Bulletin

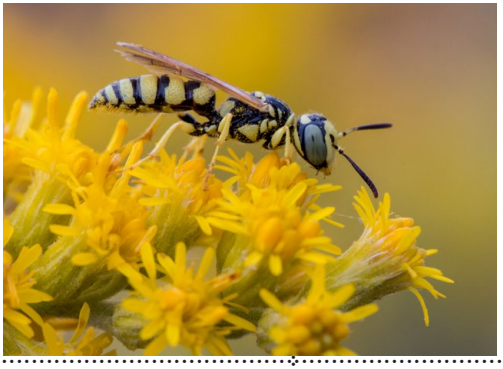
Entomological Society of Canada
Société d'entomologie du Canada

Volume 51
Number / numéro 4

December / décembre 2019

Published quarterly by the
Entomological Society of Canada

Publication trimestrielle par la
Société d'entomologie du Canada



List of Contents / Table des matières

Volume 51(4), December / décembre 2019

Captions for cover photos can be found on the back cover.
La légende des photos de la couverture se situe sur la couverture arrière.

Halyomorpha halys (Hemiptera: Pentatomidae) is an emerging pest of fruit across North America. This is an individual from London (Ontario, Canada), where the overwintering biology is being studied.

Halyomorpha halys (Hemiptera : Pentatomidae) est un nouveau ravageur des fruits en Amérique du Nord. Ici un individu de London (Ontario, Canada), où la biologie hivernale est étudiée.

[Photo: Brent Sinclair]

Looking forward

Thank you to everyone involved in planning our 2019 JAM. It was a tremendous success with three societies joining together, the Entomological Society of Canada, the Acadian Entomological Society and the Canadian Society for Ecology and Evolution. It was great to see the cross-pollination between entomologists and those that study the ecology of other organisms. The JAM was a great meeting of minds in a lovely location with wonderful food. Did everyone eat as much lobster as I did? The JAM is the highlight of our year and I think most people would say that it is not just the interesting presentations and new research opportunities that makes such meetings so exciting, but the opportunity to network with fellow entomologists, colleagues and friends and to meet new entomologists, especially students. It is so gratifying to see so many students presenting their work, and the awards presentations, occurring during a flash monsoon under a tent in a beer garden, showed the amazing quality of their work. Some conferences can be very intimidating for students, but our JAMs have always been very welcoming and safe places for students to present their first papers, with our members always willing to introduce themselves and say hi and welcome. Such early experiences at a conference have an amazing impact on

Regarder en avant

Merci à tous ceux qui ont été impliqués dans la planification de notre réunion annuelle conjointe 2019. La réunion a été un succès incroyable avec trois sociétés réunies, la Société d'entomologie du Canada, la Société acadienne d'entomologie et la Société canadienne d'écologie et d'évolution. C'était génial de voir la pollinisation croisée entre les entomologistes et ceux qui étudient l'écologie des autres organismes. La réunion annuelle était une belle rencontre des esprits dans un lieu adorable avec de l'excellente nourriture. Est-ce que tout le monde a mangé autant de homard que moi? La réunion annuelle est le moment culminant de notre année, et je pense que la plupart des gens dirait que ce ne sont pas que les présentations intéressantes et les nouvelles opportunités de recherche qui rendent les réunions si excitantes, mais l'opportunité de faire du réseautage avec des entomologistes, des collègues et des amis, et de rencontrer de nouveaux entomologistes, particulièrement les étudiants. Il est tellement gratifiant de voir autant d'étudiants présenter leurs travaux et de voir la présentation des prix, durant une mousson éclair sous une tente, sur une terrasse de microbrasserie, montrant la qualité incroyable de leurs travaux. Certaines conférences peuvent être intimidantes pour les étudiants, mais nos réunions annuelles sont toujours accueillantes et sont des endroits sécuritaires pour que les étudiants présentent leurs premiers travaux, nos membres étant toujours volontaires pour se présenter, leur dire bonjour et leur souhaiter la bienvenue. Assister à de telles conférences tôt lors des études peut avoir un impact incroyable sur la future carrière, les rêves, les aspirations et les relations des étudiants avec leur société. Merci à tous de rendre nos réunions si chaleureuses et accueillantes. Je veux également

a student's future career, dreams, aspirations and relationship with their society. Thank you to everyone for making our meetings so warm and welcoming. Also, thank you to those who filled out the ESC JAM survey after the meeting. It is very helpful in allowing us to judge how the meeting went and to plan future JAMs.

Now, we can start looking forward to our 2020 JAM in Calgary. This will be a return to our normal cozy JAM format, after our past two meetings with other large societies. Please come a bit early for a wonderful field trip planned to the Royal Tyrrell Museum in Drumheller on Saturday, 17 October 2020. This tour, organized by Bette Beswick, will be no usual tour of the museum! Come and learn about ancient invertebrates as well as vertebrates. The tour includes transportation to and from the museum, a full day's admission to the museum, a talk by an expert on specimens preserved in amber, and most exciting – a behind-the-scenes tour of the museum allowing us to see areas to which the general public do not have access. It sounds as though it will be an amazing trip. The field tour will have space for a limited number of people and will be an extra charge, which you can pay when you register for the conference. Also, the call for meeting symposia is out so please consider submitting. The decisions will be made in mid-January. It promises to be a great meeting!

At the 2019 JAM we gained our inaugural member in the "Entomology Enthusiast" category, our Criddle Award winner, Erica Burke. I want to take this opportunity to remind everyone about this exciting new membership category. It allows entomologists who are engaged with insects but don't actually derive their income from entomology, to join ESC and gain online access to our resources, including over 150 years of *The Canadian Entomologist* as well as all the *Memoirs of the Entomological Society of Canada*, for roughly half the cost of regular membership. As well, such members have the opportunity to attend conferences

remercier ceux qui ont rempli le sondage sur la réunion annuelle de la SEC après la réunion. Cela nous aide à évaluer comment la réunion s'est déroulée et comment planifier les prochaines réunions.

Nous pouvons maintenant commencer à regarder en avant vers notre réunion annuelle conjointe 2020 à Calgary. Il s'agira d'un retour vers notre format normal et douillet de réunion annuelle, après nos deux dernières réunions avec d'autres sociétés plus grosses. Venez un peu plus tôt pour profiter d'une des magnifiques excursions organisées au Musée royal Tyrrell à Drumheller le samedi 17 octobre 2020. Ce tour, organisé par Bette Beswick, ne sera pas un tour habituel du musée! Venez et apprenez-en plus sur les anciens invertébrés ainsi que sur les vertébrés. Le tour inclut le transport aller et retour du musée, une admission pour la journée complète au musée, une présentation par un expert sur les spécimens préservés dans l'ambre et, encore plus excitant, un tour dans les coulisses du musée nous permettant de voir des sections auxquelles le grand public n'a pas accès. Je pense qu'il s'agira d'une superbe excursion. Le nombre de personnes pouvant participer à l'excursion sera limité, et des frais supplémentaires – que vous pourrez payer au moment de l'inscription – s'appliqueront. De plus, l'appel pour les soumissions de symposium a été lancé, alors merci de considérer de soumettre une proposition. Les décisions seront prises à la mi-janvier. Cela promet d'être une autre superbe réunion!

Lors de la réunion annuelle 2019, nous avons obtenu notre membre inaugural pour la catégorie de membres « Enthousiastes de l'entomologie », la gagnante du prix Criddle, Erica Burke. Je voudrais saisir cette opportunité pour rappeler à tous l'existence de cette nouvelle catégorie de membres. Elle permet aux entomologistes impliqués avec les insectes, mais qui ne tirent pas leurs revenus de l'entomologie, de devenir membres de la SEC et d'obtenir les accès en ligne à nos ressources, incluant plus de 150 ans de *The Canadian Entomologist* ainsi qu'à tous les *Mémoires de la Société d'entomologie du Canada*, pour environ la moitié du tarif des membres réguliers. De plus, ces membres

and meet with all of us, at a reduced rate and receive discounts for entomology texts from some publishers. I challenge every member of ESC to communicate with an amateur entomologist you know and to tell them all about this exciting new membership opportunity. Let's hope we have many more entomology enthusiasts at our next JAM in 2020. We all know people who are interested in insects and their kin. Christmas is coming so membership is a great gift idea! Also don't forget the younger enthusiasts. I was reminded of this quite recently by two young people I met, one in the 'cuticle' and the other online. The first was a young man of 12 who wanted to visit my lab. He was a true enthusiast with an excellent knowledge of insects and a tremendous love for them; his face fell when we admitted we did actually kill (very humanely euthanize) the insects to pin them. I suggested to his parents that they might consider buying him a microscope to pursue his interests. I was told he already had three! The second was a young girl of 9 who is hard at work promoting insect conservation and environmental sustainability by educating youth to revitalize urban landscapes in order to promote native wildlife. In solidarity with the International Youth Climate Initiative, she made a Call for Action to her local county legislators to build more local greenspaces in order to counter the decline in insect populations. She is featured in a YouTube video, on TV news and websites. She has even had a poster accepted at the Entomological Society of America's 2019 meeting on the "Critical Decline in Insect Populations". I bet she was the youngest entomologist there. These young people are so inspiring. I may admit that, at her age, I was grubbing around in the dirt a bit to find insects, but I certainly wasn't trying to change the world. So, consider the young people you know and get them an "Entomology Enthusiast" membership for Christmas – in not too many years, these young people may be our next regular members.

2020 will be here very soon so please

ont l'opportunité d'assister aux réunions et de nous rencontrer à un tarif réduit, et de recevoir des rabais pour les textes entomologiques de certaines maisons d'édition. Je mets au défi chaque membre de la SEC de communiquer avec un entomologiste amateur de sa connaissance et de lui parler de cette nouvelle opportunité d'adhésion excitante. Espérons que nous aurons de nombreux enthousiastes de l'entomologie à notre prochaine réunion annuelle en 2020. Nous connaissons tous des gens intéressés par les insectes et leurs proches parents. Noël approche, alors une adhésion est une excellente idée de cadeau! N'oubliez pas non plus les plus jeunes enthousiastes. Deux jeunes personnes que j'ai récemment rencontrées me l'ont rappelé : une en personne et l'autre en ligne. La première personne était un jeune homme de 12 ans qui voulait visiter mon labo. Il est un véritable enthousiaste avec une excellente connaissance des insectes, et un amour énorme pour eux : son visage s'est effondré lors que nous avons admis tuer (une euthanasie très humaine) les insectes pour les épingler. Il a suggéré à ses parents de lui acheter un microscope pour poursuivre ses intérêts. On m'a dit qu'il en avait déjà trois! La deuxième personne est une jeune fille de 9 ans qui travaille fort pour promouvoir la conservation des insectes et la durabilité environnementale en éduquant les jeunes afin de revitaliser les paysages urbains pour promouvoir la faune native. Par solidarité avec l'initiative International Youth Climate, elle a lancé un appel à l'action aux législateurs de son comté afin de construire plus d'espaces verts pour contrer le déclin des populations d'insectes. Elle est en vedette dans un vidéo YouTube, aux nouvelles télévisées et sur des sites web. Elle a même eu une affiche acceptée lors de la réunion annuelle 2019 de la Société d'entomologie d'Amérique sur le « Déclin critique des populations d'insectes ». Je parie qu'elle était la plus jeune entomologiste sur place. Ces jeunes gens sont tellement inspirants. Je dois admettre que, à son âge, je creusais un peu dans la terre pour trouver des insectes, mais je n'essayais certainement pas de changer le monde. Considérez donc offrir aux jeunes gens que vous connaissez une adhésion

start thinking about our next National Insect Appreciation Day in June. It is not too early to plan. There are many activities that can be used to engage the public in the wonderful world of insects. See the list of links to amazing activities on our web page https://esc-sec.ca/entomology-resources/education-and-outreach/.

We also now have the option of helping ESC promote entomology for future generations by making a legacy donation to the ESC https://esc-sec.ca/legacy-donation/. For more information please contact the treasurer at ESCTreasurer@esc-sec.ca. This is a great opportunity to support the next generation of entomologists.

Also, please consider contributing to Canada's Coolest and Cruelest Insects. We all know that the species that we personally study is clearly the coolest or cruelest, so please send us a photograph and a few paragraphs explaining why. We challenge all the Regional Societies to look at their own society's logo and tell us all about it. Why is this insect your logo and what makes it so cool or cruel? Perhaps the reason it was chosen originally is lost in the mists of time but today we can bring it forward again to make it more wholly appreciated. Or perhaps there is also a very cool story about its origin that has been passed down through generations of entomologists? As examples, Pat Bouchard and Kevin Floate et al. have written articles on the roughened darkling beetle (*Upis ceramboides*) and khapra beetle (*Trogoderma granarium*), respectively, on the Society's blog and in this issue of the Bulletin. Please enjoy these and consider telling readers about your own cool and/or cruel insect.

comme « Enthousiaste de l'entomologie » pour Noël – dans pas tellement longtemps, ces jeunes gens pourraient être nos prochains membres réguliers.

2020 sera bientôt là, alors commencez à penser à votre prochaine journée nationale des insectes en juin. Il n'est pas trop tôt pour planifier. Il y a beaucoup d'activités qui peuvent être utilisées pour impliquer le public dans le merveilleux monde des insectes. Consultez la liste des liens vers de fabuleuses activités sur notre page web https://esc-sec.ca/fr/entomology-resources/education-and-outreach/.

Nous avons également maintenant l'option d'aider la SEC à promouvoir l'entomologie pour les prochaines générations en faisant un don testamentaire à la SEC : https://esc-sec.ca/legacy-donation/. Pour plus d'information, contactez le trésorier à ESCTreasurer@esc-sec.ca. Il s'agit d'une belle opportunité de soutenir les prochaines générations d'entomologistes.

Également, merci de considérer contribuer à « Ces bestioles les plus cools et les plus cruelles du Canada ». Nous savons tous que les espèces que nous étudions personnellement sont clairement les plus cools ou les plus cruelles, alors merci de nous envoyer une photographie et quelques paragraphes nous expliquant pourquoi. Nous mettons au défi toutes les Sociétés régionales de regarder leur propre logo et de nous en parler. Pourquoi est-ce le logo de votre société et qu'est-ce qui le rend si cool ou cruel? La raison pour laquelle cet insecte avait initialement été choisi est peut-être perdue dans la nuit des temps, mais aujourd'hui nous pouvons la mettre de l'avant à nouveau pour qu'il soit encore plus apprécié. Ou peut-être y a-t-il d'une histoire très cool sur son origine qui a été passée de générations en générations chez les entomologistes? Par exemple, Pat Bouchard et Kevin Floate et al. ont respectivement écrit des articles sur le ténébrion rugueux (*Upis ceramboides*) et le dermestre du grain (*Trogoderma granarium*) sur le blogue de la Société et dans ce numéro du Bulletin. Lisez-les et considérez parler aux lecteurs de votre propre insecte cool ou cruel.

Honours and Awards at JAM 2019

T. Wist for ESC

Peter Mason receives the Gold Medal from Gail Anderson

T. Wist for ESC

Zoë Lindo receives the C. Gordon Hewitt Award from Gail Anderson.

T. Wist for ESC

Isabelle Côté receives the ESC Fellow certificate for Gerhardt Gries from Gail Anderson.

S. McCann for ESC

Erika Burke accepts the Criddle Award from Gail Anderson

S. McCann for ESC

Victoria MacPhail receives the Bert and John Carr Award (on behalf of Sarah McKell) from Gail Anderson

Attendees at First Governing Board Meeting

S. McCann for ESC

In ascending order, left to right: Kevin Floate, Morgan Jackson, Joel Kits, Kateryn Rochon, Neil Holliday, Haley Catton, Rachel Rix, Heather Proctor, Laura Timms, Gail Anderson, Christine Noronha, Bill Riel, Peggy Dixon, Cedric Gillott, Brian van Hezewijk, Pat Bouchard, Suzanne Blatt, Felix Sperling. Missing from photo, James Tansey.

Service Award JAM 2019

S. McCann for ESC

Gail Anderson presents outgoing President Kevin Floate with a service award

Local Organising Committee for JAM 2019

S. McCann for ESC

(from left) Rob Johns, Chandra Moffat, Julia Mlynarek, Steven Heard

General Mixer JAM 2019

(photo credits: Tyler Wist for ESC)







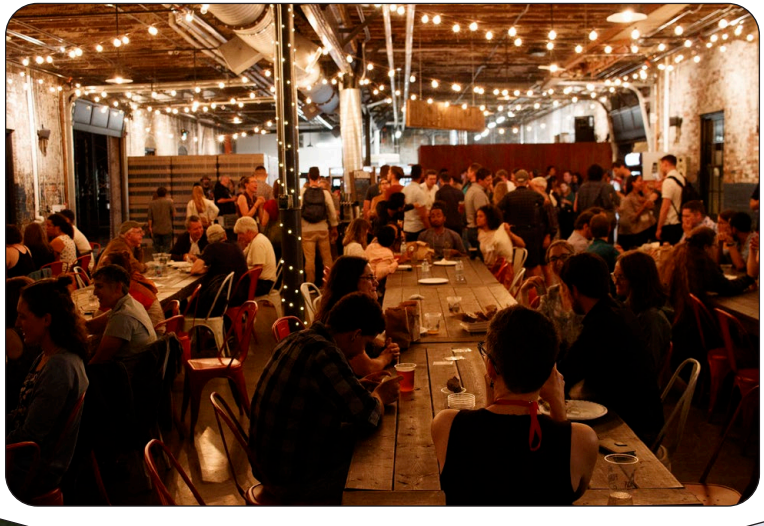



President's Reception, JAM 2019

(photo credits: Sean McCann for ESC)

Wind-up social at Picaroons, JAM 2019

(photo credits: Sean McCann for ESC)



2020 Joint Annual Meeting of the Entomological Society of Canada and Entomological Society of Alberta

18–21 October 2020
Carriage House Inn, Calgary, Alberta

On behalf of the Entomological Societies of Canada and Alberta, we are pleased to invite you to the **ESC-ESAB 2020 Joint Annual Meeting: 2020 Visioning**, 18–21 October 2020 in Calgary.

Join us for a fresh look at our insect science and the direction it's taking. Whether changing focus between past and future, regional and global, zooming in on the minutiae or taking a wide angle view, let's get together to generate some new clarity, perspectives and ideas in our entomological pursuits!

After several years of joint meetings with other societies, JAM 2020 marks a return to regular ESC programming. Visit https://jam2020.ualberta.ca/ for more information.

Keynote Speaker

Dr Laura Lavine is Professor and Chair of the Washington State University Department of Entomology. Dr Lavine received her PhD in Entomology at the University of Kentucky and was a USDA NIFA Postdoctoral Fellow at the University of Wisconsin-Madison with National Academy of Science member Michael R. Strand before moving to WSU in 2001. Her research program on the evolution of adaptation has focused on understanding the mechanisms underlying an arthropod's ability to rapidly adjust to its environment

2020 Réunion conjointe annuelle des sociétés d'entomologie du Canada et du Alberta

18–21 octobre 2020
Carriage House Inn, Calgary, Alberta

Au nom des Sociétés d'entomologie du Canada et de l'Alberta, nous sommes ravis de vous inviter à la Réunion annuelle conjointe SEC-SEAB 2020 : Visualisation 2020, du 18 au 21 octobre 2020 à Calgary.

Joignez-vous à nous pour un regard neuf sur la science des insectes et la direction qu'elle prend. Que ce soit pour changer la mise au point entre le passé et le futur, le régional et le global, pour un zoom sur les minuties ou pour prendre un angle de vue plus large, réunissons-nous pour générer de la clarté, des nouvelles perspectives et des idées de nos poursuites entomologiques!

Après plusieurs années de réunions conjointes avec d'autres sociétés, la réunion 2020 marquera un retour vers la programmation régulière de la SEC. Visitez https://jam2020-fr.ualberta.ca for plus d'informations.

Conférencière Principale

Dre Laura Lavine est professeure et directrice du département d'entomologie de l'Université de l'état de Washington. Dre Lavine a obtenu son doctorat en ntomologie de l'Université du Kentucky et a été hercheure postdoctorale financée par le USDA NIFA à l'Université du Wisconsin-Madison avec le membre de l'Académie nationale des sciences, Michael R. Strand, avant d'aller à WSU en 2001. Son programme de recherche sur l'évolution de l'adaptation porte sur la compréhension des mécanismes sous-jacents à l'habilité des arthropodes à s'ajuster rapidement à leur environnement.

STEP Corner / Le coin de la relève

Anne-Sophie Caron and Rachel Rix

S. McCann for ESC

Members of the Student and Early Professional Affairs Committee: (From left) Mathilde Gaudreau, Anne-Sophie Caron, Joanna Konopka, Rachel Rix

Canada's Coolest/Cruelest Bugs

We should like to draw your attention to the Society's new series "Canada's Coolest/Cruelest Bugs", aimed particularly at outreach and education. We believe that this offers a great opportunity for students and early professionals to hone their skill at writing for a broad audience, including non-professional entomologists. Why not tell us about your favorite insect–what's so cool/cruel about it? We'd like to know!

For details on how to prepare a submission, see page 227 and the examples that follow. The articles will be published in the Bulletin and on the Society's blog.

Please send questions or your submissions to Morgan Jackson (morgandjackson@gmail.com) or Angela Gradish (agradish@uoguelph.ca).

Research Roundup

We continue to publicize graduate student publications to the wider entomological community through our Research Roundup initiative. Check out the ESC blog for most recent featured articles. If you want your recently published article featured (or we missed yours last month!), send us an email

Les bibittes les plus cools/cruelles du Canada

Nous aimerions attirer votre attention sur la nouvelle série d'articles de la Société, « Ces bestioles les plus cools/cruelles du Canada », dont le but est de faire du rayonnement et de l'éducation. Nous croyons qu'il s'agit d'une belle opportunité pour les étudiants et les jeunes professionnels d'affiner leurs compétences de rédaction pour un auditoire plus large, incluant des entomologistes non-professionnels. Pourquoi ne pas nous parler de votre insecte préféré – qu'a-t-il de cool ou de cruel? Nous voulons savoir!

Pour plus d'information sur la préparation des soumissions, consultez la page 227 et les exemples qui suivent. Les articles seront publiés dans le Bulletin et sur le blogue de la Société.

Pour toutes questions ou pour envoyer vos soumissions, contactez Morgan Jackson (morgandjackson@gmail.com) ou Angela Gradish (agradish@uoguelph.ca).

Aperçu de la recherche

Nous continuons à faire la publicité des publications des étudiants des cycles supérieurs auprès de la communauté entomologique via notre initiative Aperçu de la recherche. Consultez le blogue de la SEC pour les plus récents articles. Si vous voulez que votre plus récent article soit mis en vedette (ou si nous l'avons manqué le mois dernier!), envoyez-nous un courriel à students@esc-sec.ca. Pour des mises à jour régulières sur la

at students@esc-sec.ca. For regular updates on new Canadian entomological research, you can join the ESC Students Facebook page or follow us on Twitter @esc_students.

Getting involved with the ESC

The Student and Early Professional Affairs Committee (SEPAC) is looking for new members (especially Early Professionals). Volunteering for the SEPAC is a great way to get involved with the Society and promote entomology to students across Canada. If you are interested in joining or just have suggestions for new initiatives in the coming year, email us at students@esc-sec.ca, or contact us personally at annesophie.caron.p@gmail.com or Rachel.Rix@dal.ca We look forward to hearing from you,

Anne-Sophie and Rachel.

recherche entomologique canadienne, adhérez à la page Facebook des étudiants de la SEC ou suivez-nous sur Twitter à @esc_students.

S'impliquer au sein de la SEC

Le comité des affaires étudiantes et des jeunes professionnels cherche de nouveaux membres (particulièrement des jeunes professionnels). S'impliquer bénévolement pour le comité est une excellente façon de s'impliquer avec la Société et promouvoir l'entomologie auprès des étudiants au Canada. Si vous êtes intéressés à joindre le comité, ou si vous avez des suggestions pour de nouvelles initiatives pour la prochaine année, écrivez-nous à students@esc-sec.ca. Vous pouvez aussi nous contacter personnellement à annesophie.caron.p@gmail.com ou Rachel.Rix@dal.ca. Au plaisir d'avoir de vos nouvelles,

Anne-Sophie et Rachel.

Thesis Roundup / Foisonnement de thèses

If you or a student you know has recently defended an entomology-related thesis at a Canadian University, and would like notice of this accomplishment published here and on the ESC website, please email students@esc-sec.ca with the relevant information (name, date, degree, thesis title, supervisor[s], and university).

Si vous, ou un étudiant que vous connaissez, avez récemment soutenu votre thèse dans un domaine lié à l'entomologie dans une université canadienne, et que vous voulez publier l'avis de cette réalisation ici et sur le site web de la SEC, merci d'envoyer les informations pertinentes (nom, date, diplôme, titre de la thèse, directeur[s] et université) à students@esc-sec.ca.

Campbell, Erin O. 2019. PhD. Molecular systematics of the greater fritillary butterflies (Nymphalidae: *Speyeria*): reduced representation sequencing, phylogeny, and incipient speciation. Supervisor: Felix A.H. Sperling, University of Alberta.

Nelson, Tyler D. M.Sc. 2019. Temporal isolation and genetic divergence in the *Choristoneura fumiferana* species complex. Supervisor: Felix A.H. Sperling, University of Alberta.

Graduate Student Showcase
Vitrine aux étudiants gradués

Moderators/Modératrices:
Anne-Sophie Caron and / et Rachel Rix

Abstracts


S. McCann for ESC

Scott, Catherine, University of Toronto Scarborough; Sean McCann, Simon Fraser University; Maydianne Andrade, University of Toronto Scarborough

Sexual selection in western black widow spiders: the role of chemical signals and social information

Social information can allow individuals to bypass the costs and risks of exploration, but may also intensify competition. Here we show that mate-searching males can exploit inadvertent social information produced by rivals to find females faster, increasing their mating success even in spite of heightened competition. In western black widows (*Latrodectus hesperus*), first-male sperm precedence leads to intense scramble competition for access to sedentary females. Unmated females signal to males via silk-bound pheromones, but cease signaling shortly after copulation. Through field- and lab-based studies, we demonstrate that females mature asynchronously in nature, creating brief windows of detectability. Larger males are more successful at localizing females, but smaller males achieve higher average search speeds. Critically, all males improve their mate-searching success by following silk draglines (byproducts of locomotion in spiders) produced by rivals to arrive at receptive females' webs faster. Silk-following males arrive at webs in which rivals are already courting, but pre-copulatory courtship lasts several hours, so the first male to arrive is not necessarily the first to mate. Moreover, we show that mate-searching males vastly outnumber signaling females on any given night. We conclude that social information use by males increases their fitness because patterns of female receptivity necessitate competition.

La sélection sexuelle chez la veuve noire de l'ouest : le rôle des signaux chimiques et de l'information sociale

L'information sociale peut permettre aux individus de passer outre les coûts et les risques de l'exploration, mais peut aussi intensifier la compétition. Nous montrons ici que les mâles en recherche de partenaires sexuels peuvent exploiter, par inadvertance, de l'information sociale produite par leurs rivaux pour trouver les femelles plus rapidement, augmentant ainsi leur succès reproducteur malgré l'augmentation de la compétition. Chez les veuves noires occidentales (*Latrodectus hesperus*), la préséance du sperme du premier mâle mène à une compétition par exploitation intense pour accéder aux femelles sédentaires. Les femelles vierges envoient des signaux aux mâles par le biais de phéromones sur la soie, mais cessent d'envoyer ces signaux rapidement après la copulation. Par le biais d'études sur le terrain et en labo, nous avons démontré que les femelles atteignent la maturation sexuelle de façon asynchrone en nature, créant de brèves fenêtres de détectabilité. Les mâles plus gros ont plus de succès à localiser les femelles, mais les plus petits mâles ont une plus grande vitesse de recherche en moyenne. Tous les mâles ont amélioré leur succès de recherche de partenaires en suivant les lignes de soie (sous-produit du déplacement chez les araignées) produites par leurs rivaux pour atteindre les toiles des femelles plus rapidement. Les mâles suivant la soie arrivent aux toiles dans lesquelles leurs rivaux sont déjà présents, mais les parades pré-copulations durant des heures, le premier mâle arrivé n'est pas nécessairement le premier à s'accoupler. De plus, nous avons montré que les mâles à la recherche de partenaires sexuels sont largement plus nombreux que les femelles en appel à chaque nuit. Nous concluons que

l'information sociale utilisée par les mâles augmente leur valeur adaptative parce que le patron de réceptivité des femelles requière de la compétition.

Konopka, Joanna, Western University


S. McCann for ESC

To parasitize or not to parasitize: decision making of egg parasitoids on the exotic *Halyomorpha halys* host.

Invasive species can affect population dynamics of natives ones. Although being attractive, an invasive host may be unsuitable for consumption by or development of the native. This scenario when previously reliable cues are not associated with an expected adaptive outcome constitutes an 'evolutionary trap'. First, the evolutionary trap potential of the exotic *Halyomorpha halys* for native egg parasitoids was assessed. Sentinel egg masses were exposed under field conditions across different habitats, followed by molecular DNA analysis for accurate parasitism quantification. The lack of success in *H. halys* egg masses was not due to rejection by the native parasitoids. Instead, emergence failure is linked to their inability to develop in this host, confirming evolutionary trap potential of *H. halys*. From this finding, the mechanism behind the mismatch between the behavioural acceptance and the lack of development was investigated in terms of relative importance of cues used by foraging females. The findings suggest that the maladaptive decision to oviposit in an unsuitable host is caused by the mismatch of the cues that females use at different steps of host recognition and acceptance, and the subsequent expected outcome of this choice. Finally, *in situ* 3D visualization by X-ray micro-computed tomography allowed us to quantify and visualize the development of parasitoids in suitable and unsuitable host eggs and to suggest possible mechanisms behind arrested parasitoid development in *H. halys.* These results are discussed from a behavioural ecology perspective, focusing on factors for successful host use by female egg parasitoids associated with *H. halys*.

Parasiter ou ne pas parasiter : la prise de décision des parasitoïdes des œufs sur l'hôte exotique *Halyomorpha halys*.

Les espèces envahissantes peuvent affecter la dynamique de populations des espèces indigènes. Même s'il est attractif, un hôte envahissant peut être impropre à la consommation ou au développement d'une espèce indigène. Ce scénario où des indices précédemment fiables ne sont pas associés au résultat adaptatif attendu constitue un piège évolutif. Tout d'abord, le potentiel de piège évolutif de l'espèce exotique *Halyomorpha halys* pour les parasitoïdes des œufs indigènes a été évalué. Des masses d'œufs sentinelles ont été exposées dans des conditions de terrain dans différents habitats, puis analysées par technique moléculaire pour une quantification précise du parasitisme par l'ADN. Le manque de succès dans les masses d'œufs de *H. halys* n'était pas causé par le rejet par les parasitoïdes indigènes. L'échec de l'émergence serait plutôt lié à leur inhabilité à se développer dans cet hôte, confirmant que *H. halys* est un piège évolutif. Suite à cette découverte, le mécanisme sous-jacent à l'inadéquation entre l'acceptation comportementale et l'absence de développement a été étudié en regardant l'importance relative des indices utilisés par les femelles en recherche d'hôtes. Les découvertes suggèrent que la décision inadaptée de pondre dans un hôte non convenable est causé par l'inadéquation des indices que les femelles utilisent à différents moments de la reconnaissance et de l'acceptation de l'hôte, et du résultat attendu de ce choix. Finalement, une visualisation 3D par tomographie à rayons X microinformatisée nous a permis de quantifier et visualiser le développement des parasitoïdes dans des œufs hôtes convenables et non convenables et de suggérer des mécanismes possibles derrière le développement interrompu de *H. halys*. Ces résultats sont discutés dans une perspective d'écologie comportementale, en se concentrant sur les facteurs de l'utilisation réussie d'hôtes par les femelles parasitoïdes des œufs associés avec *H. halys*.

Presidents' Prize Winners & Runners-up

Oral presentations

Agriculture

Winner, Pauline DeSchodt (Simon Fraser University)
Runner-up, Rachel Rix (Dalhousie University)

Ecology and Systematics

Winner, Rowan French (University of Alberta)
Runner-up, Sarah Loboda (McGill University)

Forestry

Winner, Rylee Isitt (University of New Brunswick)
Runner-up, Kirsten Thompson (University of Northern British Columbia)

Physiology and Behaviour

Winner, Alex Proulx (Brock University)
Runner-up, Mathilde Gaudreau (Université de Montréal)

Posters

Winner, Heather Spicer (Memorial University)
Runner-up, Elham Arjomandi (Carleton University)

S. McCann for ESC

From left: Rowan French (University of Alberta), winner (Ecology and Systematics); Heather Spicer (Memorial University), winner (Poster); Pauline DeSchodt (Simon Fraser University), winner (Agriculture); Kevin Floate, ESC Past President; Sarah Loboda (McGill University), runner-up (Ecology and Systematics); Alex Proulx (Brock University), winner (Physiology and Behaviour); Mathilde Gaudreau (Universite de Montreal), runner-up (Physiology and Behaviour); Rachel Rix (Dalhousie University), runner-up (Agriculture); Rylee Isitt (University of New Brunswick), winner (Forestry). Missing from photo: Kirsten Thompson (University of Northern British Columbia), runner-up (Forestry) and Elham Arjomandi (Carleton University), runner-up (Poster).

2019 ESC Student Award Winners
Gagnants des prix étudiants SEC 2019

The **Post-Graduate Student Award (PhD)** was awarded to Aaron Bell (University of Saskatchewan) who was unable to attend the meeting, so James Tansey accepted the award on his behalf. Aaron's work involves investigating the link between landscape pyrodiversity and biodiversity in Canada's boreal forest, addressing questions related to landscape configuration and disturbance (i.e., wildfire) ecology, thereby providing recommendations pertinent to biodiversity conservation and fire management in Canada.

S. McCann for ESC

The **Post-Graduate Student Award (MSc) was** awarded to Lydia Wong (University of Ottawa) who was unable to attend the meeting, so Gabriel Gauthier accepted the award on her behalf. Her project examines the impacts of drought on the reproductive success of solitary bees in a subalpine habitat.

S. McCann for ESC

Andreas Fischer was awarded the **John H. Borden Scholarship** but was not able to attend the meeting. Thus, Wim van Herk received the award on his behalf. Andreas is a PhD student at Simon Fraser University where he investigates the chemical communication of false and black widow spiders through contact and volatile sex pheromones from female spiders.

S. McCann for ESC

Carlos Barreto received a **Dr Lloyd M. Dosdall Memorial Scholarship.** Carlos is a PhD student at the University of Western Ontario where he studies global change effects on detrital food webs and ecosystem processes by investigating the biodiversity of Oribatida mites in Canadian peatlands.

S. McCann for ESC

A second **Dr Lloyd M. Dosdall Memorial Scholarship** was presented to Matthew Meehan, a PhD student at the University of Western Ontario. Matthew studies changes in predator trophic dynamics under warming conditions, by studying predator communities and predator-prey interactions through diet and predation rate. Matthew also received an **Ed Becker Travel Award** to assist him with attendance at this meeting.

S. McCann for ESC

A **Danks Scholarship** was received by James Tansey on behalf of Aaron Bell (University of Saskatchewan) who was unable to attend the meeting.

S. McCann for ESC

A second **Danks Scholarship** was awarded to Reid Miller (University of Manitoba) and accepted by Kyle Bobiwash on his behalf. Reid is examining the ecosystem services provided by two beneficial insect guilds (pollinators and decomposers) and their responses to disturbance in the Manitoba Tall Grass Prairie, which is an endangered and understudied ecosystem.

S. McCann for ESC

Kate Lindsay, an MSc student from the University of Guelph, received the **Keith Kevan Scholarship** for her work on revising the genus *Scipopus* (Micropezidae: Taeniapterinae) where she is describing new species, reassessing named species, and providing a clear generic definition that will elucidate relationships between genera in the Scipopus group.

S. McCann for ESC

The **ESC Graduate Research Travel Scholarship (PhD)** was accepted by Diana Fernandez (University of Windsor). Diana is working on integrated and ecological approaches to understanding the greenhouse and field pepper crop pest, *Anthonomus eugenii.*

S. McCann for ESC

Caitlin MacDonald (University of Guelph) was awarded the **ESC Graduate Research Travel Scholarship (MSc)**, which Kate Lindsay accepted on her behalf. Caitlin is assessing the physiological host range of the brown marmorated stink bug parasitoid *Trissolcus japonicus* and surveying for its presence in southern Ontario.

S. McCann for ESC

Student scholarships and awards in 2020

The Entomological Society of Canada works to foster entomological instruction and experiences through its student awards competition. In 2020, the annual competition for the following Entomological Society of Canada scholarships and awards will be held:

- MSc and PhD Scholarships
- the Research Travel Awards
- the John H. Borden Scholarship in IPM
- the Biological Survey of Canada Scholarship for studies in insect or terrestrial arthropod biodiversity in Canada
- the Dr Lloyd M. Dosdall Memorial Scholarships in arthropod community ecology
- the Danks Scholarships for studies on Canadian arthropod fauna
- the Ed Becker Conference Travel Awards.

Details of the application procedures are available on the Society website https://esc-sec.ca/student/student-awards/ Students are encouraged to apply for these awards with the completed award package submitted to our management team at Strauss at info@esc-sec.ca.

The deadline for all but the Becker Awards is 1 March 2020. For the Ed Becker Awards, the deadline will be the same as that for abstract submissions for the 2020 Joint Annual Meeting with the Entomological Society of Alberta in Calgary.

Prix et bourses étudiants en 2020

La Société d'entomologie du Canada travaille pour promouvoir l'éducation et les expériences entomologiques par le biais de ses prix et bourses étudiants. En 2020, la compétition annuelle pour les prix et bourses suivants de la Société d'entomologie du Canada se tiendra :

- la bourse pour études graduées
- les bourses de voyage pour la recherche
- la bourse John H. Borden en lutte intégrée
- la bourse d'études supérieures de la Commission biologique du Canada pour l'étude de la biodiversité des insectes et des arthropodes terrestres
- la bourse commémorative Dr Lloyd M. Dosdall pour l'écologie des communautés d'arthropodes
- les bourses Danks pour l'étude de la faune canadienne d'arthropodes
- les bourses Ed Becker pour la réunion annuelle.

Les détails de la procédure d'application sont disponibles sur le site Internet de la Société http://www.esc-sec.ca/f-studentawards.php. Nous encourageons les étudiants à appliquer pour ces bourses et d'envoyer le dossier complet à notre équipe de gestion à Strauss au courriel suivant : info@esc-sec.ca.

La date limite pour toutes les bourses, sauf la bourse Ed Becker, est le 1 mars 2020. Pour la bourse Ed Becker, la date limite est la même que pour la soumission des résumés pour la réunion conjointe avec la ESAb à Calgary.

Entomological Society of British Columbia

On 4 October, the ESBC held its annual meeting at the Pacific Forestry Centre in Victoria, BC. It was a lively event with a full day of excellent papers presented by students, professors, and government scientists. Topics included evolutionary ecology, semiochemistry, community ecology, biological control, and applied conservation. Taxa included beetles, bedbugs, stinkbugs, ants, wasps, bees, native and invasive fruit flies, and black widow spiders.

Jessica Fraser, a BSc student at the University of Victoria, led off the student awards with her excellent presentation titled "Genetic and organismal parasitism: Male *Drosophila testacea* carrying selfish X chromosomes are more likely to be killed by parasitoid wasps." Yonathan Uriel, an MPM student at Simon Fraser University won the award for best student paper at the Masters level for his presentation "Do polyphenisms protect the green peach aphid from parasitoids?" Andreas Fischer, also from Simon Fraser University, won the PhD award for his paper "Female black widow spiders sense, and behaviorally and physically respond to, female conspecific sex pheromone." Thanks to all of the student presenters for a full day of exciting entomology as well as lots of interesting discussions at the Friday evening social event at Swan's Pub.

On Saturday, 5 October, the Society held its annual symposium featuring "The Insect Apocalypse: Good and Bad News about Insect Diversity". The event was introduced with an excellent presentation by Neville Winchester of the University of Victoria who gave an in-depth account of the evidence pointing to large scale declines in insect abundance and diversity as well as projects, including his own, designed to address data gaps. Michelle Tseng from the University of British Columbia presented her recent work using digital collections data to examine trends in insect diversity in Vancouver over the last 70 years. The symposium also featured three papers that focused on changes in the diversity of specific taxa. Both Charlene Wood of LGL Limited and Lisa Poirier of the University of Northern British Columbia presented a summary of their long-running research on the beetle fauna of BC, while Joel Gibson of the Royal British Columbia Museum gave an interesting summary of the museum's collections, as well as his recent projects aimed at filling in some of the gaps, especially in shoreline habitats. Of course, no symposium on insect declines would be complete without a paper on pollinators, and Tyler Kelly from Simon Fraser University filled that bill nicely with his presentation on plant-pollinator interactions in BC's endangered Garry oak savannahs.

You can find a full listing of the presentations at: http://entsocbc.ca/meetings/agm-symposium-registration/.

2019 ESBC Annual Meeting

B.van Hezewijk

(Clockwise from top left) Yonathan Uriel, Lisa Poirier & Jessica Fraser, Joel Gibson, ESBC members watch presentations, Lunch & conversation, Ward Strong, Rob Higgins & Staffan Lindgren, Michelle Tseng, Andreas Fischer.

Entomological Society of Alberta

The ESA joined with the ESS to host a joint meeting, the first in 14 years, at Elkwater, in Cypress Hills Interprovincial Park, 3-5 October 2019. The venue and the talks were excellent, enabling us to ignore the unseasonable amount of snow on the ground. The program highlight was a symposium "In Memoriam of George Ball" with David Larson providing the keynote address entitled, “Our quarter: Entomology of the Prairie homestead”. In addition, there were over 25 contributed talks and 10 contributed posters. Dr Ken Fry was granted an Honorary Membership in recognition of his accomplishments and contributions to entomology and his dedication to the ESA. The next ESA will be the JAM with the Entomological Society of Canada next October in Calgary. We hope to see you there!

Entomological Society of Manitoba

The ESM held its Annual General Meeting at the University of Manitoba, 25–26 October. This year’s theme was “Insects Behave!” and the keynote speaker was Dr Bernard Roitberg (Simon Fraser University). The meeting was well-attended, and the first day’s program offered 15 oral presentations and 5 poster presentations; the second day was devoted to our symposium and included four presentations themed around insect behaviour.

ESM member Robert Wrigley is in the final steps of checking proofs for his upcoming book, *Chasing Nature: An Ecologist’s Lifetime of Adventures and Observations*, a collection of 230 short stories about insects, arthropods, and other taxa, based on the author’s days as a youth and in various senior positions at museums and interpretive centres. More details to come in the new year!

Acadian Entomological Society

eTick Online Tick Identification, now in New Brunswick

Have a question about tick identification? Do you *get* questions about tick identification? The online tick identification service, eTick (eTick.ca) is now available in New Brunswick. Anyone finding a tick anywhere in New Brunswick can take a photograph, upload it to the eTick.ca site, and receive an identification by email, normally within 24 hours. Tick identification allows a user to approach a physician or veterinarian with information that can inform health care options; it can also just satisfy curiosity about these arthropods. A user can upload photos for identification of a tick found on a person, on a pet, on another animal, or simply free in the environment.

The eTick service is funded by the Public Health Agency of Canada, and began with service only in Quebec (via Dr Jade Savage at Bishop’s University). This year, service expanded to Ontario and to New Brunswick (via Drs Joe Nocera and Steve Heard, and their graduate students, at the University of New Brunswick). Eventually, we hope to expand eTick further across Canada, with the participation of provincial health authorities and local identification teams.

We’d love your help in spreading the word about eTick to your colleagues and to the public across New Brunswick (only this Province for now, until we manage to expand). Please visit eTick.ca and check out what it has to offer!

Update on Prince Edward Island Outreach Event

As described in the previous *Bulletin*, the AES, in collaboration with the PEI Horticultural Association, hosted an entomology workshop at PEI's Farm Centre on Friday, 23 August 2019. Researchers and extension staff from AAFC and the PEI Department of Agriculture and Land spoke on subjects ranging from introductory entomology to insect-plant interactions and pest management. The event was supported by the ESC with the funds used to purchase aerial insect nets, magnifying glasses, and entomological field guides. There were 12 guests throughout the event. Snacks were provided during a break, including the best guacamole you could imagine, as well as cucumber, salad, cheese, and fruits. At the end of the presentations, participants visited PEI's Legacy Community Garden, behind the Farm Centre, and practiced their newly acquired entomological skills, including sweep netting and order identification. The equipment – field guides, insect nets, and magnifying glasses – is now available upon request by any member of the AES/ESC for future events like this.

2020 Annual Meeting

The 2020 AES meeting and AGM will be held in Nova Scotia in mid-August. Details to follow later.


S. Iberra


S. Iberra


S. Iberra


S. Iberra

Photos from the AES Public Awareness event held in PEI in August 2019

Wider aspects of a career in entomology. 8. The bug book and bug bottle

Hugh V. Danks

This series of articles outlines some ancillary aspects of my entomological career, for the potential amusement of readers. It reports the sometimes unexpected challenges of working in new places and in the real world, an approach that serves also to expose some conclusions about research activities and some information about insects and their environments—although this article stems from a foray into popular entomology rather than from research work.

In 1985, I agreed to write the text of a children's book on insects, provided I could remain involved in the project rather than simply submitting a manuscript. The venture included a collecting vessel[1], and was initiated by Somerville House Books of Toronto. Later stages, including layout, printing and marketing, were carried out by Workman Publishing, a larger company in New York City. The first edition of the "bug book and bug bottle" (Figure 1) was published in 1987.

This article outlines my involvement, both for the general interest of entomologists and as a possible resource for anyone contemplating a similar effort. Even such an apparently simple book for children has many elements.

Concept

Young children are fascinated by "bugs" and would readily engage with a lively text, especially one that encouraged a hands-on approach. The entomological content was developed on this basis, but with a number of other goals. Overall, I wanted to take an overwhelmingly positive approach to arthropods and to introduce their ecological importance.

The taxa depicted would be relatively common so that the average child might encounter them, and would bring in striking details and other information of particular interest to the audience. I chose the taxa

Figure 1. The bug book and bug bottle (1987). Page size 5 x 4.5 inches [12.7 x 11.4 cm]. All pages copyright.

[1]The idea was well received, and led to many other packages, such as the bird book and feeder, and the beach book and bucket.

Hugh Danks (hughdanks@yahoo.ca) retired in 2007 after many years as head of the Biological Survey of Canada. In that role, he helped to coordinate work on the composition and characteristics of the arthropod fauna of the country, and to summarize the results. In addition, his research studied cold-hardiness, diapause, and other adaptations to seasonality in northern regions.

also in support of another aim, to weave into the text a range of features often minimized for young readers because it is difficult to avoid unfamiliar technical words. Instructive elements would include diversity; basic traits such as the exoskeleton and the different developmental stages of metamorphosis; specializations of locomotion and vision; camouflage and other defenses against predation; behavioural features like stridulation; and the wider themes of interspecific interactions, sociality and migration.

In particular, too, the text, illustrations, and any ancillary materials had to be accurate as well as relatively easy to understand. I do not subscribe to the view, apparent in some products for children, that factual shortcuts are needed to simplify information for younger audiences.

It was important to make effective use of the "bug bottle". Recommended activities not only had to be interesting but also fully feasible, so that projects could be completed without disappointment.

Safety was of special concern to the Canadian firm. Therefore, a "do not touch" icon was used to show not only arthropods that bite or sting, but also innocuous species that children might confuse with harmful ones. (The same icon also marked fragile insects that would be damaged by handling.)

Writing and organization

Writing a text to deliver on these concepts was challenging. One key understanding, reinforced by my own family, was that an age level is not as closely circumscribed as might be thought, because children too young to read easily profit from a little help, and they comprehend a great deal when read to. Furthermore, still younger children could participate in the activities if given significant support by an adult.

In liaison with the Canadian company, the material was broken up into easily digested pieces to make it accessible. A separate page was devoted to information about each of 24 kinds of arthropods (e.g., Figure 2).

The pages were organized into four habitats, with six taxa each, to encourage outdoor activities. Arthropods that could be found in field habitats (Figure 3), on leaves, in ponds, and on the ground, were introduced.

Specific bug-bottle projects (e.g., Figure 4) were associated with a number of these pages. The projects were based on my own field experience with insects, including activities during childhood.

Some additional insects were mentioned on pages that treated biting flies (Figure 5), ants,

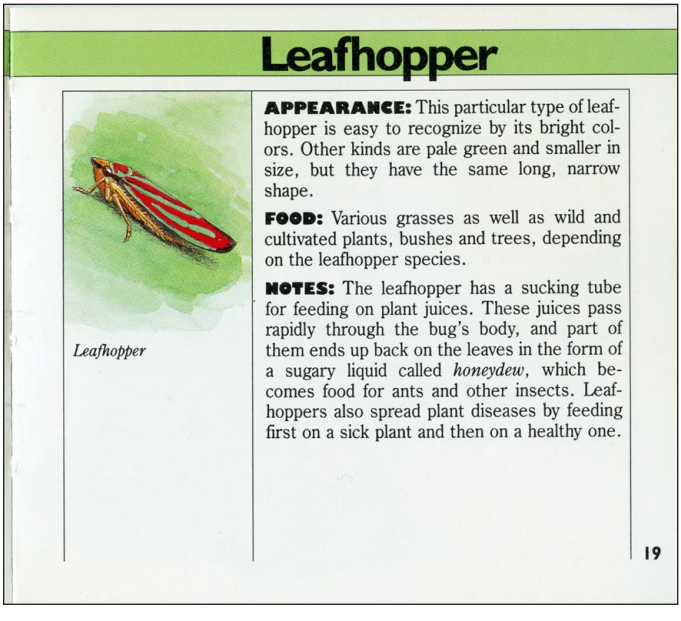


Figure 2. Sample page of the bug book, showing the leafhopper.

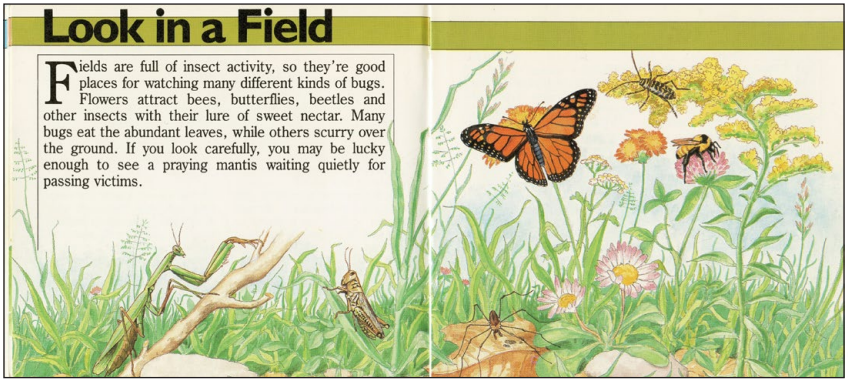


Figure 3. Introductory pages for the field habitat.

Figure 4. Sample project page, for the grasshopper.

and remarkable facts (such as information on fireflies, and how the bottle could be used to observe them for a short time). Other pages gave background information: the importance of arthropods, the different major kinds, the nature of metamorphosis, and tips for using the book and bottle. A few selected words were listed as "bug terms".

The text used as many familiar words as possible, in relatively simple sentences, whilst trying for an active feel. Most unfamiliar and technical terms were avoided or reworded, although selected terminology was introduced deliberately. Therefore, every section required substantial redrafting and editing before the manuscript was submitted. This process took as much work as for the comparable stage of any of my scientific papers!

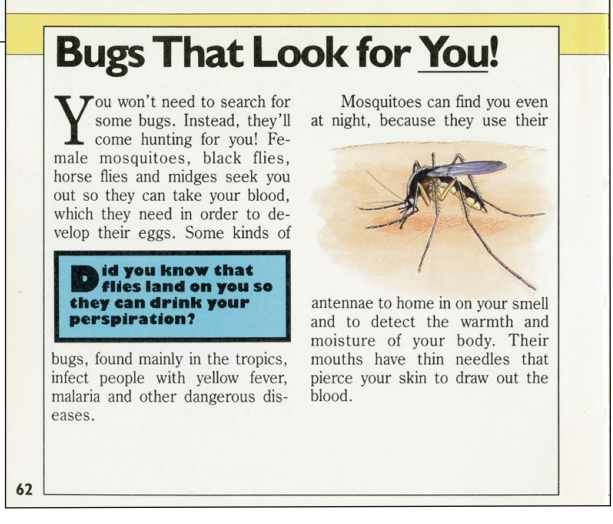


Figure 5. A page referring to biting flies.

A prototype of the bottle was also tested (Figure 6). The promoter wanted large air holes in the lid because purchasers would expect them, even though they would not be necessary for the recommended short-term uses. However, the diameter of the holes was reduced to hinder the escape of smaller occupants. A useful discovery was that a ventilated container steamed up less than a sealed one when leaves or other substrates had been added with the captures.


H. Danks

Figure 6. Paul Danks testing a prototype of the bug bottle in 1987.

Editing

The submitted text was checked by an editor chosen by the Canadian company. We disagreed about many things, through several iterations. Proposed changes simplified the language as if for very young children (below the age range I had targeted), bent the rules of grammar, included slang, and adopted a cutesy approach that seemed to me to talk down to the children. In addition, some local edits altered the meaning, and others changed the emphasis.

Unworkable activities were added because they would be "exciting". For example, having learned that ground beetles can run rapidly, the editor put in a project where beetles belonging to different children would race each other, like racehorses—but then was reluctant to believe that the beetles might not run in a straight line when required, let alone in parallel. After having to delete a number of misguided alterations, I pointed out that neither facts nor activities can be invented just because they would be useful. Eventually, I even wrote: "… if you don't know, don't change it!"

The editing stage therefore took an inordinate amount of additional work as I strove to offset flawed editorial changes. Once, I even felt the need to comment that keeping a qualified author with a Museum affiliation would be a valuable selling point for the publisher!

Following these efforts, the "final" version was entomologically sound. The English too was more or less acceptable, although I was not fond of the language in places. Fortunately, the last word belonged to an editor with the New York publisher. Even before I knew of that editor's role (although possibly she had seen my earlier comments), she returned the language towards my original style, eliminating most of the unwelcome changes.

Illustrations

Featured species were illustrated by an artist who had not previously drawn insects. Therefore, his initial pencil sketches prompted many detailed comments. For example: typical antennal segments do not resemble a string of sausages, but each one has a narrower insertion at the base and then broadens; structures such as tarsal segments cannot be generalized, and nor are they necessarily identical on adjacent legs; impressionistic renderings of wing venation are inaccurate; insects look alive only if the wing position is correct. I had suggested appropriate species for the individual pages, and later sent on images of species and key structural details. The artist made excellent use of my comments, and moreover visited the Royal Ontario Museum to examine specimens.

One thematic illustration that had been drafted featured an attractive caterpillar on an attractive leaf, but the exclusively tree-feeding notodontid caterpillar did not belong on a ground-hugging plant rosette! My response to the editor's assertion that "no one will know" was that *I* would know.

At one stage the Canadian group came up with the idea of using black-and-white illustrations to reduce costs. I was happy when my belief prevailed, that the book would not be worth producing in this way because the item simply would not sell in competition with books illustrated in colour.

Layout and page design

An attractive appearance for the book was created by designers at Workman Publishing, who developed the schemes exemplified in preceding figures. For example, text was neatly bounded by vertical rules, the different habitats were distinguished by header bands of different colours, and a bug-bottle enclosure highlighted each project. The bug bottle itself was labelled emphatically on a striking green lid.

Cover

The publisher controls all features of a book cover to tailor it to a marketing concept. A major aim is to entice potential readers to pick up the item in the first place. Typical inducements are familiar: a well known *author* will be emphasized in bold lettering; the *title* will be carefully chosen to attract the target audience, or at least to be clever, cute, or otherwise engaging; the *design (including art)* will be appealing, and might represent the genre or echo the publisher's branding; *cover text* adds details about the content; *author qualifications*, or praise for earlier books, may be highlighted; and any *packaging* will be attractive. Here the title—The Bug Book and Bug Bottle—crisply revealed the concept. It was reinforced by cover text, and the book was neatly packaged inside the bottle.

The publisher chose to show cartoon-like images on the front cover (see Figure 1). I did not like them, and for a second edition (see below) a more insect-orientated cover with realistic-looking children was designed. Nevertheless, that cover was later returned to a cartoon style, because the original edition had been successful.

Promotion

Workman Publishing did an outstanding job of promoting the book. Among other efforts, it was introduced at an important book fair in New York, and many copies were sent to appropriate publications for review. An effective carton was designed to display multiple copies in bookstores.

A major initial focus was a 2-week promotional tour arranged for me in the United States. I was first invited to New York, presumably so that, before investing in a tour, the team there could check that I was coherent! I took a taxi from my hotel to meet the publicist at a street corner near her office, and approached the person standing in the designated place, but was ignored. Extreme measures were necessary to attract her attention. "Oh sorry", she said, "I had my street face on." She explained that making eye contact with strangers on the streets of New York City can lead to trouble. In keeping with this introduction, we entered the office building through a lobby with security guards and locked barriers.

Later, during the tour, a driver stated that he could not help to unload materials, because an unlocked car left unattended downtown for the briefest moment might be driven off by someone waiting nearby for just such an opportunity. I appreciated Ottawa still more, with its lower crowding and less fraught conditions.

A major component of the tour was a series of "bug book" events. The publicist identified places interested in holding these affairs, and we developed a package with an introductory talk, a

game with the children, and a "bug hunt" in a suitable outdoor setting nearby.

My talk illustrated selected features of arthropods and amazing facts about them, emphasized their importance in the world, and explained how to find them and catch them in the bottle. Everyone who attended received a full-page participation certificate from the author, large numbers of which had to be signed in advance!

The game "bug bingo" followed the talk. It featured illustrations from the book, which were projected on to a screen as I called out each name. Participants would mark corresponding images on their game sheets (Figure 7), until someone completed a line and could call "bingo". Winners came up to receive their prizes, which were various arthropod "species" made of plastic. The level of excitement increased as more and more children won, often simultaneously. Other game sheets, on which arthropod names could be matched with information or illustrations, were also available.

The subsequent field component encouraged children to look for specimens, capturing them if feasible. They would then ask me about them, prompting identifications and further information.

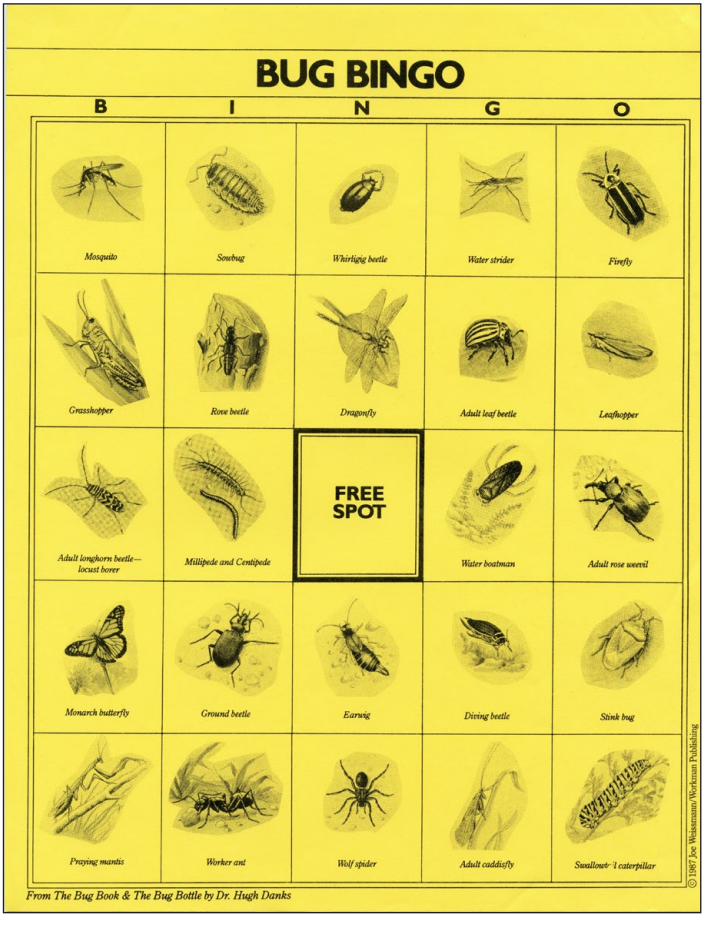


Figure 7. A sheet for the "bug bingo" game. Five different arrangements of illustrations were distinguished by paper colour.

Major events were held at the New York Botanical Garden, the Audubon Society of Portland, the Natural History Museum of Los Angeles County, the Field Museum in Chicago, and the Franklin Institute in Philadelphia. Most of them had substantial audiences. A newspaper in Portland reported that I had taken "about 170 excited children and 60 slightly less enthusiastic adults" on the bug hunt.

Thanks to the publicist, there was significant media coverage. The event in New York City attracted teams from major television stations and newspapers. It was repeated on the following day with another group of children. Many of the latter were unduly excited because they had seen coverage from the day before. Staying calm was even more necessary than it had been on the first day among the throng of camera crews and reporters.

Many journalists studied the book and bottle, spent time observing and filming the activities, and interviewed me to learn background details. Informative and positive pieces were aired on several different newscasts, and daily papers published articles.

There was one striking exception. As we entered the area in the New York Botanical Garden that served for the bug hunt, a gentleman came up to the gate. The staff informed him that the program was restricted to the children who had subscribed to it. His loud response was heard across the area: "You don't know who I am?! ... I'm Chauncey Howell, ABC News, New York!!" I had not seen him at the indoor activities, but he joined his camera crew for the bug hunt.

I was talking to a young boy about an insect he had found when Chauncey Howell, off to the side with the camera running, said to the boy "Say 'Yuck!'". The boy looked over and did so. "Why did you say that?", I asked him; "Because he asked me to", he responded. Neither our conversation about the insect nor his response to my question were shown in the broadcast, which began with a series of individual children, including the young boy, saying "Yuck!" "Yuck!" "Yuck!" "Yuck!" "Yuck!" Evidently, this is how the broadcaster had chosen to gather information about our activities. He then intoned: "Cockroaches! They are probably inside your television set watching you right now!" The "news" item concluded with more gimmicks and many more words, although few of them were relevant to the event.

The publicist had been reluctant at first to send me to Portland, Oregon ("That area has only a million people", she said!), but the Audubon Society was so keen that an event was held there anyway and was rewarded with great positive energy. Moreover, four television stations and two newspapers provided coverage. Apart from the ABC crew (which recorded some video early on by interviewing one of the local members, and then left), the teams stayed to the end, seeking information from me and compiling good footage around the pond that served as a focus for the bug hunt—despite the difficulty of preventing competing crews from appearing in their videos…

Similar activities on a smaller scale were organized in bookstores in several cities. However, the field component was often replaced with a book-signing.

The tour also included interviews, live and taped, on local radio and television stations. Nearly all of the hosts believed that they had to generate constant excitement, and seemed anxious to prevent more than a tenth of a second of silence. This hyperactivity, together with attempts to keep everything "lite", made it difficult to ensure useful content. Beyond discussion of the book and how it could be used, I tried to refer to the importance and benefits of insects, and expose some striking facts.

One interviewer started by playing a recorded sound, and asked me what bug had produced it. I could not identify the kind of insect … and then learned that the sound track had actually been assembled by combining the noises of bees, grasshoppers, and other species. The interviewer was pleased to be able to hype up such a good joke! It was helpful to remember the adage "any publicity is good publicity".

Given the frenetic pace of the shows, most of these interviews were short. It was therefore especially worthwhile to participate as a guest on a 30-minute segment of a syndicated show for

young children, Kids America, then carried on national public radio. With careful preparation, positive professional hosts, appropriate pacing, and phone-ins by children asked to identify insect sounds for the prize of a bug book and bottle, the segment was popular with listeners.

In addition to my publicity tour, Workman Publishing distributed materials to promote active use of the product. Parents were encouraged to hold a "backyard bug party" with games and other activities, and bookstores were briefed on how to arrange their own "bug day". Nevertheless, one chain of bookstores decided not to stock the book, declaring that because of the bottle it was too troublesome to shelve.

Reception

The book received favourable reviews in publications for children and for their parents. It earned the highest rating from the Canadian Toy Testing Council, and a special "Get in Touch with Nature" award, for example.

This acceptance was reflected by excellent sales, and the book was reprinted many times. The bug book and bug bottle joined the ranks of the 200 best-selling children's paperbacks of all time in about 1999, when U.S. sales exceeded 1.6 million copies.

Many children told me they had enjoyed using the book and collecting with the bottle. One comment from an adult recalled how heavily he had used it. Another praised "the clear, honest and generous way it had presented the world of insects to children."

A message from a young child asked for an identification. However, the specimen had simply been dropped into an ordinary envelope and mailed, whereupon it was processed into small pieces by the postal service. Fortunately, the remaining fragments of cuticle were enough to show that it had been a bald-faced hornet.

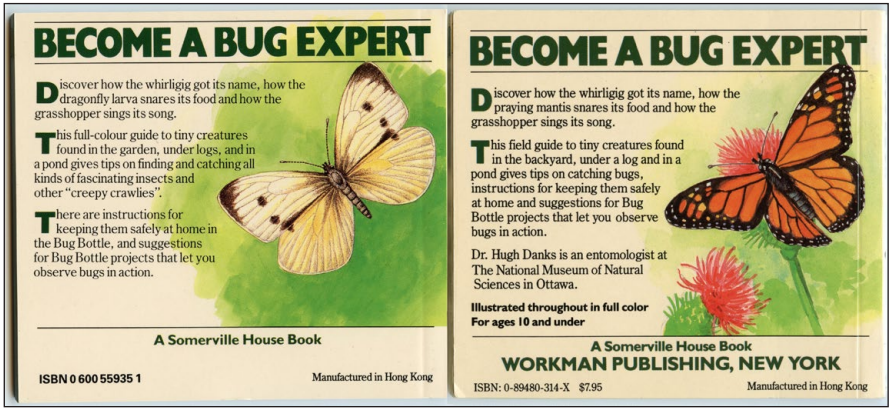
A notable communication read: "My four year old daughter latched onto a copy of your bug book and now sleeps with it. She will not part with it even to let me read it to her ... I was able to get it away ... a few seconds before she got it back, but what I saw looked very valuable. In sum, your book is loved by someone who cannot read and has impressed someone who has read it for 5–10 seconds. Take it as you will, it is meant as a compliment."!

The book was used in schools, and sometimes a whole class sent me letters. One day the teacher of one of my sons brought in a copy, and asked questions based on the content. Obviously, she expected to provide most of the answers, but had not noticed that a pupil bore the same name as the author. My son was familiar with the material, and told me that he had answered the easy questions quickly before others could do so, but waited out the more difficult ones until others had failed, whereupon he could supply the information. After this exercise, the teacher, clearly frustrated, demanded to know "How come you know so much about bugs?", giving him an opportunity he had anticipated. "Oh", he replied, "my father wrote the book." I hoped he had used a tone of voice that did not add to the teacher's frustration.

An entomologist colleague once said to me that perhaps the widely used bug book had more impact than my more narrowly distributed scientific publications. I might not have wanted that to be true, given the efforts required for the latter—and after all, my scientific contributions did elicit some "fan mail" too!

Foreign editions

Following the success of the book in North America, editions were produced in the United Kingdom, Austria, France, Sweden, and Australia, usually with minor adjustments to take account of different faunas. For example, although the monarch butterfly is well known in North America it is a rare vagrant in Europe, and was replaced in the U.K. edition with the common "cabbage white" (Figure 8). An antlion and other distinctive species appeared in the Australian edition.



H. Danks

Figure 8. Back covers of the United Kingdom edition (L) and the North American edition (R) to show the change in one of the featured species.

I was unable to evaluate the translations into German or Swedish, but "translations" into Australian were familiar (and amusing) because my wife Thelma comes from Australia! Presumably to take account of the target audience, the text of that edition was simplified. Also, more complex ideas were eliminated, such as my deliberate mention of the fact that scientists claim more than one possible explanation for some features.

Related activities

The success of the book led to invitations to participate in other activities aimed at non-entomologists. I spent several days in the United States finding and "wrangling" insects to help with an insect video, and acted in a sketch about insects for a television station in Toronto. I was special adviser for two short videos produced by the National Geographic Society. One was aimed at older children, based on a story about the adult emergence of a butterfly. The video for younger children gave information about a variety of species through a rap song.

Work on a number of other productions revealed that consultants often have limited influence on content. In particular, many camera operators (notably for television) did not want to film anything "small". The majority, who meant "anything smaller than a monarch butterfly", had limited options.

Workman Publishing

Second edition

Many years later, Workman Publishing invited me to prepare a revised and substantially expanded version, catering to the human generation after the one that had used the first edition. That book (Figure 9), published in 2009, contained 110 rather than 64 pages. It covered nearly twice as many species (e.g., Figure 10), with flowers and woods as further habitats.

New information pages added details about several earlier themes, such as a section on the environment (covering beneficial species, environmental changes,

Figure 9. The revised and expanded edition of the bug book and bug bottle (2009). All pages copyright.

and helping the environment). Pages were developed on the terrestrial adults of aquatic species (Figure 11), bites and stings, nocturnal activity, social insects, and insect traces (feeding damage, galls, webs, nests, frass, and exuviae), as well as a project on species found indoors. Nine pages were devoted to guidance for a number of collecting activities (Figure 12), and more words were added to the list of selected terms.

Scale bars (both metric and imperial) were inscribed on the lid of the bottle, and inside together with the book were a bug journal (to record observations), a chart showing the taxa (facilitating identification and allowing those found to be checked off), and a magnifier (Figure 13).

Care was needed to finalize both text and artwork, as with the 1987 version. I interacted directly with a Workman editor to tune up the text. We differed temporarily when she introduced a few Americanisms, but I had to admit that most of the target audience was American! The artist prepared the illustrations through expert use of computer software, facilitating subsequent modifications. Again, I submitted images of suitable species and relevant structures, and commented on the drafts.

The added components were carefully considered. For example, choosing a magnifier required compromises to balance the size, power, focal length, optical clarity, and construction material with cost, quality, and ease of use by children. The feasibility of "amateur" versions of some of the collecting methods was tested (e.g., Figure 14).

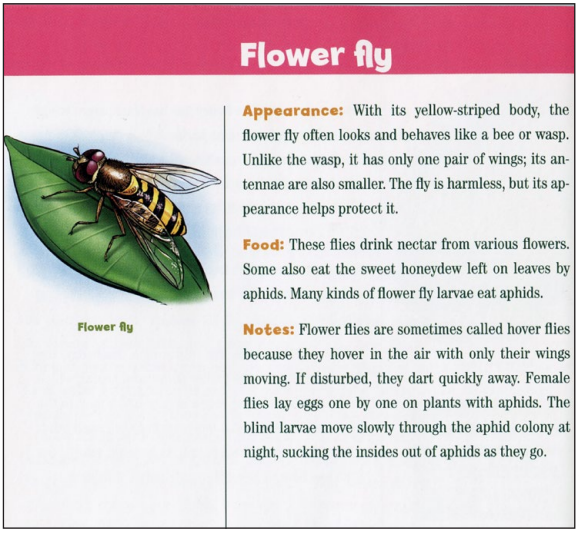


Figure 10. Sample species page from the revised edition, showing the flower fly.

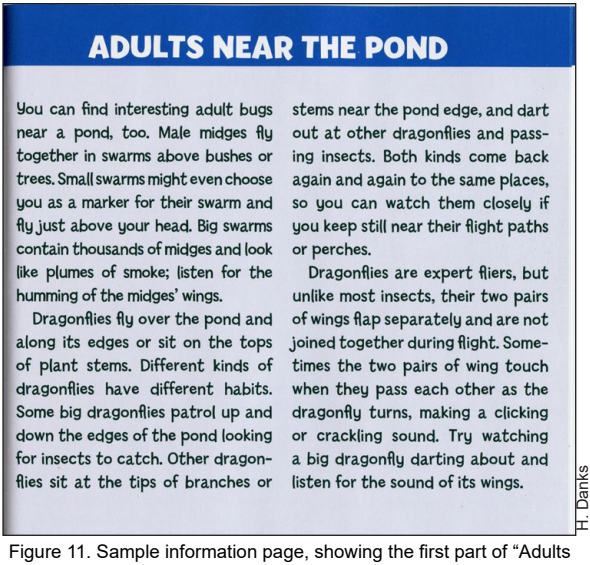
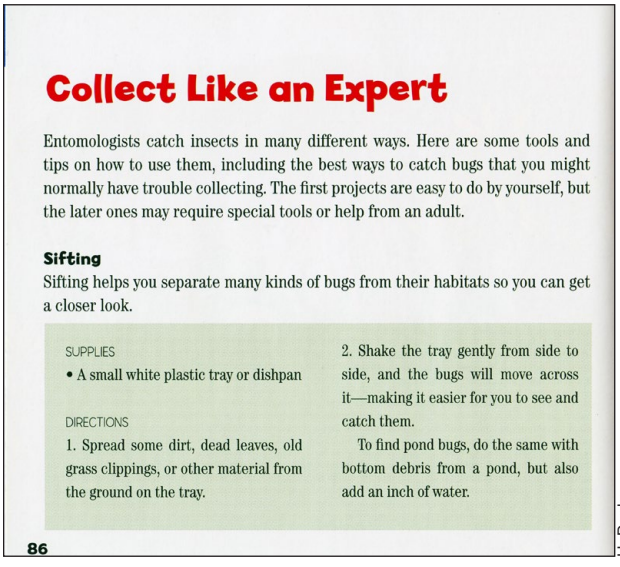


Figure 11. Sample information page, showing the first part of "Adults near the pond".

That edition also won acclaim, such as the Gold Award of Parents' Choice Foundation. However, I received relatively little direct feedback because most opinions and reviews appeared online instead. Some people noted that they had used the first edition as children and were happy



Collect Like an Expert

Entomologists catch insects in many different ways. Here are some tools and tips on how to use them, including the best ways to catch bugs that you might normally have trouble collecting. The first projects are easy to do by yourself, but the later ones may require special tools or help from an adult.

Sifting

Sifting helps you separate many kinds of bugs from their habitats so you can get a closer look.

SUPPLIES

• A small white plastic tray or dishpan

DIRECTIONS

1. Spread some dirt, dead leaves, old grass clippings, or other material from the ground on the tray.

2. Shake the tray gently from side to side, and the bugs will move across it—making it easier for you to see and catch them.

To find pond bugs, do the same with bottom debris from a pond, but also add an inch of water.

86

H. Danks

Figure 12. Start of the section about collecting methods, describing sifting.

H. Danks

Figure 13. The items enclosed in the bottle for the revised edition; and a magnified image.

to be able to buy the second one for their own children.

Many comments were gratifying because they confirmed not only that the book provided enjoyment and entertainment to children, but also that my overall concept (for both editions) had been appreciated. For example, one comment said "Author does not 'talk down' to the reader. Explanations are clear with excellent pictures"; another noted that the book was "clever, informative and fascinating" and "gives kids all the tools they need to become a bug expert, and in the process, develop a genuine understanding and respect for the natural world." A reviewer wrote "As an educational tool, this is certainly a superior product ... easy to understand and not overly technical; just the right balance to encourage and inform, but not overwhelm or bore young minds."

H. Danks

Figure 14. Author Hugh Danks testing a set-up for sheeting at night.

Other benefits

Although my work on the original edition was done outside office hours (given my other commitments), an employee of the national museum could not be paid directly. The Museum agreed that the modest author's revenue would be held in a trust fund earmarked for my research and other professional themes. A comparable avenue no longer exists, as administrators have sought to capture all revenues of this sort, a constraint that has reduced the willingness of some scientific staff to participate in wider activities. Fortunately, management could not retroactively change the agreement with me despite several attempts to do so.

The trust fund allowed me to support research with some other Canadian entomologists, contributing to a few joint publications. Also, donations to the ESC's Scholarship Fund provided much of the capital for the student scholarship established on behalf of the Biological Survey of Canada.

Revenue from the second edition accrued to the Museum. However, that version was begun mainly during work hours and completed after my retirement.

An additional benefit of the ongoing success of the bug book was its contribution to public education themes favoured by my employer. Consequently, pressure to invest undue effort in other public programmes was reduced.

Final comments

I enjoyed preparing both editions. It was very satisfying to develop products that were accurate, attractive, easy to understand, and content-rich, with activities that were appropriate and feasible. Every stage—planning, writing, editing, verifying illustrations, promotion, and feedback—brought valuable experiences beyond my scientific research. The marked success of the work, and the other activities it generated, were encouraging too.

Of course, such an endeavour depends on many people apart from the author, because a range of expertise is needed to ensure that the content is realized as an attractive product of high quality, and then marketed successfully. I was fortunate that members of the team at Workman Publishing, and the artists, were so skilled and effective.

I appreciated the variety of comments that children and their parents, as well as former children, sent to me over the years. Many people who had enjoyed using the book retained a positive attitude towards insects. Some kept a more active interest and involvement, and a select few pursued careers in entomology.

My experiences confirm several generalizations that are well known to most entomologists. Children are curious about the world and are fascinated by insects, but by the time they reach adulthood their enthusiasm may have been replaced with dislike or disgust because of ill-informed peers or parents. These negative attitudes are reinforced because some journalists do not try to provide genuine information, but in its place emphasize prejudices ("Yuck!"), use easy headlines ("Are you bugged by bugs?"), or repeat tired tropes (eccentric butterfly collectors and absent-minded professors).

Non-entomologists have a different perspective in any case. Many people have limited general knowledge about science, and so cannot grasp the context of much of the specialized information that is available. One non-entomologist's response to my detailed monograph on insect dormancy, published the same year as the first edition of the bug book, was "Oh no. Not another of these big red books we can't understand … but this bug book is great!"

As a result of their lack of knowledge about science, many people fail to appreciate the complexity of the natural world and the need for precision in describing it. Their knowledge of insects may be confined to a few pests and conspicuous species. Unfortunately, some of the individuals charged with communicating the information (more than a few journalists, public programmers, and editors) have limited understanding too.

Given this setting, all scientists should try to encourage science literacy among the general public. For entomologists, the challenge has always been: how can we focus and maintain the positive attention of people of all ages on the fascinating diversity and natural history of arthropods, and on the global prevalence and importance of the group? I hope that the bug book helped with that wider aim.

Characterizing and engineering a dengue refractory phenotype in *Aedes aegypti*

Heather Coatsworth

S. McCann

Figure 1. Adult female *Aedes aegypti* mosquito obtaining a human bloodmeal.

Dengue, a virus transmitted from person to person via the bite of an infected mosquito made the World Health Organization's (WHO's) list of top ten threats to global health in 2019 (WHO 2019). Primary infections are usually asymptomatic, but secondary infections with different viral serotypes (four currently known) can lead to dengue's 'break-bone' characteristic symptoms of severe joint pain and fever (Halstead 2008). In some cases, secondary, tertiary and quaternary infections can lead to hemorrhaging and shock syndrome due to a rare phenomenon known as antibody-dependent enhancement, which puts individuals with previous dengue exposure at a higher risk of severe symptoms including possible death (Guzman et al. 2013).

It is currently estimated that approximately half of the world's population is at risk of dengue transmission, a statistic predicted to increase as the effects of climate change continue to mount (Bhatt et al. 2013). There are no dengue prophylactics or treatments, and the use of a recently approved vaccine, Sanofi-Pasteur's Dengvaxia, caused major issues throughout the Philippines when hundreds of school-aged children died post-vaccination (Dyer 2017). With no options left on the human disease front, the next obvious target is the mosquito vector, *Aedes aegypti* (Figure 1). *Aedes aegypti* was previously successfully eradicated from 18 countries in the Americas in the mid 1960s due to large-spread insecticide spraying (Brathwaite Dick et al. 2012). Now, over 40 years later, these highly human-adapted mosquitoes are back in full insecticide-resistant force and are endemic in areas they were never present in before.

How, then, do we dampen dengue transmission? The answer to many scientists seems simple. We genetically modify them. This approach has two distinct prongs. The first, known as 'population suppression', aims to reduce the number of virus transmitting mosquitoes by reducing the number of adult female (i.e., human feeding) *Ae. aegypti* (Alphey 2014, Kean et al. 2015). This could be done by sex-skewing populations so that more males were present or by stage-specifically killing mosquitoes before they reach adulthood (McGraw and O'Neill 2013). While these are feasible in some locations, *Ae. aegypti* populations are so large that constant mass releases of mosquitoes would be necessary to create even the smallest of dents. Some individuals

Heather Coatsworth (h.coatsworth@ufl.edu) obtained her PhD in 2019 from Simon Fraser University under the supervision of Dr Carl Lowenberger. She is now a post-doctoral fellow at the University of Florida working with Dr Rhoel Dinglasan, continuing her work on mosquito-borne diseases. She has a keen interest in science education and teaching, and is committed to amplifying and supporting diverse voices in STEM fields. Heather was a participant in the Graduate Student Showcase at the ESA/ESC/ESBC JAM in Vancouver in 2018.

worry that suppressing or eradicating mosquito populations may have detrimental reverberations on local biodiversity and food webs (Takken et al. 2003).

The second idea, however, 'population replacement', might be more ecologically friendly and logistically feasible. Pathogen transmitting mosquitoes can be replaced with non-pathogen transmitting mosquitoes, all while keeping the size of *Ae. aegypti* populations the same (Alphey 2014). Although this aim has previously been targeted by introducing a bacterium, *Wolbachia*, to mosquito ovaries, it also reduces the mosquito's lifespan, making the non-pathogen transmitting mosquitoes less fit than their wildtype counterparts (McMeniman et al. 2009). Recent reports have even found that not all *Wolbachia* infected mosquitoes are dengue incompetent (Terradas et al. 2017).

Thus, we sought to create a new 'population replacement' mosquito model by altering mosquito genes necessary for viral survival. In order to do this, we used big-data approaches to compare dengue-susceptible and dengue-refractory mosquitoes collected throughout the city of Cali in the dengue endemic country of Colombia (Ocampo and Wesson 2004, Serrato et al. 2017). There were no obvious environmental trends determining where these mosquitoes were found (Ocampo and Wesson 2004). We also found no discernable differences between the gut microbiome of these two phenotypes, suggesting that the environment and the abundance and diversity of gut bacteria are not primary determinants of dengue competency in *Ae. aegypti* (Coatsworth et al. 2018). We did, however, find important differences in gene expression between these two phenotypes and showed that we could flip the phenotype of a mosquito from dengue-susceptible to dengue-refractory (and vice-versa) by knocking-down some of these genes individually (Ocampo et al. 2013, Caicedo et al. 2013, Caicedo et al. 2018). Furthermore, through a genome-wide association study comparing our two phenotypes of interest, we found mutations in genes known to be necessary for viral survival.

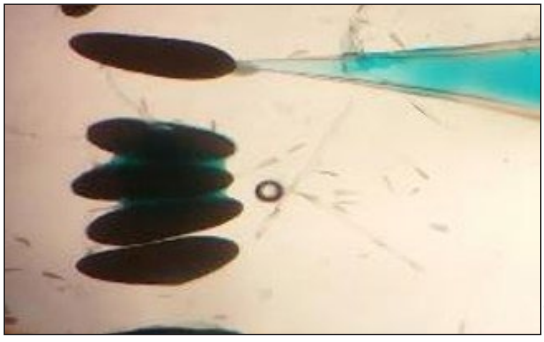
We do not know if these mutations create a dengue-free mosquito, and our gene knockdowns are temporary, and their effects are not passed onto future generations. In order to solve these problems, we tried to create genetically modified mosquitoes, permanently knocking-out the genes previously identified as potential drivers of our dengue-refractory phenotype (through DNA mutations and gene knockdowns). To do this, we used Clustered Regulatory Interspaced Short Palindromic Repeats (CRISPR) and a CRISPR-associated protein (Cas9). We created guide sequences highly specific to our genes of interest that help direct the Cas9 nuclease to generate a double stranded break in the *Ae. aegypti* DNA, introducing multiple mutations via the cell's most prominent DNA repair mechanism, Non-Homologous End Joining (NHEJ) (Gaj et al. 2013).

This approach has shown massive success across a broad taxonomic range, including plants (Shan et al. 2013), humans (Mali et al. 2013), fruit flies (Yu et al. 2013) and other mosquito species (Dong et al. 2018). In order to achieve maximum efficiency, the method should be used at the earliest life-stage possible (i.e., a single cell) to ensure that the first copies of DNA are modified. As such, subsequent copies of DNA that are created contain the desired targeted gene-knock out. In mosquitoes this means injecting the early pre-blastoderm embryo. When *Ae. aegypti* embryos are laid, they are white and too fragile to safely handle (Figure 2). It only takes 1 hour for the embryos to completely blacken (melanize) and harden

H. Coatsworth

Figure 2. *Aedes aegypti* embryos arranged from 0-hours (far left) to 1-hour (far right) post-laying.

(Jasinskiene et al. 2007). This leaves us with a 20-minute window when the embryos are mid to dark grey where we can safely handle and inject them. We line up the embryos and manually inject them at their pole with enough CRISPR-Cas9 product so that a small amount of the embryo's cytoplasm will spill out (Figure 3) (Kistler et al. 2015). If the injection is conducted properly, this cytoplasm will be re-absorbed when the embryo starts to heal (Jasinskiene et al. 2007, Kistler et al. 2015). We then allow the embryos to rest and heal and hatch them 5 days later.



H. Coatsworth

Figure 3. Injecting *Aedes aegypti* embryos.

We were able to successfully genetically modify multiple *Ae. aegypti* genes, although all our hatched individuals were mosaics, implying that they contain both modified and un-modified copies of DNA. Although we inject single-celled embryos, dipteran embryos undergo nuclear division prior to cellular division (Karaiskos et al. 2017). This means that the embryos we are injecting already contain thousands of un-modified copies of DNA prior to our injection. In order to test the dengue-competency of these mosquitoes, future studies will need to address these concerns either by targeting pre-embryonic mosquito stages or by breeding mosaic mosquitoes until full knock-out (non-mosaic) individuals are created.

In an age of misinformation and fake news, conducting research to create these genetically modified mosquitoes has become increasingly difficult. While it is extremely important to create legislation that manages these new tools, there are numerous issues facing the forward motion of researching these technologies. Public protests have stopped field trials from moving forward (Ernst et al. 2015), and some governments have prohibited research to create or test these mosquitoes (GRAIN 2019). Some researchers themselves have triggered anti-genetic modification rhetoric by inaccurately suggesting that genetic mixing between modified and wildtype mosquitoes creates 'more robust' mosquito populations (Evans et al. 2019). I am hopeful that despite these setbacks, research on creating and releasing these modified mosquitoes can continue, as we need as many tools as possible in order to dampen dengue transmission.

References

Alphey, L. 2014. Genetic control of mosquitoes. Annual Review of Entomology, **59**: 205–224. https://doi.org/10.1146/annurev-ento-011613-162002

Bhatt, S., Gething, P., Brady, O., Messina, J., Farlow, A., Moyes, C., Drake, J., Brownstein, J., Hoen, A., Sankoh, O., Myers, M., George, D., Jaenisch, T., Wint, G., Simmons, C., Scott, T., Farrar, J. and Hay, S. 2013. The global distribution and burden of dengue. Nature, **496**: 504–507. https://doi.org/10.1038/nature12060

Brathwaite Dick, O., San Martín, J.L., Montoya, R.H., del Diego, J., Zambrano, B. and Dayan, G.H. 2012. The history of dengue outbreaks in the Americas. The American Journal of Tropical Medicine and Hygiene, **87**: 584–593. https://doi.org/10.4269/ajtmh.2012.11-0770

Caicedo, P. A., Barón, O. L., Pérez, M., Alexander, N., Lowenberger, C. and Ocampo, C.B. 2013. Selection of *Aedes aegypti* (Diptera: Culicidae) strains that are susceptible or refractory to Dengue-2 virus. The Canadian Entomologist, **145**: 273–282. https://doi.org/10.4039/tce.2012.105

Caicedo, P. A., Serrato, I. M., Sim, S., Dimopoulos, G., Coatsworth, H., Lowenberger, C. and Ocampo, C. B. 2019. Immune response-related genes associated to blocking midgut dengue virus infection in *Aedes*

aegypti strains that differ in susceptibility. Insect Science, **26**: 635–648. https://doi.org/10.1111/1744-7917.12573

Coatsworth, H., Caicedo, P., Van Rossum, T., Ocampo, O. and Lowenberger, C. 2018. The composition of midgut bacteria in *Aedes aegypti* (Diptera: Culicidae) that are naturally susceptible or refractory to dengue viruses. Journal of Insect Science, **18(6)**: 12; 1–7. https://doi.org/10.1093/jisesa/iey118

Dong, Y., Simões, M.L., Marois, E. and Dimopoulos, G. 2018. CRISPR/Cas9 -mediated gene knockout of *Anopheles gambiae* FREP1 suppresses malaria parasite infection. PLoS Pathogens, **14**: e1006898. https://doi.org/10.1371/journal.ppat.1006898

Dyer, O. 2017. Philippines halts dengue immunisation campaign owing to safety risk. British Medical Journal, **359**: j5759. https://doi.org/10.1136/bmj.j5759

Ernst, K.C., Haenchen, S., Dickinson, K., Doyle, M.S., Walker, K., Monaghan, A.J. and Hayden, M.H. 2015. Awareness and support of release of genetically modified "sterile" mosquitoes, Key West, Florida, USA. Emerging Infectious Diseases, **21**: 320–324. https://doi.org/10.3201/eid2102.141035

Evans, B.R., Kotsakiozi, P., Costa-da-Silva, A.L., Ioshino, R.S., Garziera, L., Pedrosa, M.C., Malavasi, A., Virginio, J.F., Capurro, M.L. and Powell, J.R. 2019. Transgenic *Aedes aegypti* mosquito transfer genes into a natural population. Scientific Reports, **9**: 13047. https://doi.org/10.1038/s41598-019-49660-6 (Publication currently under editorial review)

Gaj, T., Gersbach, C.A. and Barbas, C.F. 2013. ZFN, TALEN, and CRISPR/Cas-based methods for genome engineering. Trends in Biotechnology, **31**: 397–405. https://doi.org/10.1016/j.tibtech.2013.04.004

GRAIN. 3 July 2019. Civil society denounces the release of GM mosquitoes in Burkina Faso. Retrieved from: https://www.grain.org/en/article/6277-civil-society-denounces-the-release-of-gm-mosquitoes-in-burkina-faso

Guzman, M.G., Alvarez, M. and Halstead, S.B. 2013. Secondary infection as a risk factor for dengue hemorrhagic fever/dengue shock syndrome: an historical perspective and role of antibody-dependent enhancement of infection. Archives of Virology, **158**: 1445–1459. https://doi.org/10.1007/s00705-013-1645-3

Halstead, S.B. 2008. Dengue virus–mosquito interactions. Annual Review of Entomology, **53**: 273–291.

Jasinskiene, N., Juhn, J. and James, A. A. 2007. Microinjection of *A. aegypti* embryos to obtain transgenic mosquitoes. Journal of Visualized Experiments, **5**: 219. https://doi.org/10.3791/219

Karaiskos, N., Wahle, P., Alles, J., Boltengagen, A., Ayoub, S., Kipar, C., Kocks, C., Rajewsky, N. and Zinzen, R.P. 2017. The *Drosophila* embryo at single-cell transcriptome resolution. Science, **358**: 194–199. https://doi.org/10.1126/science.aan3235

Kean, J., Rainey, S.M., McFarlane, M., Donald, C.L., Schnettler, E., Kohl, A. and Pondeville, E. 2015. Fighting arbovirus transmission: Natural and engineered control of vector competence in *Aedes mosquitoes*. Insects, **6**: 236–278. https://doi.org/10.3390/insects6010236

Kistler, K.E., Vosshall, L.B. and B.J. Matthews. 2015. Genome engineering with CRISPR-Cas9 in the mosquito *Aedes aegypti*. Cell Reports, **11**: 51–60. https://doi.org/10.1016/j.celrep.2015.03.009

Mali, P., Yang, L., Esvelt, K., Aach, J., Guell, M., DiCarlo, J., Norville, J. and Church, G. 2013. RNA-guided human genome engineering via Cas9. Science, **339**: 823–826. https://doi.org/10.1126/science.1232033

McGraw, E.A. and O'Neill, S.L. 2013. Beyond insecticides: New thinking on an ancient problem. Nature Reviews in Microbiology, **11**: 181–193. https://doi.org/10.1038/nrmicro2968

McMeniman, C.J., Lane, R.V., Cass, B.N., Fong, A.W., Sidhu, M., Wang, Y.F. and O'Neill, S.L. 2009. Stable introduction of a life-shortening *Wolbachia* infection into the mosquito *Aedes aegypti*. Science, **323**: 141–144. https://doi.org/10.1126/science.1165326

Ocampo, C.B., and Wesson, D.M. 2004. Population dynamics of *Aedes aegypti* from a dengue hyperendemic urban setting in Colombia. American Journal of Tropical Medicine and Hygiene, **71**: 506–513.

Ocampo, C.B., Caicedo, P.A., Jaramillo, G., Ursic Bedoya, R., Baron, O., Serrato, I.M., Cooper, D.M. and Lowenberger, C. 2013. Differential expression of apoptosis related genes in selected strains of *Aedes aegypti* with different susceptibilities to dengue virus. PLoS One, **8**: e61187. https://doi.org/10.1371/journal.pone.0061187

Serrato, I.M., Caicedo, P.A., Orobio, Y., Lowenberger, C. and Ocampo, C.B. 2017. Vector competence and innate immune responses to dengue virus infection in selected laboratory and field-collected *Stegomyia aegypti* (= *Aedes aegypti*). Journal of Medical and Veterinary Entomology, **31**: 312–319. https://doi.org/10.1111/mve.12237

Shan, Q., Wang, Y., Li, J., Zhang, Y., Chen, K., Liang, Z., Zhang, K., Liu, J., Xi, J., Qiu, J. and Gao, C. 2013. Targeted genome modification of crop plants using a CRISPR-Cas system. Biotechnology. **31**: 686–688. https://doi.org/10.1038/nbt.2650

Takken, W., Scott, T.W. and Rogers, R.J. (Eds.) 2003. Ecological aspects for application of genetically modified mosquitoes. Wageningen UR frontis series. **2.** Dordrecht: Springer.

Terradas, G., Allen, S.L., Chenoweth, S.F. and McGraw, E.A. 2017. Family level variation in *Wolbachia*-mediated dengue virus blocking in *Aedes aegypti*, Parasites & Vectors. **10**: 622. https://doi.org/10.1186/s13071-017-2589-3

World Health Organization, 2019. Ten threats to global health in 2019. Retrieved from: https://www.who.int/emergencies/ten-threats-to-global-health-in-2019.

Yu, Z., Ren, M., Wang, Z., Zhang, B., Rong, Y. S., Jiao, R. and Gao, G. 2013. Highly efficient genome modifications mediated by CRISPR/Cas9 in *Drosophila*. Genetics, **195**: 289–291. https://doi.org/10.1534/genetics.113.153825

Things to know about ticks, mosquitoes, and midges: Update from the symposium on arthropod disease vectors in Canada

Joanna Konopka

With an increased concern for emerging vector-borne diseases of public health importance in Canada, there is a pressing need for research on arthropod vectors (e.g., ticks and mosquitoes) and the diseases they transmit (e.g., Lyme disease and West Nile disease). Research in this field aims at reducing or controlling transmission but requires integration of basic biology and ecology of the vectors (e.g., host-vector and vector-pathogen interactions), predictive analyses of distribution and spread of the vectors, innovative approaches for the prevention of arthropod-borne diseases, as well as geospatial analysis of health and environmental data in an epidemiological context. The increased interest in this topic is fueled by the rapid range expansion of vectors in Canada with changing climate.

I could not think of a better way to bring attention to this timely and pressing issue of zoonotic diseases vectored by arthropods in Canada than to organize a symposium. The symposium entitled "Arthropod disease vectors in Canada: vector biology, ecology, and disease transmission" took place in August 2019 during the CSEE-ESC-AEC joint meeting in Fredericton, New Brunswick. Nicoletta Faraone (Acadia University) and I wanted to integrate research in ecology, evolution, entomology of arthropod disease vectors, and to highlight their roles in disease transmission and prevalence in Canada. We brought together a diverse group of speakers who presented their approaches to studying arthropod vectors.

The symposium started out with Manisha Kulkarni (University of Ottawa) showcasing the utilization of spatial analytic approaches to link ecological and epidemiological surveillance data and identify hotspots of Lyme disease and West Nile virus transmission at different scales in eastern Ontario. Next Kateryn Rochon (University of Manitoba) talked about bovine anaplasmosis and the changing distribution of American dog ticks that transmit the bacteria causing this disease. Christopher Zinck (University of Saskatchewan) discussed which organs and tissues in wildlife carry tick-vectored *Borrelia* infections (including evidence of co-infections with *B. burgdorferi* and *B. miyamotoi* in jumping mice). Continuing the series of "tick-talks", Vett Lloyd (Mount Allison University) detailed tick reproduction and how hybridization between *Ixodes scapularis* and *I. cookei* produces fertile offspring that are attracted to human and dog hosts. Next, Janet Sperling (University of Alberta) talked about tick (*Dermacentor albipictus*) bacterial microbiomes on elk, showing extensive variability in bacterial diversity.

The next few presentations focused on non-tick disease vectors. First, Todd Smith (Acadia University) discussed the immunological and fitness effects of infection with Hepatozoon blood parasites in *Culex* mosquito vectors, demonstrating reduced fecundity and increased midgut damage and oxidative stress in the vector. We then heard about midge-borne orbiviruses from Samantha Allen (University of Guelph) and the risk of transmission of epizootic hemorrhagic disease viruses and bluetongue viruses in wild cervids and livestock in Ontario. Finally, Nicoletta Faraone wrapped up the session by talking about using essential oils as alternatives to synthetic repellents against *Ixodes scapularis* ticks, and the possible mechanisms of tick olfaction.

Joanna K. Konopka (jkonopk1@jhmi.edu) is currently a Research Postdoctoral Fellow at the Johns Hopkins University School of Medicine in Baltimore, Maryland. She and Nicoletta Faraone co-organised the symposium on arthropod disease vectors at the 2019 JAM in Fredericton.

I hope this symposium encouraged entomologists and ecologists (at all career stages) to collaborate with the public health sector to address the critical link between vector ecology and the associated disease transmission. I look forward to more talks about vector research at future ESC meetings and to strengthening the presence of vector research in ESC.

S. McCann for ESC

From left to right: Joanna Konopka, Manisha Kulkarni, Janet Sperling, Kateryn Rochon, Samantha Allen, Christopher Zinck, Vett Lloyd (front), Todd Smith (back), Nicoletta Faraone.

Canada's Coolest/Cruelest Bugs / Ces bestioles les plus cools/cruelles du Canada

The Entomological Society of Canada is soliciting submissions for a new project aimed at outreach and education. Submissions for "Canada's Coolest Bugs" or "Canada's Cruelest Bugs" should be formatted using the example below and the first contribution available at this link https://esc-sec.ca/2018/05/29/cool-insectsthe-mourning-cloak-butterfly/. The articles will be published in the *Bulletin* and disseminated online by our ESC social media administrators. They will be assembled together for future access on the ESC website by any entomology enthusiast.

Each submission should include basic facts about the species (e.g., range, taxonomy) and a more narrative write-up (more story-based, based on the personal experience of the author with that species). This will ensure that the pertinent basic facts about the species are being delivered while maintaining appeal to a broad audience.

Please send questions or your submissions to Morgan Jackson (morgandjackson@gmail.com) or Angela Gradish (agradish@uoguelph.ca).

La Société d'entomologie du Canada sollicite des soumissions pour un nouveau projet visant à faire du rayonnement et de l'éducation. Les soumissions pour « Ces bestioles les plus cools du Canada » ou « Ces bestioles les plus cruelles du Canada » doivent suivre la mise en page de l'exemple ci-dessous et la première contribution disponible sur le lien suivant https://esc-sec.ca/fr/2018/05/29/cool-insectsthe-mourning-cloak-butterfly/. Les articles seront publiés dans le *Bulletin* et diffusés en ligne par nos administrateurs de médias sociaux. Ils seront assemblés pour un accès futur par tout enthousiaste de l'entomologie sur le site web de la SEC. Chaque soumission devrait inclure des informations de base sur l'espèce (p.ex. la distribution, la taxonomie) et une partie plus narrative (plutôt basée sur une histoire, sur l'expérience personnelle de l'auteur avec l'espèce). Cela assurera que les faits de base pertinents sur l'espèce sont livrés tout en maintenant un attrait pour un auditoire varié.

Veuillez envoyer vos questions ou vos soumissions à Morgan Jackson (morgandjackson@gmail.com) ou Angela Gradish (agradish@uoguelph.ca).

Upis ceramboides (Linnaeus, 1758), the roughened darkling beetle (Insecta: Coleoptera: Tenebrionidae)

Patrice Bouchard

Activity Period

In the northern part of their range, including Canada, adults leave their winter quarters as soon as the snow melts and mating takes place immediately. Egg laying lasts for about three months and the adults from this generation generally die before the winter. The life cycle can take 1-2 years depending on the time of egg laying and available food for development.

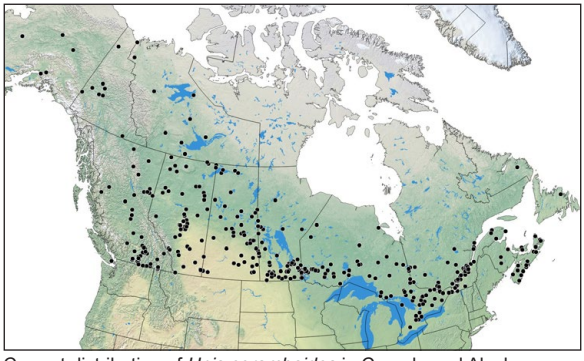
Pat Bouchard (patrice.bouchard@canada.ca) is a research scientist at Agriculture and Agri-Food Canada (Ottawa Research and Development Centre) with a particular interest in Tenebrionidae (darkling beetles) and Curculionoidea (weevils).

Dorsal habitus of *Upis ceramboides*

Hosts/Food Source
Larvae develop in, and eat, dead wood.

Habitat
Associated with both deciduous and coniferous trees and logs.

Geographic Range
Upis ceramboides is widely distributed in North America, Europe and northern Asia.



P. Bouchard and Y. Bousquet

Current distribution of *Upis ceramboides* in Canada and Alaska

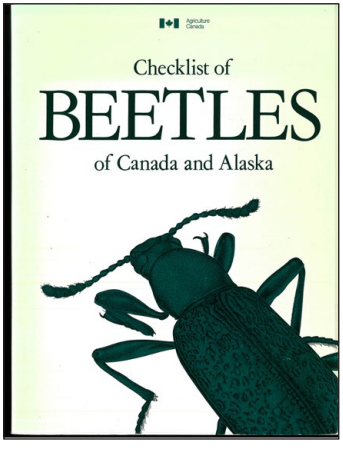
Natural history notes

The beetle family Tenebrionidae is very diverse with more than 20 000 species described worldwide and many more that await formal description. The family includes a large number of flightless species, many of which are well known for their ability to survive in some of the hottest deserts on the planet. However, the ability to adapt to extreme cold is equally astonishing in other species.

Throughout their northern range, adults of one of Canada's "coolest" beetles *Upis ceramboides*, can tolerate prolonged freezing down to −60 °C in midwinter! The adults typically overwinter just beneath loose tree bark above the snowline. Studies on their survival adaptations have led to important discoveries on freeze-tolerant strategies such as a novel non-protein antifreeze molecule and a new sugar alcohol called threitol. Unfortunately, some populations of *U. ceramboides* have become locally extinct over some of its natural range because sustained forestry practices have significantly reduced the amount of dead wood available for their larval development. The genus *Upis* belongs to the diverse tribe Cnodalonini, a tribe which is especially diverse in tropical and subtropical habitats.

Other darkling beetle species in Canada include the forked fungus beetle, *Bolitotherus cornutus* (Fabricius, 1801), that can be found in or under bracket fungi and stink beetles in the genus *Eleodes* that are common in the prairie provinces and British Columbia. A very common species is the yellow mealworm, *Tenebrio molitor* Linnaeus, 1758; larvae of this species are sold in pet shops as food for some reptiles, birds and other pets and are now also reared in large numbers to produce an alternative, environmentally-friendly source of protein for human consumption.

Adults of Canadian species in this family produce secretions they expel from their "back end" when disturbed. These are effective deterrents against predators and they can leave a smelly residue on the skin of people handling them. As opposed to the sentiment of most people, I can say that I actually like the smell from darkling beetle defense secretions, especially when I am in the field looking for these beetles. I call it the sweet smell of success!



Go Sato (AAFC)

A drawing of the charismatic, distinctive, and commonly-encountered roughened darkling beetle was used on the cover of the first edition of the *Checklist of the Beetles of Canada and Alaska*

Khapra beetle: a cruel, cool insect

Kevin Floate, Sunil Shivananjappa, Diana Wilches, Rob Laird and Paul Fields

Less than 3 mm in length (a dime is 1 mm thick), khapra beetle, *Trogoderma granarium* (Coleoptera: Dermestidae) is a wee little villain with amazing abilities that have resulted in it being recognized as one of the world's top 100 most invasive pests. Khapra beetle infests stored grain and stored grain products, causing damage by larval feeding and by contaminating the product with larval feces to alter its taste. Fine hairs that break off of the larvae can cause allergic reactions. Egg-to-adult development can occur in as little as 5 weeks with up to 10 generations per year.

Larvae and adult khapra beetle. Photocredit: Anne-Sophie Roy, European and Mediterranean Plant Protection Organization; www.invasive.org.

Adults cannot fly, so the pest is mainly spread in shipments of infested products. It is established in Asia, Africa, the Middle East, and parts of Europe; elsewhere, strict quarantine regulations are in place to prevent its establishment. The detection of infestations in quarantine countries can trigger eradication programs that can be expensive and time-consuming. A 13-yr eradication program (1953 - 1966) in the United States involved inspection of about 97 000 properties and fumigation of more than 600 infestation sites with a total estimated cost of USD $102 – 138 million (2019 dollars).

Control of this pest is hindered by the larva's amazing ability to survive exposure to extreme temperatures, starvation and insecticides. Although it is native to India, our research identifies khapra beetle to be among the most cold-tolerant of stored-product insects. To eradicate cold-acclimated larvae in diapause, exposure is required for a year at -5°C and for more than 2 months at -15°C. Why would insects from India be so cold-hardy you might ask? Our further research provides evidence that this cold-tolerance is cross-linked to the insect's ability to survive desiccation; i.e., the same physiological mechanism confers tolerance to both cold and desiccation. This makes sense, given that infestations can persist in extremely dry conditions.

Equally amazing is the ability of khapra beetle to survive conditions of extreme food deprivation for as long as 6 years in diapause. Diapause for many insect species involves the passage of time in an inactive, non-feeding stage such an egg or pupa. In contrast, khapra beetle undergoes diapause as larvae that continue to sporadically feed and intermittently shed their

Sunil Shivananjappa and Diana Wilches completed their MSc thesis research on khapra beetle in 2019 and 2016, respectively. Kevin Floate (kevin.floate@canada.ca; Agriculture and Agri-Food Canada, Lethbridge), Paul Fields (AAFC Morden) and Rob Laird (University of Lethbridge) co-supervised this research.

skin (= molt). Each time the larva molts, it shrinks a little bit in size – a phenomenon termed "retrogressive molting" and one of few such examples known to occur. This ability to shrink reduces the larva's food requirements until such time that more food becomes available. When food again becomes plentiful, the larva has the ability to increase in size and complete its development to become an adult.

One of our more recent discoveries is that khapra beetle harbors infections of *Spiroplasma* bacteria. These bacteria form symbiotic relationships and are spread from one host generation to the next via passage in the eggs laid by infected females. The nature of the relationship varies with the insect species and *Spiroplasma* strain. In some cases, infections kill male host embryos (male-killing) to increase the prevalence of *Spiroplasma* in the next host generation. In other cases, infections help protect the host from attack by parasitic wasps and nematodes. Future research is required to determine the potentially important role that *Spiroplasma* plays in survival of the khapra beetle.

Related research from our labs:

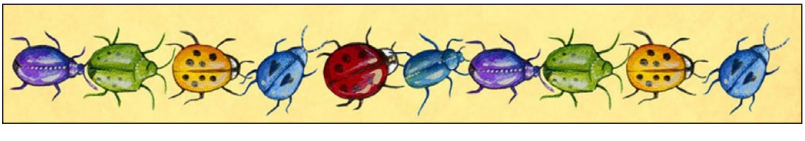
Shivananjappa, S., Fields, P., Laird, R.A. and Floate, K.D. (*First View*). Contributions of diet quality and diapause duration to the termination of larval diapause in khapra beetle, *Trogoderma granarium* (Coleoptera: Dermestidae). Journal of Stored Products Research. (https://doi.org/10.1016/j.jspr.2019.101535)

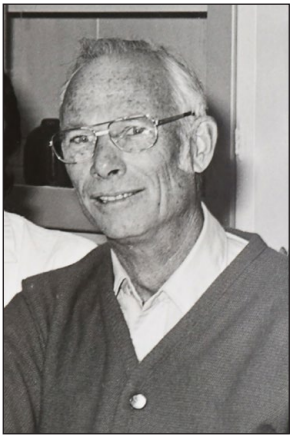
Shivananjappa, S., Laird, R.A., Floate, K.D. and Fields P. (*in press*). Cross tolerance to desiccation and cold in khapra beetle, *Trogoderma granarium* (Coleoptera: Dermestidae). Journal of Economic Entomology.

Wilches, D.M., Laird, R.A., Fields, P.G., Coghlin, P. and Floate, K.D. 2018. *Spiroplasma* dominates the microbiome of khapra beetle: comparison with a congener, effects of life stage and temperature. Symbiosis, **76**: 277–291 (https://doi.org/10.1007/s13199-018-0560-5).

Wilches, D.M., Laird, R.A., Floate, K.D. and Fields, P.G. 2017. Effects of acclimation and diapause on the cold tolerance of *Trogoderma granarium*. Entomologia Experimentalis et Applicata, **165**: 169–178 (https://doi.org/10.1111/eea.12632).

Wilches, D.M., Laird, R.A., Floate, K.D. and Fields, P.G. 2019. Control of *Trogoderma granarium* using high temperatures. Journal of Economic Entomology, **112**: 963–968 (https://doi.org/10.1093/jee/toy379).

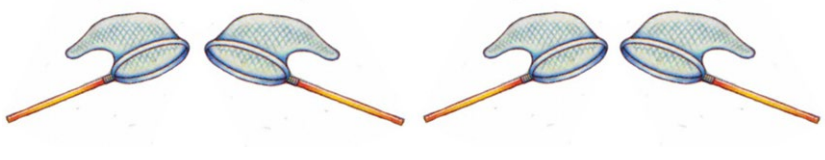


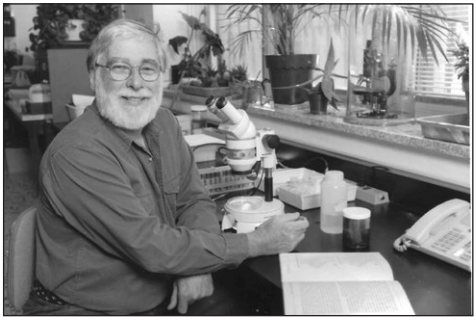

Proverbs family

Maurice Desmond (Jinx) Proverbs (1921-2018)

Born in Barbados, after attending the Imperial College of Tropical Agriculture in Trinidad, Dr Jinx Proverbs completed his BSc, MSc and PhD in entomology at MacDonald College, McGill University, Quebec. From 1947 to 1980, he worked at the Summerland Research and Development Centre, Agriculture and Agri-Food Canada, British Columbia, where part of his work involved the original research to develop the sterile insect technology for codling moth control that has since been adopted for various programs internationally. The Okanagan Kootenay Sterile Insect Release Program involving industrial scale production of irradiated moths, which developed from the research of Dr Proverbs, was implemented in 1992. In recognition of his work, Dr Proverbs was named a Fellow of the Entomological Society of Canada in 1975, and in 1978 he received the highest honour for a public servant, the Award of Merit. Dr Proverbs was reported to have an incredible knowledge of nature and was an avid fisherman, birder, and cultivator of roses. Jinx was well known in the entomology community and will be sadly missed by his loving wife of 70 years, Muriel, and their three daughters and seven grandchildren.

Tom Lowery, AAFC, Summerland RDC




J.-L. Verville

Pierre-Paul (aka Peter) Harper (1942–2019)

Pierre-Paul (aka Peter) Harper died peacefully in his sleep, 29 April 2019, at home in Saint-Hubert, Quebec. Peter was born 4 September 1942 in Masson, a small town in southwestern Quebec. His Scottish father was from Tignish (Prince Edward Island), whereas his mother was a French-Canadian from Buckingham, in the same vicinity as Masson. Harper enjoyed his Catholic secondary schooling at the Collège Saint-Alexandre, Gatineau, and thought he had found his calling early on, that of a teaching priest in Africa. He went on to earn a BA degree in classics (Greek and Latin) at Laval University in Quebec City. He continued with a biology degree at the University of Montreal, still with the intention of becoming a missionary. He did receive his BSc in 1966, but during these years, two events altered his trajectory.

First, Harper worked as a summer intern at the University's biological research station at Saint-Hippolyte, now known as the Station de Biologie des Laurentides. He worked on a botanical inventory of the station with Brother Roland Germain. In so doing, he discovered the fauna and flora of the Laurentians and became a fervent naturalist; surveying the research station became a significant part of the rest of his life. Second, having previously attended boys' schools, he discovered the fairer sex: he fell in love with his colleague, Françoise Delorme, and his dream of the priesthood and teaching in the French colonies faded away.

Harper thus reoriented his professional life towards research. He pursued a master's degree at the University of Montreal under the tutelage of Étienne Magnin, with whom he had already developed a friendship during his undergraduate work, one that would persist the rest of their lives. Magnin, a free-living Frenchman from Savoie, renowned for his work on sturgeon, supervised Harper's work on the stoneflies of the Saint-Hippolyte research station. Working side by side with Françoise, she on mayflies, the two sparked a long-term research collaboration, both receiving their MSc degrees in 1967. Peter continued his education at the University of Waterloo, earning a PhD in 1971 with the eminent stonefly expert and father of modern stream ecology, H.B. Noel Hynes. During this time, Françoise gave birth to their one and only child, Catherine.

The young family left for Europe when Peter took a postdoctoral position at University Paul Sabatier in Toulouse, France, in the hydrobiology lab of Eugène Angelier. He explored the Pyrenees and surveyed back-country streams, collecting avidly. After their year in France, Peter returned to Canada to a professorship in the Department of Biological Sciences at the University of Montreal. Peter held that position from 1972 until his early retirement in 2004, when he devoted himself to the care of Françoise who had fallen ill and subsequently died of a degenerative form of Parkinson's disease.

At the University of Montreal, Peter's teaching load was composed of undergraduate-level courses including entomology, introductory ecology, the history of biology, and bio-ethics. He had a phenomenal memory and knowledge that extended well beyond biology. He taught for hours without notes, his lectures were full of historical, philosophical, and other anecdotes, and his former students still comment on his impressive erudition. He had a way of sparking student interest, for example by introducing higher Diptera as "shit-lovers".

Throughout his career, Peter took on various administrative tasks. He was the director of the Saint-Hippolyte research station from 1975 to 1986. During these years, he spent his summers in

a nearby chalet and, net in hand, surveyed the terrain of the station and its environs. Emergence traps were installed on its lakes and streams from May through October every year. Impressive inventory series were collected and analysed, provisioning multiple student theses, dissertations, and publications. Peter was also the curator of the Ouellet-Robert Entomological Collection and its aquatic insect collections grew considerably during his tenure.

Every year, Peter collected insects across the territory of Quebec and eastern Canada. These days were overfilled and those who accompanied him knew what to expect: cover great distances, collect as much as possible to make the travel worthwhile, and stop at villages along the road to discover the region, its history, its culture, and the local food. The abundant identified material, now integrated into the Ouellet-Robert Collection, makes first class our knowledge of the aquatic insects of Quebec and the Maritimes. Peter's almost 100 publications mostly covered the ecology and taxonomy of stoneflies, mayflies, caddisflies, and aquatic Diptera. His last scientific publication was with Ed Masteller on empidids in Puerto Rico.

His scholarly interests went beyond biology; Peter earned a bachelor's degree in theology at McGill University (1998-1993) and later focused on eastern Orthodox theology, earning a certificate (1998-2003) and then a master's degree (2003-2013) from Sherbrooke University. During the 1970s, Peter joined the "Red Roof Church" community at Saint John the Evangelist. He was an active member and remained strongly attached to this particular and unique downtown Montreal Anglican high church. He penned a number of documents about its history, its architecture, and its succession of priests. He loved everything about the site and its people, and he led guided tours of the church and its cemetery in order to pass on his love of this special place. A great traveler devoted to his faith and a lover of history, Peter visited many countries on several continents, never forgetting to stop at places of worship. As Françoise's illness began to keep him more at home, he began genealogical research on the Harper and Soucy (maternal) families. He found long-lost cousins and made fun discoveries about his family's past.

From his marriage to Françoise was born Catherine, for whom his devotion was limitless. She had two sons that were the pride and joy of their grandfather. Peter loved recounting stories about his daughter, son-in-law, and grandsons. Always interested in history, people, and places, Peter wrote his memoirs during his last year in order to pass on the family history.

Written by Louise Cloutier, translated and edited by Colin Favret, University of Montreal.

Note de l'éditeur : Le texte français pour cet hommage est apparu dans *Antennae*: le bulletin de la Société d'entomologie du Québec, Volume 26, numéro 3 (automne 2019).

Books available for review / Livres disponibles pour critique

The ESC frequently receives unsolicited books for review. A list of these books is available online (http://esc-sec.ca/publications/bulletin/#toggle-id-2) and is updated as new books are received.

If you wish to review one of these books, please send an email to the Chair of the Publications Committee (Deepa Pureswaran, deepa.pureswaran@canada.ca).

You should briefly indicate your qualifications to review the topic of the book, and be able to complete your review within 8 weeks.

Preference will be given to ESC members.

Guidelines

Book reviews should be approximately 800-1200 words in length. They should clearly identify the topic of the book and how well the book meets its stated objective. Weaknesses and strengths of the book should be described.

Formatting of the review should follow that of reviews in recent issues of the Bulletin. A scan of the book cover (jpeg or tiff format, about 500 kb) should be submitted with the review.

La SEC reçoit fréquemment des livres non demandés pour des critiques. Une liste de ces livres est disponible en ligne (http://esc-sec.ca/publications/bulletin/#toggle-id-2) et est mise à jour lorsque de nouveaux livres sont reçus.

Si vous souhaitez critiquer un de ces livres, veuillez envoyer un message au président du comité des publications (Deepa Pureswaran, deepa.pureswaran@canada.ca)).

Vous devez brièvement indiquer vos qualifications pour critiquer le sujet du livre, et être en mesure de terminer votre critique en 8 semaines.

La préférence est donnée aux membres de la SEC.

Lignes directrices

Les critiques de livre doivent compter entre 800 et 1200 mots. Elles doivent clairement identifier le sujet du livre et si le livre rencontre bien les objectifs énoncés. Les forces et faiblesses du livre devraient être décrites.

Le format des textes doit suivre celui des critiques des récents numéros du Bulletin. Une version numérisée de la couverture du livre (en format jpeg ou tiff, environ 500 kb) devra être soumise avec la critique.

Currently available for review / Disponibles pour critique

Curtain, C.G. & T.F.H. Allen [Eds.]. 2018. Complex Ecology: Foundational Perspectives on Dynamic Approaches to Ecology and Conservation. Cambridge University Press. ISBN: 9781108235754 [paperback].

Dale, M.R.T. 2017. Applying Graph Theory in Ecological Research. Cambridge University Press. ISBN: 9781316105450 [paperback].

Danks, H.V. 2017. The Biological Survey of Canada: A Personal History. Biological Survey of Canada. ISBN: 978-0-9689321-9-3 [e-book].

Eiseman, C. 2019. Leafminers of North America. [e-book].

Forman, R.T.T. 2019. Towns, Ecology and the Land. Cambridge University Press. ISBN 978-1-316-64860-5 [paperback].

Frank, B., J.A. Klikman and S. Marchini. 2019. Human-wildlife interactions. Turning conflict into coexistence. Cambridge University Press. ISBN: 978-1-108-40258-3 [paperback].

Gibson, D.J. and J.A. Newman [Eds.]. 2019. Grasslands and Climate Change. Ecological Reviews. Cambridge University Press. ISBN 978-1-316-64677-9 [paperback].

Kaufman, A.B., M.J. Bashaw and T.L. Maple [Eds.]. 2019. Scientific Foundations of Zoos and Aquariums: Their Role in Conservation and Research. Cambridge University Press. ISBN 978-1-316-64865-0 [paperback].

Leidner, A.K. and G.M. Buchanan [Eds]. 2018. Satellite Remote Sensing for Conservation Action: Case Studies from Aquatic and Terrestrial Ecosystems. Cambridge University Press. ISBN 978-1-10845670-8 [paperback].

Pettorelli, N., S.M. Durant and J.T. du Toit [Eds.]. 2019. Rewilding. Cambridge University Press. ISBN 978-1-108-46012-5 [paperback].

Pohl, G.R. et al. 2018. Annotated Checklist of the Moths and Butterflies (Lepidoptera) of Canada and Alaska. Pensoft *Series Faunistica* No 118. ISBN 978-954-642-909-4 [e-book].

Saguez, J. 2017. Guide d'identification des vers fil-de-fer dans les grandes cultures au Québec. Centre de recherche sur les grains. ISBN: 978-2-9813604-5-8 [e-book].

Skevington, J., M.M. Locke, A.D. Young, K. Moran, W.J. Crins and S.A. Marshall. 2019. Field Guide to the Flower Flies of Northeastern North America. Princeton University Press. ISBN 978-0-691-18940-6 [paperback].

Volis, S. 2019. Plant Conservation: The Role of Habitat Restoration. Cambridge University Press. ISBN 978-1-108-72733-4 [paperback].

Highlights of Recent Board of Directors Meetings

The Board of Directors met twice at the time of the Joint Annual Meeting in Fredericton. The outgoing Board met for the last time on 18 August 2019, and highlights of that meeting are given below. The incoming Board met briefly on 20 August 2019 to approve appointments of officers, trustees and committee chairs for the 2019–2020 society year.

Financial matters

The Board approved the ESC's draft financial statements for 2018–2019. The ESC's Treasurer, Joel Kits, explained that revenues were higher than budgeted, and expenditures were somewhat lower; however, investments had not performed well during the year. It was pointed out that the 2018–19 levels of income from Cambridge University Press (CUP) would not persist: ESC had received a signing bonus from CUP for renewing the contract for CUP to publish *The Canadian Entomologist*, and the sales from digital archives of the journal are expected to decline as the market becomes saturated. Without these two sources of income the current revenue to ESC from publishing *The Canadian Entomologist* is approximately equal to the cost of publishing it and distributing it to members. Although the ESC's financial statements had been received in time for the Board to review them, legal requirements dictated that they could not be considered at the Annual Meeting of Members on 20 August 2019. They would be considered at a Special Members' Meeting conducted by teleconference in October. The Board also received, for information, the 2018–2019 financial statements for the ESC Scholarship Fund.

The Treasurer noted that membership dues and other fees charged by the Society had last increased in 2017, and that any increases approved by the Board would not take effect until 2021, an interval during which cumulative inflation is expected to be 8%. The Board approved proposals to increase membership rates by approximately 7.1% and to increase the charge for print access to *The Canadian Entomologist* to cover increased charges for print access levied by CUP. It was agreed that henceforth, membership rates and fees should be reviewed every two years.

President Kevin Floate reported that he will be working on two policies with financial implications. One of the reasons for the unanticipated higher revenues in 2018–2019 was the 2018 Joint Meeting with the Entomological Societies of America and British Columbia, which had drawn record attendance and generated a substantial surplus. It was felt that all the affiliated Canadian entomological societies should receive some share of large meeting surpluses, when these result from meetings with other societies. So a policy is being developed to achieve this. Secondly, ESC has been receiving requests for it to make donations to meetings and other entomological activities, and a policy is needed to deal with these requests in an objective and consistent way.

Joint Annual Meetings

The Board received reports on Joint Annual Meetings from 2019–2023. President Floate updated the Board on organization of the 2019 meeting, and indicated that a post-meeting survey would be distributed to all ESC members immediately after the meeting. Haley Catton, General Chair of the 2020 Joint Annual Meeting, reported that the meeting would take place 18–21 October 2020 in Calgary, that the venue had been finalized, and that the Local Organizing Committee was turning its attention to the program, which was expected to be similar in form to that of the 2017 meeting. No report was received on the 2021 Joint Annual Meeting, which is to be co-hosted with the Entomological Society of Ontario, probably in the region of Niagara Falls. The Entomological Societies of America and of British Columbia have formalized their agreement to meet together in Vancouver in 2022, but no further planning has occurred. The Board voted to accept an invitation from the Entomological Society of Saskatchewan to meet with that society for the 2023 Joint Annual Meeting.

President Floate reported on the implementation of the Meeting Code of Conduct for the 2019 Joint Annual Meeting between ESC, the Canadian Society for Ecology and Evolution, and the Acadian Entomological Society. This Code had been agreed to by the three participant societies, each of which had nominated a member for the Assessment Committee, which is charged with examining any complaints received. ESC is developing its own Meeting Code of Conduct to apply to all future Joint Annual Meetings co-hosted between ESC and an affiliated regional entomological society. In addition to the Code itself, which the Board has already approved in principle, an implementation document is under development, and the two will be included in the revised *Guidelines for the Organization of the Annual Meeting of The Entomological Society of Canada.* The *Guidelines* document was most recently revised in 2013, and is greatly out-of-date. Suzanne Blatt, ESC director-at-large, is leading the team that is revising this document, and which is expected to be very active in fall 2019.The Board directed that the revised *Guidelines* document include recommendations to reduce the environmental impact of Joint Annual Meetings.

Relations with Amateur Entomologists

The Entomology Enthusiast membership category is designed to provide affordable access to ESC membership benefits for amateur entomologists. The Board noted that memberships in the new category had first become available for purchase (for the 2020 membership year) at the Fredericton meeting. The Board responded to a recommendation from the ESC Membership Committee to devise a plan for bringing this category to the attention of amateur entomologists. An announcement is being drafted, and would be distributed through the ESC website and ESC's social media, as well as through the networks of the regional entomological societies.

The Board also approved a change to the Committee Guidelines for the Regional Affairs Subcommittee of the Public Education Committee. The change identifies the regional society-appointed members of that Subcommittee as being responsible for reaching out to amateur entomologists within their region and promoting ESC membership opportunities for amateurs.

Other matters

The Board received the information that the contract for association management services with Strauss event & association management had been renewed for four years, beginning 1 October 2019. Also, that the workload of the Chair of Student Awards Committee would be reduced by having Strauss' staff receive and organize applications and letters of support for scholarships and other student awards.

The Board discussed the future of the "Canada's Coolest/Cruelest insects" initiative, which was generally agreed to be a good idea, but for which only one submission has been received. It was pointed out that items written for this blog feature would also be published in the *Bulletin*, and would likely receive many more "reads" than a refereed scientific publication. Members are encouraged to consider writing an item for Canada's Coolest/Cruelest insects and submitting it to the ESC's social media coordinators.

The Board approved a change in the portion of the Committee Guidelines that contains the rules of Public Education Grants to clarify that references to "year" and "annual" pertain to the ESC's financial year, which is 1 July–30 June.

The Board provided suggestions to the ESC Science Policy Committee for topics that the Committee could consider for activity. The Board approved recommendations from the ESC Publications Committee to change wording on the html and pdf versions of future articles published in the *Canadian Journal of Arthropod Identification* to recognize the support of the journal by ESC. The meeting concluded with a roundtable in which Board members put forth their views on the challenges and opportunities faced by ESC.

69th Annual Meeting of Members

Barkers Point A, Fredericton Convention Centre, Fredericton, New Brunswick
20 August 2019, 1:30 pm

MINUTES

1. Call to Order
The meeting was called to order at 1:30 PM by President Kevin Floate, with 44 members present.

2. Notice of Meeting
Notice of the meeting was sent to all members by email on 17 July 2019, and was published in the March and June 2019 issues of the *Bulletin*.

3. Additions to and approval of the Agenda
Motion: that the agenda be approved as circulated.
Moved by Pat Mackay, seconded by Cedric Gillott. **Carried**

4. Minutes of the 68th Annual Meeting of Members
The minutes of the 68th Annual Meeting of Members were published in the March 2018 issue of the *Bulletin*.
Motion: that the minutes of the 68th Annual Meeting of Members be approved as distributed.
Moved by Neil Holliday, seconded by Jon Sweeney. **Carried**

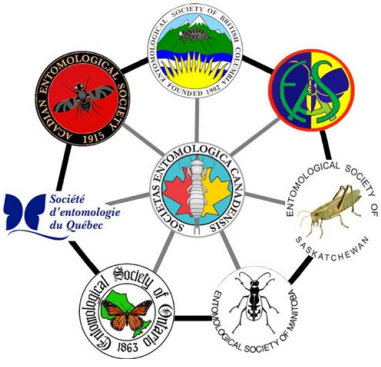
5. Commemoration of deceased members of the entomological community
The secretary reported the passing of fourteen entomologists since the previous Annual Meeting of Members: George Eugene Ball (Edmonton, AB), Peter Belton (Burnaby, BC), Georges Brossard (Montreal, PQ), Jordon Burke (Vancouver, BC), Hugh Clifford (Calgary, AB), Jim Corrigan (Blackville, NB), Charles Harvey Craig (Saskatoon, SK), William G. ("Bill") Friend (Toronto, ON), Peter (Pierre-Paul) Harper (Montreal, PQ), Walter Krivda (The Pas, MB), Norman MacLeod (Saskatoon, SK), Maurice D. ("Jinx") Proverbs (Summerland, BC), Lloyd Sippell (Sault Ste. Marie, ON), and Jerry Wyatt (Kingston, ON).
A moment of silence was observed in memory of these deceased entomologists.

6. Report from the Board of Directors
President Kevin Floate presented the report. He indicated that the ESC continues to be a strong and vibrant society. ESC membership is up, and the Society remains financially secure. During the 2018–19 society year, noteworthy activities of the Board included:

- Adoption of a *Statement of Diversity and Inclusion* (posted on the ESC website).
- Development of a Joint Annual Meeting Code of Conduct (implemented for the current three-society meeting, and being finalized for future more conventional meetings).
- Institution of the Entomology Enthusiast membership category, memberships for which first went on sale on 19 August 2019.
- Implementation of the first NAtional Insect Appreciation Day (NAIAD), to be held annually on 8 June, a date that should be regarded as a focus day for outreach activities rather than the only date on which NAIAD activities can occur.
- Institution of an option for Legacy Donations to ESC or to the ESC Scholarship Fund.
- Renewal for 4 years of the ESC's contract with Strauss event & association management.
- Preparation of a survey of ESC members regarding the 2019 Joint Annual Meeting.

President Floate listed the activities ESC has undertaken in support of better relations with regional entomological societies:

- Two meetings per year of the ESC Executive Council with regional entomological societies' presidents and regional directors.
- Adoption of an *Entomological Societies of Canada* logo.
- A one-time $1000 grant for public education to each regional entomological societies as well as annual Public Encouragement grants of $200. He noted that these funds were not always utilized.
- Enhanced visibility for regional entomological societies' activities in the *Bulletin*.



President Floate provided information on numbers of members currently and in recent years. He noted that total membership had risen by more than 100 in 2018, the year of the joint meeting with the Entomological Societies of America and British Columbia, and had remained essentially constant in the current year. He drew attention to the success of the auto-renew option, which was first introduced for the 2018 membership year, and which was currently used by 68 members. President Floate outlined the benefits of membership in ESC, and encouraged members to attend the 2020 Joint Annual Meeting, to be held at the Carriage House Hotel, Calgary, Alberta, from 18–21 October.

Membership Category	Current Members		
	2017	2018	2019
Early Professional	27	34	36
Emeritus	59	64	71 (2*)
Honorary Member	4	6	4
Regular	227	281 (51*)	252 (66*)
Student	100	142	169
Grand Total	417	527 (51*)	532 (68*)
* Members using auto-renewal			

President Floate referred members to the Up front columns in the last three issues of the ESC Bulletin for further information about ESC activities. He acknowledged that the success of the Society arose from the many individuals who work without recognition behind the scenes. He thanked the Board of Directors, the Officers, the Representatives and Trustees, the office staff, and the Chairs and members of our 16 committees for their unstinting efforts on behalf of the Society. These individuals are identified on the ESC website. He extended a warm thank-you to the organizers and volunteers of JAM 2019 and encouraged members to do the same. He reserved the majority of his thanks for ESC members. By joining the ESC and renewing their membership, by attending JAMs and contributing to the activities of regional societies, members' collective efforts bode well for the future of entomology in Canada. He thanked the ESC for the privilege of serving as President and asked if there were questions or comments.

Sandy Smith commented that the value of Public Encouragement Grants ($200) has not increased for many years. Perhaps the low value contributes to low uptake, and the board should consider an increase.

Peter Mason asked whether auto-renew members get a normal receipt. It was explained that auto-renewal membership is deducted on about the 31 December of each year, and normal receipts are available by email immediately thereafter.

7. Resolution to approve the actions of the Board
Motion: that all Bylaws, contracts, acts and proceedings of the Board of Directors of the ESC enacted, made, done or taken since 13 November 2018, being the date of the last Annual Meeting of Members, be approved, adopted, ratified, sanctioned and confirmed.
Moved by Kevin Floate, seconded by Catherine Scott. **Carried**

8. Treasurer's Report
8.1 Special Meeting to review Financial Statements for 2018–2019

Treasurer, Joel Kits, reported that, by law, financial statements must be posted no less than 21 days before a Meeting of Members that is asked to approve them. ESC's 2018-2019 financial year ended on 30 June 2019, and the auditor's examination of records was not complete until 9 August. So the Financial Statements cannot be considered by the meeting today. There will be a special Meeting of Members by moderated teleconference beginning at 12:00 noon (Central Daylight Time) on Tuesday, 22 October 2019. Further details will be communicated to members by Email.

8.2 Review Engagement for 2019–2020
Motion: that Bouris, Wilson LLP of Ottawa be appointed as public accountants to ESC and the ESC Scholarship Fund to conduct the review engagement of both sets of financial statements for the 2019–2020 financial year.
Moved by Joel Kits, seconded by Cedric Gillott. **Carried**

9. Increase in membership dues effective 2021
Motion: that membership rates increase by approximately 7.1% effective for the 2021 membership year.
Moved by Joel Kits, seconded by Sean McCann.

In discussion, Joel Kits indicated that membership rates were last increased in 2017, and by the time of the proposed increase takes effect, it is expected that cumulative inflation since the last increase will be about 8%.

Chandra Moffat pointed out that the ESC's Student and Early Professional Affairs Committee had proposed a 50% rate for Early Professionals at the time that this membership category was created, but the rate was set at 75% of the regular membership rate. She asked that the consideration be given to reducing the rate. It was noted that a graduate who is not employed could be a member in the new Entomology Enthusiast category, the rate for which is 50% of regular membership. It is noted that employed post-docs who pay Early Professional rates do not have a large income and that many are post-docs for longer than 3 years. Also, that many student members of ESC do not continue membership after graduation, and that current rates for Early Professionals may be one of the deterrents to their continuation. Cedric Gillott asked whether post-docs are really students, as the University of Saskatchewan includes both graduate students and post-doctoral fellows within its College of Graduate and Postdoctoral Studies. The Board will consider these points during the coming year.

The motion was **carried.**

10. Increase in rates for print access to *The Canadian Entomologist*

Motion: that, effective for the 2021 membership year, the additional charge for print access to *The Canadian Entomologist* be raised from $10.50 to $12.50.

Moved by Joel Kits, seconded: Paul Fields

In discussion, Joel Kits pointed out that the raise was necessary because Cambridge University Press will be charging ESC more for providing a member with print access. A member questioned whether the raise should be greater in anticipation of future increases. Joel responded that increases were infrequent, and so this was not necessary.

The motion was **carried.**

11. Election of Directors

Motion: that the following candidates be elected as Directors

Position	Candidate	Length of term	Year of term completion*
Societal Director (2nd VP)	Felix Sperling	3 years	2022
Director-at-Large	Christine Noronha	3 years	2022
Regional Director, ESAb	Boyd Mori	3 years	2022
Regional Director, ESS	James Tansey	1 year	2020
Regional Director SEQ	Étienne Normandin	3 years	2022
Regional Director, AES	Peggy Dixon	3 years	2022

*Terms end at the time of the Annual Meeting of Members

Moved by Neil Holliday, seconded: Peter Mason

Secretary, Neil Holliday, explained that all director's terms are for 3 years, but that when a director stepped down part way through their term, the remainder of the term was to be filled by a new nominee. Boyd Mori had been Regional Director for ESS, but had obtained a new position in Edmonton. Therefore, Boyd had resigned as Regional Director for ESS but ESA, which needed to nominate someone for a 3-year term, nominated Boyd. James Tansey was nominated by ESS to complete the remaining year of the ESS director's term. Neil noted that all candidates must be present to signify their agreement to be elected, or must submit a written statement of agreement. Boyd and Étienne were not present, but had emailed agreements to stand.

The motion was **carried**.

At this point, Kevin Floate presented the gavel to incoming President Gail Anderson, and the outgoing past-president, Patrice Bouchard, escorted the newly-elected 2nd Vice-President, Felix Sperling, to the podium.

12. Presentation of Service Award

President Gail Anderson presented a service award to Kevin Floate (outgoing President).

13. Resolutions on behalf of the ESC

President Anderson called upon Hugh Danks to present the resolution of thanks on behalf of the ESC:

"Whereas the Entomological Society of Canada has met jointly with the Acadian Entomological Society and the Canadian Society for Ecology and Evolution at the Fredericton Convention Centre, Fredericton, New Brunswick; and
Whereas there has been a full and interesting meeting of lectures, symposia, papers, and posters; and
Whereas the meeting has been planned with care and concern for those attending; and
Whereas there has been ample opportunity for social interaction and visits to Fredericton and surrounding areas;
Be it resolved that the Entomological Society of Canada expresses its sincere thanks to the joint CSEE/AES/ESC conference planning committee for their hard work and skill in arranging a worthwhile and entertaining program; and
Be it further resolved that the Society expresses its thanks to the corporate sponsors that generously donated funds to support activities at the meeting; and
Be it further resolved that the Society expresses its thanks to the Management and Staff of the Fredericton Convention Centre, the conference hotels, and the University of New Brunswick (Conference Services) for their courteous assistance during the Meeting."

The resolution was **carried** by a round of applause.

14. Notice of 70th Annual Meeting of Members

The next Annual Meeting of Members is scheduled to take place on Tuesday 20 October 2020 at the Carriage House Inn, Calgary, Alberta.

15.Adjournment

Motion: that the meeting be adjourned.
Moved by Peggy Dixon, seconded by Neil Holliday. **Carried**
The meeting was adjourned at 2:10 PM.

Special Meeting of Members
By teleconference
22 October 2019
MINUTES

1. Call to Order
ESC President, Gail Anderson, called the meeting to order at 12:01 CDT with 36 members participating.

2. Notice of Meeting
The notice of the meeting was published in the June and September issues of the *Bulletin*, and email notices were sent to all ESC members on 19 September, with two subsequent reminders.

3. Financial Statements for 2018–2019
ESC Treasurer, J. Kits, reported that the financial statements have been posted in the members' area of the ESC website since 18 September 2019. He proposed the motion:
Motion: That the 2018–2019 financial statements for the Entomological Society of Canada be approved.
Moved by Joel Kits, seconded by Neil Holliday.

Joel pointed out that the financial statements had been the subject of a review engagement, rather than a full audit. He noted that in the general operations fund, revenues were somewhat higher than budgeted, expenditures were somewhat lower, and investment income was a little higher than budgeted; the result was an increase in the Society's net assets. He noted that in the statement of financial position on the year-end date of 30 June 2019, both cash assets and accounts payable were unusually large because year-end occurred during the period when annual meeting registration revenues were being received from registrants and being remitted to the meeting account. Finally, he drew attention to unusually large revenues that should not be expected to occur regularly. These were associated with Cambridge University Press providing a signing bonus at the start of the new publication contract for *The Canadian Entomologist*, and a larger that normal surplus from the 2018 annual meeting, which was joint with the Entomological Societies of America and British Columbia and so was a much larger meeting than is typical for ESC.

President Gail Anderson asked whether there were any questions. There were none, and so the question was called.
The motion was **carried** unanimously.

4. Adjournment
Motion: to adjourn
Moved by Gail Anderson, seconded by Neil Holliday.
The meeting adjourned at 12:08 PM CDT.

Call for nominations: Societal Director (Second Vice-President), Director at Large

The Society will hold an online ballot to select candidates for a Societal Director and Director at Large. The selected candidates will then be presented as a slate for formal election by members at the Annual Meeting in Calgary in October. Nominations for these positions must be signed by three active members of the Society and be received by the Secretary of the Entomological Society of Canada, Neil Holliday, by 28 February 2020 (see inside back cover for contact details).

Appel à candidatures : Directeur sociétal (second vice-président), conseiller

La Société tiendra un vote en ligne afin de sélectionner des candidats pour les postes de directeur sociétal et de conseiller. Les candidats sélectionnés seront ensuite présentés à la réunion annuelle à Calgary en octobre pour une élection formelle par les membres. Les nominations pour ces postes doivent être signées par trois membres actifs de la Société et être reçues par le secrétaire de la Société d'entomologie du Canada, Neil Holliday, au plus tard le 28 février 2020 (voir le troisième de couverture pour les informations de contact).

Members' Discounts

Entomological Society of Canada members can enjoy discounts on publications from Annual Reviews, Elsevier, Cambridge University Press, and the Entomological Society of America. Details of how to benefit from these discounts are available on the member's area of the Entomological Society of Canada website at: https://esc-sec.site-ym.com/.

Remise pour les membres

Les membres de la Société d'entomologie du Canada peuvent bénéficier d'une remise lors d'achats de publications de : Annual Reviews, Elsevier, Cambridge University Press et de la Société d'entomologie d'Amérique. Les informations nécessaires pour profiter de ces remises sont disponibles dans la section des membres du site de la Société d'entomologie du Canada à : https://esc-sec.site-ym.com/.

Executive Meeting - Call for Agenda Items

If members have any items they wish to be discussed at the next Board of Directors or Executive Council meeting, please send them to the Secretary, Neil Holliday (see inside back cover for contact details), as soon as possible.

Réunion du conseil exécutif – Points à l'ordre du jour

Si des membres aimeraient ajouter des points à l'ordre du jour pour discussion à la prochaine réunion du Bureau des directeurs ou du Conseil de l'exécutif, merci de les envoyer au secrétaire, Neil Holliday (voir le troisième de couverture pour les informations de contact), le plus tôt

ESC Annual Photo Contest Winners

The ESC Publications Committee is pleased to announce the winners of the 2019 ESC photo contest and thanks the entrants for their participation. The winning photos will be enjoyed by ESC members throughout 2020 as they will be used to decorate the covers of our publications, *The Canadian Entomologist* and *Bulletin*.

The top entries are:

1st Place Bob Lalonde: A cicada (*Platypedia* sp.) expands its wings and sclerotizes.
2nd Place Tim Haye: Egg parasitoid *Telenomus* sp. emerging from stink bug eggs (Delémont, Switzerland).
3rd Place Marilyn Light: *Paralobesia marilynae* (Lepidoptera: Tortricidae) egg hatching 6 days after oviposition on a showy lady's slipper orchid (Gatineau Park, Quebec, Canada).

Entomologist in Action: Jayme Lewthwaite: A mormon metalmark (*Apodemia mormo*) individual caught in the wild in Keremeos, British Columbia, part of a captive breeding experiment to help bolster populations of this endangered species.

Honourable Mentions:
Andrea Brauner: Praying mantis having a snack (Summerland, British Columbia).
Emily Hanuschuk: A tagged two-spotted bumblebee queen (Winnipeg, Manitoba).
Debra Wertman: A rugose stag beetle from Victoria, British Columbia.
John Gavloski: A cluster of Asian ladybeetles in Carman, Manitoba.

Thank you to Amanda Roe for organizing this year's successful competition and to the judges who helped to select the winners among the many excellent photographs that were entered. Don't forget to keep taking high quality pictures of arthropods and entomology-related activities for next year's competition!

Deepa Pureswaran
Chair, Publications Committee

Seeking next ESC Treasurer / À la recherche du prochain trésorier de la SEC

The Entomological Society of Canada is looking to fill the position of Treasurer, beginning in autumn 2020. Please note that the Treasurer is considered an officer of the Society and is expected to attend the annual meeting of the Governing Board. The Treasurer's cost of attending this meeting is covered by ESC in the event the Treasurer does not have funding from another source for such expenses.

The duties include, but are not limited to, custody of the Society's funds, reporting on the finances of the Society when required, submitting a budget to the June Board meeting, submitting an audited financial statement at the end of each financial year to the membership by posting it in the members' area of the Society's website, overseeing the day-to-day business operations of the ESC, and serving as an ex officio member of several committees. Previous experience with financial reporting and/or accounting would be an advantage, as is a general knowledge of the affairs of the Society. Please express your interest in the position to the President, Gail Anderson, by 15 May 2020 (ESCPresident@esc-sec.ca). The final selection will be made by an ad hoc committee convened by the President.

La Société d'entomologie du Canada cherche à combler le poste de trésorier, à compter de l'automne 2020. Veuillez noter que le trésorier est considéré comme un dirigeant de la Société et doit assister à la réunion annuelle du conseil d'administration. Les coûts d'assister à la réunion pour le trésorier est couvert par la SEC dans le cas où le trésorier n'a pas de fonds d'une autre source pour ces dépenses.

Les tâches incluent, mais ne se limitent pas à la garde des fonds de la Société, produire des rapports sur les finances de la Société lorsque requis, soumettre un budget à la réunion du CA de juin, soumettre un état financier vérifié aux membres à la fin de chaque année financière en l'affichant dans la section des membres de la Société sur le site web, superviser les opérations d'affaires de la SEC au jour le jour, et servir comme membre ex officio de plusieurs comités. Une expérience passée dans la production de rapports financiers et/ou en comptabilité serait un avantage, ainsi qu'une connaissance générale des affaires de la Société. Merci de manifester votre intérêt pour ce poste auprès du Président, Gail Anderson, d'ici le 15 mai 2020 (ESCPresident@esc-sec.ca). La sélection finale sera faite par un comité ad hoc convoqué par le Président.

Call for Nominees: ESC Achievement Awards

Do you know a well-respected entomologist who deserves recognition because of their outstanding contributions to their science in Canada? Is this person a leader in their field due to successes in publishing, patenting, editorial work and/or grant acquisition, in the teaching and mentoring of students, or through active volunteer involvement in the ESC and other societies/organizations? If yes, consider nominating them for one of our Society's Achievement Awards. Do not hesitate to contact the Chair of the Achievement Awards Committee, Bill Riel (bill.riel@canada.ca), if you have any questions about eligibility or the nomination process.

Gold Medal and C. Gordon Hewitt Award

Both awards are for outstanding entomological contributions in Canada by an individual, but the nominees for the C. Gordon Hewitt Award must have successfully defended their doctoral thesis in the 12 years ending on December 31 of the year in which the Award is received. Parental, compassionate or medical leave is not counted as part of the 12-year period; however, such periods must be identified in the letter from the nominator.

Nominations can only be made by members of the ESC, and signed by the nominator and by at least one seconder (also to be a member of the ESC). Verified communication from a recognized email address will be accepted in lieu of a signature. Nominators should include the following information for both awards: 1. The name and address of the nominee(s); 2. A statement of relevant achievements (3–5 pages) which may include, but is not limited to, the following: outline of research areas, particularly major contributions; number of articles in refereed journals, books, book chapters, patents; editorial activities; teaching history, numbers of graduate students, teaching

Appel à candidature: Prix d'excellence de la SEC

Connaissez-vous un entomologiste respecté qui mérite une reconnaissance pour ses contributions remarquables à sa science au Canada? Cette personne est-elle leader dans son champ d'étude par ses succès en publication, brevets, travail éditorial et/ ou obtention de subventions, enseignement, mentorat d'étudiants, ou par son implication bénévole auprès de la SEC et d'autres sociétés/ organisations? Si oui, veuillez considérer de nominer cette personne pour un des prix d'excellence de notre Société. N'hésitez pas à contacter le président du comité des prix d'excellence, Bill Riel (bill.riel@canada.ca) si vous avez des questions sur l'éligibilité ou le processus de nomination.

Médaille d'or et prix C. Gordon Hewitt

Les deux prix sont pour des contributions entomologiques exceptionnelles au Canada par un individu, mais les candidats pour le prix C. Gordon Hewitt doivent avoir soutenu avec succès leur thèse de doctorat dans les 12 dernières années au 31 décembre de l'année de remise du prix. Les congés parentaux, de soignant ou de maladie ne comptent pas dans la période de 12 ans : ces périodes doivent cependant être identifiées dans la lettre de présentation.

Les candidatures doivent être soumises par des membres de la SEC, et doivent être signées par la personne qui soumet la candidature et par au moins une personne qui l'appuie (également membre de la SEC). Une communication vérifiée par une adresse courriel reconnue sera acceptée comme signature. Les candidatures doivent inclure les informations suivantes pour les deux prix : 1. Le nom et l'adresse du candidat; 2. Un énoncé des accomplissements pertinents (3-5 pages) qui peuvent inclure, mais ne se limitent pas à : le domaine de recherche et particulièrement les contributions majeures; le nombre d'articles dans des revues avec évaluation par les pairs,

awards; value of grants; involvement in ESC; active involvement and/or memberships in other Societies; entomological extension/ community involvement; organizing of symposia or meetings; 3. A current curriculum vitae; and 4. The name of the nominator and at least one seconder. The documentation should stress the particular achievement or achievements to be considered and not merely the general competences of the nominee. Other seconders may merely state their support, without documentation, in a letter of endorsement of the nomination. The Committee will not prepare the documentation nor conduct research connected with it. Please send nominations by e-mail to the Chair of the Achievement Awards Committee, Bill Riel (bill.riel@canada.ca), no later than **28 February 2020**.

Honorary Members of the Entomological Society of Canada

An Honorary Member is deemed to have made an outstanding contribution to the advancement of entomology, and may be an Active Member or former Active Member of the Society at the time of nomination.

Collectively, Honorary Members are not to comprise more than 10 members or 1% of the active membership of the Society. Nominations should be supported by at least five members of the Society, and are to be sent by e-mail to the Chair of the Achievement Awards Committee, Bill Riel (bill.riel@canada.ca) no later than **28 February 2020**.

Fellows of the Entomological Society of Canada

Fellows are deemed to have made a major contribution to entomology, and are to be Active Members of the Society at the time of nomination. Their contribution may be in

livres, chapitres de livres, brevets; activités éditoriales; historique d'enseignement, nombre d'étudiants gradués, prix d'enseignement; valeur des subventions; implication au sein de la SEC; implication active et/ou adhésion à d'autres Sociétés; implication dans la communauté entomologique et vulgarisation; organisation de symposiums ou de réunions; 3. Un curriculum vitae à jour; et 4. Le nom de la personne qui soumet la nomination et au moins une personne qui l'appuie. La documentation devrait mettre en évidence le ou les accomplissements particuliers à considérer, et pas seulement les compétences générales du nominé. D'autres personnes peuvent aussi manifester leur appui, sans documentation, dans une lettre de soutien de la nomination. Le comité ne préparera aucune documentation et ne fera aucune recherche en lien avec la nomination. Merci d'envoyer vos nominations par courriel au président du comité des prix d'excellence, Bill Riel (bill.riel@canada.ca), au plus tard le **28 février 2020**.

Membres honoraires de la Société d'entomologie du Canada

Un membre honoraire est considéré comme ayant apporté des contributions remarquables à l'avancement de l'entomologie et peut être ***un membre actif ou un ancien membre de la Société au moment de la nomination.***

Collectivement, les membres honoraires ne peuvent pas totaliser plus de 10 membres ou 1% des membres actifs de la Société. Les nomination doivent être appuyées par au moins cinq membres de la Société, et doivent être envoyées par courriel au président du comité des prix d'excellence, Bill Riel (bill.riel@canada.ca), au plus tard le **28 février 2020**.

Fiduciaires de la Société d'entomologie du Canada

Les fiduciaires sont considérés comment ayant apporté une contribution majeure à l'entomologie et doivent être des membres actifs de la Société au moment de la

any area (e.g., research, teaching, application or administration), and may be judged on the basis of contribution to and stimulation of the work of others, as well as by direct personal effort.

Collectively, Fellows may not comprise more than 10% of the active membership of the Society. Nominations should be supported by at least four members of the Society, and are to be sent by e-mail to the Chair of the Achievement Awards Committee, Bill Riel (bill.riel@canada.ca), no later than **28 February 2020**.

Wanted: Applicants for the Bert & John Carr Award

The Bert and John Carr Award was created in 2010 (see ESC *Bulletin*, June 2010 [p.102] or September 2010 [p. 170]) to support research activities by individuals who study insect faunistics, or the natural history and taxonomy of Canada's insect fauna. Preference is given to applications by amateurs, but those by students and others will be considered. Applications should consist of: 1. The name and address of the applicant; 2. A statement of the research activity to be undertaken, including a cost estimate of up to $1000; and 3. A current curriculum vitae. Applications are to be sent by e-mail to the Chair of the Achievement Awards Committee, Bill Riel (bill.riel@canada.ca) no later than **28 February 2020**.

nomination. Leur contribution peut se situer dans n'importe quel domaine (p.ex. recherche, enseignement, application ou administration), et ils seront jugés selon leur contribution et la stimulation du travail des autres, ainsi que par leurs efforts personnels.

Collectivement, les fiduciaires ne peuvent pas totaliser plus de 10% des membres actifs de la Société. Les nominations doivent être appuyées par au moins quatre membres de la Société, et doivent être envoyées par courriel au président du comité des prix d'excellence, Bill Riel (bill.riel@canada.ca), au plus tard le **28 février 2020**.

Recherchés : Candidats pour le prix Bert & John Carr

Le prix Bert et John Carr a été créé en 2010 (voir le *bulletin* de la SEC, juin 2010 [p.102] ou septembre 2010 [p.170]) afin de soutenir des activités de recherche par des individus qui étudient la faunistique des insectes ou l'histoire naturelle et la taxonomie de la faune entomologique du Canada. La préférence sera donnée aux candidatures provenant d'amateurs, mais les candidatures d'étudiants ou d'autres individus seront considérées. Les candidatures devront inclure : 1. Le nom et l'adresse du candidat; 2. Un énoncé sur les activités de recherche qui seront entreprises par le candidat, incluant le coût estimé jusqu'à 1000$; et 3. Un curriculum vitae à jour. Les candidatures doivent être envoyées par courriel au président du comité des prix d'excellence, Bill Riel (bill.riel@canada.ca), au plus tard le **28 février 2020**.

Second Virtual Symposium of the Entomological Society of America–International Branch / Second symposium virtuel de l'Entomological Society of America – International Branch

Organized by the International Branch of the Entomological Society of America (ESA), the Second Virtual Symposium was held from 8 to 10 April 2019. The objective of this event was to foster interactions among entomologists of the world at a low cost. In 2019, the event featured three themes: *Plant-Insect Interactions*, *Medical Entomology* and *Biological Control*. The themes were delivered according to two formats: three pre-recorded videos (by invitation) per theme or virtual posters. In both formats, interactions were allowed between participants by email or twitter (#ibranch19). Presenters of posters paid only $25, while participants could freely view the videos or the virtual posters (ESA and non-ESA members alike).

Julien Saguez and Charles Vincent organized the *Plant-Insect Interactions* section which occurred on Monday 8 April 2019. Video presentations were made by Elaine Backus (on electropenetrography [EPG], 607 views), Paul André Calatayud (on impact of climate change, 530 views) and Chris Jeffrey (on chemical ecology, 531 views). Twenty five virtual posters were presented in this section, which amounted to half of the posters presented during the Symposium. The participants were from 24 countries, the 5 most important being USA (147), Canada (22), India (7), Australia (6) and China (5).

Thanks to those who submitted posters and participated to this event.

If you missed this event and would like to view presentations, visit the web site (https://www.entsoc.org/international/2019-virtual-symposium) and click on the *Virtual Symposium Program.*

You are welcome to participate in the third edition of the virtual Symposium, which is planned for April 2020. Organizers must be ESA members; however, it is not necessary to be an ESA member to present a poster or participate in the Symposium.

Organisé par l'*International Branch* de l'*Entomological Society of America* (ESA), le second symposium virtuel a eu lieu du 8 au 10 avril 2019. Cet événement a pour objectif de permettre des interactions entre les entomologistes du monde entier et ce, à moindre coût. En 2019, il offrait trois thèmes, à savoir *les interactions plantes-insectes*, *l'entomologie médicale*, et *la lutte biologique*, lesquels étaient livrés selon deux formats, soit trois présentations vidéos sur invitation préenregistrées par thème, et des affiches virtuelles. Quel que soit le format des présentations, les interactions entre les présentateurs et les participants étaient possibles par courriel ou via Twitter (#ibranch19). Les présentateurs d'affiches devaient débourser uniquement 25$, alors que l'évènement était gratuit pour toute personne s'étant inscrite pour visualiser les vidéos et les affiches (incluant les non-membres de l'ESA).

Julien Saguez et Charles Vincent ont organisé la section *Interactions plantes-insectes* qui s'est déroulée le lundi 8 avril 2019. Les présentations vidéos de ce thème ont été faites par Elaine Backus (sur l'électropénétrographie [EPG], 607 visionnements), Paul André Calatayud (sur l'impact des changements climatiques, 530 visionnements) et Chris Jeffrey (sur l'écologie chimique, 531 visionnements). Il y a également eu 25 affiches qui ont été présentées dans cette section, ce qui constituait environ la moitié des affiches présentées durant le symposium complet. Les participants provenaient de 24 pays dont les 5 plus importants étaient les É.-U. (147), le Canada (22), l'Inde (7), l'Australie (6) et la Chine (5).

Merci à celles et ceux qui ont soumis des affiches et qui ont participé à cet évènement!

Si vous avez manqué cet évènement et que vous souhaitez visualiser les présentations qui ont été données, il est toujours possible de le faire en vous connectant sur le site Web de l'évènement (https://www.entsoc.org/international/2019-virtual-symposium) et en cliquant ensuite sur *Virtual Symposium Program*.

Une troisième édition est prévue en avril 2020 et vous êtes les bienvenus pour y participer. Les organisateurs doivent être membres de la ESA, mais il n'est pas nécessaire d'être membre de la ESA pour présenter une affiche ou participer à ce symposium.

Julien Saguez and / et Charles Vincent

List of Contents: Regional Journals / Table des matières : Revues des sociétés régionales

Contents of regional society journals

This regular feature highlights research published in the five regional society journals that include peer-reviewed papers. It should be noted that some regional society journals are not published on a regular basis and may not always include peer-reviewed articles.

Contenu des revues des sociétés régionales

Cette rubrique régulière met en lumière la recherche publiée dans les cinq revues des sociétés régionales qui incluent des articles révisés par les pairs. Veuillez noter que certaines revues des sociétés régionales ne sont pas publiées sur une base régulière et peuvent ne pas toujours inclure des articles évalués par les pairs.

Proceedings of the Entomological Society of Manitoba, Volume 74, 2018

First records of the brown marmorated stink bug, *Halyomorpha halys* (Stål) in Manitoba (Hemiptera: Pentatomidae). Jason Gibbs and Christopher G. Ratzlaff. pp. 5-9

Journal of the Acadian Entomological Society

(JAES may be viewed at https://www.acadianes.ca/journal.php)

Vol. 15 (published on various dates)

Occurrence of leek moth in Nova Scotia. Suzanne Blatt, Matt Peill and Rosalie Gillis-Madden, 24-26, August 2019. Full Text

FlySpotter: using citizen science to identify range expansion and fruit at risk from *Drosophila suzukii* in Nova Scotia and Newfoundland and Labrador. Catherine M. Little, Emma Rand, Megan MacIsaac, Lise Charbonneau, and N. Kirk Hillier, 27-39, September 2019. Full Text

Canadian Weed Science Society
Société canadienne de malherbologie

CWSS-SCM Newsletter

The Society has recently adopted a new style for its newsletter so that there is no longer a Table of Contents. To see what's new in Canadian weed science, go to:

https://weedscience.ca/wp-content/uploads/2019/11/october-2019.pdf

https://weedscience.ca/wp-content/uploads/2019/11/november-2019.pdf

Meeting announcements / Réunions futures

24th Biannual International Plant Resistance to Insects Symposium
Texcoco, Mexico, 2–4 March 2020
https://ipri24.cimmyt.org/

Entomological Society of America International Branch: Third Virtual Symposium
27–29 April 2020
https://www.entsoc.org/event-calendar/international-branch-2020-virtual-symposium

26th International Congress of Entomology (Entomology for our planet)
Helsinki, Finland, 19–24 July 2020
http://www.ice2020helsinki.fi/

Society for Invertebrate Pathology Annual Meeting
Merida, Mexico, 2–6 August 2020
(no website to date)

Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Alberta
Calgary, 18–21 October 2020
https://jam2020.ualberta.ca/

Entomological Society of America Annual Meeting
Orlando, Florida, 15–18 November 2020
https://www.entsoc.org/event-calendar/entomology-2020

10th International IPM Symposium: Implementing IPM across Borders and Disciplines
Denver, 15-18 March 2021
https://ipmsymposium.org/2021/index.html

Readers are invited to send the Editor notices of entomological meetings of international, national or Canadian regional interest for inclusion in this list.

Les lecteurs sont invités à envoyer au rédacteur en chef des annonces de réunions entomologiques internationales, nationales ou régionales intéressantes afin de les inclure dans cette liste.

Bulletin of the Entomological Society of Canada

Editor: Cedric Gillott
Assistant Editor: Donna Giberson

The *Bulletin of the Entomological Society of Canada*, published since 1969, presents quarterly entomological news, opportunities and information, details of Society business, matters of wider scientific importance and book reviews.

Published by the
Entomological Society of Canada
386 Broadway, Suite 503
Winnipeg, Manitoba R3C 3R6
E-mail: info@esc-sec.ca
www.esc-sec.ca/

The Entomological Society of Canada was founded in 1863 primarily to study, advance and promote entomology. It supports entomology through publications, meetings, advocacy and other activities.

Send correspondence to:
Cedric Gillott
Bulletin Editor
Department of Biology
University of Saskatchewan
112 Science Place, SK S7N 5E2
Telephone: (306) 966-4401
Fax: (306) 966-4461
E-mail: cedric.gillott@usask.ca

ISSN: 0071-0741

Submission deadline for the next issue: 31 January 2020

Bulletin de la Société d'entomologie du Canada

Rédacteur: Cedric Gillott
Rédactrice adjointe: Donna Giberson

Le *Bulletin de la Société d'entomologie du Canada*, publié depuis 1969, présente trimestriellement des informations entomologiques, des occasions, des renseignements sur les opérations de la Société, des dossiers scientifiques d'importance et des analyses d'ouvrages.

Publié par la
Société d'entomologie du Canada
386 Broadway, Suite 503
Winnipeg, Manitoba R3C 3R6
E-mail: info@esc-sec.ca
www.esc-sec.ca/

La Société d'entomologie du Canada a été établie en 1863 principalement pour promouvoir l'étude et l'avancement de l'entomologie. Elle soutient l'entomologie par l'entremise de publications, de réunions et d'autres activités.

Envoyer vos soumissions à:
Cedric Gillott
Rédacteur du *Bulletin*
Department of Biology
University of Saskatchewan
112 Science Place, SK S7N 5E2
Telephone: (306) 966-4401
Fax: (306) 966-4461
courriel : cedric.gillott@usask.ca

ISSN: 0071-0741

Date de tombée pour le prochain numéro: 31 janvier 2020

Officers of affiliated Societies, 2019-2020
Dirigeants des Sociétés associées, 2019-2020

Entomological Society of British Columbia

President	Tammy McMullan
1st Vice President:	Wim Van Herk
2nd Vice President:	Chandra Moffat
Past President	Lisa Poirier
Treasurer	Ward Strong
Editor (Journal)	Kathy Bleiker
Editor (Boreus)	Gabriella Zilahi-Balogh
Webmaster	Brian Muselle
Secretary	Tracy Hueppelsheuser

B.C. Ministry of Agriculture
1767 Angus Campbell Road, A
Abbotsford, BC, V3G 2M3
Tel: (604) 556-3031
E-mail: Tracy.Hueppelsheuser@gov.bc.ca
http://entsocbc.ca

Entomological Society of Alberta

President	Sara McPike
Vice-President	Terry Eberhardt
Past President	Lisa Lumley
Treasurer	Caroline Whitehouse
Editor (Proceedings)	Bette Beswick
Webmaster	Micky Ahn
Secretary	Héctor A. Cárcamo

Agriculture and Agri-Food Canada /
Agriculture et Agroalimentaire Canada
5403 - 1 Ave S. Lethbridge, Alberta T1J 4B1
Tel: (403) 317-2247
E-mail: esalberta@gmail.com
http://www.entsocalberta.ca

Entomological Society of Saskatchewan

President	Daniel Wiens
Vice-President	Sean Prager
Past President	Danielle Stephens
Treasurer	Tyler Wist
Newsletter Editor	Nicole Pillipow
Secretary	Iain Phillips

Saskatchewan Watershed Authority
101-108 Research Drive, Saskatoon, SK, S7N 3R3
Tel: (306) 933-7474
Email: iain.phillips@swa.ca
http://www.entsocsask.ca

Entomological Society of Manitoba

President	Alejandro Costamagna
President-Elect	Jeffrey Marcus
Past President	Erica Smith
Treasurer	Kathy Cano
Newsletter Editors	Marjorie Smith & Kateryn Rochon
Editor (Proceedings)	Terry Galloway
Webmaster	Jordan Bannerman
Secretary	Sarah Semmler

Living Prairie Museum
2795 Ness Ave, Winnipeg MB R3J 3S4
E-mail: entsocmanitobasecretary@gmail.com
http://home.cc.umanitoba.ca/esm/

Entomological Society of Ontario

President	Amro Zayed
President-Elect	Amanda Roe
Past President	David Beresford
Treasurer	Alan Macnaughton
Editor (Journal)	Chris MacQuarrie
Webmaster	Kaitlyn Fleming
Secretary	Michelle Locke

Vista Centre
1830 Bank St. P.O. Box 83025
Ottawa, ON K1V 1A3
E-mail: entsocont.membership@gmail.com
http://www.entsocont.ca

Société d'entomologie du Québec

Présidente	Annie-Ève Gagnon
Vice-présidente	Jean-Philippe Parent
Présidente sortante	Raymond-Marie Duchesne
Trésorier	Mario Fréchette
Rédactrice (Antennae)	Louise Voynaud
Webmestre	Joseph Moisan-De Serres
Secrétaire	Danielle Thibodeau

Centre de recherche et de développement
en horticulture
430, boul. Gouin
Saint-Jean-sur-Richelieu (Québec) J3B 3E6
Tél : (579)224-3063
Email : secretariat@seq.qc.ca
http://www.seq.qc.ca/

Acadian Entomological Society

President	Sebastian Ibarra
Vice-President	Gaëtan Moreau
Past President	Emily Owens
Journal Editors	Rob Johns & Sara Edwards
Webmaster	Rick West (acting)
Secretary/Treasurer	Sara Edwards

Faculty of Forestry and Env. Management
University of New Brunswick
3 Bailey Drive,
P.O. Box 4400 Fredericton, NB E3B 5A3
E-mail: treasurer@acadianes.ca
http://www.acadianes.ca

Editor's note: *Society Directors and Officers are reminded to check these lists, and submit corrections, including the names and positions of new officers.*

The last word / Le dernier mot

Cedric Gillott, Editor / Rédacteur

A. Gillott

The editorial team in Sechelt, BC

A trio of firsts

The last 3 months have flown by and memories of the splendid JAM in Fredericton are fading. We have attempted to cure this affliction in this issue by presenting our annual photo-fest of the event, sampling both its scientific and social aspects. Special thanks to Tyler (Wist) and Sean (McCann) for their great photographic skills. It was my first visit to Fredericton and I was impressed by its beauty, history, culture and, of course, its craft beers!

This issue also includes another first, namely, the start of a new series 'Canada's Coolest/ Cruelest Insects', featuring articles by Pat Bouchard and Kevin Floate et al. More articles are in the pipeline, but I want to encourage students particularly to consider sending us a contribution on their favorite beast. The series will appear both in the Bulletin and on the Society's blog page.

The 'last of these firsts' is quite remarkable — earlier this month, the Bulletin's editorial team met face to face for the first time in the 6 years that Donna has been Assistant Editor! Following a short cruise among the Gulf

Un trio de premières

Les trois derniers mois se sont envolés et les souvenirs de la splendide réunion annuelle conjointe à Fredericton s'effacent déjà. Nous avons essayé de soigner cette affliction dans ce numéro en présentant notre festival annuel de photos de l'évènement, montrant autant les aspects scientifique que social. C'était ma première visite à Fredericton et j'ai été impressionné par sa beauté, son histoire, sa culture, et bien sûr, ses bières artisanales!

Ce numéro inclut également une autre première, soit le début d'une nouvelle série appelée « Ces bestioles les plus cools/cruelles du Canada », mettant en vedette les articles de Pat Bouchard et Kevin Floate et al. Plus d'articles sont en production, mais je veux encourager particulièrement les étudiants à considérer nous envoyer une contribution sur leur bestiole préférée. La série apparaîtra autant dans le Bulletin que sur le blogue de la Société.

La dernière de ces premières est plutôt remarquable – plus tôt ce mois-ci, l'équipe éditoriale du Bulletin s'est rencontrée en personne pour la première fois en 6 ans depuis que Donna est rédactrice adjointe! Après une courte croisière sur les îles Gulf dans le but « d'étudier » les bières artisanales de la région et de faire de l'observation de la faune, ma femme et moi avons apprécié quelques jours chez Donna et son mari à Sechelt. Par hasard, cette région possède également une vaste sélection de bières et cidres artisanaux ainsi que de nombreuses excellentes opportunités

Islands for the purposes of 'studying' craft beers of the region and wildlife watching, my wife and I enjoyed a few days at the home of Donna and her husband in Sechelt. By coincidence, this area also has a wide selection of craft beer and cider as well as many excellent coastal and forest bird-watching opportunities. The weather throughout both parts of our west coast adventure was beautiful (the locals couldn't believe it) and the rain gear never left our cases!

d'observation d'oiseaux sur la côte et en forêt. La météo durant les deux parties de notre aventure sur la côte ouest a été superbe (les locaux n'y croyaient pas) et les imperméables n'ont jamais quitté nos valises!

101 Brewery staff

"Editorial" meeting at the 101 Brewery in Gibsons on the Sunshine Coast, BC

Entomological Society of Canada / Société d'entomologie du Canada

Officers & Board Members / Dirigeants et membres du CA, 2019-2020

Executive Council / Conseil exécutif

President / Présidente
Gail Anderson
Simon Fraser University, Burnaby, BC
ESCPresident@esc-sec.ca

First Vice-President / Premier vice-président
Bill Riel
Natural Resources Canada, Victoria, BC
bill.riel@canada.ca

Second Vice-President / Second vice-président
Felix Sperling
University of Alberta, Edmonton, Alberta
felix.sperling@ualberta.ca

Past President / Président sortant
Kevin Floate
Agriculture and Agri-Food Canada,
Lethbridge, Alberta
kevin.floate@canada.ca

Directors-at-Large / Conseillers
Deepa Pureswaran, Québec, Québec (2020)
deepa.pureswaran@canada.ca
Suzanne Blatt, Kentville, NS (2021)
Suzanne.Blatt@canada.ca
Christine Noronha, Charlottetown, PE (2022)
christine.noronha@canada.ca

Regional Directors / Directeurs régionaux
Brian van Hezewijk, Victoria, BC (ESBC)
brian.vanhezewijk@canada.ca
Boyd Mori, Edmonton, AB (ESA)
bmori@ualberta.ca
James Tansey, Regina, SK (ESS)
james.tansey@gov.sk.ca
Kateryn Rochon, Winnipeg, MB (ESM)
kateryn_rochon@umanitoba.ca
Alex Smith, Guelph, ON (ESO)
salex@uoguelph.ca
Étienne Normandin, Montreal, QC (SEQ)
etienne.normandin@gmail.com
Peggy Dixon, St John's, NL (AES)
peggy.dixon@canada.ca

Student and Early Professional Representative / Représentant des étudiants et des jeunes professionnels
Rachel Rix, Dalhousie University
E-mail: Rachel.Rix@dal.ca

Treasurer / Trésorier
Joel Kits
Agriculture and Agri-Food Canada, Ottawa
ESCTreasurer@esc-sec.ca

Secretary / Secrétaire
Neil Holliday
University of Manitoba, Winnipeg, MB
ESCSecretary@esc-sec.ca

Bulletin* Editor / Rédacteur du *Bulletin
Cedric Gillott
University of Saskatchewan, Saskatoon, SK
cedric.gillott@usask.ca

Asst. *Bulletin* Editor / Rédactrice adj. du *Bulletin*
Donna Giberson
U. Prince Edward Island, Charlottetown, PE
giberson@upei.ca

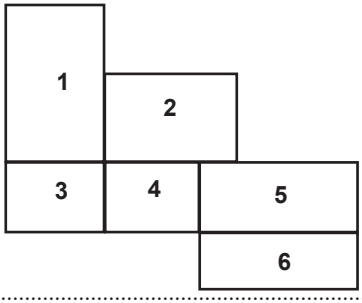
Webmaster / Webmestre
Jordan Bannerman
University of Manitoba, Winnipeg, MB
jordan.bannerman@umanitoba.ca

The Canadian Entomologist
Editor-in-Chief / Rédacteur en chef
Dezene Huber
University of Northern British Columbia
Prince George BC
editor@esc-sec.ca

Canadian Journal of Arthropod Identification
Editor-in-Chief / Rédactrice en chef
Heather Proctor
University of Alberta, Edmonton, AB
hproctor@ualberta.ca

Social Media Adminstrators / Administrateurs des médias sociaux
Morgan Jackson, Ste. Anne de Bellevue, QC
morgandjackson@gmail.com
Angela Gradish, Guelph, ON
agradish@uoguelph.ca

Head Office / Siège social
Entomological Society of Canada
386 Broadway, Suite 503
Winnipeg, Manitoba, R3C 3R6 Canada
Tel: 1-888.821.8387; +1-204.282.9823
Fax: +1-204.947.9767
E-mail: info@esc-sec.ca www.esc-sec.ca



Front cover/Plate supérieur:

1. Female ambush bug (Hemiptera: Reduviidae: Phymata) (Centreville, Ontario, Canada).
Punaise femelle (Hemiptera : Reduviidae : Phymata) (Centreville, Ontario, Canada).
[Photo: Andrea Brauner]

2. *Philanthus multimaculatus* (Hymenoptera: Crabronidae) resting on a *Solidago* inflorescence in the fall (Kelowna, British Columbia, Canada).
Philanthus multimaculatus (Hymenoptera : Crabronidae) se prélassant sur une inflorescence de *Solidago* à l'automne (Kelowna, Colombie-Britannique, Canada).
[Photo: Robert LaLonde]

3. *Buprestis aurulenta* (Coleoptera: Buprestidae) relaxing on an aged deck on Hornby Island (British Columbia, Canada).
Buprestis aurulenta (Coleoptera : Buprestidea) se prélassant sur un patio vieillissant sur l'île Hornby (Colombie-Britannique, Canada).
[Photo: Debra Wertman]

4. Tabanidae (Diptera) collecting device: no alpine entomological survey is complete without it (Lillooet, British Columbia, Canada).
Un outil de récolte de tabanidés (Diptera) : aucun inventaire entomologique alpin n'est complet sans lui (Lillooet, Colombie-Britannique, Canada).
[Photo: Ward Strong]

5. Portrait of a tiger beetle, *Cicindela campestris* (Coleoptera: Carabidae) (Delémont, Switzerland).
Portrait d'une cicindèle champêtre, *Cicindela campestris* (Coleoptera : Carabidae) (Delémont, Suisse).
[Photo: Tim Haye]

6. The western bean cutworm, *Striacosta albicosta* (Lepidoptera: Noctuidae), is becoming a major concern for producers in Ontario and Québec. Colourful egg masse on corn leaf collected in Saint-Anicet (Québec, Canada).
Le ver-gris occidental des haricots, *Striacosta albicosta* (Lepidoptera : Noctuidae), devient une préoccupation importante pour les producteurs de l'Ontario et du Québec. Des masses d'oeufs colorés sur une feuille de maïs récoltée à Saint-Anicet (Québec, Canada).
[Photo: Julien Saguez]

Back cover/Plate inférieur:

Stiretrus anchorago (Hemiptera: Pentatomidae) from Okaloacoochee Slough State Forest (Hardy County, Florida, United States of America).
Stiretrus anchorago (Hemiptera : Pentatomidae) de la forêt d'état d'Okaloacoochee Slough (Hardy County, Floride, États-Unis).
[Photo: Matthias Buck]

www.esc-sec.ca

Entomological Society of Canada
Société d'entomologie du Canada
386 Broadway
Suite 503
Winnipeg, Manitoba
R3C 3R6
E-mail: info@esc-sec.ca

Date of issue: December 2019 /
décembre 2019

ISSN: 0071-0741