"[320]One other fact is important to this case. The flies involved in this case are diurnal, that is, they do not deposit eggs or larvae at night. However, larvae will continue to grow during the night, provided there is sufficient heat available.

"[321]Entomologists cannot pinpoint with absolute

precision the PMI. Rather, they provide a range of time during which the insects likely deposited their eggs or larvae. As was explained by the appellant's experts, if the PMI range extends from several hours of darkness and into early daylight hours, the reasonable inference is that the eggs or larvae were deposited in the daylight hours, i.e., after sunrise. Similarly, if the PMI covers a period from the late afternoon or evening and into the night, it is likely the eggs or larvae were deposited before sunset. It is only if the range of time falls completely during hours of darkness that it is presumed that colonization occurred during daylight hours the preceding day.

"Flesh flies arrive after death and deposit first instar larvae. Blow flies arrive after death and deposit eggs."

"[322]This case concerns two families of flies: Sarcophagidae or flesh flies and Calliphoridae or blow flies. We use the common terminology of flesh flies and blow flies. Flesh flies arrive after death and deposit first instar larvae. Blow flies arrive after death and deposit eggs. Blow flies lay hundreds of eggs at a time, while flesh flies deposit many fewer live larvae. There are several genus or tribes of flesh flies and blow flies and many species within the tribes, which develop at different rates."

The largest maggots were found on Lynne Harper's torso, about ¼ inch long, with maggots around the face from 1/16 to 1/8 inch long. Identification to family was based on the relative abundance of the maggot mass, viviparous flesh flies deposit fewer large offspring compared to the number of eggs laid by blow flies and consequently produce smaller maggot masses than blow flies.

So, what kind of flies were the largest maggots? This question caused considerable debate. From the transcript: "[334] Dr. Brooks was present at the autopsy and took notes for Dr. Penistan. At the trial he testified that he observed that in the entrance to the front passage of the genitals there were 'masses of maggots about in this region' ".What family the maggots were depends on what was meant by the phrase "masses of maggots".

The transcript indicates that Drs. Van Laerhoven and Merritt thought flesh fly specimens were more relevant in determining the PMI in this case, and both agreed that the earliest time the flesh flies could have colonized the victim would have been the morning of June 10th.With a preamble of qualifying comments Dr. Anderson agreed. In contrast, Dr. Neil Haskell placed the time of death before 8PM on June 9, meaning that Truscott had no alibi.

We have been told by colleagues in the legal trade that official transcripts are intended to be an unbi-

ased account of the proceedings. In this case it is difficult to know what to make of the following from the transcript:

"(ii) Credibility of the entomology experts [312] Before engaging in a detailed analysis of the substance of the expert evidence, it is appropriate to begin with general observations about the credibility of the entomology experts. Broadly speaking, all of the experts whose opinions were placed before the court, except one, offered at least some support for the appellant's claim that Lynne died hours after 8:00 p.m. on June 9 and probably sometime the next morning. The sole exception was Dr. Neal Haskell, an expert called by the Crown. Dr. Haskell's opinion supported a finding that Lynne died before 8:00 p.m. on June 9.[313] Dr. Sherah Van Laerhoven and Dr. Richard Merritt, who testified for the appellant, gave evidence in a careful and measured way. Their evidence was indicative of an objective consideration of the relevant factual data. The same cannot be said for Dr. Haskell. Despite what would appear to be impressive credentials, Dr. Haskell tended to overstate the effect of his opinion. He was dogmatic and reluctant to admit obvious errors. He assumed an adversarial position as revealed in correspondence with the Crown that Crown counsel disclosed to the appellant's counsel. Several critical elements of his opinion were based on nothing more than his purported experience, which could not be verified and was not supported by any empirical work. He was unable to demonstrate that his experience had been replicated by other scientists."

This "sole exception" was in fact one of the three experts at the trial, and the criticism that his testimony was based on his own experience seems curious. By definition, scientific experts are those who can draw from their expert experience! A two to one opinion, or three to one if we include Dr. Anderson, is certainly not "all of the experts whose opinions were placed before the court . . ."

"Recent studies (e.g. Wooldridge et al. 2007, Singh and Bharti 2008) have shown that blow flies can lay eggs at night even in absolute darkness . . ."

In the final analysis, we cannot know which family the flies belonged to, whether flesh flies exonerating Truscott, or blow flies removing his alibi. The distinction was based in part on the strength of an assumed aversion to night-time activity for members of both families. Recent studies (e.g. Wooldridge et al. 2007, Singh and Bharti 2008) have shown that blow flies can lay eggs at night even in absolute darkness although they appear to be far less likely to do so outside of the lab (Singh and Bharti 2008). For us as entomologists, describing the normal behavioral patterns of an insect with a statement such as "blow flies do not lay eggs at night" is appropriate and readily understood by other entomologists. But for a member of the legal

profession which deals in absolutes, our answer above does not mean the same thing.

The case of Steven Truscott captivated a nation over half a century. It informed public opinion regarding abolishing death penalty in Canada. This case continues to be used as one of the best examples for why the death penalty should not return to Canada. And, the strength of this argument depends on the fact that flesh flies give live birth and blow flies lay eggs.

References

Ontario Court of Appeal, 2007 CanLII: Truscott (Re), 2007 ONCA 575, http://www.ontariocourts.on.ca/decisions/2007/august/2007ONCA0575.htm

Singh, D. and M. Bharti. 2008. Some notes on the nocturnal larviposition by two species of Sarcophaga (Diptera: Sarcophagidae). Forensic Sci. Int. 177: e19–e20.

Wooldridge et al. 2007. Flight activity of the blow flies, *Calliphora vomitoria* and *Lucilia sericata* in the dark. Forensic Sci. Int. 172: pp. 94–97.

2015 Electoral and Fellow candidates

Presidential Nomination (unopposed): Gard W. Otis:

Professor, School of Environmental Sciences, University of Guelph

During the summer of 1972 as a student at Duke University (Zoology, BS, 1973), I spent three months in Central America where I became obsessed with insects, especially mimicry exhibited by butterflies. That led me to the University of Kansas (PhD, 1980) where I survived stepping on a fer-de-lance, infestation by human bot flies, attacks by killer bees, acute amoebic dysentery, and the mental anguish of writing a thesis. As a professor at the University of Guelph (1982-present), I focus my energies on teaching and research about insects and beekeeping projects in developing countries. Courses I have taught—Apiculture, Insect Behaviour, and Field Entomology (co-taught by Steve Marshall)—have drawn many students into the realm of entomology. My research interests can be encapsulated by "ecology, behaviour, and the evolution of insects". My greatest famili-

2015 Electoral and Fellow candidates

arity and interest lies with honey bees and their pests, and butterflies. Of the many research projects I have been involved with over the years, I am most proud of: my thesis research on the swarming behaviour of honeybees; the honeybee breeding project I oversaw that reduced the impact in Ontario of the tracheal mite; the rediscovery of the species *Apis nigrocincta* in Indonesia; and recent research on the responses of Asian honeybees to attacks by giant hornets. But I am even more proud of the students I have taught who have gained a life-long love of insects.

I also have a strong interest in how beekeeping can contribute to improvements in livelihoods of rural people in the tropics. Between 2007-2013, I spearheaded a project in Vietnam that contributed to increases in incomes of no less than 300 families. It also led to enhancements in the status of women involved in our project and contributed to improved diets and education of the children of the beekeeping trainees. To have had such a positive impact on so many people is very gratifying. I continue to consult widely with people around the world interested in how to implement beekeeping.

At this point, I am probably supposed to detail the number of papers and books I have published, etc., but that hardly seems relevant to how I would serve the ESO. I won't make a bunch of promises about what I would do if elected president because it would be inappropriate.

Since I last served as ESO president in 2000-2001, I have not been actively involved in the society and annual fall trips to Vietnam have often prevented me from attending the annual conferences. Consequently, it would be foolish for me to make hollow promises. However, I can promise you that I would act by:

- Become quickly informed during my year as President-elect on issues ESO faces;
- Promote the ESO widely, especially to people studying insects in Ontario who do not regularly belong to the society or attend its conferences;
- Encourage participation at the annual ESO conference, of students, professors, and professional entomologists throughout the province;
- Make informed decisions only after extensive consultation with the ESO executive and, when warranted, with members at large;
- Look for ways that insects can be better understood by society and for the research our members conduct to be conveyed to others within and outside ESO.

In agreeing to stand for election as President of ESO, I am committing both the time and energy necessary to see the society through a successful year under my stewardship.

-Gard Otis

ESO Elections

Student Rep Candidate: Tammy Duong

I am currently an MSc graduate student at Carleton University under the supervision of Tom Sherratt. I study the behavioural ecology of dragonflies towards prey of varying body size and colouration. My enthusiasm for entomology has lead me to apply for student representative as I hope to join a community that shares the same excitement for all things buggy. I hope to contribute what I can to ESO and to help make entomology accessible to specialist and laypeople alike.

Student Rep Candidate: Andrew Young

Dear ESO Members,

My name is Andrew Young, and I would be delighted to be the next ESO Student Representative. I've been interested in entomology since I was a child, and spent most of my summers rearing monarch butterflies at my grandparents' house. My academic career took off after I enrolled in Steve Marshall's Insect Diversity and Biology course and was immediately fascinated. I signed up for his follow-up Field Entomology and Insect Systematics courses, and proceeded to immerse myself in the world of insects. My initial interest was in parasitic Hymenoptera, but the more courses I took with Steve, the more I began to read about Diptera. My final metamorphosis into a Dipterist took place after Steve offered me an M.Sc. position studying Syrphidae as part of the NSERC-CANPOLIN grant in 2009. Since then, I've studied Syrphidae almost exclusively, with my thesis work on the genus *Platycheirus*, a large group of sexually dimorphic Syrphidae. As a side project, I helped Gil Miranda write A Key to Nearctic Syrphidae for the Canadian Journal of Arthropod Identification, and used working versions of the key to help teach two CANPOLIN pollinator identification courses at the Canadian National Collection (CNC) in Ottawa. More recently, I've started my Ph.D. work with Jeff Skevington on Australian Syrphidae and syrphid phylogenetics at the CNC.

I believe that one of a scientist's most important skills is their ability to communicate their ideas to others, both members of the scientific community and the public. Because of this, I have sought out teaching and public outreach opportunities for most of my academic career. From TAing Insect Biology and Diversity as a M.Sc. student, to coauthoring the Key to Nearctic Syrphidae and using the drafts as a teaching aid, to visiting elementary schools with the Biodiversity Institute of Ontario during the School Malaise program, I have always enjoyed sharing my passion for entomology with others. I am also passionate about the Entomological Society of Ontario, as I believe that smaller regional societies act as an ideal venue for budding scientists to share their ideas and passion for entomology in a collegial atmosphere. Without societies like the ESO, I suspect that far fewer students would continue onto a career in entomology. Because of all of these reasons, I would be delighted to put my organizational and decision-making skills to use as the ESO student representative.

ESO Elections

Directorship 2016-18:

Laura Timms

I am an ecologist, currently working at Credit Valley Conservation in Mississauga, ON. In my job I analyze data from CVC's monitoring and inventory programs for a variety of purposes, including developing and using tools for conservation status assessments and the identification of significant wildlife habitat. While my current position does not involve much work with insects, I continue to do research on my own time as a Departmental Associate in Entomology at the Royal Ontario Museum, and as a consultant on parasitoid diversity and biological control. My research interests include insect host-parasitoid diversity and interactions. Most recently I have been investigating patterns of diversity in parasitoid wasps across northern Canada, including their natural community structure as well as how they adapt to environmental change. I have also done research on invasive species, biological control, and conservation.

I have spent time at the University of Guelph (BSc 2001), Agriculture and Agri-Food Canada, the University of Toronto (MScF 2005, PhD 2010), and at McGill University as a postdoctoral researcher with the Northern Biodiversity Program. A proud member of the ESO since 2002, I have previously served as Student Representative (2003-2005) and as a Director (2005-2008). One of the highlights of my involvement with both the ESO and the ESC was when I was invited to give the Heritage Lecture at the 150th anniversary joint annual meeting in Guelph in 2013. Attending annual meetings is one of my favourite things to do – I love catching up with old friends and colleagues, meeting new ones, and hearing about amazing and inspiring science. I would be proud to be elected as a Director to the Society, and would do my best to represent the membership and work to advance entomology in the province.

ESO Elections

Directorship 2016-18:

Alex Smith

I grew up in the Ottawa Valley, Ontario and it was in the forests, rivers, and fields of Renfrew County that I first knew that I wanted to be a biologist, but it took me several more years to determine that what I wanted to be was an entomologist. I first went to Trent University in Peterborough Ontario where I obtained a B.Sc. (Hons) and a M.Sc. (1998) working with Michael Berrill first on bacteria and then amphibians. For my PhD I moved to Montreal & McGill to work in David Green's lab on the spatial and molecular ecology of the Fowler's toad. Up successfully defending my PhD in 2004 I took an FQAR Postdoctoral Research Fellowship to the University of Guelph to work on the nascent DNA barcoding project. Here, my entomological transformation began with the opportunity to work with Dan Janzen, Winnie Hallwachs and many others (Monty Wood, Jim Whitfield, Ian Gauld, Norm Woodley) on the diversity and ecology of many types of parasitoid insects (primarily Ichneumonidae, Braconidae, and Tachinidae) in Costa Rica and with many myrmecologists (Gary Umphrey, Brian Fisher Phil Ward, Jack Longino) on species diversity, conservation, and ecology of ants. In 2015, my work is now predominantly entomological! I was hired at the University of Guelph in 2008. The focus of my research program is to better understand the contemporary distribution of hyperdiverse, and often cryptic, species of insects across major ecological gradients in tropical and temperate environments. My program is built upon projects designed to explore the causes and consequences of biodiversity across elevational, latitudinal and disturbance gradients and builds on long-term collections using phylogenetic, functional and physiological measures. You can read more about our research here: http://malexsmith.weebly.com/. At the University of Guelph, I teach (and love!) Invertebrate Zoology and the field course in Arctic Ecology. I would very much like to contribute to the ESO as a Board member and help to further Ontario's rich heritage in entomological research.

ESO Elections

Director Candidate 2016-18: Vazrick Nazari

I work at the Canadian National Collection of Insects (CNC) in Ottawa as a systematic assistant in the Lepidoptera unit. My current research involves the systematics and taxonomy of a poorly known group of micro-moths in the family Gelechiidae that includes stem gall makers on Asters and Goldenrods. I am working towards completion of a MONA (Moths of North America) fascicle for the group.

I received my MSc in 2006 from University of Alberta under the supervision of Dr. Felix Sperling, during which I studied the phylogenetic relationships among the swallowtail butterflies in the subfamily Parnassiinae using morphological and molecular characters from seven genes.

I moved to Guelph in 2006 to start my PhD at the Hebert Lab which has since grown into the Biodiversity Institute of Ontario. I was co-advised by Dr. Paul Hebert and Dr. Jean-François Landry (CNC), and my PhD thesis involved several case studies investigating the utility of DNA barcoding in Systematics and Taxonomy of Lepidoptera. I was lucky to be hired at the CNC before completing my PhD in 2010; My fascination with Lepidoptera continues and I try to find answers to all kinds of questions about Lepidoptera taxonomy.

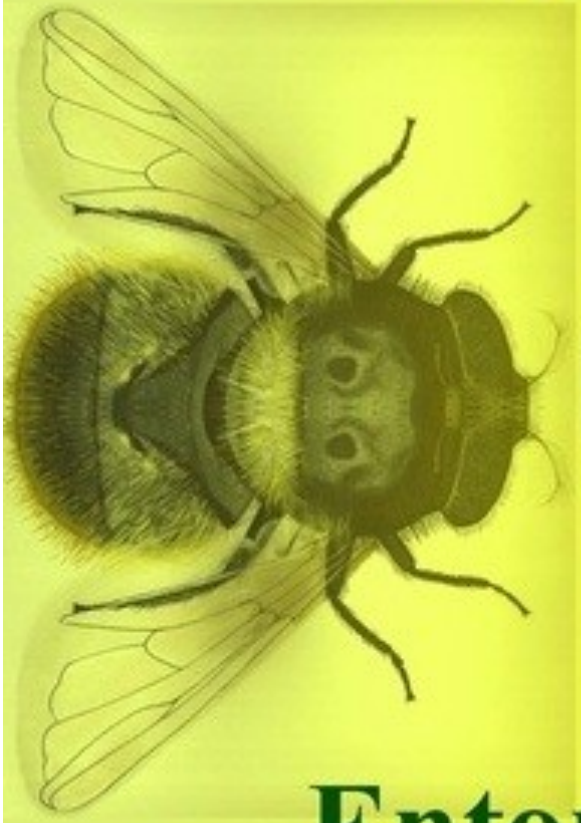
As a personal interest I am also studying the historical presence of butterflies and moths in human art and culture. I have given many talks and published several articles and a book on Lepidoptera, and I always try to increase public awareness about butterflies and moths in various other ways, most importantly through social media. Serving as a director with the ESO will provide additional opportunities for me to become more engaged with the public and to contribute towards this goal.

Annual General Meeting 2015

September 18-20

Queens University Biological Station

ELGIN, ON



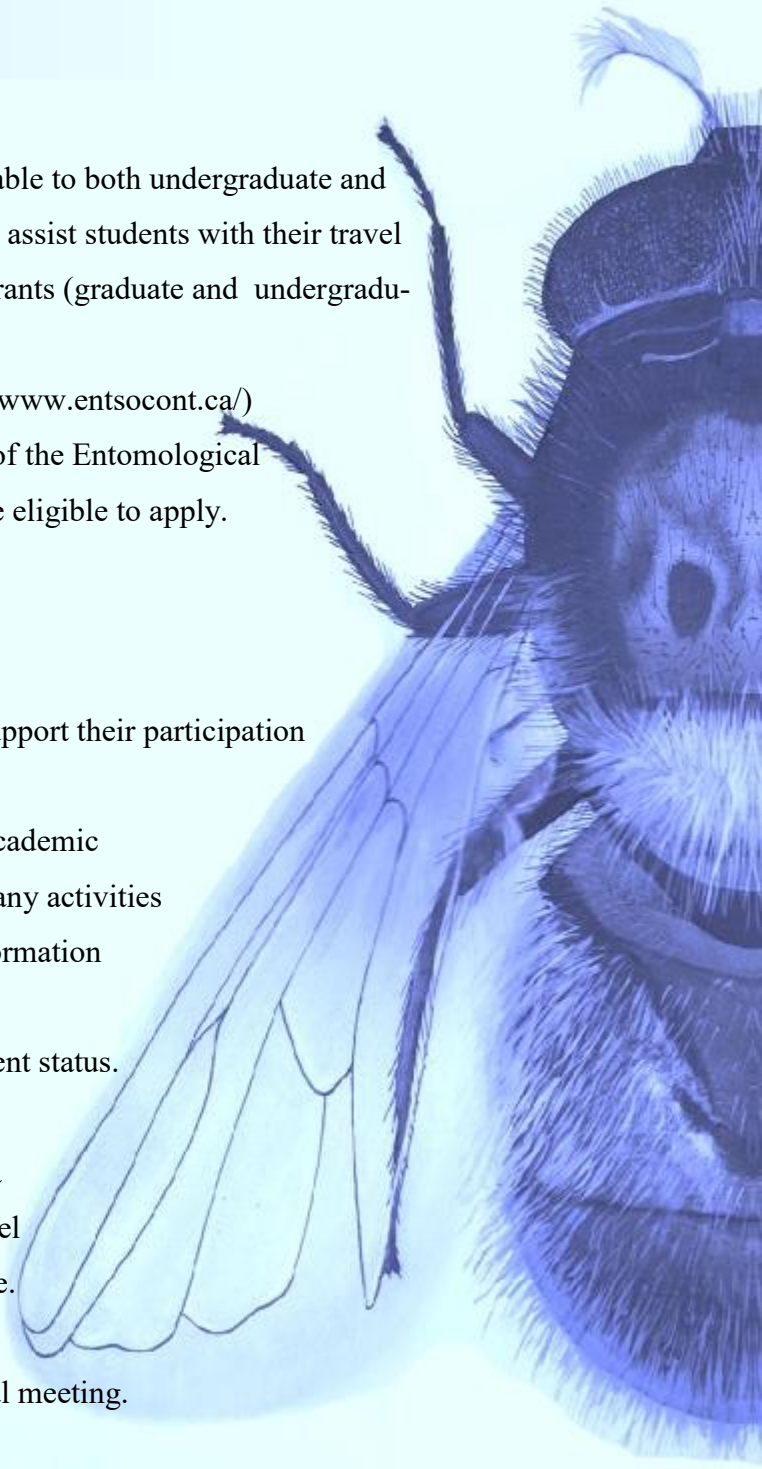
Entomological Society of Ontario

www.entsocont.ca

Contact Persons

David Beresford: davidberesford@trentu.ca **Jay Fitzsimmons:** Jay.Fitzsimmons@ontario.ca

ESO Travel Awards



Make the trip to Queen's Research Station in 2015!

The Entomological Society of Ontario has travel awards available to both undergraduate and graduate students. Each year the ESO provides travel grants to assist students with their travel expenses to the annual meeting. The ESO awards two travel grants (graduate and undergraduate) **worth $250 each**!

Student members of the ESO (registration is free—visit http://www.entsocont.ca/) who are presenting a poster or a paper at the Annual Meeting of the Entomological Society of Ontario being held **September —18-20th, 2015** are eligible to apply.

Interested students should forward:

(1) a title and short abstract for their project;

(2) a statement outlining why/how the funds will be used to support their participation in the meeting;

(3) a curriculum vitae or similar document highlighting past academic achievements, publications and awards/scholarships, and any activities that promote entomology in Ontario as well as contact information (phone number, mailing and email address); and

(4) a letter or email from their supervisor indicating their student status.

Only active student members of the ESO who are enrolled in a graduate or undergraduate program will be considered for travel awards. Students may receive only one travel award per degree.

Deadline for application is **August 20, 2015 at 12 pm**.

Recipients will be notified at least two weeks before the annual meeting.

Please send applications electronically to:

entsocont.membership@gmail.com

With the subject line "ESO Travel Award"

Bug Eye Photo Contest 2015

Prizes for:

Best photo ($50)

Best photo of an Ontario insect ($50)

Best photo by a junior entomologist under 13 (1st $25, 2nd $20, 3rd $10)

People's Choice Award ($50)

Open to ESO members and all Ontario residents, no entry fee

Submission deadline: September 1st, 2015

Submit photos to: esophotos@gmail.com

Winners announced: September 24th, 2015

Ontario resident means anyone who makes their primary residence in Ontario—international students welcome! Copyright for the photo remains with photographer; use must be granted for ESO promotional material. Images must be of insects or closely related arthropod species (e.g. mites, spiders). All submissions must be as digital files. The judging criteria will be based on: **a)** Image composition; **b)** Visual impact of image; **c)** Subject interest; **d)** Sharpness of subject; **e)** Difficulty of image acquisition; and **f)** Lighting.

Photographic enhancement is allowed as long as it is something that could also be achieved in a real darkroom with a colour or black & white negative (e.g., adjustment of contrast, colour enhancement, cropping, etc.). However, very obvious enhancements will be negatively scored.

You may submit up to 3 unique images, but can only win one prize plus the People's Choice Award. Submit the image file by creating a digital file that is the equivalent of 7.5 inches by 10 inches (19.5cm by 25.4 cm), at 300 dpi, formatted as a jpg. Create a filename using an appropriate title, underscore, your last name, underscore, first initial (e.g. **dragonfly_smith_j**). Images may be either "Landscape" or "Portrait" in orientation. Images recorded on film must be digitally scanned and then edited according to the prescribed resolution (i.e., 7.5 inches by 10 inches, at 300 dpi) for submission.

The best pictures submitted will be selected by judges and entered into the **People's Choice Award competition**. The selected pictures will be posted on the ESO website and/or on a photo sharing website such as flickr for the community to vote on. The pictures will also be displayed at the Annual General Meeting of the Entomological Society of Ontario for further voting. If you do not wish for your pictures to be posted in such a way, you can choose to not participate in the People's Choice Award.

Please include a short description of your entries (where they were taken, why you like them, etc.) and whether the picture is of an Ontario insect and if you are a child under the age of 13. You must also indicate if you would like to be considered for the People's Choice Award. Do not forget to include your complete address.

Discover the amazing world of insects at...

bug day!

Organized by the Entomological Society of Ontario

When: Saturday, September 26th, 10 am to 3 pm
Where: Canada Agriculture And Food Museum,
861 Prince of Wales Drive, Ottawa Rain or shine
Who: All ages **Cost: FREE!!!** **Paid parking available on site**

Activities include:
Live insect zoo
Guided insect expeditions
Insect eating
Cockroach races
Kids' insect crafts
Ask a bug expert

Sponsors:

The Ottawa Field-Naturalists' Club

CANADA AGRICULTURE AND FOOD MUSEUM
MUSÉE DE L'AGRICULTURE ET DE L'ALIMENTATION DU CANADA

More info at http://www.entsocont.ca/bug-day-ottawa-2015.html

2nd annual

LONDON BUG DAY

September 12th, 2015
10am-3pm

Held at:

Children's MUSEUM

The London Children's Museum
21 Wharncliffe Rd. S.

Free admission all day!

Discover the wonderful world of insects at this FREE all-ages event!

ACTIVITIES INCLUDE:

- Monarch butterfly workshops (11am & 1pm)
- Live insect zoo & cockroach racing
- Edible insects
- Kids' insect crafts & facepainting
- How to identify insects
- How to attract pollinators to your garden

...and much more!

CAMBRIDGE Butterfly CONSERVATORY

NATURE CONSERVANCY CANADA

(Participating organizations)

Visit our Facebook page!

ORGANIZED BY:
THE ENTOMOLOGICAL SOCIETY OF ONTARIO

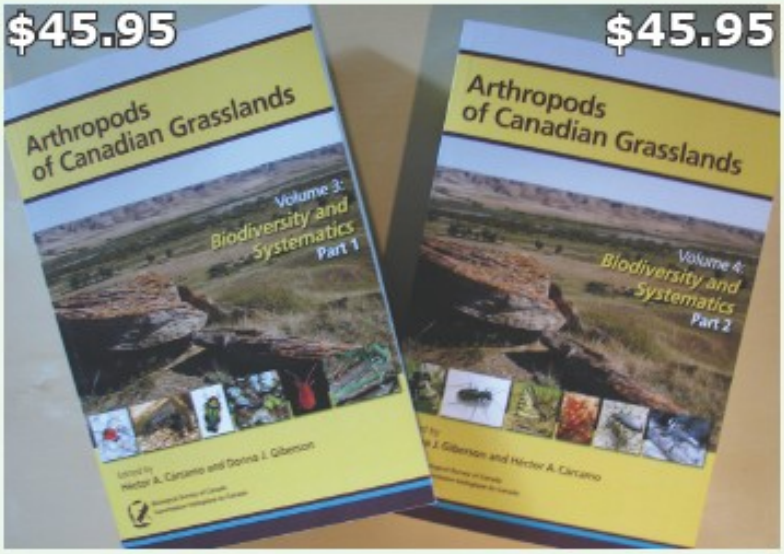
Vista Centre, 1830 Bank St.
P.O. Box 83025, Ottawa
ON K1V 1A3
entsocont@gmail.com
www.entsocont.ca

Entomological Society of Ontario 1863

H.Goulet

Arthropods of Canadian Grasslands

A project of the Biological Survey of Canada



Announcing the publication of Volumes 3 and 4 in the Arthropods of Canadian Grasslands series.

The Arthropods of Canadian Grasslands series is intended to increase awareness of the plight of Canada's grasslands, to draw attention to its associated arthropods, and to provide a baseline reference to support future studies of arthropods in these environments. The first two volumes focused on the formation and extent of native grasslands and subsets of their associated arthropods (Vol. 1; $45.95) and arthropods in agro-ecosystems (Vol. 2; $46.10). A fifth volume is also being planned for the future. The individual chapters are available for free download on the new Biological Survey of Canada Website (http://biologicalsurvey.ca/monographs/read/17).

Volumes 3 and 4 provide more of a systematic treatment with checklists and ecological/distributional information for >8,000 species in a variety of grassland insect groups.

Ordering Information

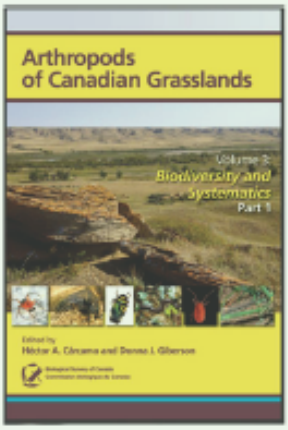
Books may be ordered through Volumes Direct via
http://www.volumesdirect.com/SearchResult.aspx?KeyWords=Arthropods%20of%20Canadian%20

Biological Survey of Canada
c/o Entomological Society of Canada
393 Winston Avenue, Ottawa, ON K2A 1Y8
biologicalsurvey@gmail.com

http://biologicalsurvey.ca/

Cárcamo, H. A. and D. J. Giberson (eds.).
Arthropods of Canadian Grasslands (Volume 3): Biodiversity and Systematics Part 1.
Biological Survey of Canada, Ottawa, ON
ISBN 978-0-9689321-6-2
To Order: http://www.volumesdirect.com/detail.aspx?ID=5355

$45.95



Chapter 1. **G. G. E. Scudder** An Introduction to the Biogeography of Canadian Grassland Arthropods

Chapter 2. **B. A. Snyder** Myriapoda and Terrestrial Isopoda of the Prairies of Canada

Chapter 3. **F. Beaulieu and W. Knee** Plant-feeding Mites of the Canadian Prairies

Chapter 4. **H. Cárcamo, J. Pinzón, R. Leech, and J. Spence** Spiders (Arachnida: Araneae) of the Canadian Prairies

Chapter 5. **T. D. Galloway, H. C. Proctor, and S. V. Mironov** Chewing Lice (Insecta: Phthiraptera: Amblycera, Ischnocera) and Feather Mites (Acari: Astigmatina: Analgoidea, Pterolichoidea): Ectosymbionts of Grassland Birds in Canada

Chapter 6. **Z. Lindo** Springtails (Hexapoda: Collembola) of the Prairie Grasslands of Canada

Chapter 7. **L. M. Dosdall and D. J. Giberson** Stoneflies (Plecoptera) of the Canadian Prairie Provinces

Chapter 8. **R. A. Cannings** The Dragonflies and Damselflies (Odonata) of Canadian Grasslands

Chapter 9. **J. Miskelly** Orthoptera of the Grasslands of British Columbia and the Yukon Territory

Chapter 10. **G. G. E. Scudder** The Heteroptera (Hemiptera) of the Prairies Ecozone of Canada

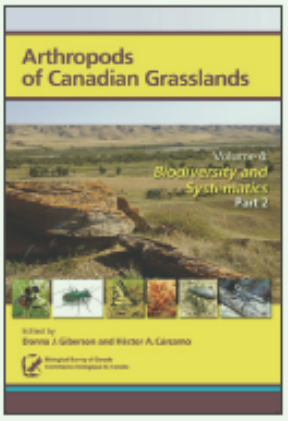
Chapter 11. **K. G. A. Hamilton** Canadian Grasslands and Their Endemic Leafhoppers (Hemiptera: Auchenorrhyncha: Cicadellidae)

Chapter 12. **R. G. Foottit and E. Maw** Aphids (Hemiptera: Aphidoidea) of the Prairies Ecozone of Canada

Chapter 13. **D. C. Currie** Black Flies (Diptera: Simuliidae) of the Prairie Grasslands of Canada

Giberson, D.J. and H.A. Cárcamo (eds.).
Arthropods of Canadian Grasslands (Volume 4): Biodiversity and Systematics Part 2.
Biological Survey of Canada, Ottawa, ON
ISBN 978-0-9689321-7-9
To Order: http://www.volumesdirect.com/detail.aspx?ID=5356

$45.95



Chapter 1. **N. J. Holliday, K. D. Floate, H. Cárcamo, D. A. Pollock, A. Stjernberg, and R. E. Roughley** Ground beetles (Coleoptera: Carabidae) of the Prairie Grasslands of Canada

Chapter 2. **W. G. van Herk and R. S. Vernon** Click Beetles and Wireworms (Coleoptera: Elateridae) of Alberta, Saskatchewan, and Manitoba

Chapter 3. **P. Bouchard and Y. Bousquet** Darkling Beetles (Coleoptera: Tenebrionidae) of Canadian Grasslands

Chapter 4. **R. S. Anderson, P. Bouchard, and H. Douglas** Weevils (Coleoptera: Dryophthoridae, Brachyceridae, Curculionidae) of the Prairies Ecozone in Canada

Chapter 5. **G. R. Pohl, B. C. Schmidt, J. D. Lafontaine, J.-F. Landry, G. G. Anweiler, and C. D. Bird** Moths and Butterflies of the Prairies Ecozone in Canada

Chapter 6. **B. C. Schmidt, F. A. H. Sperling, and A. D. Macaulay** Moths and Butterflies (Lepidoptera) of the Peace River Region: Case Study of a Disjunct Grassland Fauna

Chapter 7. **R. A. Cannings** The Robber Flies (Diptera: Asilidae) of Western Canadian Grasslands

Chapter 8. **J. R. N. Glasier and J. H. Acorn** An Annotated List of Ants (Hymenoptera: Formicidae) from the Grasslands of Alberta and Saskatchewan

Chapter 9. **M. D. Schwarzfeld** Ichneumonidae (Hymenoptera) of the Canadian Prairies Ecozone: A Review

Chapter 10. **B. J. Sharanowski, Y. M. Zhang, and R. W. M. U. M. Wanigasekara** Annotated Checklist of Braconidae (Hymenoptera) in the Canadian Prairies Ecozone

Chapter 11. **C. S. Sheffield, S. D. Frier, and S. Dumesh** The Bees (Hymenoptera: Apoidea, Apiformes) of the Prairies Ecozone with Comparisons to other Grasslands of Canada

Ontario Pest Management Conference 2015

November 12, 2015
Guelph, Ontario

Crop Life Graduate Student Oral and Poster Competition and OPMC Undergraduate Student Poster Competition

Call for Submitted Oral and Poster Presentations - Students

This year the Ontario Pest Management Conference (OPMC) will be held on November 12, 2015 at the Victoria Park East Golf Course, Guelph, ON. Research presented at the OPMC will focus on all aspects of pest management associated with food and fibre production, and animal and human health. The theme of this year's conference is "**Convergence of Food Security and Sustainable Pest Management**".

Once again, ***CropLife Canada – Ontario Council*** will be sponsoring awards of **$500 each** for Best Graduate Student Oral Presentation and Best Graduate Student Poster at the 2015 OPMC.
In addition, OPMC provides a **$250** award for the best undergraduate student poster presentation.

Categories of presentation:

Oral Presentation – One $500 award (Crop Life -Ontario Council) and plaque for a graduate student.

Poster Presentation – One $500 award (Crop Life-Ontario Council) and plaque for a graduate student.

Poster Presentation – One $250 award (OPMC) and plaque for an undergraduate student.

The 2015 agenda has openings for a maximum of **6 graduate student oral presentations**, **6graduate student posters** and **4 undergraduate posters**. Student submissions will be accepted on a first come, first serve basis. Spots in the competition are filled quickly, so make your decision to participate in this year's OPMC as early as possible.

Your abstract for the 2015 OPMC should be sent to Dr. **Melanie Filotas**, Program Coordinator, melanie.filotas@ontario.ca (OMAFRA) and **Mike Celetti**, Judging Coordinator, michael.celetti@ontario.ca by **4 pm on Monday, September 21, 2015**.

Eligibility:

The student must either be currently enrolled in a degree program (undergraduate or graduate) or have graduated from a degree program (undergraduate or graduate) since the last conference (November 2014);

The student must be the principal investigator and presenter of the paper or poster; and

Canadian and International students are eligible to participate in the competition but they must be attending a Canadian university.

Oral Presentations:

12 minutes + 3 minutes for questions and discussion

All presentations should be in Power Point format. To minimize potential incompatibilities between the software versions you use to create your presentation, limited use of animation, and use of common Windows fonts for text and symbols is recommended and you are asked to test the final copy on a different computer than the one used to create it.You will be asked to email a copy of your presentation to the conference organizers **3 days prior to the conference (by 4 pm on Monday, November 9, 2015**) so it can be pre-loaded on the conference computer. Bring a back-up copy of your presentation on a USB memory stick to the conference. All presentations will be placed on one computer to facilitate close adherence to the schedule.

Poster Presentation:

Posters must be 4' (height) x 3' (width), portrait format. Compliance with these dimensions is important. The header should include the title, authors and institution where the work was conducted. Photos of the student presenting the poster also can be included on the right side of the header. **Student competitors must be present at the poster during the designated judging time and for the second half of the lunch break**. Following submission of your abstract and acceptance of your poster you will be given a Poster Number. A copy of your poster must be sent to the judging coordinator by email (michael.celetti@ontario.ca) **three**

(3) days prior to the conference – by4 pm on-Monday, November 9, 2015. This is so the judges can have access to your poster content ahead of time, ensuring efficient judging at the conference. **Failure to submit a copy of your poster by November 9will result in disqualification from the competition.** When you arrive at the conference your poster should be placed on the board displaying your Poster Number. Posters can be set up beginning at 8:00 am on November 12and must remain in place until afternoon coffee is over. Any posters not claimed at the end of the conference will be removed and discarded by organizers unless other arrangements have been made.

Conference Web-site:

More information on the 2015 OPMC can be found at www.opmconference.ca.

Abstract Submission Requirements:

Abstracts should be no more than 250 words. Editors reserve the right to shorten your abstract should it exceed this word limit. Abstracts must be submitted by email in Word format. Include the following information with your abstract:

- Author(s) name(s) – indicate name of presenter in bold
- Author's primary supervisor name and email address.
- Address of each author – use superscript numbers to indicate the proper address for each author, including email information.
- Abstract – 250 words or less
- Indicate presentation category: Graduate Paper (Oral), Graduate Poster or Undergraduate Poster.
- You will be notified within 10 days of submission whether your presentation has been accepted in the category requested.
- The OPMC frequently receives more submissions than it can accommodate for the competition. Once accepted, student competitors are **required** to give a minimum of **two weeks' notice** (no later than **Thursday, October 29, 2015)** if they are not able to fulfill their commitment to participate in the competition. This is to allow sufficient time to inform potential replacements of that spot. **Students who do not provide at least two weeks' notice will not be refunded their registration fee.**

Deadline for Submissions: 4pm, Monday September 21, 2015or until competition spots are filled

Abstract should be sent to:

Dr. Melanie Filotas, OMAFRA
Email: **melanie.filotas@ontario.ca**

and

Mike Celetti, OMAFRA
Email: **michael.celetti@ontario.ca**

www.opmconference.ca

Call for Submitted Posters - General

This year the Ontario Pest Management Conference (OPMC) will be held Thursday November 12, 2015 at the Victoria Park East Golf Course, Guelph, ON. Research presented at the OPMC will focus on all aspects of pest management associated with food and fibre production, and animal and human health. The theme of this year's conference is "**Convergence of Food Security and Sustainable Pest Management**".

As we have a limited number of openings on the 2015 agenda for submitted posters we hope that you make a decision to participate in this year's OPMC as early as possible. Submissions will be accepted on a first come, first serve basis. Your abstract for the 2015 OPMC should be sent to Dr. Melanie Filotas (OMAFRA) by **Monday, September 21, 2015**. Please note: details on the Crop Life Student Competition Submissions are provided in a separate document.

Poster Presentation: **Posters must be 4' (height) x 3' (width), portrait format. Compliance with these dimensions is important.** Posters will be accepted on a first come, first served basis – space is limited. The header should include the title, authors and institution where the work was conducted. When you arrive at the conference your poster should be placed on the board displaying your Poster Number. **Poster presenters are asked to stay by their posters during the second half of the lunch break.** Posters can be set up beginning at 8:00 am on November 12 and must remain in place until afternoon coffee break is over. Any posters not claimed at the end of the conference will be removed and discarded by organizers unless other arrangements have been made.

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Abstract Submission Requirements:

Abstracts should contain no more than 250 words. Editors reserve the right to shorten your abstract should it exceed this word limit. Abstracts must be submitted by email in Word format. **A faxsubmission will not be accepted**. Include the following information with your abstract:

- Author(s) name(s) – indicate name of presenter in bold
- Address of each author – use superscript numbers to indicate the proper address for each author, including telephone and email information.
- Abstract – 250 words or less
- You will be notified by **Dr. Melanie Filotas** within 10 days of submission whether your presentation has been accepted for OPMC 2015.

Deadline for Submissions: Monday, September 21, 2015

Abstract should be sent to:

Dr. Melanie Filotas
Specialty Crops IPM Specialist
Ontario Ministry of Agriculture, Food and Rural Affairs
Email: **melanie.filotas@ontario.ca**

Submissions

Why not submit something to the Newsletter?

If you have a story, project, photo, profile, job posting, or upcoming event that you would like ESO Membership to know about, please contact the **ESO NL Editors** via email at:

(ldesmart@gmail.com

Subject: *ESO Newsletter*

We would love to hear from you. If there is something you would like to see in the ESO NL, or some activity or event you feel the ESO should be a part of, please let us know.

Topics of Interest

ESO Buffoonery

Field Seasons

Conferences/Events

Biology Note

Funny or Interesting Anecdote

Book/Article/Conference Review

Fun Fact

Scientific Illustration

Photography

Special Projects

Thesis Summaries

ESO Buffoonery . . . again

Complaints about Funding

. . . anything you find interesting

Guidelines

This is *not* a Scientific Journal like **JESO**. **This is a general interest Newsletter/Magazine, so you should try to have some fun with it. We encourage photos and figures, and your profile information with a photo of yourself.**

We *only* recommend:

500-2000 words

A Title

We do NOT pay for content.

Publish in JESO

Consider submitting your next manuscript to the . . .

Journal of the Entomological Society of Ontario

Instructions to authors are available on-line at:

www.entsocont.ca

As of 2011, page charges in JESO have been waived!

Electronic submissions should be directed to:

JESOeditor@gmail.com

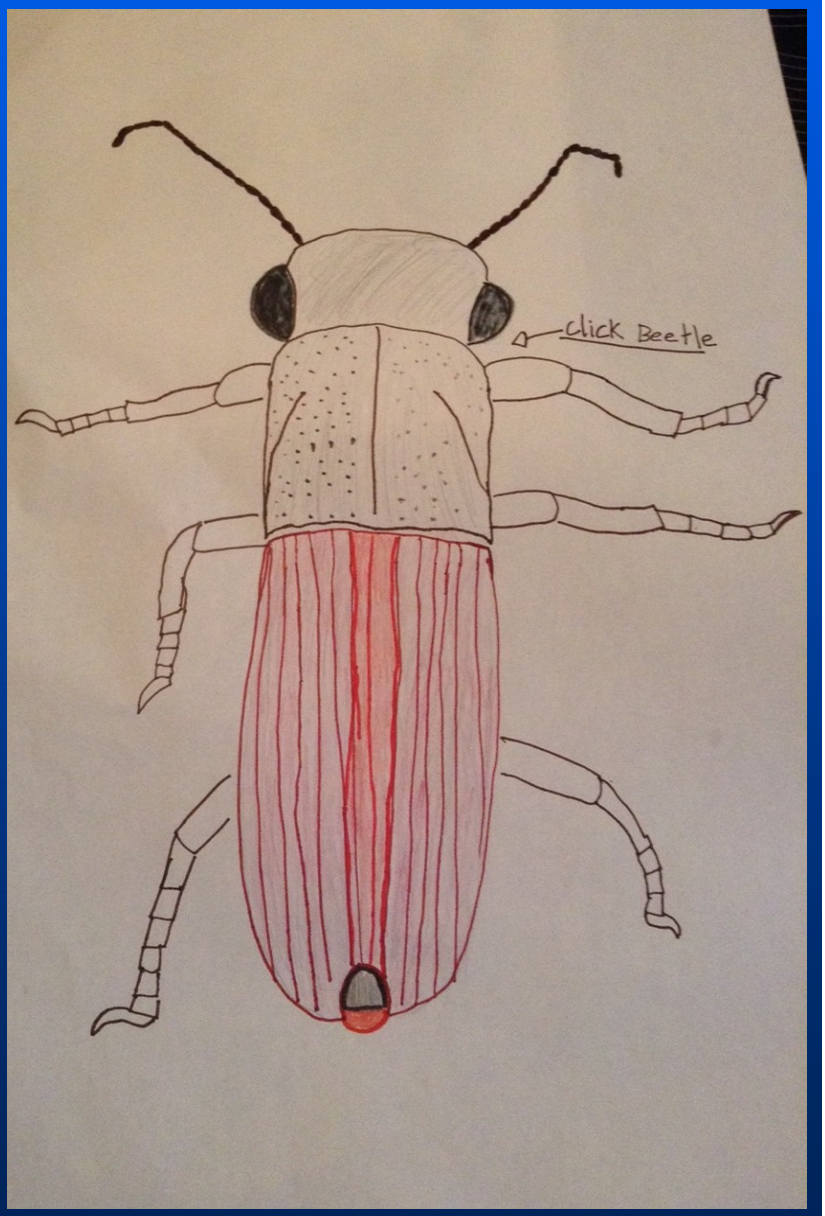
Submissions should be directed to:

Chris MacQuarrie
CFS - GLFC | SCF - CFGL
Canadian Forestry Service
1219 Queen Street East
Sault Ste. Marie, Ontario, Canada

Tel: 705.541.5666

Cover & Section Photo Credits

Some photos were reprinted from those submitted to the 2013 ESO Bug Eye Photo Competition! Submit your bug photo to the 2014 competition.



On the Cover
Beetle illustration by: **Julian Meale.**

If you enter the **Bug Eye Photo Contest,** your picture could be used in the **ESO Newsletter**!

Image Credits

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Officers of the ESO page: Illustration by: **Trevor Burt** 2

Table of Contents: Toxomerus flying by **Angela Skevington** 3

Membership info ad: Green Bottle Fly (*Lucilia sericata*) by: **Mark Helm** 4

ESO AGM: Illustration by **Trevor Burt** 37

ESO Travel Awards: Illusration by **Trevor Burt** 38

74

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