

# Bulletin

Entomological Society of Canada  
Société d'entomologie du Canada

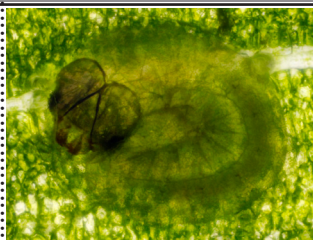
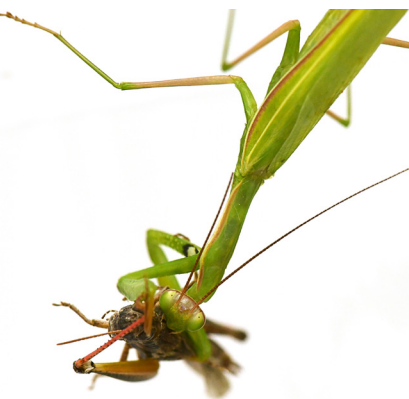
Volume 52  
Number / numéro 2



June / juin 2020

Published quarterly by the  
Entomological Society of Canada

Publication trimestrielle par la  
Société d'entomologie du Canada



# List of Contents / Table des matières

Volume 52(2), June / juin 2020

Up front / Avant-propos .....	81
Joint Annual Meeting 2020 / Reunion annuelle conjointe 2020.....	84
STEP Corner / Le coin de la relève.....	85
News from the Regions / Nouvelles des régions.....	87
Bert and John Carr Award 2019 / Le Prix Bert et John Carr 2019.....	89
<b>Special Features / Articles spéciaux</b>	
Wider aspects of a career in entomology. 10. Undergraduate activities (Hugh V. Danks).....	91
The great black widow race: how males use the silk road to find females faster (Catherine Scott).....	98
<b>Canada's Coolest/Cruellest Bugs / Ces bestioles les plus cools/cruelles du Canada</b>	
Big sand tiger beetle, <i>Cicindela formosa generosa</i> "manitoba" Dejean, 1831 – How it came to occupy centre stage on the logo for the Entomological Society of Manitoba (Terry D. Galloway)....	104
<i>Melanoplus bivittatus</i> (Say 1825), the two-striped grasshopper (Cedric Gillott).....	106
<b>In memory / En souvenir de</b>	
Kenneth ("Ken") William Richards (Joe Shorthouse.) .....	110
Douglas A. Craig (Douglas C. Currie).....	113
Ronald Harry Gooding(Janet Sperling and Bev Mitchell).....	117
Paul-Michael Brunelle (Donald F. McAlpine).....	118
<b>Books available for review / Livres disponibles pour critique.....</b>	<b>120</b>
<b>Book reviews / Critiques de livre</b>	
Nature Underfoot: Living with Beetles, Crabgrass, Fruit Flies, and Other Tiny Life Around Us, by J. Hainze (Kishan Sambaraju).....	121
The Lives of Bees: The Untold Story of the Honey Bee in the Wild., by Thomas D. Seeley. (Cory S. Sheffield).....	123
In Search of Meadowlarks: Birds, Farms, and Food in Harmony with the Land, by John M. Marzluff (Stéphane Bourassa).....	125
<b>Society business / Affaires de la Société</b>	
Seeking next ESC Webmaster / À la recherche du prochain webmestre de la SEC.....	127
70th Annual Meeting of Members and Board of Directors Meetings / 70e assemblée annuelle et réunions du conseil d'administration de la SEC.....	128
Executive Meeting - Call for Agenda Items / Réunion du conseil exécutif – Points à l'ordre du jour.....	128
Members' discounts / Remise pour les membres.....	128
Highlights of the recent Board of Directors meeting.....	129
Nominations for ESC Board of Directors / Nominations pour le Conseil d'administration de la SEC.....	130
Announcement of Changes in the ESC Standing Rules / Annonce de changements dans les règles permanentes de la SEC.....	132
ESC Scholarship Fund / Le Fonds de bourses d'études de la SEC 2019 Donors – Donateurs et donatrices pour 2019.....	134
Sixteenth Annual Photo Contest / Seizième concours annuel de photographie.....	135
<b>List of contents: Regional Society Journals / Table des matières : Revues des sociétés régional.....</b>	<b>137</b>
<b>Contents of newsletters / Contenu des bulletins</b>	
Canadian Weed Science Society / Société canadienne de malherbologie.....	138
<b>Announcement / Annonce</b>	
Canadian Pest Management Research Report / Rapport de recherche de la lutte dirigée.....	138
<b>Meeting announcements / Réunions futures.....</b>	<b>139</b>
<b>Officers of affiliated societies / Dirigeants des sociétés associées .....</b>	<b>141</b>
<b>The last word / Le dernier mot .....</b>	<b>142</b>

Captions for cover photos can be found on the back cover.

La légende des photos de la couverture se situe sur la couverture arrière.



Cluster of multicoloured Asian lady beetles (Coleoptera:  
Coccinellidae) [Carman, Manitoba, Canada]  
Un agrégat de coccinelles asiatiques (Coleoptera :  
Coccinellidae) de diverses couleurs [Carman, Manitoba,  
Canada]

[Photo: John Gavloski]



### The New Reality

Well, I must admit, this is a very different Up front article than the one I had in mind a few short weeks ago. It is quite unbelievable how the world has changed into a completely new reality in such a short time. We have all learned to work from home, which is particularly difficult for entomologists as we work primarily in the lab and field rather than at a desk. For those of us in academia, we learned how to remotely teach classes and labs with just 48 hours warning. We have all had to become extremely adept at learning new ways to do things, as well as often having to cope with suddenly learning to home school children at the same time as working remotely.

We have also all sadly watched regular meetings and conferences be cancelled or postponed one by one, including the International Congress of Entomology (ICE), which many of us would have attended. ESC had already awarded \$850 travel awards to three exceptional students so that they could register at the early bird rate. As ICE has now been postponed until next year and no refunds will be made, a decision was made that these students would receive the award now, as long as they have registered and submitted an abstract.

Our thoughts are now with the ESC JAM

### La nouvelle réalité

Eh bien, je dois admettre, il s'agit d'un texte d'Avant-propos bien différent que celui que j'avais en tête il y a quelques semaines seulement. C'est incroyable de voir à quel point le monde a changé pour une réalité complètement différente en aussi peu de temps. Nous avons tous appris à travailler de la maison, ce qui est particulièrement difficile pour les entomologistes puisque nous travaillons principalement au laboratoire et sur le terrain plutôt que derrière un bureau. Les universitaires ont appris à enseigner à distance les cours et les labs dans un délai de 48h. Nous avons tous dû apprendre de nouvelles façons de faire les choses et, pour plusieurs, nous avons dû faire face à l'école à la maison pour les enfants, en plus du travail à distance.

Nous avons également tristement regardé toutes les réunions et conférences régulières être annulées, ou reportées, une après l'autre, incluant le Congrès international d'entomologie (ICE), auquel plusieurs d'entre nous devaient participer. La SEC a déjà remis 850\$ de bourses de voyage à trois étudiants exceptionnels pour qu'ils puissent bénéficier du taux d'inscription hâtif. Puisque le ICE a été reporté à l'an prochain sans possibilité de remboursement, la décision a été prise que ces étudiants recevraient leur bourse maintenant, en autant qu'ils se soient inscrits et qu'ils aient soumis un résumé.

Nos pensées se tournent maintenant vers la réunion annuelle conjointe de la SEC à Calgary, prévue en octobre. Ma première version de ce texte d'Avant-propos, écrit il y a quelques jours, disait que nous prendrions une décision très bientôt à savoir si la réunion annuelle 2020 devait être annulée. Cependant, j'ai maintenant dû modifier cet article. La Société d'entomologie de l'Alberta a pris la

in Calgary, scheduled for October. My first version of this Up front article, written just days ago, said that we would be making a decision very shortly about whether to cancel JAM 2020. However, I now have to amend this article. The Entomological Society of Alberta has made the sad and painful decision to cancel our Calgary JAM. The Entomological Society of Alberta Local Organizing Committee has dedicated a tremendous amount of time and effort to develop an exciting, interesting and fun program for JAM 2020 and we cannot thank them enough for all their hard work. Nevertheless, we knew that a decision had to be made soon. Realistically, we know that this is the correct and responsible decision and is in line with Health Canada recommendations and restrictions, imposed by the federal and provincial governments, yet it is still very sad. Simply postponing to 2021 is not a possibility as the Entomological Society of Ontario has also already dedicated a great deal of time and effort and has committed financially to the venue for the 2021 meeting, and the 2022 meeting with the Entomological Society of British Columbia and the Entomological Society of America is also already committed. I cannot thank the Local Organizing Committee enough, and especially Haley Catton, for all their hard work, blood, sweat and tears that go into organizing a JAM and understand how terribly disheartening this is. It would have been a great meeting and we were all looking forward to it. However, in these surreal times we have to accept the new reality and 'stay safe'.

Last year saw our inaugural National Insect Appreciation Day (NAIAD) and this year we planned greatly expanded activities across the country with much more media attention. Unfortunately, most NAIAD activities involve getting lots of people together to play with insects which is not possible in our current world. However, we will be going ahead with the Insect Picture Challenge, which involves posting at least one picture of an insect on 8 June with the hashtag #insectpicturechallenge.

On a more positive note, Public Education

décision sécuritaire et douloureuse d'annuler notre réunion annuelle à Calgary. Le comité organisateur local de la Société d'entomologie de l'Alberta a dédié énormément de temps et d'énergie à développer un programme excitant, intéressant et amusant pour la réunion 2020, et nous ne pouvons pas les remercier assez pour leur travail ardu. Néanmoins, nous savions qu'une décision devait être prise bientôt. Pour être réalistes, nous savons qu'il s'agit de la bonne décision, responsable, alignée avec les recommandations et les restrictions de Santé Canada imposées par les gouvernements fédéral et provinciaux, mais c'est tout de même très triste.

Simplement reporter la réunion à 2021 n'est pas possible puisque la Société d'entomologie d'Ontario a déjà investi beaucoup de temps et d'énergie et s'est commise financièrement pour la réunion 2021, et la réunion 2022 avec la Société d'entomologie de Colombie-Britannique et la Société d'entomologie d'Amérique est également déjà engagée. Je ne peux remercier suffisamment le comité organisateur local, et particulièrement Haley Catton, pour leur travail ardu, et le sang, la sueur et les larmes qui vont de pair avec l'organisation d'une réunion annuelle conjointe, et je comprends que ce doit être terriblement décourageant. Cependant, durant ces temps surréels, nous devons accepter la nouvelle réalité et rester en sécurité.

L'an dernier, nous avons inauguré notre Journée nationale des insectes et cette année, nous avons prévu élargir grandement les activités dans tout le pays avec plus d'attention des médias. Malheureusement, la plupart des activités de cette journée impliquent de rassembler des gens ensemble afin de jouer avec les insectes, ce qui n'est pas possible dans notre monde actuel. Cependant, nous irons de l'avant avec le Défi des photos d'insectes, qui implique de publier au moins une photo d'insecte le 8 juin avec le mot-clic #insectpicturechallenge.

Sur une note plus positive, les subventions de promotion auprès du public sont passées de 200\$ à 500\$ par année, à partir du 1<sup>er</sup> juillet



Grants have been increased from \$200 a year to \$500 a year, starting 1 July 2020 (although they can no longer be carried over to subsequent years). Although the current COVID-19 situation makes outreach at the moment somewhat problematic, you might want to be thinking about new outreach activities and applying for funding for equipment and supplies now for later events.

And on another positive note, our new Entomology Enthusiast category has attracted 19 new members! Welcome! And please tell your friends about us.

Stay safe, stay well and remember, insects aren't affected by COVID-19, they'll still be there when we are let out again!

2020 (bien qu'elles ne puissent plus être reportées à des années subséquentes). Bien que la situation actuelle avec la COVID-19 rendent les activités de vulgarisation problématiques en ce moment, vous pourriez penser à de nouvelles activités et appliquer pour un financement pour de l'équipement et du matériel aujourd'hui, pour des événements futurs.

Et sur une autre note positive, notre nouvelle catégorie d'enthousiastes de l'entomologie a attiré 19 nouveaux membres! Bienvenue! Et parlez-en à vos amis.

Demeurez en sécurité, demeurez en santé, et rappelez-vous, les insectes ne sont pas affectés par la COVID-19, alors ils seront encore là quand nous pourrons sortir à nouveau!



D. Giberson

Western Tiger Beetle (*Cicindela oregona*) spotted on a Sechart Inlet beach (BC) in early April, 2020.

2020 Joint Annual Meeting of the Entomological Society of  
Canada and Entomological Society of Alberta  
2020 Réunion conjointe annuelle des sociétés d'entomologie  
du Canada et de l'Alberta



Cancelled

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

We regret to announce that JAM2020 has been cancelled due to the COVID-19 pandemic. We thank everyone involved for their efforts in organizing and supporting the meeting to this point. We hope everyone stays safe and healthy during this time and we will see you at future ESAb and ESC meetings.

Nous avons le regret d'annoncer que la réunion annuelle conjointe 2020 a été annulée à cause de la pandémie de COVID-19. Nous remercions tout le monde pour leurs efforts dans l'organisation et pour soutenir la réunion jusqu'à maintenant. Nous espérons que tout le monde reste en sécurité et en santé durant cette période, et nous vous reverrons dans des réunions futures de la SEAb et de la SEC.



## COVID-19

This is a hard time for everyone, and we want to check in with the students, post-docs and early professionals of the Society. While we are surrounded by uncertainty, we want to make sure that we are doing everything in our power to help our fellow members and put initiatives in place to support you throughout and after the pandemic.

As the co-chairs of the Student and Early Professional Affairs Committee, we want to be able to make your concerns known to the Entomological Society of Canada at large. If you have concerns about the upcoming joint annual meeting, about how this situation affects job and academic opportunities, or suggestions on how we can help you in this trying time, please let us know.

The Canadian Federation of Students (<https://cfs-fcee.ca/covid-19/>) is a great place for resources, both for mental health and for possible financial aid. We also encourage you to reach out to local associations that may be better equipped to guide you through your own provinces' resources.

The Government of Canada has announced supports for students and post-doctoral researchers. More information can be found at <https://www.canada.ca/en/departement-finance/economic-response-plan.html> and <https://www.canada.ca/en/departement-finance/news/2020/04/support-for-students-and-recent-graduates-impacted-by-covid-19.html>.

Please remember that this Society is here to support you and to reach out if you need help!

## COVID-19

Ce sont des temps difficiles pour tout le monde et nous voulions nous assurer du bien-être des étudiants, stagiaires post-doctoraux et des jeunes professionnels de la société. Bien que nous soyons entourés d'incertitude, nous souhaitons faire tout ce que nous pouvons pour que nos camarades se sentent soutenus et de mettre en place des initiatives pour vous supporter pendant et après la pandémie.

Comme co-présidentes du Comité des affaires étudiantes et des jeunes professionnels, nous voulons vous donner la possibilité de vous faire entendre par le reste de la Société d'entomologie du Canada. Si vous avez des inquiétudes à propos de la prochaine réunion annuelle, par rapport à l'impact de la situation sur les opportunités d'emplois et académiques, ou si vous avez des suggestions sur la façon dont nous pouvons vous aider durant ces temps difficiles, veuillez nous les communiquer.

La Fédération canadienne des étudiantes et étudiants (<https://cfs-fcee.ca/fr/covid-19/>) est une excellente ressource tant pour la santé mentale que pour de possibles aides financières. Nous vous encourageons aussi à contacter vos associations locales qui sont mieux équipées pour vous guider à travers les ressources spécifiques à vos provinces.

Le gouvernement du Canada a aussi annoncé des mesures de soutien pour les étudiants et chercheurs post-doctoraux. Plus d'informations peuvent être obtenues sur les sites <https://www.canada.ca/fr/ministere-finance/plan-intervention-economique.html> et <https://www.canada.ca/fr/ministere-finance/nouvelles/2020/04/soutien-aux-etudiants-et-aux-nouveaux-diplomes-touche-par-la-covid19.html>.

Souvenez-vous que la société est là pour vous soutenir et contactez-nous si vous en avez besoin!

## 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 at [students@esc-sec.ca](mailto: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](mailto:students@esc-sec.ca), or contact us personally at [annesophie.caron.p@gmail.com](mailto:annesophie.caron.p@gmail.com) or [Rachel.Rix@dal.ca](mailto:Rachel.Rix@dal.ca). We look forward to hearing from you,

Anne-Sophie and Rachel.

## 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](mailto:students@esc-sec.ca). Pour des mises à jour régulières sur la 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](mailto:students@esc-sec.ca). Vous pouvez aussi nous contacter personnellement à [annesophie.caron.p@gmail.com](mailto:annesophie.caron.p@gmail.com) ou [Rachel.Rix@dal.ca](mailto: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](mailto: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](mailto:students@esc-sec.ca).



## Acadian Entomological Society

**Annual Meeting.** The AES Annual Meeting is scheduled for the 10 August 2020. The theme is “Arthropods Affect Everything”. Due to the COVID-19 pandemic, the presentations and AGM will be held virtually via Zoom.

**Further expansion of eTick.** “eTick” is a public platform for image-based identification of tick specimens. It is a collaboration between federal, academic and provincial agencies and is a service that anyone can take advantage of with a few carefully taken photos. The program began with the provinces of New Brunswick, Quebec and Ontario, but this year has expanded to include Newfoundland and Labrador, Nova Scotia and Saskatchewan. Quite simply, if you find a tick on you or your pet, you can take a few photos of it (instructions on the website: [eTick.ca](http://eTick.ca)) and submit them in a private profile that you create. You will receive correspondence on the specimen within a day (usually less).



## Entomological Society of Saskatchewan

An event missed in earlier issues occurred on 27 September 2019 when the Society’s Youth and Amateur Encouragement Committee (YAEC) took the show on the road. Tyler Wist, Chrystel Olivier and Karolina Push-Bochenska presented a Good Bugs – Bad Bugs talk to hundreds of students from North Battleford elementary schools at the city’s Western Development Museum. Regrettably, further YAEC activities, such as the annual Good Bugs – Bad Bugs presentations to Saskatoon Grade Three students through ‘Ag in the Classroom’ and the Society’s popular booth at Gardenscape in late March, were sidelined by the COVID-19 pandemic.



## Entomological Society of British Columbia

Having lived in Victoria for almost 9 years now I have just about experienced a full population cycle of the western tent caterpillar, *Malacosoma californicum pluviale*. From a low of zero in 2016, a casual counting of tents along my bike route to the Pacific Forestry Centre has seen a four-fold increase each year for the past 3 years. If the trend continues, I’m expecting to see hundreds this spring, and perhaps an equal number of calls from the public inquiring what can be done about them. My usual response is “Wait a year or two”. This, however, is not the answer most people are looking for.

A few years ago, I happened upon a website that allowed one to search back-issues of the local newspaper, originally called The Daily British Colonist, which has been published in one form or another since 1858. Out of curiosity I entered ‘tent caterpillar’ in the search box and to my surprise many results were retrieved. The oldest was from 14 June 1862 in what appears to be a letter to the editor titled “The Caterpillar Nuisance”. It reads in part:



*In a recent issue you notice the visitation of caterpillars with which Victorians are now afflicted, while districts more remote, such as Saanich and Lake and the oak clad slopes of Salt Spring Island, are almost wholly exempted from their ravages. The cause and the remedy are obvious enough. Moths and butterflies deposit their eggs high in the oak trees in myriads, upon the bark, and protect them against the winter with a glutinous covering, above the reach of man. Nature has provided a remedy in the woodpecker, the robin and the jay; and the wholesale destruction of these and similar birds, and consumption of them in restaurants in town, ought at once to be stopped.*

Clearly dining in Victoria 160 years ago was a different experience when a woodpecker pie might be on the menu! But what I found more interesting was that people had a very clear understanding of the importance of natural enemies in the environment and how their destruction might have cascading effects. Two months later in the 6 August issue, it is noted that the Game Act was being amended to prohibit the hunting of small birds. It is not clear that the “caterpillar nuisance” has abated since the act was changed but I think it is ironic that the caterpillars were in part responsible for the protection of their own enemies.

Brian Van Hezewijk



B. Van Hezewijk

Young larvae of the western tent caterpillar (*Malacosoma californicum pluviale*) basking in the late April sun.

## Bert and John Carr Award 2019 / Le Prix Bert et John Carr 2019

The Bert and John Carr Award is a cash award to support research activities on insect faunistics, natural history and/or taxonomy of Canada's insect fauna. In 2019 two awards were made. The recipients were Sarah MacKell and Jonathan Charron, and their reports are presented below.

Le prix Bert & John Carr est remis à des individus qui étudient la faunistique des insectes, ou l'histoire naturelle et la taxonomie de la faune entomologique du Canada. En 2019, deux prix ont été remis. Les récipiendaires étaient Sarah MacKell et Jonathan Charron, et leurs rapports sont présentés ci-dessous.



**Sarah MacKell**

I am very honoured to receive this award. I'm currently a MSc student at York University studying bee competition within urban landscapes. My current project, that the Carr Award has contributed to, is focused on investigating whether there is floral resource competition between honeybees and native bees within Toronto, Ontario. Toronto has a high diversity of bees, with over 350 species. Recently, there has been a large increase in urban beekeeping because of the public's excitement about saving the bees. The enthusiasm cultivated by bees is very inspiring, but many people don't know that honeybees are non-native and possibly have negative impacts on our native bees in Canada. There have been many studies on competition between honeybees and native bees within other countries but most of them have focused on agricultural or natural areas.

During the spring and summer of 2019, I conducted sampling within parks and gardens in Toronto. With my collected specimens, I am now investigating whether increases in honeybee abundance have impacted bee community composition and fitness within these sites. The money from the Carr Award was put towards sampling and processing equipment for this project. My study aims to get a better understanding of the possible impacts that high levels of urban beekeeping can have on native bees and whether we should consider bee conservation management plans that limit urban beekeeping.

I first became interested in studying insect conservation during my BSc in environmental sciences at the University of Guelph. I took multiple courses on pollinators and conducted my own research on bumblebees and neonicotinoids. These experiences sparked my interest in conserving bees within Canada. I wanted to start studying bees within urban landscapes to get a better understanding of the problems they face outside of agriculture. Before finding my passion for bees, I worked at Agriculture and Agri-Food Canada, Ontario Ministry of Agriculture, Food and Rural Affairs, and Ontario Ministry of the Environment, Conservation and Parks researching soil physics, food safety, and water quality.



**Jonathan Charron**

Il s'agit pour moi d'un honneur de recevoir ce prix prestigieux. J'aimerais par ailleurs féliciter Sarah MacKell qui a également reçu le prix Bert & John Carr pour l'année 2019.

J'ai obtenu un baccalauréat en Sciences biologiques à l'Université de Montréal. C'est pendant mes études universitaires que j'ai développé un intérêt marqué pour l'entomologie et l'arachnologie. Éventuellement, j'ai pu constater à quel point les opilions étaient sous-représentés dans la littérature scientifique au Canada, et plus particulièrement au Québec, où j'habite. Cette réalisation m'a amené à m'intéresser davantage à cet ordre méconnu d'arachnides. J'ai ainsi entrepris d'étudier la faunistique des opilions au Québec. Le prix Bert & John Carr m'a permis d'avoir accès au matériel nécessaire pour la capture et l'identification des spécimens. J'ai fait de l'échantillonnage dans plusieurs régions du Québec. Il s'agit d'une activité stimulante, car les spécimens récoltés sont souvent une première mention pour certaines régions. Le projet est actuellement encore en cours. Ce projet n'aurait jamais vu le jour sans la contribution dévouée de plusieurs arachnologues qui m'ont beaucoup aidé et appris.

Cependant, mon expérience m'a amené à réaliser qu'il existe encore beaucoup de travail à faire. La faune opilienne des cavernes, notamment, mériterait d'être étudiée plus en profondeur dans nos latitudes. Il semble que ces milieux recèlent encore de nombreuses surprises. Mon souhait est que les opilions soient un jour aussi bien étudiés au Canada que le sont les araignées. Je ne peux qu'encourager les arachnologues amateurs ou professionnels à étudier les opilions. Il s'agit d'un domaine de recherche encore peu exploré, malgré l'abondance de ces arachnides dans la plupart des milieux. Je suis certain qu'un effort coordonné permettra de redonner à l'opilionologie ses lettres de noblesse au Canada.



### Wider aspects of a career in entomology.

#### 10. Undergraduate activities

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. This article treats my time as an undergraduate student.*



My undergraduate education began towards the end of 1962 in the Department of Zoology and Applied Entomology at Imperial College (University of London). The zoology curriculum included entomology, but more specialized courses were held back until the final year, so I continued to study insects on my own.

Interesting species came to my light trap (noted in ESC Bulletin 52: 19). Some handsome moths had appealing common names, like the angle shades (Figure 1). Several taxa of small moths were impressively diverse and challenging to identify, including pugs (Figure 2) and tortricids (Figure 3). There were plume moths (Figure 4) with strikingly dissected wings, large orange parasitoids (Figure 5) that search for host caterpillars at night, and green lacewings with shining golden eyes reflecting the light. Some kinds of flies and other insects—even a few individuals of normally diurnal species such as yellowjackets—also assembled at the light.



Gail Hampshire (CC BY 2.0)

Figure 1. The angle shades moth (the noctuid *Phlogophora meticulosa*). Wingspan about 5 cm.



Ben Sale (CC BY 2.0)

Figure 2. The common pug moth (the geometrid *Eupithecia vulgata*), one of the 45 species of the genus that are now recognized in the United Kingdom. Wingspan 1.5–1.8 cm.

---

*Hugh Danks ([hughdanks@yahoo.ca](mailto: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.*



Patrick Clement (CC BY 2.0)



Figure 3. The barred fruit-tree tortrix moth (the tortricid *Pandemis cerasana*), one of the nearly four hundred species of the family known from the U.K. Wingspan 1.6–2.5 cm.

Didier Descouens (CC BY-SA 2.0)



Figure 4. The common plume moth (the pterophorid *Emmeline monodactyla*), at rest (top) and with the wing plumes visible (bottom). Wingspan 1.8–2.7 cm.

Ben Sale (CC BY 2.0)

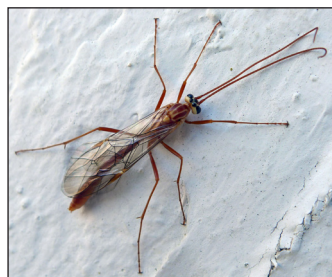


Figure 5. One of the species of large orange parasitoids that are attracted to light (the ichneumonid *Ophion* sp., perhaps *obscuratus*). Length 1.5–2.0 cm.

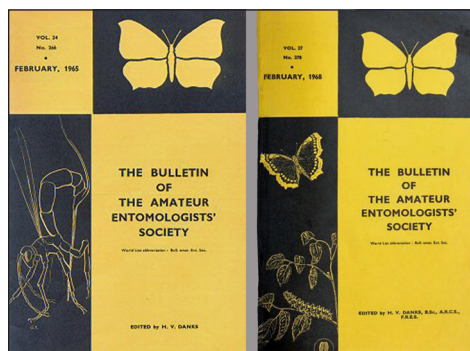
Gail Hampshire (CC BY 2.0)

Butterflies, moths, bees, and wasps were collected more widely too. My travels even took me to France a couple of times to explore other communities, revealing distinct faunal differences in the resident insects—and distinct cultural differences in the resident humans...

Those interests led to further involvement in the Amateur Entomologists' Society (AES), and before long I became Editor of the Society's Bulletin (Figure 6). The work was time-consuming because there were six issues per year. Resources for this volunteer role were limited, and much of my correspondence (in the days before email) was sent out in used envelopes sealed with unsightly tape.

Editing the Bulletin for the next 5 years taught me many things. First, the job called for communication with authors of widely different personalities, backgrounds, and skills.

Second, preparing manuscripts showed me how to edit for clarity and correct syntax—and naturally I tried to make suggestions to authors as tactfully as possible! The few American contributors posed particular challenges because they used words like “thusly”.<sup>1</sup> In addition, the details of each manuscript (including abbreviations, capitalizations, numbers, and many other minutiae) were standardized to make the publication tidy and



H. Danks

Figure 6. Covers of two issues of the Bulletin of the Amateur Entomologists' Society from the 1960s.

<sup>1</sup>“Thusly” was regarded in England as a pointless synonym of “thus”, used occasionally only for humorous effect.



assist readers. Such tasks are now much easier, compared to work on hard copies only, because modern word-processors have a search function.

Third, the Editor was responsible for liaisons with the printer, requiring mark-up of manuscripts to instruct the typesetter, detailed reading and annotation of the several proof stages, and layout of each issue into pages. This work required knowledge of conventions for copy editing and for correcting proofs. I also developed various schemes for checking the proofs, because simply reading through like many authors do tends to miss most errors<sup>2</sup>.

The Bulletin was produced with linotype (metal printing blocks cast in lines of type)<sup>3</sup>, and pages were laid out by cutting and pasting the galley proofs and specifying interline separations to optimize general appearance and the location of breaks between articles. Much effort was needed too to learn how to compile an efficient index for the diverse contents of each annual volume, especially because computers were not yet available. All those experiences helped me later to prepare and publish briefs and books (e.g., *Insect dormancy*, *Insects of the Yukon*) on behalf of the Biological Survey of Canada.

It soon became evident that any potentially ambiguous instruction to a printer will be misinterpreted, one of the many elements of Murphy's Law of Printing. A phrase had to be added to the cover of my first issue in the final proof stage. I wrote the addition with a red pen to make sure that the printer saw it, and approved the proof with the message: "O.K. with addition shown in red." Only black ink was ever used on the cover (as elsewhere), but when that issue was printed and distributed, the added phrase shone forth from the front in bright red ink!

A more general lesson came from dealing with the printer. Final production of one of my first issues of the Bulletin was substantially delayed; an enquiry elicited the response that it was almost done. After another long delay, the same assertion was made. Finally, in the continuing absence of action, I concluded that "The squeaky wheel gets the grease" and began daily nagging that led almost immediately to completion of the job. This strategy might be effective when the "wheel" has some power, such as payment to a tradesman, or the likelihood of future business. When there is little power (as for a junior employee), "The quacking duck gets shot" might apply instead! However, composure, logic, and measured persuasion are normally more relevant than either of these aphorisms.

A few professional entomologists were involved with the AES<sup>4</sup>. They included well known taxonomists who worked at the British Museum (Natural History), some of whom were reputed to be somewhat eccentric. One was a volunteer proof-reader for the Bulletin. My visit to his office revealed shelves bearing an impressive assortment of museum drawers housing specimens under study, as well as a number of labelled jars. One of the labels read: "Pieces of string too short to be useful"! It was tempting to speculate about other useless hoards, as exemplified by the labels created in Figure 7.

Even after a year or two, few readers of the Bulletin (apart from people on the AES council) had met me, but they had seen my editorials and articles about insect conservation and other topics. Some of those contributions were rather pompous, which might explain what happened at the Imperial College Biology Club when I was introduced to a new first-year entomology student.

---

<sup>2</sup> Moreover, at that time proofs tended to contain many more errors, because text was retyped by the typesetter rather than just reformatted from a digital submission.

<sup>3</sup> Linotype was cumbersome compared with the digital systems now used for printing, but such hot-metal casting systems were much less troublesome than the manual letter-by-letter typesetting (letterpress) that preceded them. Linotype was replaced mainly by phototypesetting, now also obsolete, and then by a series of increasingly sophisticated computer-based methods.

<sup>4</sup> Professional entomologists have long been involved in helping the AES, and the society is now affiliated with the Royal Entomological Society of London.

There was a pause. “Not the Mr Danks who edits the AES Bulletin?,” she asked. When that suspicion was confirmed, a look of incredulity spread across her face. “Oh,” she said, “I thought Mr Danks was an *o-o-old* man.”

Each annual cohort of undergraduates in “special” degree programmes like mine comprised only a dozen students. Courses in zoology and other sciences were prescribed during the first 2 years, but then students specialized for the last year in either parasitology or entomology. The members of my cohort were strikingly diverse despite their limited numbers.

One parasitology student had a photographic memory and could remember every word of a text and even where it was located on the page. Another was very effective although he was dyslexic. A third concentrated on examination technique, spotting questions and seeking extra marks; some Schadenfreude was elicited when the top students learned that he had received a final degree one grade lower than them. A high grade was especially important because only the most successful students would have an opportunity to undertake graduate work.

One entomology student worked long hours, but made sure that everyone knew about his dedication. Another always corrected the pronunciation of scientific names as if he knew how they were pronounced, but later would correct the same names in the other direction. There was even a student from Canada, Barry Wright, who became the long-term curator of entomology at the Nova Scotia Museum of Natural History in Halifax.

A student who lived near the college liked to collect moths in the evening. One night, he climbed to the top of a fine Victorian lamp-post (Figure 8) to obtain a choice specimen attracted to the light. A sonorous voice accosted him from below, as a London policeman enquired what on earth he thought he was doing. The collector reporting this story was highly indignant, because his treasured specimen almost escaped when the policeman insisted on verifying the explanation. In a city with many public houses, most people climbing a lamp-post late at night would not be under the influence of entomology.

My daily commute to London was by train and tube (subway) at first, but later used a secondhand motorcycle<sup>5</sup>. This machine was heavy and had limited power (Figure 9), but despite

<sup>5</sup> One summer, I took the motorcycle engine completely apart to learn in more detail how it worked. No parts were left over after the motor had been cleaned and reassembled, and it still operated—but that tedious exercise was most valuable in justifying my decision to become an entomologist rather than an engineer or a mechanic.

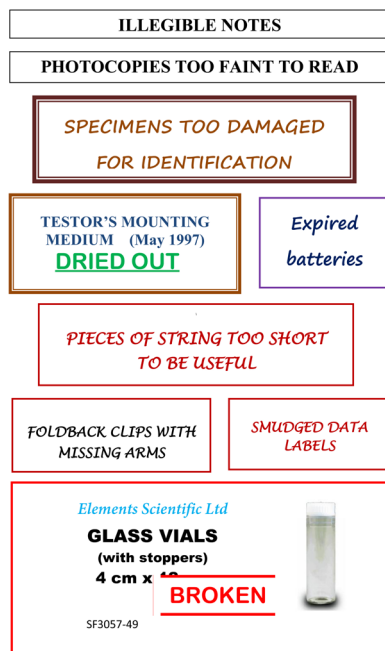


Figure 7. Potentially useless hoards, as suggested by an actual label referred to in the text.



Figure 8. Victorian lamp-post in London.

H. Danks

Iridescent (CC BY-SA 3.0)



Figure 9. Motorcycle of the type ridden by the author during the 1960s (Francis Barnett Falcon 200 cc 2-stroke).

the modest speed, and leather gauntlets, the 20-km journey frequently left my hands so cold on winter mornings that I held my arms up over my head for many minutes after arrival, to slow the influx of blood into my fingers and reduce the unbearable pain as they warmed up. At the time, the winter temperatures that I experienced in Canada some years later would have been inconceivable. Warmer clothing would be readily available there—but no one with any common sense rode a motorcycle in the winter...

The overall reputation of the college was sterling, but some of the classes

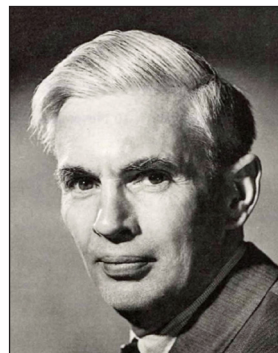
were not. For example, the organic chemist talked rapidly into the blackboard, which was obscured by his shock of hair as he wrote across the full width of the board whilst erasing with his trailing hand. The insect physiologist imparted little scientific information, but instead told stories about the lives of individual physiologists.

Key courses on vertebrates focussed on the skulls of mammals and on the fossil bones of dinosaurs, with almost no information about living organisms. Information from one of those instructors was unreliable; in an illustration copied from the textbook, she even marked a pair of lines from a label (indicating the key structure) as the structure itself. Such errors created a need during examinations for sophisticated answers that would encompass both the correct information and that provided by the instructor!

These and other imprecisions suggested that my undergraduate work could have been done in a few months if I had known in advance what knowledge was needed—but of course I did not. Indeed, the time could have been even shorter: for instance, learning the complete classification of the Crustacea never proved useful, although the task served as an exercise in organization, memorization, and comprehension of hierarchies. In fact, most activities are relatively inefficient because of the need for incremental learning as they proceed. Nevertheless, no learning is ever really wasted. Exposure at school to Latin and Greek gave context to scientific names. Lessons in French and German stimulated my existing interest in language, an interest that led to further studies of French and, eventually, of Japanese. Moreover, I tried to synthesize scientific literature from across the world, unlike some other authors who limit themselves to work published in their own languages, or even mainly in their own countries.

At the college, course lectures by O.W. Richards (Figure 10) and R.G. Davies, both of whom had been responsible for the textbook of entomology I consulted as a schoolboy, were particularly informative. Those by the former were somewhat dry, but occasionally an unexpected sentence would get the students' attention. To emphasize male-female disparity (as in Strepsiptera), he once declared in a deadpan voice: "The male emerges in the morning, copulates, and is always dead by lunchtime."

He worked on many groups during his career, and had studied



Walter Bird/The Royal Society

Figure 10. The entomologist O.W. Richards. Image from Biographical Memoirs of Fellows of the Royal Society **33**: 538 (1987).

sphaerocerid flies collected by a British Museum expedition to the Rwenzori (formerly Ruwenzori) mountains of equatorial Africa. On these high massifs separated by deep gorges, wing reduction has evolved multiple times, as in insects from other isolated and adverse habitats. During his lecture on sphaerocerids, Professor Richards suddenly proclaimed: “You know they call me the King of the Wingless Flies of Ruwenzori.”

Some of our instruction in the final year took place on the Imperial College Field Station at Silwood Park, about 45 km west of the London campus in South Kensington. Interesting entomology classes were held outdoors and followed up in the laboratory. They were led by faculty whose active research programs gave them detailed field knowledge of bugs, beetles, wasps, ants, and other taxa, making the classes more valuable than if they had simply relied on a textbook.

A few presentations featured other organisms. The field component of an introduction to birds started at 5 a.m. so that the songs of the dawn chorus could be heard. The senior zoologist in charge gave a long lecture the previous evening. He was prone to pausing for effect as he drew on a pipe. A recently appointed junior member of the entomology faculty decided to attend the lecture, but eventually nodded off while the professor was waiting for the class to respond to a question. Half an hour later, the faculty member awoke with a start to see the professor, puffing on the pipe, looking in his direction—so he blurted out an answer to the earlier question. This performance was much appreciated by the students, especially those who had not remained fully engaged in a lecture that was approaching the end of its unremitting second hour.

Some students also had difficulty staying alert during later lectures on insecticide spraying, which addressed every conceivable variety of spray nozzle in excruciating detail. The instructor was a former member of the British army, who had classified each nozzle into a hierarchical numbered sequence (1.1.2.4..., etc.), according to such features as size, shape, spray-pattern, pressure, and application.

Despite the lower appeal of a few of these sessions, my interest in biology was sustained not only by entomology courses but also by books on ecology that were published during this period (e.g., Figure 11). They reinforced my ecological interests and consolidated earlier conclusions about conservation and other issues, confirming the complexity with which organisms interact with their environments, as well as the challenges of synthesizing the information.

The final year of undergraduate work included individual research projects. My laboratory project examined oviposition behaviour in a tiny polyphagous parasitoid (Figure 12), and taught me that researchers must be adaptable. For example, I built an experimental arena completely

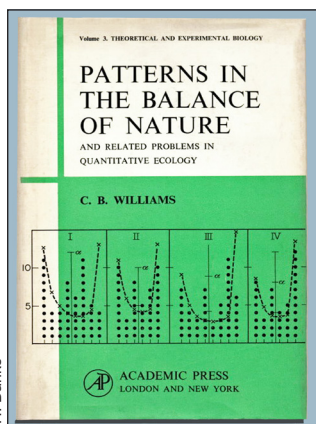


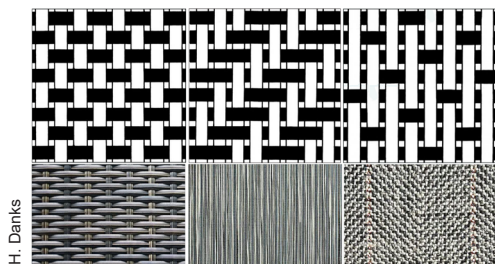
Figure 11. Patterns in the balance of nature..., by C.B. Williams, published in 1964.



Figure 12. Pteromalid chalcidoid of the *Dibrachys cavus* complex. Length usually about 2.0–2.5 mm.

Univ. Oslo, Nat. Hist. Mus. (CC BY-NC-SAP)





H. Danks

Figure 13. Features of different fabrics, as might be used to construct artificial cocoons to test parasitoid responses. Top, the three basic weaves: L to R plain (firm), twill (softer), satin (smooth). Bottom, a few variants: L to R basket (doubled in one direction), rib (different thickness in each direction), herringbone (broken twill).



Atwok (CC BY-SA 3.0;2.5;2.0,1.0)

Figure 14. The halictid bee *Lasioglossum calceatum* (synonyms include *Halictus cylindricus* and *H. calceatus*). Length about 0.8 cm.

surrounded by panes of ground glass to minimize the directional effects of ambient light in the laboratory. A detailed study of fabrics allowed me to sew miniature envelopes, containing wax moth larvae, from materials with different weaves, textures, thicknesses, and spaces between fibres (cf. Figure 13), giving a range of “host cocoons” that varied in surface roughness and ease of penetration. (Other conditions were tested too, such as scent from host frass.)

My field project studied bees and wasps nesting in sand at Silwood Park. That project underlined the difficulty of assessing the structure of nests in the soil, but in particular confirmed that observing insects properly requires much detailed attention. Some species active at the sandbank proved difficult to follow until I could develop and refine a “search image” for each one. Moreover, such mental pictures of what to look for were most effective when they were based not only on appearance but also on characteristic behaviour and preferred subhabitat.

Early in the project, I identified a species of bee (Figure 14). In response to my request for confirmation, Professor Richards merely glanced over at the specimen and identified it.<sup>6</sup> He knew hundreds of species of British insects on sight, and remarkably was able to recognize most of them in the field. When asked how, he would quote obscure key characters such as “hairs shorter on sternite 5,” features that could not possibly be seen in the circumstances.

This ability showed that there is no substitute for familiarity with the fauna, allowing experienced biologists to arrive at an identification by integrating clues from habitat, structure, posture, and behaviour (“because it looks like it”). In the same way, entomologists who have collected extensively in the field know which pond or other habitat is most likely to contain their quarry.

O.W. Richards knew many efficient means of field identification. He saw a solitary wasp, belonging to a group of species normally discriminated by minor morphological details, and told us that it was either a particular species that could sting humans or its almost identical congener that could not. He picked the specimen up to check. It was the former, but he seemed unfazed as it stung him while he explained the taxonomic characters used to distinguish museum specimens of the two species!

In due course, O.W. would supervise my doctoral studies. His personality and abilities would then become even more apparent.

<sup>6</sup> He gave it a different name, but fortunately my resulting dismay was short-lived because the difference stemmed from a synonym rather than a misidentification.



## The great black widow race: how males use the silk road to find females faster

Catherine Scott

For solitary animals that reproduce sexually, finding a partner is a critical first step in the sequence of events that lead to mating. We know quite a lot about the traits that help males win fights over females (including weapons like the horns of stag beetles), and how female preferences can lead to the evolution of extravagant ornaments and displays (like the tails of male peacocks—or peacock spiders). But these two mechanisms of sexual selection (male competition and female choice, respectively) can often only operate on males that actually locate females to compete over or court. In many animals, and particularly in terrestrial arthropods, a race to find females often determines which males get the opportunity to pass on their genes. The kinds of traits that help males to win this race are less well understood than male ornaments and weapons, in part because it can be tricky to track mate searching males in nature.

In the first published study resulting from my PhD work (Scott et al. 2019), my coauthors and I used experiments and observations of the natural movements made by black widow males to learn more about what gives them an edge when it comes to finding females. We already knew from previous work that multiple males often arrive on a female's web over the course of a single night (Scott et al. 2015a), but little about how they ended up there. Female black widows produce a sex pheromone that functions as a chemical personal ad. This chemical message is released from the silk of a female's web, and it provides males with information about her location and sexual receptivity (Kasumovic & Andrade 2004; MacLeod & Andrade 2014; Scott et al. 2015b). Before this study, we didn't know the range of this message, just that it operates over some distance, allowing males to locate females who are ready to mate. Male black widows detect the female's pheromone using sensory hairs on their legs (Ross & Smith 1979). Once a male finds a female, he engages in a courtship dance that transmits vibrations through her web, providing her with information about his identity and quality as a mate (Vibert et al. 2014). After several hours of dancing and laying down silk all over the web and the female's body (this silk likely transmits a male sex pheromone; Ross & Smith 1979), and assuming he is not interrupted by a rival or eaten



S. McCann

Figure 1. Female (left) and male (right) western black widow spiders (*Latrodectus hesperus*).

---

Catherine Scott ([catherine.elizabeth.scott@gmail.com](mailto:catherine.elizabeth.scott@gmail.com)) is an arachnologist and behavioural ecologist with a particular interest in chemical communication of spiders and other arachnids. Currently a postdoctoral fellow at Acadia University, she recently completed her PhD at the University of Toronto Scarborough. This article includes material presented in the Graduate Student Showcase at the 2019 JAM in Fredericton.

by the female<sup>1</sup>, the male eventually mates with her. Spiders do this in a strange and unique way, directly transferring sperm with their modified pedipalps. In black widows, the first male to mate can break off the tips of his copulatory organs inside the female, effectively blocking rival males from inseminating her, and thus ensuring his paternity (MacLeod 2013).

To begin to understand how males find females in nature, we (Sean McCann, my coauthor/collaborator and partner, and I) went to a coastal site on southeastern Vancouver Island, where black widows are extremely abundant (Figure 2). First, we spent about 6 months in the field tracking hundreds of male black widows as they went about their business in their natural habitat. We marked all of the females (who generally stay put on their capture webs, which makes them relatively easy to keep track of) and males (who actively search for females) that we encountered during the season (Figure 3). This allowed us to estimate how many males survive the trip to find females (only about 12%! ) and how far they move when they do survive: in most cases, less than 60 m, but sometimes more than 200 m, which is rather impressive for spiders with a body length of less than 1 cm! We were also able to determine that males outnumber receptive females by more than 10 to 1 during the height of the mating season, which means that competition over mates is fierce, making traits and tactics that confer an advantage to searching males all the more important.

The experimental part of our study involved setting up a series of actual races for male black widows—first longer-distance contests in the field, and then shorter sprints in the laboratory. For the Great Black Widow Races of 2016 and 2017, we set up a 60-m course on the sand



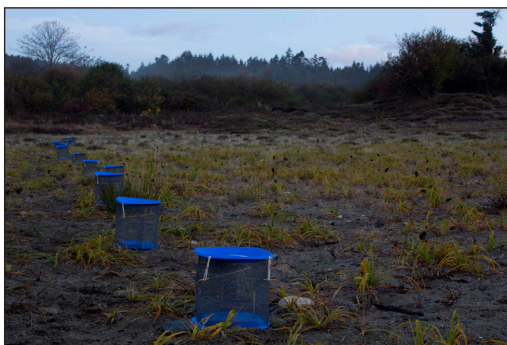
S. McCann

Figure 2. Our field site on the sand dunes of southern Vancouver Island, British Columbia. At this site, driftwood logs provide shelters for western black widows.



S. McCann

Figure 3. A female (yellow 567, whose number corresponds to the location of the paint marks on her legs) consumes an unlucky male.



S. McCann

Figure 4. The finish line of the 2016 Great Black Widow Race. Each cage contains a female black widow on her pheromone-emitting web.

<sup>1</sup> Sexual cannibalism is rare in *L. hesperus*, but when it does happen it is most often before the male ever has a chance to copulate. This is particularly likely if the female is hungry (Johnson et al. 2011).

dunes at our field site. The finish line was made up of a series of mesh cages containing females and their silk (Figure 4). Before the race, we weighed in each male on a tiny scale, measured the length of his legs, and painted him with unique racing stripes so we would be able to track whether he completed the race and calculate his average speed. At sunset (black widows are nocturnal, so males search for females at night) we released groups of about 20 males at 10 m intervals from the finish line, so that the closest group only had to travel 10 m and the farthest group had to travel 60 m. The course was set up so that males would be downwind of the line of pheromone-emitting females (assuming that the weather forecast was correct), and once all of the males were released, we waited at the finish line for them to start arriving outside of females' cages.

In 2016, when the wind was strong and came fairly consistently from the forecasted direction, males released at all distances up to 60 m were equally likely to find females (Figure 5), which suggests that they are very sensitive to the smell of females. In 2017, however, when the wind ended up being weak and highly variable in direction, males released farther than 40 m from females were never able to locate them. Clearly, wind speed and direction will strongly affect the ability of a male to detect and find a female using only their sense of smell. But these experiments revealed something surprising. In 2016, we found that the males that started out farthest from females achieved the fastest average speeds<sup>2</sup> during searching—up to almost 1.5 m per minute (or more than 150 body lengths for spiders that are typically less than 1 cm long)! And in 2017 we found that not only were males able to reach the finish line even after the wind shifted so much that smelling females on the racecourse was likely impossible, but also that the vast majority of males ended up outside of the cage of the single female who was in line with the direction of the wind during the first few hours of the experiment.

Spending time watching what these spiders actually do when they search for females helped us make sense of these results. Male black widows have very poor vision, so they are guided toward females by their sense of smell. To get their bearings, they climb up vegetation, and wave their first pair of legs (which are covered with sensory hairs), apparently 'tasting' the wind (Figure 6). After a



S. McCann

Figure 5. A green-marked male crosses the finish line! also we



S. McCann

Figure 6. A white-marked male has climbed up some grass and is extending his forelegs to taste the air for female pheromones.

<sup>2</sup> We also found a relationship between male size and speed: smaller males were faster, as expected. However, larger males were more likely to survive searching, suggesting that intermediate males might be the most successful searchers in this species.

while, they will climb back down to the ground and continue to move toward their target. Like all spiders, male black widows trail silk draglines behind them as they move through their environment. They anchor these safety lines to the vegetation periodically, such that they leave a silk path wherever they go. We noticed that when a searching male encounters one of these trails, he runs along it, using it like a silk highway. We realized that if males recognize the silk of rival males, they may use their trails to find females, even if wind conditions make it difficult to smell a female directly. And since these spiders are much more adept at walking on silk than on the ground, this might explain why the males in our experiments who traveled farthest also traveled fastest. The males released at 60 m would have been most likely to encounter the silk trails left behind by all those who were released closer to the females.

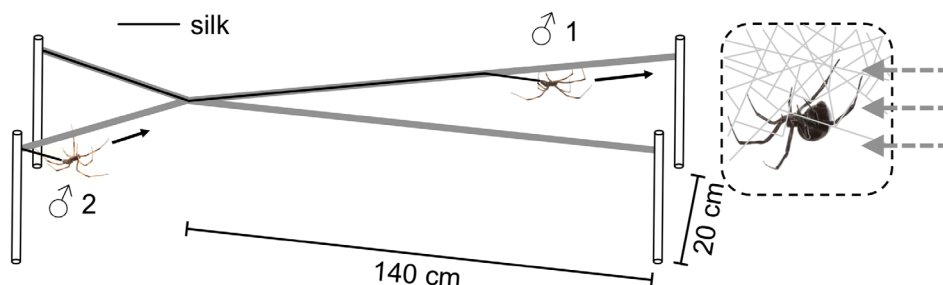


Figure 7. The X-race, an experimental setup for testing whether males follow or avoid the silk of rival males (from Scott et al. 2019).

To test this idea directly, we next ran a series of experiments that we called the X-races, the first of which was carried out by students in the behavioural ecology class Sean and I taught together at the University of Toronto Scarborough in 2017. The race course in this experiment is an X-shaped maze made out of string, with a female set up at one end with a fan behind her to blow her pheromone toward the male, who is released on one of the short arms of the X at the end opposite the female (Figure 7). After being placed on the string, he moves upwind and when he reaches the centre of the X, he can choose to follow either arm—both lead to the female, and either way, he leaves a trail of silk behind him. Next, we introduce a second male to the end of the maze farthest from the female, but on the opposite arm from the first male. When this male gets to the intersection of the X, he now has a choice to follow or avoid the silk of the rival male. We used this experimental set up to confirm that males follow the silk of rivals when given the choice, and that they travel faster when they do. Using a modified version of the X-race, we also found that males only follow the silk of other black widows (and not that of closely related false widow males, which also occur at our field site), which means that the information on the silk is species-specific.

When we put all this together, it tells us that male black widows use the somewhat surprising tactic of following their rivals to find females faster, and that exploiting the silk trails produced by earlier searchers allows them to locate females efficiently even when conditions make it difficult to directly detect their chemical messages. It might not seem like a great idea to follow another male to a female's web, because this guarantees a competition over the opportunity to mate with



that female. We would expect male animals to use cues about the presence of rival males to avoid competition, when given the choice (and in at least one other spider species, they do). But our time following this population in the field revealed that these males are unlikely to ever have that choice. There are so few sexually receptive females signaling on any given night that competition is inevitable. In this situation, the best tactic for males may be to arrive at a female's web as fast as possible, even if other males are already there. Although being the first male to mate is important for black widows, being first to arrive is not critical, because courtship may last several hours. It's at this point, at the female's web, that competition and female choice can finally kick in (Figure 8).

These results reveal a surprising means of using indirect information to gain a competitive edge in the race to find females. We are hopeful that our experimental race designs can allow us and other researchers to learn more about spider mate-searching behaviour and chemical communication in the future. Setting up races over different kinds of terrain to look at the effects of physical barriers on male performance, or doing races over several days and longer distances could yield more insights into what traits are important for searching males. Longer distance ultramarathons for spiders might be more appropriate in environments where females are more widely dispersed than at the site we studied. And the X-race is a convenient way to test male decision-making under controlled laboratory conditions while using a setup that reasonably reflects how male spiders actually move in the field.

## References

- Johnson, J.C., Trubl, P., Blackmore, V., and Miles, L. 2011. Male black widows court well-fed females more than starved females: silken cues indicate sexual cannibalism risk. *Animal Behaviour*, **82**: 383–390. doi:10.1016/j.anbehav.2011.05.018
- Kasumovic, M.M. and Andrade, M.C.B. 2004. Discrimination of airborne pheromones by mate-searching male western black widow spiders (*Latrodectus hesperus*): species- and population-specific responses. *Canadian Journal of Zoology*, **82**: 1027–1034. doi:10.1139/z04-081
- MacLeod, E. 2013. New insights into the evolutionary maintenance of male mate choice behaviour using the western black widow spider, *Latrodectus hesperus*. PhD Thesis, University of Toronto.
- MacLeod, E.C. and Andrade, M.C.B. 2014. Strong, convergent male mate choice along two preference axes in field populations of black widow spiders. *Animal Behaviour*, **89**: 163–169. doi:10.1016/j.anbehav.2013.12.023
- Ross, K. and Smith, R.L. 1979. Aspects of the courtship behavior of the black widow spider, *Latrodectus hesperus* (Araneae: Theridiidae), with evidence for the existence of a contact sex pheromone. *Journal of Arachnology*, **7**: 69–77. <https://www.jstor.org/stable/3704955>
- Scott, C., Kirk, D., McCann, S., and Gries, G. 2015. Web reduction by courting male black widows renders pheromone-emitting females' webs less attractive to rival males. *Animal Behaviour*, **107**: 71–78. doi:10.1016/j.anbehav.2015.06.009

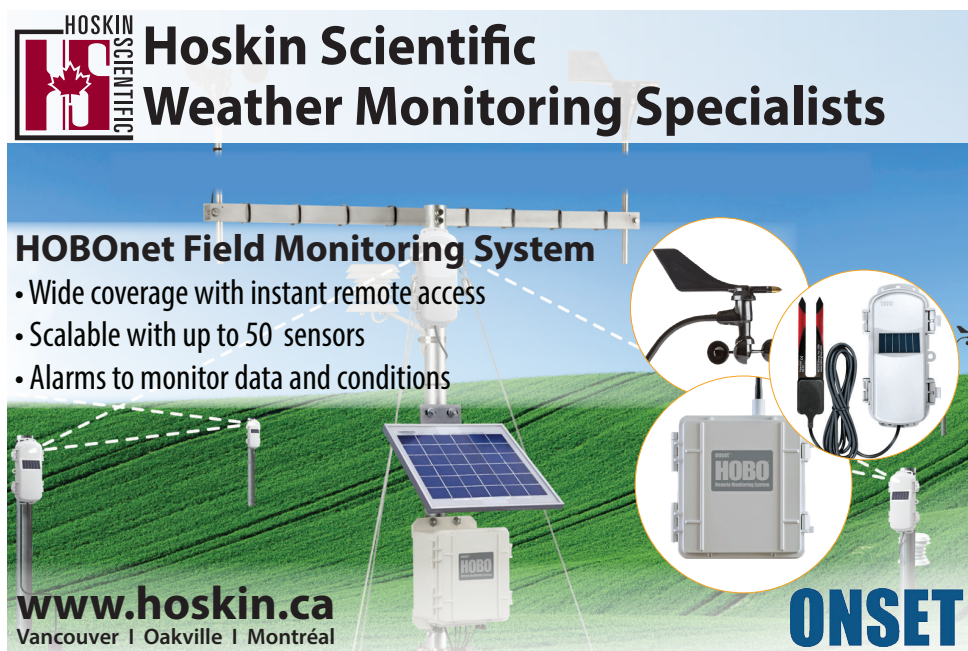


S. McCann

Figure 8. Two males which have arrived at the same female's web one after the other.



- Scott, C., McCann, S., and Andrade, M.C.B. 2019. Male black widows parasitize mate-searching effort of rivals to find females faster. *Proceedings of the Royal Society B*, **286**: 20191470. doi:10.1098/rspb.2019.1470
- Scott, C., McCann, S., Gries, R., Khaskin, G., and Gries, G. 2015. *N*-3-methylbutanoyl-*O*-methylpropanoyl-L-serine methyl ester–pheromone component of western black widow females. *Journal of Chemical Ecology*, **41**: 465–472. doi:10.1007/s10886-015-0582-x
- Vibert, S., Scott, C., and Gries, G. 2014. A meal or a male: the ‘whispers’ of black widow males do not trigger a predatory response in females. *Frontiers in Zoology*, **11**: 4. doi:10.1186/1742-9994-11-4
- 



**HOSKIN SCIENTIFIC** **Hoskin Scientific**  
**Weather Monitoring Specialists**

**HOBOnet Field Monitoring System**

- Wide coverage with instant remote access
- Scalable with up to 50 sensors
- Alarms to monitor data and conditions

**www.hoskin.ca**  
Vancouver | Oakville | Montréal

**ONSET**

The advertisement features a background image of a green field with a weather station. A solar panel is mounted on a pole, and a HOBOnet sensor is visible. A circular inset shows a close-up of the HOBOnet sensor and its connection to a HOBOnet logger. The HOBOnet logo is also visible on the logger.

(paid advertisement/ publicité payée)

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

## Big sand tiger beetle, *Cicindela formosa generosa* "manitoba" Dejean, 1831 – How it came to occupy centre stage on the logo for the Entomological Society of Manitoba

Terry D. Galloway

The big sand tiger beetle, *Cicindela formosa generosa* "manitoba" Dejean, 1831 (Figure 1), is the largest tiger beetle in Manitoba. It occurs across southern parts of the province where there are sandy blowouts large enough to support a population, and along the margins of larger open sand dunes (Wallis 1961). *Cicindela formosa* Say, 1823 is widely distributed in central and eastern North America (see distribution map in Acorn [2001]). It is quite variable in appearance and a

number of subspecies have been described. Wallis (1961) considered the population in southern Manitoba and southeastern Saskatchewan to be a distinct subspecies. It is a strong flier and, when it is warm, the beetles react quickly to movements of intrepid entomologists. The adults of each new generation emerge in August (Criddle 1910) and shortly thereafter construct deep burrows in which to overwinter. They emerge the following May and are active until August, when they overlap briefly with the next cohort of newly emerging adults. They are active predators, and were always a hit at public entomological displays; more on that later. The adults prey on a wide variety of invertebrates, including other, smaller tiger beetles. Ants are common dietary components, especially the aggressive thatching ants which occupy large nests in sandy, vegetated areas. I have on occasion seen severed heads of these ants still attached to an antenna or tarsus of big sand tiger beetles. Larvae excavate distinctive vertical burrows, with a lateral bend near the surface, which opens into the side of an open pit that acts in part to trap insects traveling across the sand. The larvae dash out to feed upon these hapless victims. Criddle (1910) found the larvae to take 2 years in their development into adulthood in Manitoba, living in burrows that, at their deepest, exceed 2 metres.

The big sand tiger beetle first appeared as the logo of the Entomological Society of Manitoba on the cover of Volume 48 of its *Proceedings* in 1992. How it got there is what I want to describe in the remainder of this article. The origins go back to 1966, when the Society proposed a project be designed to commemorate Manitoba's upcoming centennial in 1970. Bill Hanec became chair



Figure 1. The big sand tiger beetle, *Cicindela formosa generosa* "manitoba".

L. de March

---

Terry Galloway ([Terry.Galloway@umanitoba.ca](mailto:Terry.Galloway@umanitoba.ca)) is a retired veterinary entomologist in the Department of Entomology, University of Manitoba, Winnipeg. He spends most of his entomological efforts these days studying ectoparasites of wildlife. He is also the editor of the *Proceedings* of the Entomological Society of Manitoba.

of the committee in 1968. This coincided with a report by the Regional Representative, Lawrie Smith, that the ESC had struck a committee to investigate ways of encouraging students to take an interest in entomology. The ESM moved ahead with a prize to be awarded to the student with the best entomological display at the Manitoba Students' Science Fair. Frank Friedrich of Beliveau Junior High School was awarded \$10.00 in 1970 for his collection of Coleoptera and Lepidoptera. Lawrie Smith, who was by that time Chair of the Centennial Project Committee, received support from the ESM to continue and perhaps even expand the activities of the committee. By the next year, Laurie had submitted an article on collecting and preserving insects to the *Manitoba Science Teachers' Bulletin* and was contacting teachers directly about engaging students in entomology. The plan was to begin providing students with information and supplies to begin collecting insects.

Tom Cole took over as committee chair and assembled student starter kits, which included a polystyrene plastic box with a clear, hinged lid, an introductory guide to collecting and preserving insects, a package of 100 insect pins, and a killing bottle including a small supply of ethyl acetate, all for the price of \$4.75. In 1973, Lawrie Smith chaired the newly named Youth Encouragement Committee, and along with Tom Cole and Andy Kolach, they assembled 50 additional kits which, for the same price, now included a foam spreading board. These kits sold well, 36 being sent out that year, and the committee began expanding their advertising in the school communities and increasing their public profile with seminars, presentations and a public display at the Manitoba Museum of Man and Nature.

The ESM President during 1973-74 was R.N. Sinha, and he had a slightly different vision for public education for the Society. He was determined to engage graduate students in entomology in these activities, and he encouraged Terry Galloway to become the chair of the committee that year, along with four committee members, Lawrie Smith, Bruce Taylor, Bob Semple, and Bill Preston. With a committee stronger in numbers and ideas, activities greatly expanded, including a meeting attended by about 50 young entomologists and their families to discuss insects, and a week-long public entomological display at the Polo Park Shopping Mall. In subsequent years, the committee became known as the Youth Encouragement and Public Education Committee, and activities expanded even further to include organized field trips, workshops to build collecting equipment, and entomology film nights. The public displays at Polo Park and, later, St. Vital Centre became a popular annual event in which many society members participated.

As the group of young entomologists grew, at one point drawn from a mailing list of >100 participants, there was interest in having a formal name. A lively debate and a vote among workshop attendees led to the suggestion and acceptance of "The Young Entomologists". In 1981, The Young Entomologists voted on a logo for their group. Tiger beetles had always been very popular at public displays, where a terrarium full of them often shared a table with a colony of thatching ants. Inevitably, some of the ants made their way into the terrarium of tiger beetles. You can imagine what happened next and why this display was so popular with the public. Perhaps because of the general fondness for tiger beetles, and because the candidate was at the time called *Cicindela formosa manitoba* Leng, 1902, the big sand tiger beetle was selected by vote. The design was left to scientific illustrator Carol Galloway, and her design was accepted and struck onto lapel buttons (Figure 2), proudly worn by members of the group.



J.Bannerman

Figure 2. Young Entomologists button with the image of the big sand tiger beetle, *Cicindela formosa generosa* "manitoba"

As it happened, the scientific journal of the ESM, the *Manitoba Entomologist*, last appeared in 1982, Volume 13, its fate sealed by rising costs of publication. Submitted scientific papers were thereafter published in the *Proceedings*. During the transition in editors from Al Wiens to Richard Westwood, the format for Volume 48 of the *Proceedings* in 1992 changed considerably, and it was at this point that the decision was made to use *Cicindela formosa manitoba* as the new ESM logo. The graphics of the Young Entomologists' logo were modified from her original by Carol Galloway who deleted the title and expanded the name of the Society in full, and it appeared for the first time on the cover. The logo eventually appeared on Society stationary and has been a fixture in Society publications ever since.



From its humble beginnings among youth encouragement activities, the big sand tiger beetle has now graced the Society's pages for almost 30 years.

## References

- Acorn, J. 2001. Tiger Beetles of Alberta. Killers on the Clay, Stalkers on the Sand. University of Alberta Press, Edmonton, Alberta, Canada.
- Criddle, N. 1910. Habits of some Manitoba tiger beetles (Cicindelidae). No. 2. The Canadian Entomologist, **39**: 9–15.
- Wallis, J.B. 1961. The Cicindelidae of Canada. University of Toronto Press.

## *Melanoplus bivittatus* (Say 1825), the two-striped grasshopper Cedric Gillott



D. Johnson

Figure 1. *Melanoplus bivittatus*, the two-striped grasshopper. Left to right: Copulating adults, 1st instar nymph on its allowance, two fourth instar colour morphs.

Of the 600 or so species of short-horned grasshoppers (Acrididae: Orthoptera) found in North America, over 300 species belong to the sub-family Melanoplinae (spur-throated grasshoppers, so-called because of the prominent peg/spine located between the forelegs). About 240 melanopline species are in the genus *Melanoplus* Stål., including *Melanoplus bivittatus* (Figure 1) (Arnett 2000).

Cedric Gillott ([cedric.gillott@usask.ca](mailto:cedric.gillott@usask.ca)) is a professor emeritus at the University of Saskatchewan. As an insect physiologist particularly interested in male reproductive biology, he used the non-diapause strain of *Melanoplus sanguinipes* extensively in his research.



Though many melanoplinae have quite restricted ranges, *M. bivittatus* is widespread over North America (Figure 2), from east to west coasts, south as far as northern Mexico and Texas (but not Florida), and north as far as central Alberta, Saskatchewan, Manitoba, and Ontario, southern Quebec, and the Atlantic provinces, including southern Newfoundland but not Labrador (Pfadt 1989). Within this range, its preferred habitat is tall herbaceous vegetation, including tallgrass prairie, roadside ditches, and field margins.

Given its huge geographic range, it is unsurprising that *M. bivittatus* is polyphagous, feeding not only on grasses, including many cereal crops, but also on many other plants, especially alfalfa, sweet clover, flaxweed, plantain, dandelion, and ragweed. Studies have shown that the inclusion of these 'non-grasses' provides *M. bivittatus* with essential nutrients for improved growth and fecundity.

The two-striped grasshopper (rarely also called the yellow-striped grasshopper) is one of the largest melanoplinae, with males reaching 25 mm and females slightly over 40 mm in length. It is among the most easily recognised of the Prairie grasshoppers for its conspicuous yellow stripes that run on each side of the head dorsum, along the edge of the pronotum, and the length of the tegmina, coming together posteriorly to form a triangle. Its eggs are among the earliest of the *Melanoplus* species to hatch. There are usually five nymphal instars, though six are sometimes seen, and their development takes around 6 weeks. Sexual maturity requires up to 2 weeks, and (in laboratory studies) females may deposit as many as a dozen egg pods, each containing 50 to 100 eggs. Embryonic development begins immediately and may be 60-80% complete before entering diapause for overwintering. Though most populations follow this 1-year life cycle, populations at higher elevations, for example, in the Rockies, may take 2 years to complete their development.

An interesting feature of the biology of *M. bivittatus* is that, like its better-known African cousins, the locusts, it may become migratory at high population densities. The phenomenon occurs in both older nymphs and adults, with the latter developing longer wings and slimmer bodies than the non-migratory form (Pfadt 1989). While little firm data seems available for migration distances in the two-striped grasshopper, movements of its more intensely studied congener, the migratory grasshopper, *M. sanguinipes* (Fabricius) have been quantified. Thus, nymphs of this species may migrate as much as 15 km, travelling about 0.15 kph, while adults can fly at speeds of 15-20 kph, typically covering 40-50 km each day. A record from 1938 reveals that a swarm flew over 600 km from northeastern South Dakota to southwestern Saskatchewan.

Like some other members of the genus (notably *M. sanguinipes*), *M. bivittatus* may become under suitable conditions (for the insect, not farmers!) a pest, sometimes of devastating

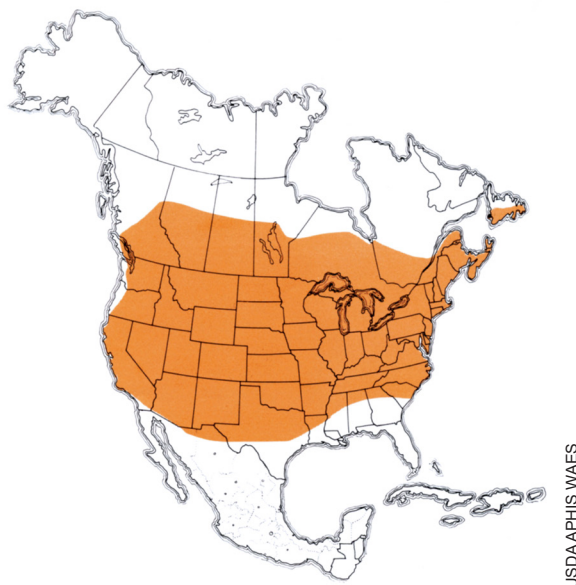


Figure 2. The geographic range of *Melanoplus bivittatus* (from Pfadt 1989).



proportions. This was especially the case as the original shortgrass Prairie was broken, roads were built with ditches alongside (making for excellent egg-laying sites), and drifting of soil occurred, in conjunction with favorable weather for nymphal development over several successive years. Though never considered *the* most important pest on the Canadian Prairies (that 'title' going to *M. sanguinipes*), especially when cereals were the predominant crops, *M. bivittatus* occasionally causes significant damage to some 'newer' crops such as lentils, where its polyphagous habit leads to feeding on flowers and pods (Olfert and Slinkard 1999).

So, what makes *M. bivittatus* stand out for me as a 'cool' insect. I offer two reasons. First, it would have been an ideal insect for physiological research – good size, easily maintained and so on. The only drawback was its single generation per year! The early grasshopper biologists didn't consider it a worthwhile species in which to try to develop a continuously reproducing form through selective breeding – it was simply 'insufficiently pestiferous'! Instead, they focussed on the economically more important migratory grasshopper, which also has the advantage of being a very 'plastic' species in terms of its life history. Thus, in the extreme north of its range, a generation may take 2 or 3 years to complete and includes a diapause in the nymphal as well as the egg stage; by contrast, in Mexico, there may be as many as five generations per year (Robert Randell, pers. comm.). Starting in the late 1950s from 3 founder females, a 12-year selective breeding program over some 75 generations enabled Pickford and Randell (1969) to produce a non-diapausing strain that was ideal for laboratory studies. The non-diapause strain, incidentally, was subsequently shipped widely across North America to fellow orthopterists. As an aside, in the mid-1970s, I and my laboratory colleagues briefly attempted to 'domesticate' *M. bivittatus*. We collected the eggs from large numbers of field-caught adults. The eggs were chilled at various temperatures, for different lengths of time. Perhaps we were too impatient (and *M. bivittatus* eggs may have an intense diapause) but no eggs hatched! However, I learned recently that Dan Johnson in the 1980s, while at the Lethbridge Research Station of Agriculture Canada, began developing a continuously breeding population of *M. bivittatus*. Over a period of about 10 years until the work was discontinued, a population was developed in which about 90% of the eggs developed directly (i.e., without chilling) (Dan Johnson, pers. comm.).

The second reason is that the two-striped grasshopper is the insect on the Entomological Society of Saskatchewan's insignia (Figure 3a, b). Unfortunately, the rationale for selecting this species (rather than, for example, the better known migratory grasshopper, or a non-grasshopper) is not recorded. The Society first discussed the need for an insignia in December 1964 at its Annual General Meeting, and Professor Jacob Rempel (Biology Department, University of



Figure 3. Development of the Entomological Society of Saskatchewan insignia. The original pen and ink drawing prepared by J.G. Rempel (left) and the present version of the insignia (right).

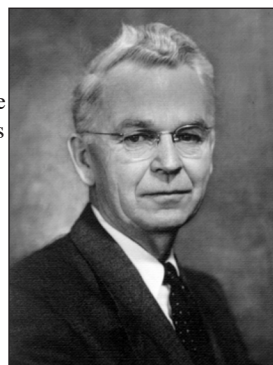
Saskatchewan) (Figure 4) offered to draft a figure. At the 1965 AGM, a motion to make *M. bivittatus* the insect of choice for the insignia was approved. The minutes of that meeting give no indication of whether other insects were considered. Two years later, in 1967, at the Society's 15<sup>th</sup> AGM, the membership formally approved the insignia's design.

### Acknowledgements

Sincere thanks to Dr Dan Johnson (University of Lethbridge) for comments and use of his excellent photos, and to the University of Wyoming Agricultural Experiment Station for permission to use Figure 2.

### References

- Arnett, R.H.Jr. 2000. American Insects: A Handbook of the Insects of America North of Mexico. 2<sup>nd</sup> Edition. CRC Press, Boca Raton, FL.
- Olfert, O. and Slinkard, A. 1999. Grasshopper (Orthoptera: Acrididae) damage to flowers and pods of lentil (*Lens culinaris* L.). Crop Protection, **18**: 527–530.
- Pfadt, R.E. 1989. Twostriped grasshopper *Melanoplus bivittatus*. Species Fact Sheet. In Field Guide to Common Western Grasshoppers. USDA APHIS Wyoming Agricultural Experiment Station Bulletin 912.
- Pickford, R. and Randell, R.L. 1969. A non-diapause strain of the migratory grasshopper, *Melanoplus sanguinipes* (Orthoptera: Acrididae). The Canadian Entomologist, **101**: 894–896.



Ent Soc Sask

Figure 4. Professor J.G. Rempel.



**ATELIER JEAN  
PAQUET INC.**

**MATÉRIEL ENTOMOLOGIQUE  
ENTOMOLOGICAL SUPPLIES**

**Courriel: [jeanpaquet@webnet.qc.ca](mailto:jeanpaquet@webnet.qc.ca)**

**[www.atelierjeanpaquet.com](http://www.atelierjeanpaquet.com)**

(paid advertisement/ publicité payée)

## In memory / En souvenir de

**A**mateur entomologist before his teens, lover of southern Alberta grasslands, foothills and mountains, expert on bumblebees, leaf cutter bees and pollination, manager of Agriculture and Agri-Food Canada's Plant Genetic Resources of Canada centre in Saskatoon, world traveller, and loving husband, father and grandfather are a few of the attributes in the legacy of Ken Richards.

Ken was born in Lethbridge, Alberta, in 1946, the son of a railway engineer and a teacher. He had two sons from a first marriage: Keith and his wife, Theresa, and Aaron and his wife, Julia, along with grandchildren, Thea and Elliot. Ken married Linda Mae in 1986 and they had a daughter, Kimberly.

Ken was destined to becoming an entomologist at a very early age. His passion for insects and early life experiences were in concert with two friends who spent their youth together while living only four blocks apart. The story of how Ken and his friends became entomologists, and the remarkable similarities of their education and careers is unlikely to re-occur in Canadian entomology.

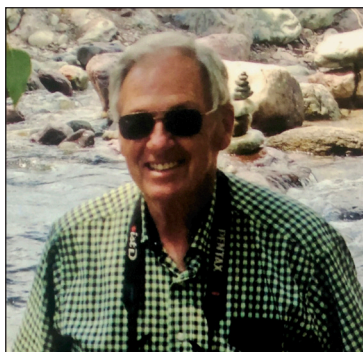
Few retired entomologists writing about a friend can recall first meeting as early in life as the author of this tribute. Ken and I first met in 1951 when we were 5 years old! Our houses were one block apart in a neighbourhood of war time houses in North Lethbridge. We first met when we were enrolled in summer kindergarten, and I recall stopping each day at Ken's house so we could walk to school together.

In 1954 at the age of 8, Ken and I joined a Cub Scout Pack. At one meeting, an entomologist from the local Lethbridge Agriculture Canada Research Station gave a presentation on insects and displayed drawers of insect specimens. From that meeting on, we pledged that we would become scientists who would study insects. Years later, we discovered that the visiting entomologist was the famed bee biologist, Gordon Hobbs. Gordon had a major impact on Ken, as Ken was invited on field trips to the mountains west of Lethbridge with Gordon's two technicians and famed photographer, Evan Gushul. This kind of mentorship would not be allowed today because of liability issues. In return for the invitation, Ken helped count bumblebees in artificial hives and carried equipment.

When each of our families moved to larger homes in South Lethbridge, Ken and I again found ourselves living a few blocks apart. We frequently walked 2 km to the south to explore insect life in a steep-walled glacial coulee called Six-Mile Creek. Ken was hired one summer to collect tiger beetles at this site for University of Alberta graduate student Richard Freitag.

At age 12, Ken and I met Ruby Larson, a plant geneticist working at the Lethbridge Research Station who founded the Junior Science Club of Lethbridge where a group of 12-14 year-old boys met in her basement Saturday mornings to learn about science. By the age of 14, Ken was hooked on bumblebees. He won the Grand Award in the second Lethbridge and District Science Fair in 1964, with a project on bumblebees, and was sent to the Canada-Wide Science Fair in Montreal.

The third student of entomology in our group who joined the club later was David Larson (no relation to Ruby) who lived close to us both.



L. Richards

**Kenneth ("Ken") William Richards**  
**(10 Aug. 1946 – 17 Dec. 2019)**



E. Gushul

Ken Richards (right), David Larson (centre) and Joe Shorthouse (left) at a 1960 meeting of the Junior Science Club of Lethbridge in the basement of Ruby Larson's house.

Ruby took the three of us to Lethbridge meetings of the Entomological Society of Alberta in 1960 and 1963 where our insect collections were exhibited. All three of us went to the University of Alberta to study entomology for our undergraduate and MSc degrees. Ken studied bumblebee ecology for his MSc under the supervision of George Evans.

There were to be other events where our careers followed similar paths. In 1967, Ken, Peter Kevan and I were chosen for a summer-long expedition to study insects at a research camp on the shore of Lake Hazen at the northern tip of Ellesmere Island, about 900 km from the North Pole. Ken studied two species of high arctic bumblebees and returned the following year to collect more data for his MSc.

In recognition of the extraordinary events that brought the three Lethbridge students of entomology together for their MSc degrees, Brian Hocking, founding editor of the University of Alberta journal *Quaestiones Entomologicae*, devoted the entire Volume 9 Number 2(1973) issue to publications arising from the graduate work of Ken, David and myself. Hocking prefaced the issue with an editorial on Ruby Larson entitled 'For love or money?' where he celebrated her role in instilling the love of entomology in the three individuals.

Continuing on similar career paths for our PhD's, Ken went to the University of Kansas to study bumblebees. Waterton Lakes National Park was part of Ken's PhD study area, and in the last 5 years of his life, he made weekly trips to the Park at peak flowering times to record bumblebee biodiversity.

Ken began his career as a forage crop entomologist in 1974 at the Lethbridge Research Station, now called the Lethbridge Research and Development Centre, of Agriculture and Agri-Food Canada (AAFC). He took over this position from his teenage mentor, Gordon Hobbs. Ken undertook research on leafcutter bees and other pollinators. Ken also had research projects using Canadian leafcutter bees in Hungary, Yugoslavia, and China. He later became the manager of forage crops at the Lethbridge Research Station. Ken credited his success here to his friend and workmate, John Virostek, who was Gordon Hobbs' technician before Gordon retired, and Ken's technician thereafter.

In 1996, Ken shifted his scientific focus from bees to genetic resources when he became manager of Plant Genetic Resources of Canada (PGRC) when it relocated to the AAFC Saskatoon Research and Development Centre. A decision was made in Ottawa to transfer all the Canadian seed germplasm (550,000 samples) to Saskatoon, and Ken was charged with supervising the design of a facility to house seeds that had previously been stored at various sites across Canada. He designed operational procedures and hired staff, and PGRC opened in 1998. His work first involved plants, but later included a fungal collection in Ottawa, the plant virus collection from Summerland, British Columbia, the clonal collection of fruit trees and small fruits at Harrow, Ontario and potato breeding in Fredericton, New Brunswick. Ken also initiated the collecting of native species Canadian plants for PGRC, and participated in seed collecting missions to Greece and Ukraine.

As a member of various Canadian delegations attending meetings of the United Nations Food and Agriculture Organization (FAO) in Rome, Ken became involved in international negotiations related to the Treaty on Plant Genetic Resources, and the FAO Commission on Genetic Resources. Ken ensured that the operation of PGRC was closely coordinated with similar activities in the United States. Through his close working relationship with the U.S. Department of Agriculture, Agricultural Research Service's (USDA/ARS) National Plant Germplasm System (NPGS), Ken was invited to serve as chair of the U.S. external review panels. He undertook this role for 15 years



J. Shorthouse

Ken Richards (left), Joe Shorthouse (centre) and Peter Kevan (right) at Lake Hazen on Ellesmere Island in 1967.



chairing each committee as it assessed the 5-year research and germplasm management plans. Ken also chaired the external review panel for the U. S. National Program 305 Crop Production program, which included the USDA/ARS's bee research. While doing this, Ken served on the Scientific Advisory Committee of the NSERC Strategic Network project called The Canadian Pollination Initiative (NSERC-CANPOLIN) throughout its 5-year life.

When a decision was made by the Government of Canada to establish a gene bank for the Canadian Animal Genetic Resources program at the Saskatoon Research and Development Centre, in cooperation with the University of Saskatchewan, Ken was given the lead to negotiate its initiation and assemble staff.

Ken's Saskatoon position led him to speak in many venues around the world. He was proud to deliver a collection of Canadian germ plasm for the opening of the Svalbard Global Seed Vaults on a remote island in the Svalbard archipelago, halfway between mainland Norway and the North Pole. This seed vault is deep inside a mountain in a region of permafrost where seeds remain frozen even without power. In the last 6 years of his career at Saskatoon, Ken oversaw a group of six research scientists who were working on plant and animal genetic resources with their technicians. Ken and his teams received two Gold Harvest Awards from Agriculture and Agri-Food Canada. The Award in 2001 recognized the team's contribution to the FAO's State of the World's Plant Genetic Resources, and the second Award in 2008 recognized the team for its First Global Plan of Action for Animal Genetic Resources.

When Ken retired in 2011, he and Linda purchased an acreage near Lethbridge. Throughout his retirement, Ken continued to review gene bank programs in the United States, and he undertook seed increases of various species of Canadian native plants on their acreage for PGRC.

In late 2019 Ken completed his research on the biodiversity of native bees in Waterton Lakes National Park. He had data on bees and their host plants from before 1996, along with five summers following his return to southern Alberta. His data included bee counts following the large 2017 Kenow wildfire in the Park.

Ken joined the Lethbridge and District Horticultural Society and soon became a member of the Board. He participated in excursions such as the annual wildflower hike to the Rocky Mountains, and frequently gave presentations at meetings where members learned about the role of bees in gardens and the need for seed banks to sustain genetic diversity. He presented similar lectures for Parks Canada and Glacier National Park in nearby Montana. The Horticultural Society started a Legacy Ornamental Garden in a new park in North Lethbridge, and Ken was on the steering committee to guide its progress. He prepared a long-term plan for the garden that was accepted by the City of Lethbridge. In the summer of 2019, Ken raised and introduced plants to an alpine section of the garden, and was planning a fruit and berry section at the time of his passing.

Ken had expertise in many different disciplines having made scientific contributions to both entomology and plant genetics. He leaves a rich collection of scientific and semi-popular publications authored in two distinct disciplines. He was an outstanding ambassador for Canadian agriculture and studies of Canadian bees. He will be remembered for his incessant desire to learn and share his knowledge of complex biological issues with both scientists and the public. He thrived on drawing attention to beauty in the natural world thereby uniting the Arts and Sciences. He will be missed by his family, a wide network of friends, members of the Lethbridge Horticultural Society, and researchers in entomology and plant genome communities across Canada and around the world.

### Acknowledgements

Information on Ken provided by Axel Diederichsen of Plant Gene Resources of Canada, Saskatoon, Peter Bretting, of the United States Department of Agriculture, Washington, D. C., Paul Stevenson of the Lethbridge and District Horticultural Society, and Ken's wife, Linda, of Lethbridge, is gratefully acknowledged.

Joe Shorthouse. Professor Emeritus, Laurentian University, Sudbury, Ontario.



The year 2020 will not be remembered fondly by history, but especially so for friends and colleagues of Doug Craig, who passed away from complications with cancer in early January (Figure 1). Doug was a multitasking fixture of the Canadian entomological community for more than half a century, publishing more than 100 papers that spanned the realms of insect morphology, palaeontology, embryology, microscopy, hydrodynamics, systematics and biogeography. He was, however, best known for his contributions to the study of black flies (Diptera: Simuliidae) — a little loved but fascinating group of bloodsucking insects. Doug enjoyed a long and distinguished career at the University of Alberta, where he was a key member their legendary Entomology Department (Ball, 1985). He taught a wide variety of undergraduate courses and sponsored 18 graduate students and 4 postdoctoral fellows during his 31-year tenure as professor. Doug took early retirement in 1997 at age 58, but remained active until his death. Remarkably, nearly half (52) of his 113 publications were produced during his time as Professor Emeritus.

Douglas Abercrombie McBeath Craig was born on 24 October 1939 in Nelson, New Zealand — the son of Andrew and Violet Craig. Doug's mother died when he was only 6 years old, and he spent the next 4 years in a series of foster homes until his father remarried in 1949. Doug attended Nelson College from 1953-1957, moving to Christchurch in 1958 to attend Canterbury University. It was

there that he met his future wife, Ruth Heath, in a Botany class. They married in 1962 while still enrolled in their undergraduate programs, with Doug attaining his B.Sc. (Honours) degree the following year. As was typical in New Zealand at the time, Doug commenced a direct-entry PhD program at Canterbury University, where he studied the biology of New Zealand net-winged midges (Diptera: Blephariceridae). After defending his thesis in late September 1966, Doug and Ruth departed the very next day for what was supposed to be a temporary gig at the University of Alberta in Edmonton. Janet Sharplin — the Department of Entomology's insect morphologist — was going on sabbatical, and Doug's role was to cover her courses for the year. As fate would have it, the sabbatical evolved into maternity leave, with Janet opting not to return to her former role. Doug was at the right place at the right time, transitioning seamlessly from Sessional Instructor to Assistant Professor in 1968. Once settled in the security of a tenure-track position, Doug and Ruth set about expanding their family. Daughter Jaqueline was born in May 1968 followed by son Michael in June 1970. They lived in a succession of residences before settling into their 'forever' home in 1974. Situated in the Belgravia District immediately south of campus, the Craigs' beautifully appointed bungalow became a social hub for generations of University of Alberta entomologists.

Doug's career-long focus on black flies started soon after his arrival in Alberta. The Head of the Entomology Department at that time, Brian Hocking, was an internationally renowned authority on



M. Craig

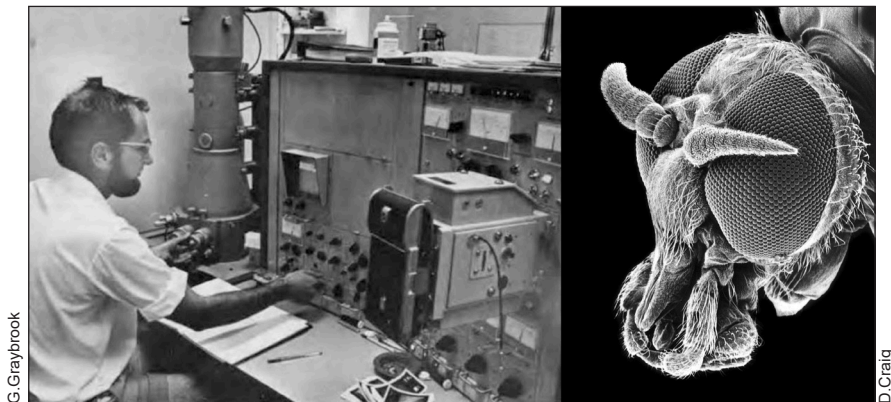
**Douglas A. Craig  
(1939 – 2020)**



R.E.G. Craig

**Doug and Ruth Craig in New Zealand**

the ecology, physiology, medical importance and control of biting flies. It just so happened that one of Hocking's students, Osman Abdelnur, was in the midst of preparing a manuscript from his PhD thesis on the biology of some Alberta black flies. The journal was prepared to accept the manuscript if Abdelnur provided illustrations for some of the characters in his dichotomous keys — a challenge for anyone lacking artistic skills. Doug volunteered to step in, producing the drawings needed for the paper to be accepted. The high quality of Doug's illustrations was evident in his first published (though uncredited!) renderings of black fly bits and parts (Abdelnur, 1968). Nonetheless, the exercise proved sufficient to spark Doug's interest in black flies, with his own publications on the group soon to follow (Craig, 1968a, 1968b).



Left: Doug Craig operating the first SEM in the Department of Entomology. Right: The head of *Helodon susanae* — Doug's most reproduced SEM image.

In the early part of his career, Doug's black fly research concerned various aspects of embryology, histology, morphology and methodology — a transdisciplinary approach that served him well throughout his career. But Doug's early embrace of scanning electron microscopy (SEM) proved to be a game changer (Craig and Braybrook, 1972). He first used the SEM to reveal the ontology of larval black fly heads (Craig, 1972), later launching a long and productive line of research on the morphology and function of labral fans — the filter-feeding apparatus of larval black flies. The technology proved equally effective for exploring other character systems and taxa, providing endless grist for Doug's lab and the broader university community. Doug took his first sabbatical around the same time (1972/1973), traveling to Tahiti and New Caledonia to launch another new research program on the diversity, evolution and biogeography of southern Pacific black flies. Subsequent sabbaticals to the South Pacific in 1980/1981 and 1988 provided enough material to produce a series of important revisionary works for the region, along with a pair of biogeographical studies that rank among Doug's most cited publications.

The 1980s heralded a new chapter in Doug's career with his burgeoning lab and development of an entirely new research focus. Long fascinated by the complexities of the labral fans of larval black flies, Doug became curious about how they worked. He was greatly influenced by Rubenstein and Koehl's (1977) paper that applied theoretical considerations to the mechanisms of filter feeding organisms. Another major influence was stream hydrologist Bob Newbury, who at the time was a research scientist at the Freshwater Institute in Winnipeg. In 1983 Doug attended a field course offered by Newbury at the Wilson Creek Experimental Watershed in Manitoba, thus spawning the field of "Behavioural Hydrodynamics". Over the next decade or so, Doug and

his collaborators published dozens of papers that applied hydrodynamic principles to the study of morphological adaptations to life in flow. This period represented the highwater mark of his academic career at the University of Alberta, though circumstances were soon to change. In 1994 the university folded the tightly-knit Department of Entomology into the much larger Department of Biological Sciences. The new dynamics exacted a toll, especially with regard to Doug's teaching assignments, which were adjusted to suit the needs of the new, supersized, department. Doug happily took early retirement when the opportunity arose in 1997.

Far from settling into quiet retirement, Doug's emancipation from teaching and graduate student supervision proved a boon for his research productivity. He continued going to the lab on a daily basis, focussing on his revisionary studies of South Pacific black flies and other simuliids of interest. It was during that period that he dove deeply into the geological literature, publishing his highly cited research on the geographical history of southern Pacific islands. I suspect few other biologists have the skill and background to comprehend (let alone synthesize!) the arcane geological literature on that subject. Doug and Ruth relished the opportunity to return to their natal land to study the black flies (sand flies or *te namu*, as they're known locally) of New Zealand. The result was a massive 336-page tome on the taxonomy, bionomics and evolution of the 19 species of *Austrosimulium* known from that country (Craig et al., 2012). Remarkably, the last 3 years of Doug's life were among his most productive, with at least 10 papers published during that time. Among them was a series of six major revisions of the Gondwanan black flies of Australia — a monumental collaboration that came to fruition only through Doug's leadership and perseverance. At least one other such contribution was in the works, though Doug sadly died before it was completed.

It's difficult to encapsulate one's life and accomplishments in a short note, and there was certainly more to Doug than just his academic achievements. Although exceptionally attentive to the needs of his graduate students, Doug didn't require that his name appear on all their papers — despite the fact most were supported both intellectually and financially. Imagine Doug's CV had he adopted a more conventional approach to graduate-student supervision. He was also a key figure in the social life of the Department, hosting countless extracurricular events at the Craig family home. In fact, Doug and Ruth's home was the temporary first place of residence for many students and postdocs when they first arrived in Edmonton. That's just the kind of folks the Craigs were. In 2012 Doug organized the "1922: Then and Now Symposium", a celebration of past and present entomologists at the University of Alberta. It attracted an international gathering of about 100 former department members and accompanying guests. The timing was right, as many key members of the former department have since passed, including George Ball, Bruce Heming, Ron Gooding, Andy Nimmo, Mac McIntyre and Robin Leech.

Doug's passion for research was matched only by his zest for the finer things in life, whether it be travel, classical music, engaging in conversation (he was a gifted raconteur!) or enjoying a fine scotch or wine ("the red stuff", as he liked to call it). He especially enjoyed concocting witty subject lines for email messages, using cringe-inducing puns that related to the contents of his messages. I, for one, very much miss seeing his missives in my inbox. In Doug's typical humble fashion, he requested that no funeral be held upon his death. Nonetheless, there was considerable interest on the part of Doug's many friends and colleagues to hold an event in his honour. The family agreed, offering to hold a Celebration of Life at the Craig family home in June of this year. Unfortunately, the COVID-19 pandemic intervened and the event was cancelled. I can't help but wonder whether Doug is smiling at our scuttled efforts to skirt his wishes. You see, Doug was never one to say good bye, so we'll have to settle for his favoured signoff "Toodles for the nonce".

Doug Craig's publications and other research contributions are posted on ResearchGate:  
[https://www.researchgate.net/profile/Douglas\\_Craig/research](https://www.researchgate.net/profile/Douglas_Craig/research)

## References

- Abdelnur, O.M. 1968. The biology of some black flies (Diptera: Simuliidae) of Alberta. *Quaestiones Entomologicae*, **4**: 113–174.
- Ball, G.E. 1985. History of the Department of Entomology, 1922–1985. *Agriculture and Forestry Bulletin, The University of Alberta* **8**: 3–12.
- Craig, D.A. 1968a. The clarification of a discrepancy in descriptions of maxillary musculature in larval Simuliidae. *Quaestiones Entomologicae*, **4**: 31–32.  
<https://www.biodiversitylibrary.org/item/208825#page/55/mode/1up>
- Craig, D. A. 1968b. The embryogenesis of the larval head of *Simulium venustum* Say (Diptera: Nematocera). *Canadian Journal of Zoology*, **47**: 495–503. <https://doi.org/10.1139/z69-088>
- Craig, D.A. 1972. Observing insect embryos with a scanning electron microscope. *The Canadian Entomologist*, **104**: 761–763. <https://doi.org/10.4039/Ent104761-5>
- Craig, D.A., and G.D. Braybrook. 1972. Another point of view: the Scanning Electron Microscope. *Agriculture Bulletin, The University of Alberta*. Autumn: 4–6.
- Craig, D.A., R.E.G. Craig and T.K. Crosby. 2012. Simuliidae (Insecta: Diptera). *Fauna of New Zealand*, **68**: 1–336. <https://biotaxa.org/fnz/article/view/1840/3116>
- Rubenstein, D.I. and M.A. Koehl. 1977. The mechanisms of filter-feeding: some theoretical considerations. *The American Naturalist*, **111**: 981–994.

Douglas C. Currie  
Royal Ontario Museum, Toronto



**R**onald Harry Gooding, professor emeritus at the University of Alberta passed away on 29 December 2019.

Ron, born 18 October 1936, grew up in Edmonton and attended the University of Alberta, obtaining his BSc in 1957. He received an MA from Rice University in Texas and ScD from Johns Hopkins, then spent two years as a research associate at Vanderbilt. Ron returned to Edmonton in 1966 as an assistant professor in the Department of Entomology, where his research initially focussed on digestive processes in mosquitoes. His distinguished career included five years of administrative duty as Department Chair from 1989 to 1994. He guided his Department through interfaculty negotiations that resulted in the merger of Entomology with Zoology and ultimately the creation of the Department of Biological Sciences. Ron continued his teaching and research in the new department, maintaining a long-term study of tsetse flies until retirement in 2002. His tsetse research began with their digestive physiology and biochemistry and moved later to their genetics, receiving international recognition in multiple fields. He loved meeting people and was always learning from new experiences.

Ron enjoyed teaching and is fondly remembered for his courses on insect biochemistry as well as medical and veterinary entomology, the latter being legendary among his students. Each lecture had a story associated with it. In one of these, as an undergrad working bare-chested in the hot sun at Lethbridge, Ron was observing tethered warble flies thinking he was dealing with *Hypoderma lineatum* rather than *H. bovis*. With *H. lineatum*, the eggs are laid in a line on a recumbent host and are easily detected whereas *H. bovis* lays eggs singly on an active host. The way Ron told the story, when his supervisor noted the fly eggs on his chest, he told Ron he would need to walk around with a hand held above his head. Since the grub normally burrowed to the highest point in the back of a cow, he would need to either remove the eggs immediately or devise a way to convince the grub not to end up in his brain. Ron's matter-of-fact delivery of that lecture impressed generations of students with the importance of knowing the species identity, not just the genus, of one's study animal.

Ron was also active in service contributing to the Entomological Society of Canada as Director-at-Large and to the Entomological Society of Alberta since his student days, as well as serving as President in 1987. He became an emeritus professor at the University of Alberta in 2002 and continued to be active in the local entomological community and as a reviewer.

While he was Chair of Entomology, Ron became a serious practitioner of Tai Chi, later crediting this focus with giving him the necessary strength and balance to help him through the challenging merger period. He also enjoyed time with his wife Sheila, son Rick, daughter-in-law Elizabeth and his three granddaughters, Anna, Claire and Grace.

Janet Sperling and Bev Mitchell (Professor Emeritus), Department of Biological Sciences, University of Alberta with appreciated input from Rick Gooding and Sheila Gooding.



**Ronald Harry Gooding  
(1936–2019)**



**Paul-Michael Brunelle**  
**(7 November 1952 – 18**  
**January 2020)**

**P**aul Michael Brunelle, 67, Atlantic Canadian odonatologist and notable graphic designer, passed away unexpectedly at his cabin-cum-laboratory in rural Middle New Cornwall, Nova Scotia, on 18 January 2020.

Paul was born 7 November 1952 in Halifax, Nova Scotia. He graduated from Dartmouth High School in the then city of Dartmouth, Nova Scotia, since absorbed into the Halifax Regional Municipality. A talented artist, Paul attended the Nova Scotia

College of Art and Design (since 2003 NSCAD University) at a period when NSCAD was recognized internationally as “the best art school in North America”. Graduating, with a Bachelor of Design in Communication Design in 1976, he founded Graphic Design Associates (GDA) in Halifax, with partner Dereck Day. A variety of significant regional and national design projects followed, including the Nova Scotia Health card featuring Kejimikujik National Park and a series of fishing fly stamps for Canada Post. From 1992 to 1994, Paul served as President of the Graphic Designers of Canada (GDC), an organization of design professionals in media and design-related fields and Canada’s national certification body for graphic and communication design. In 1999 Paul was awarded designation as a fellow of GDC, a mark of his accomplishments and influence on the design profession in Canada. A first-rate natural history illustrator, Paul was also a member of the Guild of Natural Science Illustrators, a North American organization concerned with communicating and clarifying scientific ideas visually.

The late 1980s to early 1990s was a time of tumultuous change in Paul’s life. His only child, Michael, was born (1991), and Paul, then in his late thirties, abandoned a successful commercial career in graphic design to pursue life as a free-lance Odonatologist. Ultimately, this proved to be a financially precarious move. So much so, that in the decades that followed it left Paul lurching from debt (much of the time) to occasional plenty (when project or contract money was available). Nonetheless, Paul managed to pay the rent on a small apartment in Halifax (until he moved out of the city in 2017), supported a more-than-modest smoking habit with his own rolled, loose leaf tobacco cigarettes, and when times were especially tight, subsisted on a staple of beans and rice.

Throughout his life, Paul had a passion for natural history and the outdoors, and like so many notable natural historians through the ages, was self-taught. This led him to devote the latter half of his life to the study of the dragonflies and damselflies of the northeast, at the time relatively poorly known. In the 90 years prior to 1990, only about 4700 records of Odonata had accumulated for the entire Acadian region (Maine and Maritime Canada), with these collected mainly incidental to other studies undertaken largely by professional entomologists. In Canada



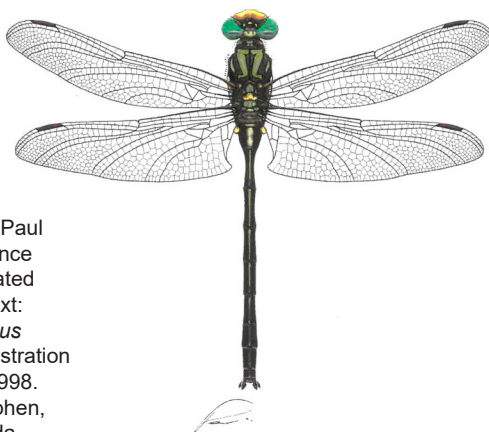
Paul Brunelle and his customized “Odemobile” jeep on the search for Odonata in the Jacquet River Gorge Protected Natural Area in August 2010, during a New Brunswick Museum-organized biodiversity survey.

this included, most notably, Edmund M. Walker of the University of Toronto and founder of the Royal Ontario Museum invertebrate collections. In 1993, Paul established the Atlantic Dragonfly Inventory Program (ADIP), an unfunded, volunteer survey to which interested persons were encouraged to submit specimens and data to given standards. From 1999 to 2003, Paul was contracted by the State of Maine Department of Inland Fisheries and Wildlife to help co-ordinate (with Wildlife Biologist Dr Philip deMaynadier) the Maine Damselfly and Dragonfly Survey (MDDS) for the same purpose. At the time of Paul's death, as result of his own efforts, his oversight of organized surveys (undertaken largely by amateurs), and his enthusiastic encouragement of anyone who could hold an insect net, he had meticulously databased in excess of 67,000 records of odonates from Maine and the Maritimes. During the course of his entomological career, Paul produced about 80 journal papers, consulting and species status reports, and newsletter contributions dealing with odonates. This included, with Paul Catling and the Royal British Columbia Museum's Robert Cannings (one of Paul's early mentors), an annotated checklist of the Odonata of Canada.

Throughout the early 1990s and until his death, Paul's interest in damselflies and dragonflies never flagged and became his primary vocation. Funded by a number of agencies, his insect survey work took him to some of the most remote bogs, streams and marshes of the Maritimes and the northeastern USA, usually alone, and often at risk of sinking into a quagmire. An early highlight was his 1995 discovery of a new species of dragonfly, the broad-tailed shadowdragon (*Neurocordulia michaeli*), which he described in the scientific literature and named for his son in 2000. A dusk-flying species, Paul discovered larvae in the Canoose, a cool, clear, rocky stream in Charlotte County, New Brunswick. The find was significant (it had been nearly half a century since anyone had discovered a new shadowdragon in North America) and led to dragonfly specialists from across the continent making the trek to southeastern New Brunswick when the 1996 annual meeting of the Dragonfly Society of the Americas was held in St. Stephen, New Brunswick to mark the discovery. The same year Paul was awarded the Entomological Society of Canada's Norman Criddle Award, which recognizes the contributions of an outstanding non-professional entomologist to entomology in Canada.

A fuller tribute to Paul's life, with a full bibliography of his publications and other writings, will appear in *The Canadian Field-Naturalist*.

Donald F. McAlpine  
Department of Natural History  
New Brunswick Museum



While a fine natural history illustrator, Paul also understood the scientific importance of carefully recording the data associated with each of his illustrations. Image text: *Gomphus* [=Phanogomphus] *descriptus* Banks, 1896. Mature male, 250%, Illustration by Paul-Michael Brunelle, February 1998. Dennis Stream at Highway 1, St. Stephen, Charlotte Co., New Brunswick, Canada, June 23rd, 1995. P.M. Brunelle.

*Gomphus descriptus* Banks 1896  
Mature male, 250%, illustration by Paul-Michael Brunelle, February 1998  
Dennis Stream at Highway 1, St. Stephen, Charlotte County, New Brunswick, Canada, June 23rd, 1995, P.M. Brunelle

## 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](mailto: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](mailto: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].
- Klimaszewski J., et al. 2020. Synopsis of Adventive Species of Coleoptera (Insecta) Recorded from Canada. Part 5: Chrysomeloidea (Cerambycidae, Chrysomelidae, and Megalopodidae). Advanced Books. [e-book] doi: 10.3897/ab.e50613.

- 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. Field Guide to the Flower Flies of Northeastern North America. 2019. Princeton University Press. ISBN 978-0-691-18940-6 [paperback].
- Stock, M. 2019. The Flying Zoo – Birds, Parasites and the World They Share. University of Alberta Press. 978-1-77212-374-6 [softcover].
- Volis, S. 2019. Plant Conservation: The Role of Habitat Restoration. Cambridge University Press. ISBN 978-1-108-72733-4 [paper back].
- Wilson, K., Fenton, A., Tompkins, D., eds. 2019. Wildlife Disease Ecology. Linking Theory to Data and Application. Cambridge University Press. 978-1316-50190-0 [paper back].

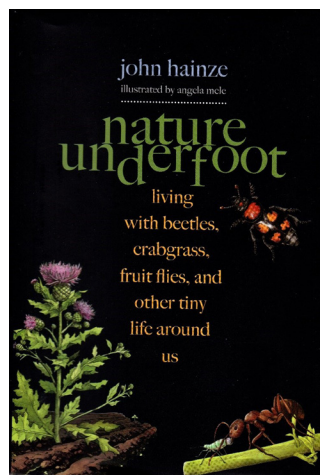
## Book reviews / Critiques de livre

*Nature Underfoot: Living with Beetles, Crabgrass, Fruit Flies, and Other Tiny Life Around Us.* Hainze, J. 2020. Yale University Press. New Haven and London. xvi + 254 pp. ISBN 978-0-300-24278-2. Hardcover.

This book draws our attention to small living forms that surround us in our everyday lives that many might ignore or may consider a nuisance. The author, John Hainze, an entomologist with interests in studying religion, ethics, and science as well as experience in developing pesticide products, convincingly argues that these supposedly lesser creatures and plant life that inhabit our homes, lawns, and neighborhoods, deserve our careful consideration. He makes a compelling case for coexistence and reminds us to keep in mind the remarkable resilience exhibited by these creatures, having survived millions of years and overcoming past extinction events, and our “moral obligation” to be aware of, appreciate, and protect them.

The book begins with a **Preface** (ix–xiii) that briefly describes the impact of pesticides and human-induced habitat changes on arthropods, particularly worldwide declines in insect populations, and unwanted plants. Then, the author puts forward his thesis on why we should try to lessen these losses by adopting a healthy regard for other life forms especially those that we share space with. This section is followed by the **Acknowledgments** (xv–xvi).

The **Introduction** (pp. 1–10) highlights how nature pervades urban environments as tiny





crustaceans (pillbugs and sowbugs), insects, and plants such as dandelions and crabgrass. The author mentions the negative impacts of our activities like using insecticides at home on non-harmful creatures and encourages us to be more aware and value the diversity of life in our midst.

Section One, **Anthropocene Winners** (pp. 11–32) covers the lives and survival strategies of two insect species (silverfish and fruit fly) and two species of plants (dandelion and crabgrass) seen routinely in household settings to emphasize their adaptive success over evolutionary time scales. Section Two, **Nature at Work** (pp. 33–57) introduces three insect species including honey bees and bumble bees that play very critical and well-recognized roles in food supply via pollination. Life histories of these two species, and adaptation and life histories of hover flies (Diptera: Syrphidae) and millipedes are described. The importance of these organisms in nature and the destructive influences of land-use changes and other factors on declines in bee and hover fly populations are discussed. Section Three, **Inadvertent Domestication: The Pets We Didn't Want** (pp. 58–80) details behavior, morphology, ecology, and adaptations of common household arthropod species that include the clothes moth, the bed bug, and the house centipede and concludes with a considerable amount of information on house dust mites. I noted that no mention was made of insects in stored foods, which was a bit surprising to me.

Section Four, **Anthropocene Invasions** (pp. 81–105), as the name implies, discusses invasive insect and plant species that have become established in North America due to human migration and international trade. This section blends ecology, spread, adaptation, and success in the invaded range of three species of non-native insects, the multicolored Asian lady beetle, the Asian tiger mosquito, and the yellow fever mosquito, and two species of noxious plants, Canada thistle and garlic mustard. Section Five, **The Unlucky: Anthropocene Extinctions** (pp. 106–137) explores the influences of human activities, and other factors, on population declines of different types of species, especially insects including non-targets of insecticide usage. Examples presented include the large blue butterfly in Britain; the Hine's emerald dragonfly, the Franciscan manzanita plant, and the American burying beetle in the USA. Section Six, **Human Exceptionalism?** (pp. 138–162) presents the extraordinary capabilities and evolutionary successes of tiny organisms and suggests that we take a holistic view of all organisms and value their contributions considering the unique roles that they play in their ecosystems. Social insects (termites and ants), human gut bacteria, and dung beetles are included as examples.

Section Seven, **Coexistence** (pp. 163–183) proposes that humans reduce the environmental burden of their explosive population growth and overexploitation of resources by considering lives of other beings. The author cites density-dependent reproductive behavior of meadow voles and provides several examples of cooperative association between different organisms such as between plants and herbivores (e.g., acacia plant and acacia ant) and between different insect species (e.g., ants and aphids) to support his views. Section Eight, **Valuing our Anthropocene Partners** (pp. 184–218) advocates appreciation and respect for insects and other smaller living beings and provides supporting information from various world religions and cultures, and views expressed by prominent individuals including philosophers to convince the readers of the need to recognize and show empathy for other life forms. The author forcefully argues that human behaviors and decisions regarding life forms in our surroundings and beyond should be based on an understanding of the inherent value of each species, an awareness of the interconnectedness of life, and consequences of our actions on their habitat. The subsequent sections include **Notes**, **Bibliography**, and **Index**.

I enjoyed reading this well-written book, replete with interesting examples and stories, and learned some fascinating biological and ecological aspects of some of the organisms that I previously did not know. I particularly liked the concluding sections where the author attempts to support his reasons for taking care of the small, harmless living forms around us in the spirit

of 'live-and-let-live' and urges us to take guidance from world's sacred traditions and scriptures in this regard. The text or theme, at times, appeared repetitive, particularly in the last section, perhaps to strongly drive the author's viewpoint to the readers.

Surprisingly, there weren't any color images of the species described within the book. A black and white illustration of one of the focal species (or a combination of species) in each section is provided at the start of that section possibly to highlight their continued existence since prehistoric times. Less informed readers will need to search the internet for color photos of some of the organisms. This book requires at least some basic knowledge about general ecology, entomology, and religion and ethics to fully appreciate the subject matter. This is an excellent resource for teachers and parents to engage children in discussing smaller life forms and to heighten their curiosity about nature. I tried to do the same and was pleasantly surprised to get to know some very interesting thoughts and ideas.

In a potential future edition, any concrete recommendation(s) on how to balance the competing priorities of protection of human health (or conservation of native biodiversity) and ethical management of harmful species will further strengthen the message of the book. In addition, the value and scope of this work would be global if the central message can be appropriately modified to suit situations in poor countries where crop protection is essentially a life-and-death situation for subsistence farmers, and insect-borne diseases can easily overwhelm healthcare systems. Overall, this is a very good book to have on your shelf and I will recommend it to any one with interest in entomology, ecology, conservation, and nature.

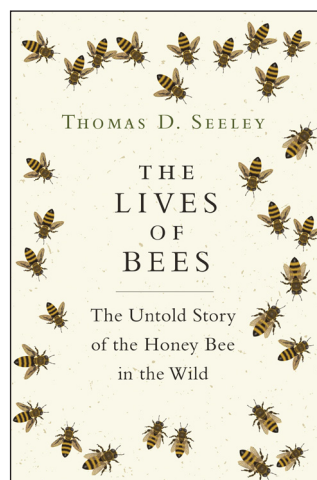
Kishan Sambaraju  
Canadian Forest Service, Quebec City

---

***The Lives of Bees: The Untold Story of the Honey Bee in the Wild.*** Seeley, Thomas D. 2019. Princeton University Press, Princeton, New Jersey. Hardback, 376 pp. ISBN 9780691166766. US\$29.95.

In the last two decades, many books have been published on bees, covering a broad range of topics, including their importance as pollinators, general life history, conservation, and methods that people can use to promote and conserve bees and other pollinators. Most of these have been written for a general audience, the majority written by non-academics, more specifically, non-melittologists. As a bee researcher, I am always excited when new academic titles involving bees are published by authorities on the topic. There are many such books on honey bees and honey bee biology; many of these are very good, but as someone more interested in the natural history of bees, I have always found the books of Thomas D. Seeley among my favourites. Of these, "*The Wisdom of the Hive*", "*Honeybee Ecology*", "*Honeybee Democracy*" and "*Following the Wild Bee*" are all excellent, though the latter two are relatively recent and are very much complementary to his newest book "*The Lives of Bees*", which I briefly review here.

In his newest work, Seeley once again introduces us to some of the classic studies that he, his



graduate students, collaborators, and his mentors have conducted on honey bee biology. I love reading about these studies and the people who conducted them, and Seeley's enthusiasm serves as a great reminder of how interesting honey bees really are. In *The Lives of Bees*, the focus is not on "managed" honey bees living in artificial hives, but rather on the feral honey bees living in the wild, in this case, the New England woodlands. The differences between the lives of managed and those of feral honey bees are not trivial, and Seeley, in his elegant writing style, explains how these feral colonies live lives much differently than those living in artificial hives. Most importantly, Seeley explains why studying these differences offers much to understanding the present situations faced by honey bees for life in managed colonies. For instance, in addition to seemingly preferring cavities of much smaller volume, feral honey bees prefer smaller nest entrances and nesting in cavities much higher off the ground. These preferences have ecological and evolutionary significance that are important for understanding some of the issues with managed colonies. Seeley also provides some useful analysis of the economics of both the feral and the managed hive, particularly the energetics of wax and comb production within these natural versus larger artificial cavities. With a very low (i.e., 20%) conversion efficiency of honey to wax, one can really start to appreciate why honey bees need to be so efficient at finding and exploiting floral resources, especially when living in large cavities and in high colony concentrations common in bee yards.

Seeley is truly a wonderful science writer, and one of the best at synthesizing information from honey bee studies conducted across the globe, placing information into the context of the big picture, that of understanding problems with honey bee husbandry. His ability to communicate his science, and the science of others into common themes makes his books a pleasure to read for both academics and general readers alike. His enthusiasm for honey bees and honey bee research, and his respect for his mentors and graduate students is obvious throughout his books. Although I am only hitting the tip of the iceberg with respect to the amount of information in this 376 page book, *The Lives of Bees* is a resource for which one really has to have a copy in hand to fully appreciate its content and beauty. It is loaded from cover to cover with many excellent photographs and illustrations, with each chapter focused on a particular topic. This work will be of value to bee researchers and a general audience, though I think is especially valuable to those working in the honey bee industry. Honey bees are wonderful bees, and perhaps our greatest allies in the Animal Kingdom. We are well aware of the issues commercial colonies face, and the fact that bee keepers continue to report losses while we have a growing need for crop pollinators. We are largely to blame because we manage honey bees in ways that are very different from how they prefer to live – *The Lives of Bees* explains the latter and provides an opportunity for us to re-think husbandry practices for honey bees. When left to their own devices, honey bees seem very capable survivors. Perhaps using husbandry practices that are more in line with their natural ecology instead of in ways to fully exploit the ecological services and products they provide, we can make a more sustainable industry.

Cory S. Sheffield  
Royal Saskatchewan Museum, Regina

*In Search of Meadowlarks : Birds, Farms, and Food in Harmony with the Land.* Marzluff, John M. 2020. Yale University Press. New Haven and London. 352 pp. ISBN 9780300237146. CAN \$36.50. Hardcover.

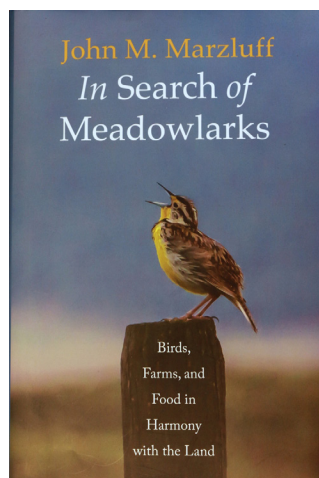
Being an amateur ornithologist and bird lover myself, I was happy to read the latest book of John M. Marzluff. Like many of us, I am concerned with agricultural practices and their impacts on the environment and the wildlife we love. John Marzluff knows birds. He is a professor of wildlife sciences at the University of Washington. In this book, the co-author of “*In the Company of Crows and Ravens*” takes to the road to visit farms and their ecosystems to discover what some people are doing to farm sustainably.

The book starts with an honest look at reality: land conversion to agriculture has been dramatic for the grassland bird population and natural biodiversity. To make things worse, the world population size is predicted to increase and reach 11 billion in 2100, de facto, increasing food demand and more natural land conversion to farms. In that context, how can we keep feeding the world while protecting natural environments and biodiversity? This question is what leads the author to reflect on how we produce our food, what are the consequences of that production on the environment and what strategies can be put in place to improve the cohabitation of wildlife and agriculture. Because a world without the meadowlark’s song and the prairie chicken’s dance would not be the same.

After an interesting review of the history of agriculture where the author discusses subjects like the domestication of plants and animals, the rise of agriculture, wildlife adaption to agriculture and the industrialisation of farming, he goes on the road to visit some farms. With his binoculars in hand, the author starts his journey in Nebraska and Iowa where the corn and soybean fields can go as far as the eye can see. The story develops around family farms and the reality they live in. This sets the context to discuss many topics such as pesticide use, economics of farming, government subsidies and conservation programs. Then, the author brings us to many other places in the United States to visit more farms and meet more people. Along the way, I was pleased to have a list of some of the birds he observes, while discussing topics like the local challenges of farming, the local agricultural history and the impact of specific agricultural practices on wildlife conservation. I found the formula of the book very effective as we get an intimate look at the reality of the farmers in the context of their environment and the economy. Every place and the people he visits set the stage for great topics of discussion. I particularly enjoyed Chapter 5, “Working Birds”, as the author follows some researchers who are enhancing bird populations to increase pest control in vineyards.

We then leave America to see how sustainable farming is approached in Costa Rica. The abundance of birds and wildlife is an undeniable richness in Costa Rica. When the government committed to reserve almost a third of the land as parks, it provided unique opportunities for sustainable farmers to supplement their income with ecotourism. This part of the book was quite enjoyable, as the author not only describes with enthusiasm the wildlife he observed, but also describes the relationship and philosophy that sustainable farmers have toward wildlife. It is impossible for birders and naturalists to read this part of the book and not want to be in Costa Rica admiring the beauty of nature.

The author moves on to discuss cattle ranches before discussing the extinction and evolution



of birds around our agriculture. Aside from government subsidies for conservation that needs to improve, the author concludes by discussing the three main topics he believes need to be addressed to reduce the impact of agriculture expansion on wildlife: food waste, diet change and yield gap.

Overall, this book offers the reader a great overview of the challenges we face to harmonize agriculture and wildlife. The scientific research and facts are present in every part of the book and they are well explained, well integrated and not overwhelming. I found that John Marzluff has a great talent to summarize complex issues and popularize them for everybody to understand. I would say this book is written primarily for the general public with an interest in conservation and agriculture. It is not just about the birds; in fact, I would say this is not a bird book but rather an environmental conservation book. Since I am an entomologist, I was a bit disappointed about the little space that was given to insects in this book considering the importance they have in agriculture. But overall, this was a very interesting and educational read that I recommend to anyone interested in these topics.

Stéphane Bourassa  
Canadian Forest Service, Quebec City



Mayfly through the window. A non-traditional view of a mayfly captured through the window glass. *Callibaetis* probably *ferrugineus hageni* (Ephemeroptera: Baetidae) photo taken in late April, in Sechelt, BC.



### Seeking next ESC Webmaster

The Entomological Society of Canada is seeking an individual to fill the position of ESC webmaster, beginning as soon as possible. The webmaster is an officer of the society and reports to the Society's Board of Directors. The duties of the position include maintaining the Society website (see: <https://esc-sec.ca/>), which was completely redesigned about 2 years ago. The webmaster makes updates to news items and the jobs board, posts the quarterly issues of the bulletin, and periodically updates board and committee membership pages, lists of awardees, photo pages, and the common names and directory of education data bases. The website uses the WordPress content management system, which is easy to learn even for someone with limited experience with website design and maintenance. Note that the membership area of the website and items relating registration and paper submission for joint annual meetings are maintained by the Society's Association Management Company, and are not part of the ESC webmaster's responsibilities.

Please express your interest in the position to the President, Gail Anderson, by 15 July 2020 ([ESCPresident@esc-sec.ca](mailto:ESCPresident@esc-sec.ca)). The final selection will be made by an ad hoc committee convened by the President. For more information about the position, please contact the current webmaster, Jordan Bannerman: [jordan.bannerman@umanitoba.ca](mailto:jordan.bannerman@umanitoba.ca).

### À la recherche du prochain webmestre de la SEC

La Société d'entomologie du Canada recherche une personne pour occuper le poste de webmestre de la SEC, débutant le plus rapidement possible. Le webmestre est un dirigeant de la Société et se rapporte au conseil d'administration de la Société. Les tâches de ce poste incluent la maintenance du site web de la Société (voir : <https://esc-sec.ca/fr/>) qui a été complètement revampé il y a environ 2 ans. Le webmestre fait des mises à jour pour les nouvelles et les emplois à afficher, affiche les numéros trimestriels du bulletin, et mets périodiquement à jour les pages du CA et des membres des comités, les listes de récipiendaires, les pages de photos et les bases de données des noms communs et du répertoire des formations. Le site web utilise le système de gestion de contenu WordPress, qui est facile à apprendre même pour quelqu'un n'ayant qu'une expérience limitée avec la conception et la maintenance de sites web. La section des membres du site web et les éléments en lien avec l'inscription et la soumission de présentations pour les réunions annuelles conjointes sont maintenus par la compagnie de gestion d'association de la Société, et ne font pas partie des responsabilités du webmestre.

Veuillez manifester votre intérêt pour ce poste auprès de la Présidente, Gail Anderson, au plus tard le 15 juillet 2020 ([ESCPresident@esc-sec.ca](mailto:ESCPresident@esc-sec.ca)). La sélection finale sera faite par un comité ad hoc convoqué par la Présidente. Pour plus d'information sur le poste, veuillez contacter le webmestre actuel, Jordan Bannerman : [jordan.bannerman@umanitoba.ca](mailto:jordan.bannerman@umanitoba.ca).

## 70th Annual Meeting of Members and Board of Directors Meetings

Because of COVID-19, the Joint Annual Meeting with the Entomological Society of Alberta, scheduled for 18–21 October 2020, has been cancelled. Consequently, the Annual Business Meeting of Members of the Entomological Society of Canada will be held by teleconference in fall 2020, at a date and time to be determined. Details of the meeting will be communicated to members by email and in the September issue of the Bulletin. Once arrangements for the Annual Meeting of Members have been made, teleconference meetings of the outgoing Board of Directors Meeting and the incoming Board of Directors will be scheduled. Matters for consideration at any of the above meetings should be sent to Neil Holliday, Secretary of the Entomological Society of Canada (see inside back cover for contact details).

## 70<sup>e</sup> assemblée annuelle des membres et réunions du conseil d'administration

À cause de la COVID-19, la réunion conjointe annuelle avec la Société d'entomologie de l'Alberta, prévue du 18 au 21 octobre 2020, a été annulée. Par conséquent, l'assemblée annuelle des membres de la Société d'entomologie du Canada se tiendra par téléconférence à l'automne 2020, à une date et une heure à déterminer. Les détails de l'assemblée seront communiqués aux membres par courriel et dans le numéro de septembre du Bulletin. Une fois que les arrangements pour l'assemblée annuelle des membres auront été pris, les réunions par téléconférence du conseil d'administration sortant et du nouveau conseil d'administration seront planifiées. Les sujets à considérer pour une des ces réunions doivent être envoyés à Neil Holliday, Secrétaire de la Société d'entomologie du Canada (voir la troisième de couverture pour les informations de contacts).

---

## 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.

---

## 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/>.

## Highlights of the recent Board of Directors meeting

The ESC Board of Directors met by teleconference on Tuesday, 21 April 2020. The Board learned that the Society had entered into a Memorandum of Understanding with the Dufault Foundation, whereby the Foundation will annually contribute funds to allow increased numbers of Ed Becker Conference Travel Awards to be made. The Dufault Foundation represents ESC's former treasurer, Christopher Dufault, and his wife Heather. It is hoped that this initiative will precipitate other similar arrangements to fund student travel to ESC meetings.

The Board gave approval to the final version of the Meeting Code of Conduct, which will be used for future Joint Annual Meetings (JAMs). A condition of JAM registration will be agreement to abide by the Code, which will be posted on the ESC website and the JAM website. The Board also approved an implementation document that indicates the responsibilities of JAM organizers with respect to the Code. Both these documents will appear in the new version of the Guidelines for organizing a JAM, the revision of which is nearing completion. The Board approved a revised financial policy with respect to JAMs. The policy updates wording of the existing policy and has a new section that provides more equitable distribution among Canadian entomological societies of large surpluses resulting from meetings such as those held with the Entomological Society of America. Before Board approval, each of the ESC's seven affiliated regional societies indicated agreement with the new policy. The Board received input from the ESC Webmaster and Executive Council with respect to an earlier recommendation of the Annual Meetings Committee that ESC take over the creation and management of JAM websites. The Committee's recommendation was not approved; ESC will continue to maintain a summary page of current and former JAMs; the JAM local organizing committees will continue to be responsible for creating the JAM-specific websites that include information on accommodations, program, etc., and provide the links to registration and paper submission pages.

The Board received information on past and future JAMs. The 2019 JAM with the Canadian Society for Evolution and Ecology (CSEE) and the Acadian Entomological Society generated a surplus, but final accounting has been delayed by the COVID-19 situation. The Board learned that the Executive Council has recently met with the Chair of the Local Organizing Committee for JAM 2020 to discuss how to proceed with that 2020 meeting, given the impact of COVID-19. The participants in this meeting agreed to gather information on alternative options and scenarios in preparation for a further meeting in mid-May. In the event that JAM 2020 does not proceed, the ESC would hold its Annual Meeting of Members by moderated teleconference call, as was done in 2019 for approval of Financial Statements. The Board also received updates on progress in the organization of JAMs 2021–2023.

The Board learned of, or approved, several actions precipitated by COVID-19. The 2020 National Insect Appreciation Day (NAIAD) will be entirely virtual, and ESC will not encourage any group activities. The three students who received notification that they would receive ESC's International Congress of Entomology (ICE) Student Travel Awards were expected to have registered for ICE. As ICE is now postponed for 1 year with no option to gain a registration refund, the Board acted to allow the award amounts to be paid now to the awardees who had registered. The Board approved recommendations from the Finance Committee to respond to the COVID-19-influenced market downturn in ways that will limit financial impacts to the Society.

The Board approved the recommendation of the Achievement Awards Committee with respect to the identity of the winner of the 2020 Entomological Society of Canada Gold Medal. The Committee also provided, for the Board's information, details of two approved applications for Bert and John Carr Awards. The Board received from the Publications Committee a proposal to move from having a single editor-in chief for *The Canadian Entomologist* to a model in which

two or three co-editors-in-chief share the editorial workload. The Board approved the proposal in principle and set in motion the changes needed to implement the co-editor-in-chief model. The Board endorsed the recommendation of an ad-hoc selection committee that Dr Ward Strong be appointed ESC Treasurer, effective December 2020. The Board received an update on an initiative to develop region-specific lists of keys for identification of Canadian insects.

The Board approved changes to standing rules and to the committee guidelines; details of changes to the standing rules are reported in a separate notice in this issue. Two of the changes were responses to matters raised at the Annual Meeting of Members in Fredericton in 2019. Both of these matters had been referred to the Finance Committee to ensure changes would not compromise the financial health of the Society. In response to a plea for more financial concessions for early-career members, in particular post-doctoral fellows, the Board changed the standing rules to allow Early Professional Members to remain in this membership category for 5 years after obtaining their highest degree. However, in recognition that some members are in permanent positions and excellent financial circumstances within 5 years of their highest degree, wording on the membership form will indicate that, at this career stage, members can choose to pay the regular or the early professional membership rate. It was observed at the Annual Meeting of Members that there was limited use by regional entomological societies of the Public Encouragement Grants, possibly because their value has been \$200 per annum since 1982. The Board voted to change the committee guidelines governing these grants to increase their amount to \$500, but to cease allowing carryover of unclaimed grants from previous years. The change in amount will be effective for next ESC fiscal year (beginning 1 July 2020); ESC will honour unclaimed amounts from the \$200 grant program. The Board also made a change to the standing rules to recognize the importance of the role of the association management company in the Society's operations, and to direct the reader to a definition of the duties that ESC expects the company to perform.

---

## Nominations for ESC Board of Directors / Nominations pour le Conseil d'administration de la SEC

The following have been nominated and agreed to stand for election in 2020 for the indicated positions. Members will receive more details on this year's process by email. In accordance with our By-laws under the Canada Not-for-profit Corporations Act, a plebiscite/vote first will be held to 'select candidates' for a slate of Directors. The slate will then be presented for formal election at the Annual Meeting of Members.

The current ballot will select candidates for a Director-at-Large and a Societal Director (Second Vice-President). The plebiscite will be conducted electronically, with the webpage for balloting active from **1 June to 15 July 2020**. PLEASE REMEMBER TO VOTE!

To vote, use the following link: <https://forms.gle/5uhsZVi3PTskHfsE9>.

Les personnes suivantes ont été nommées et ont accepté de se présenter pour les élections de 2020 pour les postes indiqués. Les membres recevront plus de détails sur le processus de cette année par courriel. Conformément à notre règlement intérieur en vertu de la loi canadienne sur les organisations à but non lucratif, un plébiscite/vote sera d'abord tenu afin de sélectionner les candidats pour une liste de directeurs. La liste sera ensuite présentée pour une élection formelle à la réunion annuelle des membres.

Ce vote sélectionnera les candidats pour un poste de conseiller et un poste de directeur sociétal (second vice-président). Le plébiscite sera conduit électroniquement, et la page web pour voter sera active du **1 juin au 15 juillet 2020**. N'OUBLIEZ PAS DE VOTER!

Pour voter, utilisez le lien suivant : <https://forms.gle/5uhsZVi3PTskHfsE9>.

**Candidates for Societal Director / Second Vice-President : Candidats pour le poste de director / directrice sociétal(e) / second(e) vice-président(e)**



Chris MacQuarrie  
(CFS Sault Ste. Marie)



Brent Sinclair  
(Western University)

**Candidates for Director-at-Large : Candidats pour le poste de conseillère**



Emma Despland  
(Concordia University)



Vincent Hervet  
(AAFC, Winnipeg)



## Announcement of Changes in the ESC Standing Rules

At its meeting on 21 April 2020, the Board of Directors of ESC approved two changes to the standing rules. The change to Standing Rule I Membership extends the duration of eligibility for the Early Professional Membership category in response to a plea at the 2019 Annual Meeting of Members to reduce the financial burden of membership for early-career entomologists, particularly post-doctoral fellows. The change to Standing Rule IX Management of the Corporation recognizes the importance of the association management company to ESC operations and to indicate where a list of the company's duties can be found.

### Standing Rule I Membership

Section I. 1) (c) is changed from:

(c) Early Professional Member

An individual accepted as a member by the Corporation who is in compliance with By-Law 12 through payment of Early Professional Member annual dues and who is within 3 years (based on the calendar year) of graduation from their highest educational degree.

To:

(c) Early Professional Member

An individual accepted as a member by the Corporation who is in compliance with By-Law 12 through payment of Early Professional Member annual dues and who is within 5 years (based on the calendar year) of graduation from their highest educational degree.

### Standing Rule IX. Management of the Corporation

The rule is amended by the addition of section (c) (bolded)

1) Provision of Corporation management activities

(a) From time to time, the Executive Council, with advice from the Secretary and Treasurer, shall recommend to the Board for approval

i) the Corporation management activities that are to be performed by agents or employees of the Corporation, and

ii) the arrangements by which those activities are to be performed

(b) Board approval of the recommendations identified in IX a) shall empower the Corporation's officers to enter into a contract with an association management agency or enter into an employment agreement of an agreed duration, in accordance with Bylaw 4.

**(c) The list of duties for the association management company shall be specified in the contract established with the association management company**

## Modifications des Règles permanentes de la SEC

Lors de sa réunion du 21 avril 2020, le conseil d'administration de la SEC a approuvé deux modifications aux règles permanentes. La modification à la règle permanente I Membres prolonge la durée de l'éligibilité pour la catégorie de membres jeunes professionnels en réponse à la demande lors de l'assemblée annuelle des membres 2019 de réduire la charge financière d'adhésion pour les entomologistes en début de carrière, particulièrement les postdocs. La modification à la règle permanente IX Gestion de l'Organisation reconnaît l'importance de la compagnie de gestion des associations pour les opérations de la SEC et indique où trouver la liste des tâches de la compagnie.

### Règle permanente I Membres

Section I. 1) (c) est modifiée de sa forme actuelle :

(c) Membre jeune professionnel

Un individu accepté comme membre par l'Organisation conformément au règlement intérieur 12 par le paiement de la cotisation annuelle des membres jeunes professionnels et qui est à moins de trois ans (basés sur les années civiles) de l'obtention de son plus haut diplôme d'éducation.

Pour:

(c) Membre jeune professionnel

Un individu accepté comme membre par l'Organisation conformément au règlement intérieur 12 par le paiement de la cotisation annuelle des membres jeunes professionnels et qui est à moins de cinq ans (basés sur les années civiles) de l'obtention de son plus haut diplôme d'éducation.

### Règle permanente IX. Gestion de l'Organisation

La règle est modifiée par l'ajout de la section (c) (en gras)

1) Disposition des activités de gestion de l'Organisation

(a) De temps en temps, le conseil exécutif, avec les conseils du secrétaire et du trésorier, doit recommander au CA pour approbation

i) les activités de gestion de l'Organisation qui doivent être effectuées par des agents ou des employés de l'Organisation, et

ii) les arrangements selon lesquels ces activités doivent être effectuées

(b) L'approbation par le CA des recommandations identifiées en IX a) doivent habiliter les dirigeants de l'Organisation de signer un contrat avec un agent de gestion d'association ou de signer un contrat de travail d'une durée convenue, en conformité avec le règlement administratif 4.

**(c) La liste des tâches de la compagnie de gestion des associations doit être spécifiée dans le contrat établi avec la compagnie de gestion des associations.**

## ESC Scholarship Fund

Once again the Society would like to thank and acknowledge the very generous donors to the ESC Scholarship Fund. These tax-deductible donations are very important to the Society, as it is only because of these donations that the scholarship fund is self-sustainable. Donations can be made at any time and a receipt for income tax purposes in Canada will be issued. Please make cheques payable to the Entomological Society of Canada. Donations can also be made online via the Members' Area (<https://esc-sec.site-ym.com/donations/>).

## Le Fonds de bourses d'études de la SEC

La Société tient à remercier, une fois de plus, les très généreux donateurs et donatrices au Fonds de bourses d'études de la SEC. Ces dons déductibles d'impôt sont très importants pour la Société, puisque c'est seulement grâce à ces dons que le Fonds de bourses d'études est autosuffisant. Les dons peuvent être faits en tout temps, et un reçu pour fin d'impôt vous sera envoyé. Veuillez libeller votre chèque au nom de la Société d'entomologie du Canada. Des dons peuvent également être faits via la section des membres (<https://esc-sec.site-ym.com/donations/>).

### 2019 Donors – Donateurs et donatrices pour 2019

Albert, P.J.	Galloway, Mary M.	Philogene, B.J.R.
Barr, William	Gibson, Gary	Poland, Therese
Behan-Pelletier, Valerie	Holliday, Neil J.	Richards, Miriam
Borden, John	Horton, David R.	Roitberg, Bernard
Byers, Robert. J.	Lindgren, Staffan	Rosenberg, David M.
Cameron, Alan E.	Marshall, Valin George	Sawinski, T.A.
Devine, Alexandra	McPike, Sarah	Scott, Ian
Fields, Paul	Morewood, William Dean	Soroka, Juliana J.
Freitag, Richard	Peschken, Diether	Sweeney, Jon

... and those who preferred to remain anonymous.

... et ceux et celles qui ont préféré rester anonyme.

## Sixteenth Annual Photo Contest

The 16th Annual Photo Contest to select images for the 2021 covers of *The Canadian Entomologist* and the *Bulletin of the Entomological Society of Canada* is underway. The cover images are intended to represent the breadth of entomology covered by the Society's publications. Insects and non-insects in forestry, urban or agriculture; landscapes, field, laboratory or close-ups; or activities associated with physiology, behaviour, taxonomy or IPM are all desirable. A couple of 'Featured Insects' are also needed. If selected, your photo will grace the cover of both publications for the entire year. In addition, winning photos and a selection of all submitted photos will be shown on the ESC website.

### Contest rules:

Photos of insects and other arthropods in all stages, activities, and habitats are accepted. To represent the scope of entomological research, we also encourage photos of field plots, laboratory experiments, insect impacts, research activities, sampling equipment, etc. Photos should, however, have a clear entomological focus.

Digital images must be submitted in unbordered, high-quality JPG format, with the long side (width or height) a minimum of 1500 pixels.

Entrants may submit up to five photographs. A caption must be provided with each photo submitted; photos without captions will not be accepted. Captions should include the locality, subject identification as closely as is known, description of activity if the main subject is other than an insect, and any interesting or relevant information. Captions should be a maximum of 40 words.

The entrant must be a member in good standing of the Entomological Society of Canada. Photos must be taken by the entrant, and the entrant must own the copyright.

The copyright of the photo remains with the entrant, but royalty-free use must be granted to the ESC for inclusion on the cover of one volume (6 issues) of *The Canadian Entomologist*, one volume (4 issues) of the *Bulletin*, and on the ESC website.

The judging committee will be chosen by the Chair of the Publications Committee of the ESC.

The Photo Contest winners will be announced on the ESC website, and may be announced at the Annual Meeting of the ESC or in the *Bulletin*. There is no cash award for the winners, but photographers will be acknowledged in each issue in which the photos are printed.

Submission deadline is 31 August 2020. Entries should be submitted as an attachment to an email message; the subject line should start with "ESC Photo Contest Submission". Send the email message to: [photocontest@esc-sec.ca](mailto:photocontest@esc-sec.ca).



## Seizième concours annuel de photographie

Le seizième concours annuel de photographie visant à sélectionner des images pour les couvertures de *The Canadian Entomologist* et du *Bulletin de la Société d'entomologie du Canada* pour 2021 est en cours. Les images sur la couverture doivent représenter l'étendue entomologique couverte par les publications de la Société. Des photos représentant des insectes ou autres arthropodes forestiers, urbains ou agricoles, des paysages, du travail de terrain ou de laboratoire, des gros plans, ainsi que montrant des activités associées à la physiologie, au comportement, à la taxonomie ou à la lutte intégrée seraient souhaitées. Deux « insectes vedettes » sont également recherchés. Si elle est sélectionnée, votre photo ornera la couverture des deux publications pour l'année entière. De plus, vos photos gagnantes et une sélection de photos soumises seront montrées sur le site Internet de la SEC.

### Règlements du concours :

Les photos d'insectes et autres arthropodes à n'importe quel stade, effectuant n'importe quelle activité et dans n'importe quel habitat sont acceptées. Afin de représenter les sujets de la recherche entomologique, nous encourageons également les photos de parcelles de terrain, expériences de laboratoire, impacts des insectes, activités de recherche, équipement d'échantillonnage, etc. Les photos doivent, cependant, avoir un intérêt entomologique clair.

Les images numériques doivent être soumises sans bordure, en format JPG de haute qualité, avec le plus grand côté (largeur ou hauteur) d'un minimum de 1500 pixels.

Chaque participant peut soumettre jusqu'à cinq photographies. Une légende doit être fournie pour chaque photo soumise : les photos sans légendes ne seront pas acceptées. La légende doit inclure la localisation, l'identification du sujet le plus précisément possible, la description de l'activité si le sujet n'est pas un insecte, et toute information intéressante ou pertinente. Les légendes doivent avoir une longueur maximale de 40 mots.

Les participants doivent être membres en bonne et due forme de la Société d'entomologie du Canada. Les photos doivent avoir été prises par le participant, et le participant doit en posséder les droits d'auteur.

Le participant conserve les droits d'auteur de la photo, mais l'utilisation libre de droits doit être accordée à la SEC afin de l'inclure sur la couverture d'un volume (6 numéros) de *The Canadian Entomologist*, un volume (4 numéros) du *Bulletin*, et sur le site Internet de la SEC.

Le comité d'évaluation sera choisi par le président du comité des publications de la SEC.

Les gagnants du concours de photographie seront annoncés sur le site Internet de la SEC et pourront être annoncés à la réunion annuelle de la SEC ou dans le *Bulletin*. Il n'y a pas de prix en argent pour les gagnants, mais les photographes seront remerciés dans chaque numéro où les photos seront imprimées.

La date limite de soumission est le 31 août 2020. Les soumissions doivent être faites en pièces jointes d'un courrier électronique. L'objet du message doit débiter par « Soumission pour le concours de photographie de la SEC ». Envoyez vos courriels à: [photocontest@esc-sec.ca](mailto:photocontest@esc-sec.ca).





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

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.

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.



## Journal of the Entomological Society of British Columbia, Volume 116 (2019)

(JESBC may be viewed at <https://journal.entsocbc.ca/index.php/journal>)

### Forum

#### [Weather and insects in a changing climate](#)

V.Nealis

[PDF](#)

3-16

### Articles

#### [Collections of fleas \(Siphonaptera\) from Pacific marten, \*Martes caurina\* \(Carnivora: Mustelidae\), reveal unique host-parasite relationships in the Haida Gwaii archipelago](#)

C.M.Bergman, T.D.Galloway, P.Sinkins

[PDF](#)

17-24

#### [Dispersal of \*Bactericera cockerelli\* \(Hemiptera: Trioizidae\) in relation to phenology of matrimony vine \(\*Lycium\* spp.: Solanaceae\)](#)

W.R.Cooper, D.R.Horton, J.Thinakaran, A.Karasev

[PDF](#)

25-39

#### [Assessments of \*Rhagoletis pomonella\* \(Diptera: Tephritidae\) infestation of temperate, tropical, and subtropical fruit in the field and laboratory in Washington State, U.S.](#)

W.L.Yee, B.Goughnour

[PDF](#)

40-58

### Scientific Notes

#### [Promachus dimidiatus Curran \(Diptera: Asilidae\): a robber fly genus and species new to British Columbia](#)

R.A.Cannings, T.Ehlers, A.Manweiler, T.Kohler, E.Hayes, D.Knopp

[PDF](#)

59-63

#### [Toxonevra muliebris \(Harris\) \(Diptera: Pallopteridae\): a European fly new to North America](#)

R.A.Cannings, J.F.Gibson

[PDF](#)

64-68

### Obituary

#### [Peter Belton \(6 September 1930 – 1 April 2019\)](#)

M.Hart

[PDF](#)

69-71



Newsletter

### Canadian Weed Science Society Société canadienne de malherbologie

Winter 2020

[https://weedscience.ca/wp-content/uploads/2020/03/Newsletter-Winter-2020KP\\_Final.pdf](https://weedscience.ca/wp-content/uploads/2020/03/Newsletter-Winter-2020KP_Final.pdf)

President's Message.....	1-2
Join Our Society.....	3
CWSS-SCM 2020 Gatineau Photo Contest.....	3
Conference photos.....	4
CWSS Award Winners .....	5
Sponsor Recognition.....	6
Upcoming Events.....	7
2019-2020 Board of Directors.....	7

## Announcements / Annonces

### Canadian Pest Management Research Report / Rapport de recherche de la lutte dirigée

The 2019 Pest Management Research Report is now available. It can be found on the Canadian Phytopathological Society website <http://phytopath.ca/publication/pmrr/>.

L'édition 2019 du Rapport de recherche de la lutte dirigée est maintenant disponible. Il se trouve sur le site web de la Société canadienne de phytopathologie <http://phytopath.ca/publication/pmrr/>.

## Meeting announcements / Réunions futures

**In view of the COVID-19 situation, readers should check the meeting website to ascertain if the conference is still proceeding.**

### **Society for Invertebrate Pathology Annual Conference**

Merida, Mexico, 2–6 August 2020

(no website to date)

**Cancelled**

### **Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Alberta**

Calgary, 18–21 October 2020

<https://jam2020.ualberta.ca/>

**Cancelled**

### **Entomological Society of America Annual Meeting**

Orlando, Florida, 15–18 November 2020

<https://www.entsoc.org/event-calendar/entomology-2020>

### **10<sup>th</sup> International IPM Symposium: Implementing IPM across Borders and Disciplines**

Denver, 15–18 March 2021

<https://ipmsymposium.org/2021/index.html>

### **26th International Congress of Entomology (Entomology for our planet)**

Helsinki, Finland, 19–24 July 2020

**Moved to 18–23 July 2021**

<http://www.ice2020helsinki.fi/>

### **XVth International Conference on Ephemeroptera and XXIth International Symposium on Plecoptera**

Fort Collins, Colorado, 25 July–1 August 2021

(no website to date)

### **Society for Invertebrate Pathology Annual Conference**

Port Elizabeth, South Africa, 1–5 August 2021

(no website to date)

### **Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Ontario**

Niagara Falls, 3–6 October 2021

(no website to date)

---

*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](mailto:info@esc-sec.ca)  
[www.esc-sec.ca/](http://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](mailto:cedric.gillott@usask.ca)

ISSN: 0071-0741

Contents copyrighted 2020 by the Entomological Society of Canada

**Submission deadline for the next issue: 31 July 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](mailto:info@esc-sec.ca)  
[www.esc-sec.ca/fr/](http://www.esc-sec.ca/fr/)

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](mailto:cedric.gillott@usask.ca)

ISSN: 0071-0741

Droits d'auteur 2020 Société d'entomologie du Canada

**Date de tombée pour le prochain numéro: 31 juillet 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,  
Abbotsford, BC, V3G 2M3  
Tel: (604) 556-3031  
E-mail: [Tracy.Hueppelsheuser@gov.bc.ca](mailto: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](mailto:esalberta@gmail.com)  
<http://www.entsocalberta.ca>

### Entomological Society of Saskatchewan

President Sean Prager  
Vice-President Stephen Srayko  
Past President Daniel Wiens  
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](mailto: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 &  
Katelyn 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](mailto: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](mailto:entsocont.membership@gmail.com)  
<http://www.entsocont.ca>

### Société d'entomologie du Québec

Présidente Annie-Ève Gagnon  
Vice-président Jean-Philippe Parent  
Président 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](mailto: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 Riley Islett  
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](mailto: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.*





### No JAM: In fact, very little of anything!

Cancellation of JAM 2020, though tremendously disappointing, was nevertheless entirely expected given the lock down policies enacted by governments, both national and provincial. I (and hundreds of others!) look forward to our annual get-togethers for the opportunities they provide to meet long-standing ('old') and new ('young') acquaintances, to say nothing of hearing of recent developments in entomology.

However, the absence of a JAM is but one aspect of COVID-19's massive effect on our field of endeavour. Far more significant is the closure of university campuses and government research and development centres. This action, sensible though it is, has put a total stop to the research activity of our graduate students and post-doctorals who represent the future of entomological science in Canada. And remember, this inability to work applies not only to laboratory-based research, but also to the collection and analysis of data from the field.

Inevitably, this hiatus will require an extension of the time allowed for students to complete their projects and with it, funds (both stipendiary and operating) to support this extension. In this gloomy context, I was pleased to learn that the Tri-council agencies have already committed to an extra year of funding for everyone holding a grant in the current fiscal year and to an extension of graduate student scholarships, though details of the latter have not been announced.

### Pas de réunion annuelle conjointe : en fait, pas grand-chose!

L'annulation de la réunion annuelle conjointe 2020, bien que très décevante, était néanmoins totalement prévisible considérant les politiques de confinement adoptées par les gouvernements, autant au niveau national que provincial. J'avais hâte (moi et des centaines d'autres!) à notre rencontre annuelle pour les opportunités qu'elle apporte de revoir des connaissances de longue-date (« vieilles ») ou plus récentes (« jeunes »), sans parler d'entendre les derniers développements en entomologie.

Cependant, l'absence de la réunion annuelle n'est que l'un des aspects de l'effet massif de la COVID-19 sur notre milieu. De façon plus importante, il y a la fermeture des campus universitaires et des centres de recherche et de développement gouvernementaux. Cette action, aussi raisonnable soit-elle, a mis un arrêt complet aux activités de recherche de nos étudiants des cycles supérieurs et post-doctorants qui représentent l'avenir de la science entomologique au Canada. Et rappelez-vous, cette inhabilité à travailler ne s'applique pas qu'à la recherche en laboratoire, mais aussi à la collecte et à l'analyse de données du terrain.

Inévitablement, cette interruption demandera une prolongation au temps alloué aux étudiants pour terminer leurs projets et, avec cela, les fonds (autant pour la rémunération que pour les opérations) afin de soutenir cette prolongation. Dans ce contexte sombre, j'ai été ravi d'apprendre que les trois organismes de financement se sont déjà engagés à donner une année supplémentaire de financement à tous ceux qui détiennent une subvention dans l'année fiscale actuelle, et une prolongation pour les bourses d'études supérieures, bien que les détails de cette dernière n'aient pas encore été annoncés.

# Entomological Society of Canada, 2019-2020

## Société d'entomologie du Canada, 2019-2020

### Executive Council / Conseil exécutif

#### President / Présidente

Gail Anderson  
Simon Fraser University, Burnaby, BC  
[ESCPresident@esc-sec.ca](mailto:ESCPresident@esc-sec.ca)

#### First Vice-President / Premier vice-président

Bill Riel  
Natural Resources Canada, Victoria, BC  
[bill.riel@canada.ca](mailto:bill.riel@canada.ca)

#### Second Vice-President / Second vice-président

Felix Sperling  
University of Alberta, Edmonton, Alberta  
[felix.sperling@ualberta.ca](mailto:felix.sperling@ualberta.ca)

#### Past President / Président sortant

Kevin Floate  
Agriculture and Agri-Food Canada,  
Lethbridge, Alberta  
[kevin.floate@canada.ca](mailto:kevin.floate@canada.ca)

### Directors-at-Large / Conseillers

Deepa Pureswaran, Québec, (2020)  
[deepa.pureswaran@canada.ca](mailto:deepa.pureswaran@canada.ca)  
Suzanne Blatt, Kentville, NS (2021)  
[Suzanne.Blatt@canada.ca](mailto:Suzanne.Blatt@canada.ca)  
Christine Noronha, Charlottetown, PE (2022)  
[christine.noronha@canada.ca](mailto:christine.noronha@canada.ca)

### Regional Directors / Directeurs régionaux

Brian van Hezewijk, Victoria, BC (ESBC)  
[brian.vanhezewijk@canada.ca](mailto:brian.vanhezewijk@canada.ca)  
Boyd Mori, Edmonton, AB (ESAB)  
[bmori@ualberta.ca](mailto:bmori@ualberta.ca)  
James Tansey, Regina, SK (ESS)  
[james.tansey@gov.sk.ca](mailto:james.tansey@gov.sk.ca)  
Kateryn Rochon, Winnipeg, MB (ESM)  
[kateryn\\_rochon@umanitoba.ca](mailto:kateryn_rochon@umanitoba.ca)  
Alex Smith, Guelph, ON (ESO)  
[salex@uoguelph.ca](mailto:salex@uoguelph.ca)  
Étienne Normandin, Montreal, QC (SEQ)  
[etienne.normandin@gmail.com](mailto:etienne.normandin@gmail.com)  
Peggy Dixon, St John's, NL (AES)  
[peggy.dixon@canada.ca](mailto: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](mailto:Rachel.Rix@dal.ca)

### Treasurer / Trésorier

Joel Kits  
Agriculture and Agri-Food Canada, Ottawa  
[ESCTreasurer@esc-sec.ca](mailto:ESCTreasurer@esc-sec.ca)

### Secretary / Secrétaire

Neil Holliday  
University of Manitoba, Winnipeg, MB  
[ESCSecretary@esc-sec.ca](mailto:ESCSecretary@esc-sec.ca)

### Bulletin Editor / Rédacteur du Bulletin

Cedric Gillott  
University of Saskatchewan, Saskatoon, SK  
[cedric.gillott@usask.ca](mailto:cedric.gillott@usask.ca)

### Asst. Bulletin Editor / Rédactrice adj. du Bulletin

Donna Giberson  
U. Prince Edward Island, Charlottetown, PE  
[giberson@upe.ca](mailto:giberson@upe.ca)

### Webmaster / Webmestre

Jordan Bannerman  
University of Manitoba, Winnipeg, MB  
[jordan.bannerman@umanitoba.ca](mailto: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](mailto:editor@esc-sec.ca)

### Canadian Journal of Arthropod Identification

#### Editor-in-Chief / Rédactrice en chef

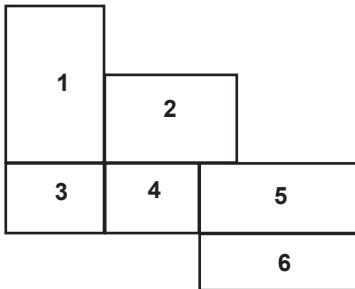
Heather Proctor  
University of Alberta, Edmonton, AB  
[hproctor@ualberta.ca](mailto:hproctor@ualberta.ca)

### Social Media Administrators / Administrateurs des médias sociaux

Morgan Jackson, Ste. Anne de Bellevue, QC  
[morgandjackson@gmail.com](mailto:morgandjackson@gmail.com)  
Angela Gradish, Guelph, ON  
[agradish@uoguelph.ca](mailto: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](mailto:info@esc-sec.ca) [www.esc-sec.ca](http://www.esc-sec.ca)



[www.esc-sec.ca](http://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](mailto:info@esc-sec.ca)

Date of issue: June 2020 /  
juin 2020

ISSN: 0071-0741

### Front cover/Plate supérieur:

1. Praying mantis (Mantodea: Mantidae) having a snack  
[Summerland, British Columbia, Canada]  
Une mante religieuse (Mantodea : Mantidea) prend sa collation  
[Summerland, Colombie Britannique, Canada]  
[Photo: Andrea Brauner]

2. *Apodemia mormo* (Lepidoptera: Riodinidae) individual caught in the wild as part of a captive breeding experiment to help bolster populations of this endangered species [Keremeos, British Columbia, Canada]  
Un individu *Apodemia mormo* (Lepidoptera : Riodinidae) capturé en nature dans le cadre d'une expérience d'élevage en captivité afin d'aider à soutenir les populations de cette espèce menacée [Keremeos, Colombie Britannique, Canada]  
[Photo: Jayme Lewthwaite]

3. *Platypedia* (Hemiptera: Cicadidae) expands its wings and sclerotises.  
Un *Platypedia* (Hemiptera : Cicadidae) étend ses ailes et se sclérifie.  
[Photo: Bob Lalonde]

4. Egg parasitoid *Telenomus* (Hymenoptera: Platygasteridae) emerging from stink bug (Hemiptera: Pentatomidae) eggs [Delémont, Switzerland]  
Des parasitoïdes des oeufs du genre *Telenomus* (Hymenoptera : Platygasteridae) émergent d'oeufs de punaises (Hemiptera : Pentatomidae) [Delémont, Suisse]  
[Photo: Tim Haye]

5. *Paralobesia marilynnae* (Lepidoptera: Tortricidae) egg hatching six days after oviposition on a showy lady's slipper (Orchidaceae) [Gatineau Park, Québec, Canada]  
Des oeufs de *Paralobesia marilynnae* (Lepidoptera: Tortricidae) émergent six jours après la ponte sur le cyripède royal (Orchidaceae) [Parc de la Gatineau, Québec, Canada]  
[Photo: Marilyn Light]

6. *Sinodendron rugosum* (Coleoptera: Lucanidae) [Victoria, British Columbia, Canada]  
*Sinodendron rugosum* (Coleoptera : Lucanidae) [Victoria, Colombie Britannique, Canada]  
[Photo: Debra Wertman]

### Back cover/Plate inférieur:

Tagged *Bombus bimaculatus* (Hymenoptera: Apidae) queen [Winnipeg, Manitoba, Canada]  
Une reine *Bombus bimaculatus* (Hymenoptera : Apidae) marquée [Winnipeg, Manitoba, Canada]  
[Photo: Emily Hanuschuk]