Celebrating 50 Years of the ESC Bulletin

Bulletin

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Société d'entomologie du Canada

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

In 2017, this automated pest monitoring system was used to record the abundance of armyworm moth (*Mythimna unipuncta*; Lepidoptera: Noctuidae). It enables us to catch insects and to take pictures that are automatically sent to the user [St-Mathieude-Beloeil, Québec, Canada].

En 2017, ce système de surveillance automatisé des ravageurs a été utilisé afin d'enregistrer l'abondance de la légionnaire uniponctuée (*Mythimna unipuncta*; Lepidoptera : Noctuidae). Il permet d'attraper des insectes et de prendre des photos qui sont automatiquement envoyées à l'utilisateur. [St-Mathieu-de-Beloeil, Québec, Canada].

[Photo: Julien Saguez]

JAM 2018 – An amazing event

Our recent JAM, co-hosted by the ESBC, ESC and ESA, was the second largest ever meeting of entomologists in North America, being bested only by the 2016 International Congress of Entomology in Orlando, Florida. Members of the planning team (see table below) invested a considerable amount of their time and energy in this endeavour and deserve your thanks. A special shout-out to the Annual Meeting Co-chairs, that is, Chris MacQuarrie (ESC), Bill Riel (ESBC), Cheryle O'Donnell (ESA) and Surendra Dara (ESA). And let's not forget the hundreds of people who were involved behind the scenes to make the meeting as enjoyable, interesting and as seamless as possible. If you were one of those people, you were likely a volunteer and I congratulate you on a job well done. Let's also give credit to the sponsors, the exhibitors and, of course, to the presenters and attendees. When we work together as a community, we can make amazing things happen… and we did.

The months leading up to this meeting gave me a greater appreciation for the amount of preparation involved in hosting a successful event of this size. For our society, it fell upon Patrice Bouchard (now Past-President) to carry the lion's share of the responsibility. Despite dealing with an incessant flurry of emails from all directions, he somehow managed to keep his efficiency and sense of humour. Vincent Hervet (outgoing ESC Secretary) and Neil Holliday (incoming ESC Secretary) provided key

Réunion annuelle conjointe 2018 – Un évènement formidable

Notre récente réunion annuelle, co-organisée par la SECB, SEC et ESA, a été la deuxième plus grande réunion d'entomologistes en Amérique du Nord, dépassée seulement par le Congrès international d'entomologie 2016 à Orlando, Floride. Les membres de l'équipe de planification (voir le tableau ci-dessous) ont investi une part considérable de leur temps et énergie dans cette initiative et mérite vos remerciements. Un merci tout spécial aux co-présidents de la réunion annuelle : Chris MacQuarrie (SEC), Bill Riel (SECB), Cheryle O'Donnell (ESA) et Surendra Dara (ESA). Et n'oublions pas les centaines de personnes qui ont été impliquées en coulisse pour rendre cette réunion aussi agréable, intéressante et harmonieuse que possible. Si vous étiez une de ces personnes, vous étiez probablement bénévole et je vous félicite pour un travail bien fait. Donnons aussi le crédit aux partenaires financiers, exposants et, évidemment, présentateurs et participants. Lorsque nous travaillons ensemble comme communauté, nous pouvons accomplir des choses incroyables… et nous l'avons fait.

Les mois menant à cette réunion m'ont donné une appréciation plus grande de l'importance de la préparation requise pour organiser avec succès un évènement de cette taille. Pour notre société, c'est Patrice Bouchard (maintenant Président-sortant) qui s'est taillé la part du lion des responsabilités. Malgré la gestion d'un flot incessant de courriels provenant de toute part, il a réussi à garder son efficacité et son sens de l'humour. Vincent Hervet (secrétaire sortant de la SEC) et Neil Holliday (nouveau secrétaire de la SEC) ont fourni un soutien clé à cet égard. Et un bon mot pour Geoff Powell, directeur exécutif de la SEC, qui surveille les opérations du siège de la Société au jour le jour. Des rôles plus petits, mais néanmoins importants ont été joués par les membres du conseil d'administration, les dirigeants, et les

Canadian entomologists on 2018 JAM planning committee (in bold), with roles / Entomologistes canadiens sur le comité de planification de la réunion annuelle conjointe 2018 (en gras), avec leur rôle

2018 Planning Team	Name
ESA President (2018)	Michael Parrella
ESC President (2018)	**Patrice Bouchard**
ESBC President (2018)	**Jenny Cory**
ESA Annual Meeting Co-Chair	Cheryle A. O'Donnell
ESA Annual Meeting Co-Chair	Surendra Dara
ESC Annual Meeting Co-Chair	**Chris MacQuarrie**
ESBC Annual Meeting Co-Chair	**Bill Riel**
ESA Student Competition Co-Chair	Rayda Krell
ESA Student Competition Co-Chair	Patricia Prasifka
ESC Student Competition Co-Chair	**Jason Gibbs**
ESBC Student Competition Co-Chair	**Dezene Huber**
ESA Poster Co-Chairs	Rob Meagher
ESA Poster Co-Chairs	Wendy Johnson
ESA Poster Co-Chairs	Julie Peterson
ESA Student Affairs Representative	Casey Parker
ESC Student and Early Professional Affairs Committee Representative	**Joanna Konopka**
ESBC Student Affairs Representative	**Dan Peach**
ESC Interests	**Staffan Lindgren**
ESA Staff	Rosina Romano

support in this regard. And a nod to Geoff Powell, who is the ESC's Executive Director and oversees the day-to-day operations of the Society's headquarters. Lesser but important roles were played by members of the Board of Directors, Officers, and by Chairs and members of the various committees. With the stewardship of Gail Anderson (1st Vice-President) and Bill Riel (2nd Vice-President), the organization of JAMs in 2020 and 2021 will be in good hands.

As a community, we also need to congratulate ourselves on the success of the Society's journal, *The Canadian Entomologist*. This year marks the end of its 150th year of continuous publication. From its early days as a mainly regional publication doubling as a newsletter, *TCE* has taken tremendous strides and is now a well-respected international journal conveying knowledge and excitement of entomological discoveries to a global audience. To commemorate *TCE*'s sesquicentennial anniversary, Dezene Huber (the current Editor-in-Chief) and myself (past E-i-C) wrote a review that encapsulates the journal's birth,

présidents et membres des différents comités. Avec l'intendance de Gail Anderson (première Vice-présidente) et Bill Riel (second Vice-président), l'organisation des réunions annuelles en 2020 et 2021 est entre bonnes mains.

En tant que communauté, nous devons également nous féliciter pour le succès de la revue de la Société, *The Canadian Entomologist*. Cette année marque la fin de sa 150e année de publication continue. Depuis ses premiers jours comme publication principalement régionale doublée d'un bulletin, *TCE* a fait des pas de géants et est maintenant une revue internationale respectée transmettant les connaissances et l'excitation des découvertes entomologiques à un auditoire global. Pour commémorer l'anniversaire sesquicentenaire du *TCE*, Dezene Huber (l'éditeur-en-chef actuel) et moi-même (ancien éditeur-en-chef) avons écrit un article de synthèse qui encapsule la naissance, la croissance, l'évolution et les défis de la revue (Floate et Huber 2018). Il a été agréable de l'écrire et le fait de parcourir les archives de la revue a fourni des perspectives

growth, evolution and challenges (Floate and Huber 2018). It was enjoyable to write and reading through the journal's archives provided some interesting insights. I encourage you to embark upon your own expedition through *TCE*'s archives to explore the work of our academic forebears, bearing in mind the following quote attributed to George Norlin… "*Who knows only his own generation remains always a child*". To guide us along the path to *TCE*'s bicentennial, the Society has renewed our partnership with Cambridge University Press, who will continue as the journal's publisher for the next 7 years.

Our partnership with the Regional Entomological Societies (RES) is uniquely embedded into the bedrock upon which our national Society has been built. To strengthen and maintain this partnership, the ESC's Board of Directors has initiated a series of discussions with the Presidents of the RES to share our collective experiences and concerns, and to discover ways we can help each other. ESC actions arising from these discussions thus far include video presentations from the ESC President at annual meetings of RES, a new fund to promote outreach/education initiatives by RES, early plans to explore a 'national insect' day, and use of the ESC *Bulletin* to better enhance the visibility of RES journals. For example, the September issue of the *Bulletin* lists the contents for recent issues of the *Journal of the Entomological Society of British Columbia*, the *Journal of the Entomological Society of Ontario*, and the *Journal of the Acadian Entomological Society*. Collaborations that promote the activities and membership of both the RES and the ESC help to ensure our mutual long-term viability. One sign of this viability is right in front of you… this issue of the *Bulletin* (December, 50[4]) marks the 50th year of our Society's newsletter.

As we head into the closing days of 2018, it seems premature to talk about our next annual meeting. However, JAM 2019 is only 9 months away. Next year we meet jointly with the Acadian Entomological Society and the Canadian Society of Ecology and Evolution in Fredericton, New Brunswick, from 18-21 August (http://csee-esc2019.ca/). Because JAM 2019 will be held

intéressantes. Je vous encourage à entreprendre votre propre expédition dans les archives de *TCE* afin d'explorer les travaux de nos ancêtres académiques, gardant en tête la citation suivante attribuée à George Norlin… « *Qui ne connaît que sa propre génération demeure un enfant à jamais* »[1]. Afin de nous guider dans le chemin du bicentenaire du *TCE*, la Société a renouvelé son partenariat avec les Presses de l'Université Cambridge, qui continuera comme maison d'édition de la revue pour les 7 prochaines années.

Notre partenariat avec les sociétés d'entomologie régionales (SER) est ancré de façon unique dans le socle sur lequel notre Société nationale a été construite. Pour renforcer et maintenir ce partenariat, le conseil d'administration de la SEC a initié une série de discussions avec les présidents des SER afin de partager notre expérience et nos inquiétudes collectives, et de découvrir les façons dont nous pouvons nous entraider. Les actions de la SEC émergeant de ces discussions incluent jusqu'à maintenant des présentations vidéos du Président de la SEC à présenter aux réunions annuelles des SER, un nouveau fonds pour promouvoir les initiatives de communication/éducation par les SER, des idées pour explorer une journée nationale des insectes, et l'utilisation du *Bulletin* de la SEC pour augmenter la visibilité des revues des SER. Par exemple, le numéro de septembre du *Bulletin* présente le contenu des numéros récents du *Journal of the Entomological Society of British Columbia*, du *Journal of the Entomological Society of Ontario*, et du *Journal of the Acadian Entomological Society*. Les collaborations qui promeuvent les activités et les adhésions des SER et de la SEC aident à assurer une viabilité mutuelle à long-terme. Un signe de cette viabilité est juste devant vous… ce numéro du *Bulletin* (décembre 50]) marque la 50e année du bulletin de notre Société.

Alors que nous approchons des derniers jours de 2018, il semble prématuré de parler de notre prochaine réunion annuelle. Cependant, la réunion annuelle 2019 n'est que dans 9 mois. L'an prochain, nous nous réunirons avec la Société d'entomologie acadienne et la Société canadienne d'écologie et d'évolution à Fredericton, Nouveau-

[1] Traduction libre de la version originale anglaise

about 3 months ahead of our normal October/November meeting slot, some of the ESC's deadlines have been advanced. For example, the deadline for receipt of nominations for the ESC Achievement Awards and applications for the Carr Award is 31 December 2018. Please keep this in mind if you plan to apply or to nominate someone for these awards.

I close with a reminder that the ESC has opportunities for all members who wish to become more actively involved in societal operations. We have a number of committees that regularly recruit new members (http://esc-sec.ca/the-society/committees/). If you wish to join one of these committees, contact the Chair and let them know. If committee work isn't your calling, become engaged in other ways. Submit an article or a book review to the Bulletin (http://esc-sec.ca/publications/bulletin/). Write a blog (http://esc-sec.ca/blog/) or send a tweet (https://twitter.com/canentomologist?lang=en). Submit or review an article for *The Canadian Entomologist* (https://www.cambridge.org/core/journals/canadian-entomologist). Encourage your fellow entomophiles to join the ESC if they haven't already. And of course, remember to renew your own membership (http://esc-sec.ca/joinrenew/)! And when you do renew, keep in mind that we now have an auto-renew option (very helpful for the forgetful among us). Also, a reminder to please update your contact information (including user name), particularly if you are one of the many folks affected by the recent email transition in the federal government. This can be done by clicking on the "Manage Profile" link after you log in to the "Member's Area". Finally, please read the article (page 199) about the history and roles of the Entomological Society of Canada Scholarship Fund which, since its inception, has paid out more than one quarter million dollars in graduate student support.

Reference / Référence

Floate, K.D. and D. Huber. 2018. Congratulations to *The Canadian Entomologist* on its sesquicentennial anniversary! The Canadian Entomologist **150**:1-11 (http://doi.org/10.4039/tce.2017.64).

Brunswick, du 18 au 21 août (http://csee-esc2019.ca/index-fr.html). Puisque la réunion 2019 se tiendra environ 3 mois avant notre créneau habituel en octobre/novembre, toutes les dates limites pour les prix et bourses seront aussi devancées de 3 mois. Par exemple, la date limite pour recevoir les nominations pour les prix d'excellence de la SEC est le 31 décembre 2018. Merci de le garder en tête si vous prévoyez appliquer ou nominer quelqu'un pour ces prix. Je termine avec un rappel que la SEC a des opportunités pour tous les membres qui souhaitent devenir impliqués plus activement dans les opérations sociétales. Nous avons plusieurs comités qui recrutent régulièrement de nouveaux membres (http://esc-sec.ca/fr/the-society/committees/). Si vous souhaitez joindre un de ces comités, contactez son président pour lui faire savoir. Si le travail en comité n'est pas votre tasse de thé, impliquez-vous autrement. Soumettez un article ou une critique de livre au *Bulletin* (http://esc-sec.ca/publications/bulletin/). Écrivez un billet pour le blogue (http://esc-sec.ca/fr/blog/) ou envoyez un gazouillis (https://twitter.com/canentomologist?lang=fr). Soumettez ou révisez un article pour *The Canadian Entomologist* (https://www.cambridge.org/core/journals/canadian-entomologist). Encouragez vos collègues entomophiles à joindre la SEC s'ils ne l'ont pas déjà fait. Et bien sûr, rappelez-vous de renouveler votre adhésion (http://esc-sec.ca/fr/adhesion/)! Et lorsque vous renouvelez, rappelez-vous qu'il y a maintenant une option d'auto-renouvellement (très utile pour ceux d'entre nous qui sommes distraits). Veuillez également mettre à jour vos informations de contact (incluant votre nom d'utilisateur), particulièrement si vous êtes de ceux qui ont été affectés par la récente migration dans les adresses courriel du gouvernement fédéral. Ceci peut être fait en cliquant sur « Manage Profile » après vous être connectés dans la section des membres. Finalement, veuillez lire l'article (page 199) sur l'histoire et les rôles du Fonds de bourses d'études de la Société d'entomologie du Canada qui, depuis sa création, a payé plus d'un quart de million de dollars en soutien aux étudiants des cycles supérieurs.

Honours and Awards at JAM 2018

S. McCann for ESC

S. McCann for ESC

Jacques Brodeur receives the Gold Medal from Kevin Floate ..... and was obviously enjoying the presentation of his Address.

S. McCann for ESC

Kevin Floate presents Rob Johns with the C. Gordon Hewitt Award.

S. McCann for ESC

Hugh Danks receives his Honorary Membership Certificate from Kevin Floate.

S. McCann for ESC

S. McCann for ESC

John Spence (left) and Paul Fields (right) receive their Fellowship Certificates from Kevin Floate.

Governing and Editorial Boards at JAM 2018

S. McCann for ESC

Attendees at the first Board of Directors meeting at the ESC-SEC JAM in Vancouver (L-R).
Back row: Kevin Floate, Alex Smith, Gail Anderson, Étienne Normandin, Patrice Bouchard, Vincent Hervet, Neil Holliday, Joel Kits, Geoff Powell, Boyd Mori
Front row: Dezene Huber, Deepa Pureswaran, Haley Catton, Bill Riel, Kateryn Rochon, Véronique Martel, Anne-Sophie Caron, Suzanne Blatt

S. McCann for ESC

Attendees at the Editorial Board Meeting: *L to R (by head position):* Kevin Floate, Chris MacQuarrie, Rob Johns, Patrice Bouchard, Leah Flaherty, Mark Rheault, Deepa Pureswaran, Katherine Bleiker, Barbara Bentz, Véronique Martel, Maya Evenden, Christian Schmidt, Suzanne Blatt, Derek Sikes, Dezene Huber, Therese Poland, Heather Proctor, Andrew Smith, Zoë Lindo, Julia Mlynarek, Lisa Lumley, Chandra Moffat, Jon Sweeny, Chris Buddle, Chris Cutler, Dan Edwards.

Service Awards JAM 2018

T. Wist for ESC

(Clockwise, from top left) Service Awards were presented to Patrice Bouchard (outgoing President), Christopher Dufault (Treasurer 2014-2018), Bill Riel (ESC Co-Chair, JAM 2018 Planning Team) with Jenny Cory (ESBC President 2017-2018), Chris MacQuarrie (ESC Co-Chair, JAM 2018 Planning Team) and Vincent Hervet (Secretary 2017-2018).

T. Wist for ESC

T. Wist for ESC

T. Wist for ESC

S. McCann for ESC

General Mixer, JAM 2018

(photo credits:
Tyler Wist for ESC)

General Mixer, JAM 2018

(photo credits:
Tyler Wist for ESC)

Joint Presidential Reception, JAM 2018

(photo credits:
Tyler Wist for ESC)

Announcing the 2019 JAM
18-21 August
Fredericton, New Brunswick

In August 2019, the **Entomological Society of Canada** will meet jointly with the **Acadian Entomological Society** and the **Canadian Society for Ecology and Evolution**. Join us on the banks of the beautiful St. John River as we bring these three sister societies together for their first-ever joint meeting!

- Link ecological principles and theory to applied entomology
- Learn new tools and approaches relevant to your work
- Celebrate how insects fit into broader ecological studies
- Meet new colleagues and gain new perspectives

Follow the meeting on Twitter (*@CSEE_Meetings*) or find more details (including the **Call for Symposia and Workshop Proposals**) on the web: http://csee-esc2019.ca

Annonce pour la réunion conjointe 2019
18-21 août
Fredericton, Nouveau-Brunswick

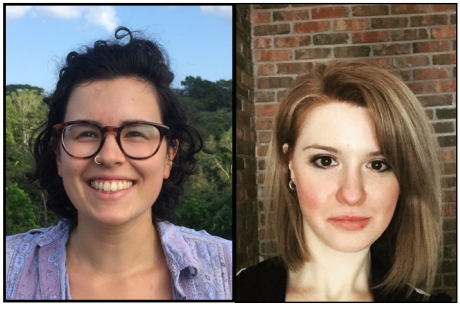
En août 2019, la **Société d'entomologie du Canada** se réunira conjointement avec la **Société acadienne d'entomologie** et la **Société canadienne d'écologie et d'évolution**. Joignez-vous à nous sur les rives du magnifique fleuve Saint-Jean alors que nous réunirons pour la première fois ces trois sociétés sœurs!

- Liez les principes écologiques et la théorie à l'entomologie appliquée
- Découvrez de nouveaux outils et de nouvelles approches pertinents à vos travaux
- Célébrez la façon dont les insectes cadrent dans les études écologiques plus vastes
- Rencontrez de nouveau collègues et acquérez de nouvelles perspectives

Suivez-nous sur Twitter (*@CSEE_Meetings*) ou trouvez plus d'informations sur le site web (incluant l'**appel de propositions de symposiums et des ateliers**) : http://csee-esc2019.ca/index-fr.html

STEP Corner / Le coin de la relève

Anne-Sophie Caron and Rachel Rix



2018 ESA, ESC, and ESBC Joint Annual Meeting – Feedback on the Graduate Student Showcase

We would like to congratulate once more everyone who participated in the Graduate Student Showcase. The calibre was extremely high and all presentations were exceptional! We would like to acknowledge the five winners: Heather Coatsworth, Charity Owings, Daniel Peach, Thomas Whitney and Miles Zhang, but also to applaud the runners up who came extremely close to participating in the showcase: Lina Bernaola, Mark Demkovich, Justin Gaudon and Joanna Konopka, as well as everyone who applied. We encourage you to apply for next year's GSS which will take place at the JAM of the ESC, AES and CSEE in Fredericton, New Brunswick, next August.

Thank you also to our judges: Julia Mlynarek, Jason Gibbs, Rayna Krell, Patricia Prasifka and Paul Abram. Thanks to Rosina Romano for the help with the organisation.

Finally, thanks to Joanna Konopka for helping us run the showcase!

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. For regular updates

La réunion annuelle ESA, ESC, and ESBC de 2018 – Retour sur la vitrine aux étudiants gradués

Nous voulons féliciter encore une fois toutes les personnes qui ont participé à la vitrine. Le calibre était extrêmement élevé et toutes les présentations étaient exceptionnelles ! Nous souhaitons reconnaitre nos cinq présentateurs: Heather Coatsworth, Charity Owings, Daniel Peach, Thomas Whitney et Miles Zhang, mais aussi les finalistes qui étaient à quelques points de participer à la vitrine: Lina Bernaola, Mark Demkovich, Justin Gaudon et Joanna Konopka, ainsi que tous ceux ayant appliqué. Nous vous encourageons à appliquer pour la vitrine de l'année prochaine qui aura lieu à la réunion annuelle de la SEC, AES et CSEE à Frédériction, au Nouveau-Brunswick, au mois d'août prochain.

Nous voulons aussi remercier nos juges : Julia Mlynarek, Jason Gibbs, Rayna Krell, Patricia Prasifka et Paul Abram. Merci aussi à Rosina Romano pour son aide lors de l'organisation.

Finalement, merci à Joanna Konopka pour son aide inestimable lors du déroulement de la vitrine !

Aperçu de la recherche

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

on new Canadian entomological research, you can join the ESC Students' Facebook page or follow us on Twitter @esc_students.

Directory of Entomological Education

SEPAC is working to further amend and update the Directory of Entomological Education. If you wish to be added to the directory, or wish to amend and/or update your current directory information, please contact us at students@esc-sec.ca.

Getting involved with the ESC

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

We look forward to hearing from you,
Anne-Sophie and Rachel.

Répertoire des formations en entomologie

Le comité des affaires étudiantes et des jeunes professionnels de la SEC travaille sur l'amélioration du répertoire des formations en entomologie. Si vous souhaitez être ajouter au répertoire ou que vos informations soient mise à jour ou modifier, vous pouvez communiquer avec le comité des affaires étudiantes et des jeunes professionnels à students@esc-sec.ca.

S'impliquer au sein de la SEC

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

Au plaisir d'avoir de vos nouvelles,
Anne-Sophie et Rachel.

Thesis Roundup / Foisonnement de thèses

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

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

Graduate Student Showcase
Vitrine aux étudiants gradués

Moderators/Modératrices:
Anne-Sophie Caron and / et Joanna Konopka

(abstracts reprinted from annual meeting programme)

T. Wist for ESC

Canadian Graduate Student Showcase Participants (from left):
Heather Coatsworth, Dan Peach and Miles Zhang

Heather Coatsworth (Simon Fraser University)
with Paola Caicedo, Clara Ocampo and Carl Lowenberger

Engineering a dengue refractory phenotype in *Aedes aegypti*.

Dengue viruses infect 50-100 million people annually and are transmitted principally by *Aedes aegypti*. Complications such as dengue hemorrhagic fever or dengue shock syndrome can be fatal. Not all *Ae. aegypti* females transmit dengue viruses. In Cali, Colombia, approximately 30% are naturally resistant to all four dengue serotypes through midgut refractory mechanisms, while the remaining 70% transmit the viruses. We used a combination of molecular biology and bioinformatic methods to identify the differences between refractory and susceptible mosquitoes. RNA sequencing, 16S rRNA bacterial profiling, and a genome-wide association study (GWAS) were used to flag a subset of genes thought to contribute to the two phenotypes. Genes from this subset that were able to 'flip' the phenotype of mosquitoes from susceptible to refractory through RNAi-based knockdowns were further tested with gene-editing technology. Mosquito embryos were serially injected with CRISPR-Cas9 guide RNA complexes for a lysosomal cysteine protease and a heparan sulfate proteoglycan. DNA was extracted from mosquitoes post-mortem, and sequenced to determine transformation success. A genetic basis for mosquito dengue resistance would allow us to create lines of permanently refractory mosquitoes to dampen dengue transmission.

Concevoir un phénotype réfractaire à la dengue chez *Aedes aegypti*.
Les virus de la dengue infectent de 50 à 100 millions de personnes par année et sont transmis principalement par *Aedes aegypti*. Les complications qui y sont liés telles que la fièvre hémorragique ou le syndrome du choc de la dengue peuvent être fatals. Mais ce ne sont pas toutes les femelles de *Ae. Aegypti* qui transmettent le virus dengue. À Cali, en Colombie, environ 30% de ces femelles sont naturellement résistantes aux quatre sérotypes de la dengue par des mécanismes réfractaires du système digestif, alors que 70% restent capables de transmettre le virus. Nous avons utilisé une combinaison de méthodes de biologie moléculaire et de bio-informatique pour identifier les différences entre les moustiques réfractaires et susceptibles. Le séquençage de l'ARN, le profil bactérien de la rARN 16S et une étude d'associations pangénomiques (GWAS) ont été utilisés pour signaler un sous-ensemble de gènes qui pourraient contribuer aux deux phénotypes. Les gènes de ce sous-ensemble qui seraient capables de faire basculer le phénotype des moustiques de susceptible à réfractaire à travers un « knockdown » de bases ARNi ont été testés plus en profondeur dans le cadre de technologies de manipulation des gènes. Les embryons de moustiques ont été injectés avec un guide de complexes d'ARN CRISPR-Cas9 pour un gène lysosomal de cystéine-protéase et un heparan sulfate de protéoglycanes. L'ADN a été extrait des moustiques post-mortem et séquencé pour déterminer le succès de la transformation. Une base génétique pour la résistance des moustiques à la dengue nous permettra de créer des lignées de moustiques réfractaires de façon permanente et d'atténuer la transmission de la dengue.

Charity Owings (Indiana University-Purdue University)
Environment and vertebrate resource availability mediate population genetic structure of the black blow fly, *Phormia regina* Meigen (Diptera: Calliphoridae).
Blow flies are biological drones, surveying animal communities while continuously searching for resources, a behavior which may directly contribute to their chaotic population genetic structure. The goals of this research were twofold: determine environmental mediators of blow fly population genetics, and use biological data gathered by the blow flies themselves to survey vertebrate communities. Spatiotemporal collections (N = 12) were made within each of three environments: urban (Indianapolis, IN), semi-pristine (Great Smoky Mountains National Park, GSMNP), and pristine (Yellowstone National Park, YNP). Dissected gut contents of adult *Phormia regina* Meigen (Diptera: Calliphoridae) females (N = 10) underwent DNA extraction, genotyping, vertebrate sequencing, and fecal metabolite screening. AMOVA analysis revealed slight spatiotemporal structure within each region (mean $F'_{ST} = 0.037$) but pronounced structure overall ($F'_{ST} = 0.580$). Most environmental variables (e.g. temperature, humidity, wind speed, resource availability) significantly predicted fly kinship ($P < 0.01$), thus confirming environmental impact on fly population genetics. More than 30 vertebrate species were identified from adult fly guts (present in >25% flies). Anthropogenic influences between environments was markedly different, as dogs comprised a large portion of DNA in urban flies (32% vs 11%, 0% in GSMNP, YNP, respectively), though vertebrate feces was detected more frequently in non-urban environments. Overall, environmental factors largely contributed to blow fly population genetics via indirect mediation of vertebrate resource availability. Understanding resource availability in a given environment can predict genetic variability of local adult fly populations, which has broad applications in pest management, medicolegal entomology, and conservation biology.

La disponibilité des ressources environnementales et provenant de vertébrés modère la structure génétique des populations chez les mouches noires de la viande, *Phormia regina* Meigen (Diptera: Calliphoridae).

Les mouches noires de la viande (Calliophoridae) sont des drones biologiques qui sondent les communautés animales, cherchant continuellement des ressources. Ce comportement pourrait directement contribuer à leur structure génétique de populations assez chaotique. Les objectifs de cette recherche se déclinent en deux aspects : déterminer les facteurs environnementaux modérant la génétique de population chez les mouches noires de la viande et utiliser les données biologiques collectées par les mouches elles-mêmes pour étudier les communautés de vertébrés. Des échantillons spatio-temporels (N=12) ont été collectés dans chacun des trois environnements : urbain (Indianapolis, IN), semi-intact (parc national des Great Smoky Mountains, GSMNP) et intact (parc national de Yellowstone, YNP). Le contenu des intestins des femelles adultes de *Phormia regina* (N=10) a subi une extraction d'ADN, un génotypage, un séquençage pour les vertébrés et un dépistage des métabolites fécaux. Une analyse AMOVA a révélé une légère structure spatio-temporelle dans chacune des régions (F'_{ST} moyen = 0.037), mais une structure prononcée globalement (F'_{ST} = 0.580). La plupart des variables environnementales (p. ex. température, humidité, vitesse du vent, disponibilité des ressources) prédisait la filiation des mouches ($P < 0.01$), confirmant ainsi l'impact environnemental sur la génétique des populations chez ces mouches. Plus de 30 espèces de vertébrés ont été identifiées à partir des intestins de mouches adultes (présent dans > 25% des mouches). L'influence anthropogénique entre les environnements était manifestement différente étant donné que les chiens constituaient une grande partie de l'ADN chez les mouches urbaines (32% vs 11%, 0% dans GSMNP et YNP, respectivement). Pourtant, les matières fécales de vertébrés étaient plus souvent détectées dans les environnements non-urbains. Généralement, les facteurs environnementaux ont grandement contribué à la génétique des populations chez les mouches noires de la viande à travers une modération indirecte de la disponibilité des ressources de vertébrés. Comprendre la disponibilité des ressources dans un environnement donné peut prédire la variabilité génétique des populations de mouches adultes. Ceci a des applications générales sur la gestion des insectes ravageurs, sur l'entomologie médicolégale ainsi que la conservation biologique.

Dan Peach (Simon Fraser University)
with Regine Gries and Gerhard Gries.

Do multi-modal foraging cues attract mosquitoes (Diptera: Culicidae) to flowers?

Mosquitoes use olfactory, CO_2, visual, and thermal cues to locate vertebrate hosts but also consume plant sugars from (extra-floral) nectaries, and aphid honeydew. Heretofore, sugar-foraging mosquitoes were thought to be guided solely by floral odorants and their role as pollinators was not clear. Working with the common tansy, *Tanacetum vulgare*, the common hawkweed, *Hieracium lachenalii*, northern house mosquitoes, *Culex pipiens*, and yellow fever mosquitoes, *Aedes aegpyti*, as model species, we tested the hypotheses that (H1) the entire inflorescence Gestalt of olfactory, CO_2 and visual cues is more attractive to sugar-foraging mosquitoes than floral odorants alone, (H2) mosquitoes provide pollination services, and (H3) aphid honeydew odorants attract mosquitoes. Testing H1, we demonstrate that (i) visual and olfactory tansy inflorescence cues in combination attract more mosquitoes than olfactory cues alone, (ii) UV light-reflecting and absorbing patterns of hawkweed inflorescences affect mosquito foraging decisions; (iii) tansies become net producers of CO_2 after sunset and CO_2 enhances the attractiveness of synthetic floral odorants; (iv) some floral odorants/gases are produced by

nectar-dwelling microbes; and (v) the tansy floral blend includes odorants typically emanating from human skin, breath, or skin microbiota. Testing H2, we demonstrate that *Cx. pipiens* readily carries pollen and induces significant seed set in *T. vulgare*. Testing H3, we demonstrate that both aphid-infested plants and (synthetic) honeydew odorants, some of which microbe-derived, attract *Ae. aegpyti*. Overlapping olfactory and CO_2 cues between plants and vertebrates shed light on the evolution of haematophagy, supporting the concept that haematophagy of mosquitoes has arisen from phytophagy.

Les indices d'alimentation multimodaux attirent-ils les moustiques (Diptera: Culicidae) vers les fleurs?

Les moustiques utilisent des indices olfactifs, visuels, thermiques ainsi que le CO_2 pour localiser leurs hôtes vertébrés, mais aussi pour consommer les sucres provenant des nectaires (extra-floraux) des plantes et du miellat des pucerons. Jusqu'ici, on croyait que les moustiques se nourrissant sur le sucre s'orientaient uniquement grâce aux odeurs émises par les fleurs. Leur rôle comme pollinisateur n'était donc pas clairement défini. En travaillant avec la tanaisie commune, *Tanacetum vulgare*, l'épervière de Lachena, *Hieracium lachenalii*, le maringouin domestique, *Culex pipiens,* et le moustique responsable de la fièvre jaune, *Aedes aegpyti*, comme espèces modèles, nous avons testé les hypothèses que (H1) le complexe entier de l'inflorescence, incluant les indices olfactifs, visuels et le CO_2 serait plus attirant pour les moustiques que les indices olfactifs seuls, (H2) les moustiques fournissent un service de pollinisation et (H3) les indices olfactifs du miellat des pucerons attirent les moustiques. En testant H1, nous avons démontrer que (i) les indices visuels et olfactifs de l'inflorescence de la tanaisie attirent plus de moustiques en étant combinés que les indices olfactifs seuls, (ii) les propriétés de réflexion et d'absorption de l'inflorescence de l'épervière affectent les décisions des moustiques en termes d'alimentation, (iii) la tanaisie devient un producteur net de CO_2 après le crépuscule et le CO_2 augmente l'attrait des indices olfactifs floraux synthétiques, (iv) certains des odorants/gaz floraux sont produits par des microbes habitant le nectar et (v) le mélange floral de la tanaisie inclue des odeurs émanant typiquement de la peau ou de l'haleine humaine ou du microbiote de la peau. Testant H2, nous avons démontré que *Cx. pipiens* transporte facilement le pollen et incite la formation des graine chez *T. vulgare*. Testant H3, nous avons démontré que *Ae. aegpyti* est attiré autant par les plantes infestées par des pucerons que par des odorants de miellats synthétiques, certains dérivés de microbes. Le chevauchement des indices olfactifs et de CO_2 entre les plantes et les vertébrés élucide l'évolution de l'hématophagie, supportant le concept que l'hématophagie chez les moustiques a émergé de la phytophagie.

Thomas D. Whitney (USDA Forest Service, and University of Georgia)
with Rima Lucardi and Kamal J. K. Gandhi.

Origins of an emergent forest health pest: Population genetic structure of the eastern white pinebast scale (*Matsucoccus macrocicatrices*).

A novel dieback phenomenon has emerged in eastern white pine (*Pinus strobus* L.) across its range. Associated with symptoms of bark cankers, bottom-up crown thinning, and sapling mortality is an understudied insect herbivore not previously considered to be a serious damaging agent: the eastern white pinebast scale, *Matsucoccus macrocicatrices* (Hemiptera: Matsucoccidae). From existing museum specimens, we can infer the scale occupied a native range limited to New England and southeastern Canada, but today that range includes area as far south as Georgia and as far west as Michigan. Our objective was to explain the bast

scale's recent discovery and current presence outside the Northeast. We hypothesized that if a recent introduction (<100 yrs) to the Southern Appalachian and Great Lakes regions occurred, individuals and/or populations would show high relatedness to those from New England/ southeastern Canada but reduced genetic diversity due to founder effect. We developed 9 *M. macrocicatrices*-specific microsatellite markers and assessed the structuring of genetic diversity and relatedness within and among 22 populations from across the range of eastern white pine. Results showed no signatures of bottlenecking and indicated significant differentiation among the three regions (Fst = 0.324, P < 0.001). This provides evidence that the scale has co-occurred with its host tree since the last glacial maxima and perhaps went unnoticed outside the Northeast until recently. With a native range that likely includes the Southern Appalachians and Great Lakes, it remains unclear why this previously benign herbivore is now considered a pest.

Les origines d'un insecte ravageur forestier : la structure de la génétique de population d'une cochenille s'attaquant au pin blanc (*Matsucoccus macrocicatrices*).

Un nouveau phénomène de dépérissement a émergé chez le pin blanc (*Pinus strobus* L.) à travers sa répartition. Un insecte herbivore sous-étudié qui n'était pas auparavant considéré comme un agent destructeur, la cochenille *Matsucoccus macrocicatrices* (Hemiptera: Matsucoccidae), est associée à des symptômes de chancres de l'écorce, un amincissement ascendant de la couronne et à la mortalité chez les jeunes arbres. À partir des spécimens de musées déjà existant, nous pouvons déduire que la cochenille occupait une zone se limitant à la Nouvelle-Angleterre et au sud-est du Canada, mais que cette zone s'étend maintenant jusqu'à la Géorgie au sud et le Michigan à l'ouest. Notre objectif est d'expliquer la récente découverte de la cochenille et sa présence actuelle en dehors du nord-est des États-Unis. Nous proposons que si une introduction récente (<100 ans) était survenue dans le sud des Appalaches et dans la région des Grands-Lacs, les individus et/ou les populations présenteraient un haut niveau de parenté à ceux de la Nouvelle-Angleterre et du sud du Canada, mais une diversité génétique réduite due à l'effet fondateur. Nous avons développé 9 millions de marqueurs microsatellites spécifiques aux macrocicatrices et nous avons évalués la structure de la diversité génétique et de la parenté à travers et entre 22 populations dans la région du pin blanc. Les résultats ne montraient aucune signature de goulot d'étranglement et indiquaient une différentiation significative entre les trois régions (Fst = 0.324, P < 0.001). Ceci nous indique que la cochenille était co-occurrente avec son espèce hôte depuis le dernier maximum glacial et qu'elle est sûrement passée inaperçu dans le nord-ouest jusqu'à récemment. Avec une étendue incluant le sud des Appalaches et les Grands-Lacs, on ignore encore pourquoi cet herbivore auparavant bénin est maintenant considéré comme un ravageur.

Miles Zhang (University of Central Florida)

The evolution of *Peristenus* (Hymenoptera: Braconidae): Taxonomy, phylogenetics and ecological speciation.

Parasitoid wasps are ecologically and economically important as biological control agents. However, little is known about the diversity, distribution and biology of most hymenopteran parasitoids due to their small size, morphological conservatism, and complex life styles. The focus of my PhD research was to investigate the evolution and speciation of euphorine braconid wasps, using a combination of multilocus phylogenetics and population genomic techniques combined with traditional taxonomy. The three chapters of my dissertation are divided into different taxonomic ranks of euphorine braconids, focusing on genera, species, and populations.

First at the generic level, I built a multilocus phylogeny of the tribe Euphorini with extensive taxa sampling around the globe. I confirmed the monophyly of *Peristenus* and *Leiophron*, two important biological control agents, and provided updated generic concepts and identification resources to aid applied researchers. Then at the specie level, I focused on cryptic species within the *Peristenus pallipes* complex in North America, using an integrative taxonomic approach of molecular, morphological, and ecological data to resolve the taxonomic confusion within this species complex. Finally focusing on the population level, I used genome-wide SNPs data to determine allochrony as a possible driver of speciation between two sympatric *Peristenus* species. My dissertation provided a comprehensive analysis of *Peristenus* at multiple taxonomic ranks using phylogenetics and population genomics, providing insights into their evolutionary history that can be extrapolated into other groups of parasitoid wasps. The results from these studies also advanced our understanding of this group of animals of theoretical, economical, and conservation importance.

L'évolution de *Peristenus* (Hymenoptera: Braconidae): Taxonomie, phylogénétique et spéciation écologique.

Les guêpes parasitoïdes sont écologiquement et économiquement importantes comme agents de contrôle biologique. Pourtant, on en connait peu sur la diversité, la distribution et la biologie de la plupart des parasitoïdes hyménoptères à cause de leur petite taille, leur conservatisme morphologique et de leurs cycles de vie complexes. L'objectif de recherche lors de mon doctorat était d'étudier l'évolution et la spéciation des guêpes braconides euphorinés en utilisant une combinaison de phylogénétique avec plusieurs loci et de techniques de génomique de population ainsi que de taxonomie traditionnelle. Les trois chapitres de ma thèse étaient divisés en suivant les rangs des braconides euphorinés, se concentrant sur les genres, les espèces et les populations. Premièrement, au niveau du genre, j'ai construit une phylogénie à plusieurs loci de la tribu Euphorini avec un échantillon exhaustif du taxon autour du globe. J'ai confirmé la monophylie de *Peristenus* et *Leiophron*, deux importants agents de lutte biologique, et j'ai fourni des concepts génériques révisés ainsi que des ressources pour l'identification de ces groupes pour aider les chercheurs dans l'application de cette recherche. Puis, au niveau de l'espèce, je me suis concentré sur les espèces cryptiques à l'intérieur du complexe de *Peristenus pallipes* en Amérique du Nord en utilisant une approche de taxonomie intégrative avec des données moléculaires, morphologiques et écologiques pour résoudre la confusion taxonomique à l'intérieur de ce complexe. Finalement, en me concentrant sur les populations, j'ai utilisé un jeu de données pangénomiques de SNP pour déterminer si l'allochronie est un facteur de spéciation entre deux espèces sympatriques de *Peristenus*. Ma thèse a offert une analyse compréhensive de *Peristenus* à divers rangs taxonomiques en utilisant la phylogénétique et la génomique de population, permettant ainsi un aperçu de leur histoire évolutive qui peut être extrapolée à d'autres groupes de guêpes parasitoïdes. Les résultats de cette étude peuvent aussi faire progresser notre compréhension de ce groupe d'importance théorique, économique et de conservation.

Presidents' Prize Winners & Runners-up at the Vancouver JAM

Canadian university-based students, both graduate and undergraduate, performed very well in the many Presidents' Prize sessions at JAM 2018. For full details of the presentations, refer to the 2018 JAM Program (https://www.entsoc.org/sites/default/files/files/2018 Joint Annual Meeting Program-Web(1).pdf).

Graduate Student Competition - Oral presentations

Plant-Insect Ecosystems: Behaviour

Winner: Kelsey Jones (University of Alberta)

Plant-Insect Ecosystems: Landscape

Winner: Jenny Liu (University of Guelph)

Runner-up: Charles-Etienne-Ferland (University of Guelph)

Medical, Urban and Veterinary Entomology

Winner: Andreas Fischer (Simon Fraser University)

Medical, Urban and Veterinary Entomology (Social Insects)

Runner-up: Asim Renyard (Simon Fraser University)

Physiology, Biochemistry and Toxicology: Vector Biology

Runner-up: Nicolas Salcedo-Porras (Simon Fraser University)

Systematics, Evolution and Biodiversity (Morphology)

Runner-up: François Brassard (Concordia University)

Systematics, Evolution and Biodiversity (Speciation)

Runner-up: Erin Campbell (University of Alberta)

Graduate Student Competition - Posters

Plant-Insect Ecosystems: Integrated Pest Management 3

Winner: Cassandra Russell (University of Guelph)

Plant-Insect Ecosystems: Bees

Runner-up: Janean Sharkey (University of Guelph)

Virtual Posters

Winner: Kyra Lightburn (University of Guelph)

Undergraduate Student Competition - Oral presentations

Medical, Urban and Veterinary Entomology

Winner: Emmanuel Hung (Simon Fraser University)

Runner-up: Jaime Chalissery (Simon Fraser University)

Systematics, Evolution and Biodiversity

Winner: Kiara Calladine (University of Saskatchewan)

Plant-Insect Ecosystems 1

Runner-up: Adam Discher (Acadia University)

Plant-Insect Ecosystems 2

Runner-up: Jan Lee (Simon Fraser University)

Undergraduate Student Competition - Posters

Systematics, Evolution and Biodiversity 2

Winner: Rowan French (University of Alberta)

Physiology, Biochemistry and Toxicology

Runner-up: Danielle White (University of the Fraser Valley)

2018 ESC Student Award Winners
Gagnants des prix étudiants SEC 2018

A **DR LLOYD M. DOSDALL MEMORIAL SCHOLARSHIP** was awarded to **Pauline Deschodt.** Pauline is a PhD candidate at Simon Fraser University. Her work focuses on pathogen ecology and evolution, examining within and between host competition. Her work involves investigating the effects of mixed pathogen infections within a single host, as well as pathogen interactions at the host population level. She is primarily interested in the effects of pathogen competition on replication and secondary transmission.


T. Wist for ESC

A second **DR LLOYD M. DOSDALL MEMORIAL SCHOLARSHIP** was presented to **Matthew Muzzatti**, Master's student, University of Guelph. Matthew completed a BSc majoring in Biodiversity at Guelph in 2015. He developed a passion for entomology after participating in a field entomology course in Missouri. His research is focused on developing a pheromone-based action threshold to help control swede midge infestation levels in canola.


T. Wist for ESC

Joel Goodwin received an **ESC ED BECKER CONFERENCE TRAVEL AWARD** and a **POSTGRADUATE STUDENT AWARD (MSC)**. Joel is an MSc student at Acadia University. He is interested in the field of integrated pest management, specifically for the control of forest pests. Joel's thesis research is focused on developing a multimodal monitoring system for the invasive beech leaf mining weevil (*Orchestes fagi)* by analyzing the effects of visual, chemical, and auditory cues on the insect's behaviour.


T. Wist for ESC

Joanna Konopka also received an **ESC ED BECKER CONFERENCE TRAVEL AWARD**. Joanna holds BSc and MSc degrees in Biology, and she has recently defended her PhD at Western University on trophic and competitive interactions of egg parasitoids of stink bugs (including *Halyomorpha halys*). She is a behavioural ecologist with experience and expertise in 3D high resolution live insect imaging, insect molecular biology, insecticide toxicology, integrated pest management, chemical ecology, and biological control.


T. Wist for ESC

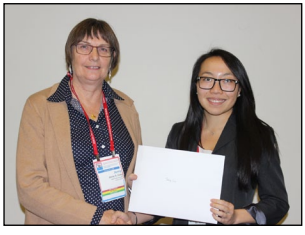
Samantha MacPherson was the third recipient of an **ESC ED BECKER CONFERENCE TRAVEL AWARD.** Samantha is a fourth-year student completing a BSc in Biology with Honours at Acadia University. She has previously worked as a research assistant investigating the repellent and insecticidal properties of a novel granite dust product in crop protection. Currently, she is in the INSECTA lab, investigating olfaction in ticks, the physiological and behavioural tick response to essential oils for the development of new repellant products for human protection.


T. Wist for ESC

Catherine Little won a **GRADUATE RESEARCH TRAVEL SCHOLARSHIP (PHD).** Catherine is currently completing her PhD at Memorial University of Newfoundland and Labrador. She is investigating interactions between olfactory reception, visual cues, and evolution of host preference in *Drosophila suzukii*. She has recently returned from The Swedish University of Agricultural Sciences (SLU) where she was invited as a visiting researcher to identify and confirm attraction to the female sex pheromone of *D. melanogaster* and *D. suzukii*.


T. Wist for ESC

Jenny Liu received a **POSTGRADUATE STUDENT AWARD (MSC)**. Jenny is a second-year Master of Science student in the University of Guelph's School of Environmental Sciences. Her study insect is the swede midge, a serious pest of cruciferous crops, most notably canola, and if populations are not controlled it may spread from Ontario to the major canola-producing regions of Canada.


T. Wist for ESC

The **JOHN H. BORDEN SCHOLARSHIP** was presented to **Dan Peach**. Dan is a PhD candidate at Simon Fraser University. His research is focused on the relationships between mosquitoes and plants, using the mosquitoes *Aedes aegypti* and *Culex pipiens* as model organisms. Using chemical ecology, visual ecology, and microbiology, Dan investigates how mosquitoes locate floral nectar, aphid honeydew, and other sources of plant sugar.


T. Wist for ESC

Asim Renyard also received a **POSTGRADUATE STUDENT AWARD (MSC)**. Asim is a Master of Pest Management student at Simon Fraser University. His current thesis focusses on researching the foraging and communication ecology of western carpenter ants. His primary research interests are identifying pheromones used during ants' alarm and trail following behaviour, the semiochemical cues they exploit during foraging and the drivers of colony level recruitment to food sources.


S. McCann for ESC

Cassandra Russell received a **GRADUATE RESEARCH TRAVEL SCHOLARSHIP (MSC)**. Cassandra is a Master's student at the University of Guelph in Environmental Sciences. Her research centres around integrated pest management, specifically in the monitoring and management of pepper weevil, *Anthonomus eugenii.* By researching alternative trap designs to study the chemical ecology of pepper weevil, Cassandra hopes to develop improved monitoring tools to be used in both field and greenhouse peppers.


T. Wist for ESC

Melanie Scallion received a **GRADUATE RESEARCH TRAVEL SCHOLARSHIP (PHD)** as well as a **POSTGRADUATE STUDENT AWARD (PHD)**. Melanie is a PhD candidate in the Department of Biology at Carleton University. She studies sonic defenses of Bombycoidea caterpillars. She is investigating why only some species produce sound while others are "mute" by studying correlations between sonic defense and traits such as body size, coloration, and other defense mechanisms.

T. Wist for ESC

Catherine Scott also received a **POSTGRADUATE STUDENT AWARD (PHD)**, as well as the **DANKS SCHOLARSHIP**. Catherine is a PhD candidate at the University of Toronto. Catherine combines observational and experimental work in the field and laboratory to study the sexual behaviour and chemical ecology of the western black widow spider, *Latrodectus hesperus*. In addition to her work on black widows, Catherine has collaborated on studies of the behavioural ecology of hobo and false widow spiders, social wasps, army ants, and insect-specialist birds.

T. Wist for ESC

Anthony Zerafa (McGill University) also received a **DANKS SCHOLARSHIP**, as well as the **BIOLOGICAL SURVEY OF CANADA SCHOLARSHIP** and an **MSC RESEARCH TRAVEL SCHOLARSHIP**. Unfortunately, Anthony was not at the Vancouver JAM to receive his awards in person.

Student scholarships and awards

In 2019 a competition for the following Entomological Society of Canada scholarships and awards will be held: MSc and PhD Scholarships, the Research Travel Awards, the John H. Borden Scholarship in IPM, the Keith Kevan Scholarship for studies in insect systematics, the Dr Lloyd M. Dosdall Memorial Scholarships in arthropod community ecology, the Danks Scholarships for studies on Canadian arthropod fauna, and the Becker Conference Travel Awards. Details of the application procedures are available on the Society website http://www.esc-sec.ca/studentawards.php. Students are encouraged to apply for these awards. The deadline for all but the Becker Awards is 16 February 2019. For the Becker Awards, the deadline will be the same as that for abstract submissions for the Joint Meeting with the Acadian Entomological Society and the Canadian Society for Ecology and Evolution in Fredericton.

Prix et bourses étudiants

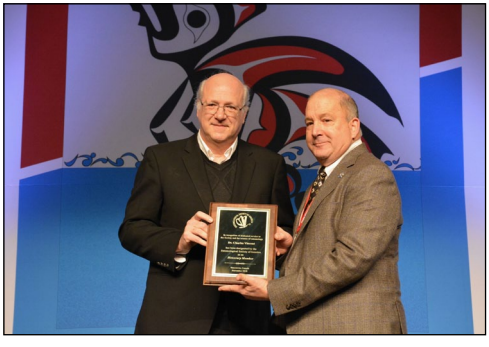
En 2019, une compétition pour les prix et bourses suivants de la Société d'entomologie du Canada se tiendra : la bourse pour études graduées, les bourses de voyage pour la recherche, la bourse John H. Borden en lutte intégrée, la bourse Keith Kevan pour études en taxonomie des insectes, la bourse Dr Lloyd M. Dosdall pour l'écologie des communautés d'arthropodes, les bourses Danks pour l'étude de la faune canadienne d'arthropodes, et les bourses Ed Becker pour la réunion annuelle. Les détails de la procédure d'application sont disponibles sur le site Internet de la Société http://www.esc-sec.ca/f-studentawards.php. Nous encourageons les étudiants à appliquer pour ces bourses. La date limite pour toutes les bourses, sauf la bourse Ed Becker, est le 16 février 2019. Pour la bourse Ed Becker, la date limite est la même que pour la soumission des résumés pour la réunion conjointe avec la Société acadienne d'entomologie et la Société canadienne d'écologie et d'évolution à Fredericton.

News from the regions / Nouvelles des régions

In this section, we highlight news from the regional entomological societies in Canada. Regional societies are reminded to send their news to the Editor by the deadline for each issue.

Dans cette section, nous soulignons les nouvelles des sociétés d'entomologie régionales au Canada. Les sociétés régionales doivent envoyer leurs nouvelles à l'éditeur avant la date limite de chaque numéro.

People in the news / Gens qui font les manchettes



J. Saguez

Michael P. Parella (right), President of the Entomological Society of America, presenting an ESA Honorary Membership plaque to Charles Vincent (left).
Michael P. Parella (à droite), Président de la Entomological Society of America présentant une plaque de Membre honoraire de la ESA à Charles Vincent (à gauche).

Charles Vincent

Dr. Charles Vincent was inducted as an Honorary Member of the Entomological Society of America at JAM 2018 in Vancouver. Charles has been a member of the ESA since 1984 and has served the Society in numerous capacities over the past three decades. He has twice received an Exceptional Service Award (in 2000 and 2007) and in 2013 was elected an ESA Fellow. Charles was president of ESC in 2003-4, is a Fellow of ESC and was the 2010 Gold Medal Winner. For the full citation documenting Charles' achievements, see https://www.entsoc.org/sites/default/files/files/2018 Joint Annual Meeting Program-Web(1).pdf (p. 40).

Dr. Charles Vincent a été élu Membre Honoraire de la Entomological Society of America lors de la réunion conjointe tenue à Vancouver en novembre 2018. Charles est membre de la ESA depuis 1984 et a rendu de nombreux services à la ESA depuis trois décennies. Il a été récipiendaire de deux prix pour services exceptionnels (en 2000 et 2007) et a été élu Fellow de la ESA en 2013. Charles a été Président de la SEC en 2003-2004. Il est un Membre associé de la SEC et récipiendaire de la Médaille d'or de la SEC en 2010. Des informations complémentaires sont disponibles au:
https://www.entsoc.org/sites/default/files/files/2018 Joint Annual Meeting Program-Web(1).pdf (p. 40).

Wider aspects of a career in entomology. 4. The high Arctic continued

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.

My fieldwork in 1969 as one of a group of entomologists and vertebrate zoologists at Polar Bear Pass on Bathurst Island (see the previous article in this series [ESC *Bulletin* **50**: 115]) continued as winter came to an end. Eventually, the temperature rose above freezing. Acclimatized to the cold as we were by then, some of us pranced around in shirtsleeves rejoicing in the +4°C warmth. Even so, the weather remained unpredictable. Snow, rain, and sunshine could be seen simultaneously across the horizon on more than one occasion. Entomologist Bob Byers and I continued to explore, whatever the conditions, as we tried to collect more arthropods.

The winter snow had been redistributed and packed hard by the fierce winds, so that it was not possible to distinguish between a shallow layer of snow, as in a slight depression, and a deep accumulation in a watercourse. However, the hard-packed snow softened rapidly as the weather warmed up. In these circumstances, snow that was firm enough to support the weight of a hiker on the outward journey might suddenly give way during a return later in the day. It was therefore possible to drop thigh-deep into the snow that had collected in creek beds. I liked to carry an ice axe during that period, because it would provide useful leverage to get back out. The wish to avoid being stuck there for long was reinforced by a realization that lying on the snow like a seal would not be the ideal pose for an encounter with a polar bear.

In fact, polar bears often passed through between inlets on the east and west coasts of the island—hence the name Polar Bear Pass. Mammalogist David Gray was alone on ridges for long periods while he observed muskoxen, and had brought a husky dog to accompany him. The dog would provide an alert about approaching bears, and help to distract one if it came too close. (A rifle would be used only as a last resort.) The husky was generally tethered at its station just outside the hut whenever it was not out on polar-bear duty. It spent most of its time there on two activities apart from sleeping. First, it could amuse itself by watching the numerous lemmings, which were at their population peak. Not uncommonly, a lemming track could be seen on the snow but would end suddenly just where the dog was at the limit of its tether. A second, longer-term, activity of the husky (perhaps because it was not used to being the only dog) was howling. Later, it proved to have been pregnant.

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

H. Danks

Fig. 1. Meltwater flowing through the top part of the snowpack above a creek (27 June 1969).

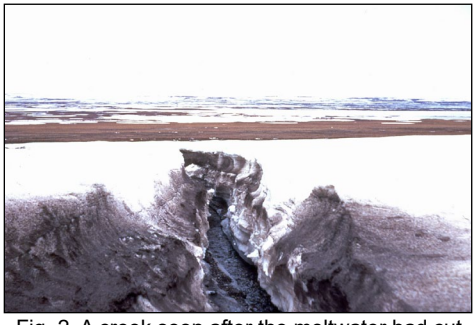


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Fig. 2. A creek soon after the meltwater had cut down to the bed (30 June).

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Fig. 3. Lower part of a creek flowing into the sedge meadow, with lake beyond (4 July).

In due course, the softened snow in creeks melted further and water began to flow in the top part of the snow pack (Fig. 1). Within a few days it had cut down to the streambed (Fig. 2). Such creeks supplied water to the wetland (Fig. 3).

On a few occasions a Single Otter aircraft came to the camp (Fig. 4), for example to pick up two members of the group who left before the others. Normally, the plane landed into the wind near the end of the camp ridge and was stopped almost instantly by the powerful breeze, coming to rest just beside our accommodation. One day, however, the plane arrived when it was unusually calm. We indicated this to the pilot with a "windsock", but perhaps he did not see it and landed in the usual place. After touchdown, the aircraft ran on and on without stopping. It passed the end of the ridge and started down towards a place where taking off again would be very difficult. Moreover, below the ridge-top the terrain was still wet from the thaw and hence soft enough for the wheels to dig in, which would have led to disaster. Just in time, the pilot gunned the engine and the plane staggered back off the ground and dropped into the valley. Before it reached

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Fig. 4. Single Otter aircraft coming in to land on the camp ridge.

the bottom, it had gained enough airspeed to generate the lift needed to climb back up. The pilot then circled and circled, and circled again before touching down, to make certain that he had an exceptionally long landing strip...and perhaps to recover his composure! Many local flights in the Arctic are made possible by pilots with a high tolerance of risk.

The severe conditions and remoteness of arctic areas make all operations there relatively risky, of course. Therefore, field camps were instructed to make scheduled radio contact every day with personnel from the Polar Continental Shelf Project at Resolute. That radio link was sometimes tenuous, in which case our scheduled contact was made through a field camp of geologists on another island who could exchange somewhat clearer transmissions with both Resolute and us. Often, I was the one trying to make contact because my voice was deemed to transmit effectively. When I was told (both then and later) that my voice is distinctive, I hoped that a compliment was intended!

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Fig. 5. Snow on 11 June above the main study pond, which is delineated by wooden stakes; the scale is suggested by the rolled-up surveyor's metal tape, about 30 cm in diameter.

Bob Byers and I carried out research on insect cold hardiness in addition to our general collecting. Bob worked under difficult conditions mainly to prepare and embed tissues for later cytological examination. I studied especially the larvae of chironomid midges in a shallow pond, the same sort of habitat I was studying farther south. In the Arctic, such ponds are frozen solid during the winter, unlike my recent discoveries near Ottawa that many habitats remain unfrozen then. While the pond was frozen (Fig. 5), a steel ice chisel (illustrated in article 2 of this series [ESC *Bulletin* **50**: 50]) served to gain access to the pond bottom. On the first such occasion, I pushed aside the snow and struck a firm blow with the ice chisel, using the full width of the blade and a nearly upright orientation, just as in temperate conditions. However, the arctic ice was so cold that it was as hard as concrete; the first blow jarred my hands painfully but made virtually no impression on the ice. I had to invent a different technique using the corner of the blade, although fortunately the ice gradually became less hard farther from the surface because it was less cold. Access to the substrate allowed me to remove completely frozen samples that contained chironomid larvae. The samples were placed in a large cooler so that they would remain frozen until they could be shipped back to Ottawa.

As the season advanced, the pond started to melt (Fig. 6a) and then thawed completely (Fig. 6b). Habitat temperatures were monitored in spring and early summer with a thermograph powered by a battery pack (visible in Fig 6a). This shallow pond thawed relatively quickly, but

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Fig. 6a. The main study pond on 20 June, partly thawed; the thermograph and battery pack can be seen across it.

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Fig. 6b. The same pond on 19 July, fully thawed.

after the thaw the substrate a few centimetres below the surface, adjacent to permafrost, was much colder than the topmost layers. Chironomid larvae could develop rapidly only in the most superficial zone. The first adults emerged from this pond less than two weeks after the thaw, although the largest species took longer to complete development, beginning emergence just before we left in the third week of July.

Once most of the snow had melted, the rate of run-off diminished and it became feasible to ford the river (Fig. 7). The place to do this had to be chosen carefully, because the current was still very strong. Fast rivers are hazardous even at surprisingly shallow depths, especially when substrates are unstable or slippery, and the detailed features of this channel were not yet known to us. Moreover, a river passable on one day might be very difficult to cross less than a day later, just like the softening snow in creek beds noted above. As the saying goes: "you never step into the same river twice", because so many variables are in play.

After crossing the river we explored creeks and other habitats that were previously inaccessible. We had wandered well away from camp to collect in these new areas when a large, white animal suddenly appeared in the distance, and then moved steadily closer. We stopped collecting and, pursued by the animal, hurried back to the safety of camp, crossing the river at the maximum speed that might be considered safe. We rushed up to the top of the ridge and deployed the telescope. As the pale fur of its underside caught the light, we saw that it was not a polar bear but a caribou. These animals are curious, and will approach to see what is going on.

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Fig. 7. A reach of the Goodsir river after the peak flow had subsided (10 July).

It would soon be time to leave the research station. Some additional photographs were taken (e.g., Fig. 8), and I donated the necktie I had worn in the Arctic (for warmth and out of habit) to decorate the shielding around the camp sanitary facility! Our transport landed on the camp ridge without incident, and took off again with us aboard. The flight to Resolute was likewise uneventful, although the land we flew over was strikingly barren and rocky (especially compared to the "arctic oasis" of Polar Bear Pass), rather than merely white with snow as it had been on the journey to camp six weeks previously.

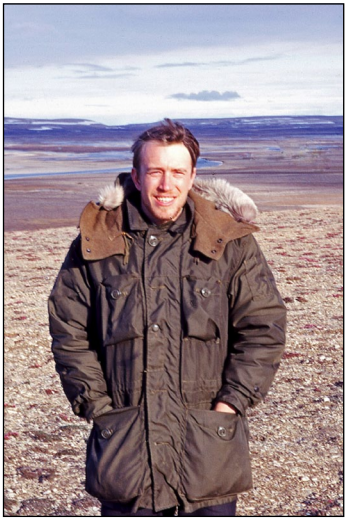

Fig. 8. Author Hugh Danks on Bathurst Island in July 1969.

The rest of our journey home would not be so smooth. Fog set in as soon as we arrived in Resolute, and the aircraft that would carry us back south could not land. These conditions confirmed the relatively sunless climate of the region, responsible for the particular impoverishment of the insect fauna there.

The cloud and fog persisted. I started to worry about the state of my frozen samples in the cooler, despite the relatively low temperatures and the dry ice that had been added in Resolute. It was possible that the weather would clear at any time, but in the end we were held up in Resolute for almost one week. This delay confirmed the lesson that it is not wise to plan strict timelines for research in these regions.

We stayed at the relatively basic (but expensive) accommodation available at Resolute, and soon noticed that ropes had been strung between every hut, even closely adjacent ones. Everyone was required to hold and follow these ropes at all times during conditions with very low—including zero—visibility due to blowing snow. Such blizzard conditions are very dangerous. Without the rope guide, people only a few inches from a hut can get lost and freeze to death.

We took short trips around the airfield, for example to the hill above Char Lake (Fig. 9), and to the boulder shore behind the community. However, we had to stay close by in case an aircraft was able to land. Seeking something else to do, Bob and I decided to get a haircut from the local barber. Apparently, his main role was to trim the hair of members of the Canadian Forces at the Resolute base, a fact that should have alerted us to what would happen when each of us tried in turn to indicate what sort of haircut we would like. I was reminded of Henry Ford's declaration

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Fig. 9. Char Lake at Resolute, and the hill above the lake; the thawed edge of the ice-covered lake can be seen on the near side (21 July).

about the earliest mass-produced cars: “any customer can have a car painted any color that he wants so long as it is black”. In Resolute, a person could have any haircut that he wanted so long as it was so short that it looked like all the others.

Also trying to find something to do was an older German tourist, who spoke virtually no English. He had come in response to somewhat misleading advertisements from the airline that offered these scheduled flights (Nordair, which no longer exists). The promised short visit would allow travellers to experience the land and its people, see polar bears and other wildlife, perhaps admire the northern lights, and take in the spirit of the Arctic. Instead, the tourist was stranded on a small fogged-in patch of land for nearly a full week, with few facilities, and with almost nothing to divert him from his growing frustration. He talked mostly with the only person who could readily communicate with him, the German-speaking wife of one of the scientists who was in transit through Resolute. For the whole time, she bore his increasingly vociferous complaints with admirable grace and fortitude, although the intensity of his grievances was evident even to those who did not speak German!

At last the weather started to clear, and we were asked to be ready for departure at 5 a.m. Several postponements followed, because the aircraft would take off from Baffin Island—beginning a flight of more than 1500 km—only if its chances of landing at Resolute were good. Nevertheless, we were able to depart soon after noon. A long layover in Frobisher Bay (now Iqaluit) followed as the plane made another round trip to Resolute, carrying in supplies while the weather remained suitable, before it continued to Montreal.

Our journey resumed in late evening. Acclimatized to the arctic cold, we were jolted in Montreal by an air temperature above 80°F (26°C) and a relative humidity above 80%, produced by the incursion of an air mass from the Gulf of Mexico. Moreover, the last flight to Ottawa had just left. After an uncomfortable and sleepless night on airport seating, we finally boarded our flight. Even then, because of air-traffic delays, the plane circled Ottawa airport for an additional trying 40 minutes before landing. At long last I reached my apartment and fell into bed, nearly 30 hours after rising soon after 4 a.m. in Resolute to pack. Exhausted from being awake that long, I slept uninterrupted for more than 12 hours, by far the longest sleep of my life.

The following day, I returned to the laboratory to start work, most urgently on the material inside the cooler, which was now in a walk-in freezer. Still frozen solid, the chironomid larvae were used for further studies, including continuing exposures to subfreezing temperatures. Most undamaged larvae recovered on thawing, although some species survived much less well after an additional 12 weeks at −18°C.

Subsequently, the general collections of arthropods brought back from Bathurst Island were identified, through the cooperation of many taxonomists at the Canadian National Collection. These identifications led to a characterization of the local fauna that was summarized in the previous article in this series.

Studies on the tolerance of *Trogoderma granarium* (khapra beetle) at extreme temperatures and on its associated bacteria.

Diana M. Wilches

Trogoderma granarium (khapra beetle) is a pest of stored agricultural products with a preference for grains, cereals, and spices – it is also among the world's most important invasive species (Fig. 1) (Eliopoulos 2013). It is a quarantine insect for Canada, United States, South America, Australia, and New Zealand (OEPP/EPPO, 2015). If introduced into these countries, it would limit the access of these commodities to international markets, causing a large economic impact (Myers and Hagstrum 2012; Eliopoulos 2013).

Figure 1. Adult and larvae of *T. granarium*, khapra beetle, on treated canola seed.

The prominence of *T. granarium* as a pest reflects its ability to feed on a wide variety of commodities and the facultative diapause of its larvae (Lindgren & Vincent 1959). Under ideal conditions, egg-to-adult development takes 4-5 weeks. Under suboptimal conditions, larvae enter a diapause state in which they can remain for many months or even years. External cues that trigger and maintain larval diapause include exposure to low temperatures, inadequate food, and rearing in isolated or crowded conditions (Burges 1962; Nair and Desai; 1972). In my research, I induced larval diapause in 57.3% of individuals reared at densities of 73 larvae/g diet (Wilches et al. 2017). Larvae induced to diapause in this manner were used in subsequent experiments.

The larval diapause of *T. granarium* increases its tolerance to insecticides (e.g., phosphine), starvation, low temperature, high temperature, and desiccation (Lindgren and Vincent 1959; Bell et al. 1984). The most commonly used method of control for *T. granarium* is fumigation with methyl bromide (Fields and White 2002). However, this fumigant is being de-registered for all uses so that alternative methods of control are needed (Fields and White 2002; Athanassiou et al. 2019). For my MSc thesis research, I tested the tolerance of *T. granarium* to extreme high and low temperatures as potential methods of control. In addition, the bacterial community associated with insects (i.e., the microbiome) can affect their host's biology and can increase their tolerance to extreme conditions (Gosalbes et al. 2010). Therefore, I also evaluated the bacteria associated with *T. granarium* to gain insight into factors that increase the tolerance of this insect to extreme conditions and insecticides.

Tolerance to low temperatures

All species of stored-product insects that have been tested to date are freeze-intolerant and avoid death at sub-zero temperatures by avoiding freezing. Freeze-intolerant insects remain in an unfrozen supercooled state by delaying freezing that occurs at their supercooling point (SCP)

Diana Wilches (diana_wico2@hotmail.com) was an MSc student at the Department of Biological Sciences, University of Lethbridge, where she is currently employed as a Laboratory Technician. The work reported here is an offshoot of her presentation in the Graduate Student Showcase at the 2017 Joint Annual Meeting in Winnipeg.

(Lee 1991; Fields 1992). I calculated the SCP of eggs, larvae, diapausing larvae, diapausing larvae acclimated to cold, pupae, and adults of *T. granarium* by decreasing the temperature in a cooling system to reach -50°C and recording the temperature every second. The SCP was identified by a spike of about 2°C in temperature, which represents the release of heat due to liquid crystallization. In *T. granarium,* eggs had the lowest supercooling point (average −26.2°C) followed by diapausing-acclimated larvae (−21.5°C), pupae (−21.3°C), acclimated larvae (−19.9°C), diapausing larvae (−19.6°C), adults (−18.7°C), and non-diapausing non-acclimated larvae (−14.4°C) (Wilches et al. 2017).

There is significant mortality of freeze-intolerant insects at temperatures higher than the SCP by factors unrelated to freezing (Strang 1992; Linnie 1999; Fields 1992). The survival of insects at low temperatures above their SCP is time- and temperature-dependent with shorter durations of exposure and warmer temperatures resulting in increased survival. To calculate the combination of temperature and duration needed to kill a given percentage of the population, individuals were exposed at different low temperatures for different exposure times. The most cold-tolerant life stage was identified by exposing each life stage to −10°C for various durations. According to their LT_{50} (estimated time until 50% mortality), the most cold-tolerant stage was the diapausing-acclimated larvae (average 87.0 d) followed by acclimated larvae (51.0 d), diapausing larvae (19.0 d), adults (3.6 d), non-diapausing non-acclimated larvae (2.0 d), pupae (0.4 d), and eggs (0.2 d). Because it was the most cold-tolerant stage, we performed additional tests with diapausing-acclimated larvae to estimate the time required to achieve 95%, 99% and probit 9 (99.9968%) mortality at various low temperatures. Results estimated times for 99% mortality to be 571, 279, 220, 51 and 9 d at 0, −5, −10, −15 and −20°C, respectively (Wilches et al. 2017). To meet requirements for control of quarantine pests, exposure of between 13 and 70 days at −0 to −15°C achieved a probit 9 mortality (Wilches et al. 2018). We speculate that a mechanism conferring joint tolerance to cold and desiccation may explain the finding that *T. granarium*, a species of tropical origin, is among the most cold-tolerant stored-product insect pests.

Tolerance to high temperatures

I also evaluated the potential for high temperatures as a method of control of *T. granarium* in a two-step process. First, different life stages were held at 45°C for different periods to calculate LT_{50} values. In descending order, the most heat-tolerant life stages at 45°C were diapausing larvae (LT_{50} = 41–122 h), non-diapausing larvae (LT_{50} = 47 h), adults (LT_{50} = 33 h), pupae (LT_{50} = 25 h), and eggs (LT_{50} = 10 h). The LT_{50} values estimated for diapausing larvae were variable when tests were repeated on different dates but this life stage was still identified as the most heat-tolerant life stage. Second, diapausing larvae were held at 45, 50, 55 and 60°C for different periods to calculate LT_{50}, LT_{95}, LT_{99} and probit 9 (99.9968% mortality) values. Estimated LT_{99} values for diapausing larvae were 288 h at 45°C, 6 h at 50°C, 1.1 h at 55°C, and 1 h at 60°C. Based on these results, an exposure of 2 h at 60°C is needed to control *T. granarium*. To meet requirements for control of quarantine pests, exposure of between 2 and 12 h at 50–60°C is recommended to achieve probit 9 mortality, but additional experiments are needed to confirm this estimate (Wilches et al. 2018).

Bacteria associated with *T. granarium*

The high tolerance of *T. granarium* to extreme conditions might be due to its associated microorganisms, but no studies have been done to address this question. In other insect species, microbial symbionts can help facilitate digestion, supplement essential nutrients, overcome extreme conditions, enhance thermotolerance or affect reproduction (Gosalbes et al. 2010; Fukatsu et al. 2007; Wilches et al. 2016). I investigated the microbiome of *T. granarium* and factors that might affect its composition with three questions: 1) When reared on the same diet and under similar conditions, how does the microbiome of *T. granarium* compare with that of its congener

T. variabile?; 2) What is the effect of life stage and diapause on the microbiome composition of *T. granarium*?; and 3) How do extreme temperatures affect the microbiome of *T. granarium* adults? To answer these questions, I collected live insect samples (one individual per sample) in 95% ethanol. These insects were then surface sterilized using a hypochlorite solution, prior to whole DNA extraction, 16S rRNA gene amplification with PCR and next-generation sequencing using the Illumina MiSeq platform. To assess the effect of extreme temperatures (Question 3), I collected unsexed adults (n = 6) immediately after they had survived an exposure of 42 hr at −15°C or 4 hr at 50°C (Wilches et al. 2018).

For Question 1, I determined that the core microbiomes of *T. granarium* and *T. variable* are similar in composition, but that of *T. granarium* has a significantly higher relative abundance of *Spiroplasma* bacteria (Fig. 2). This finding suggests a possible key association between *T. granarium* and *Spiroplasma*. *Spiroplasma* are insect symbiotic bacteria that can be mutualists,

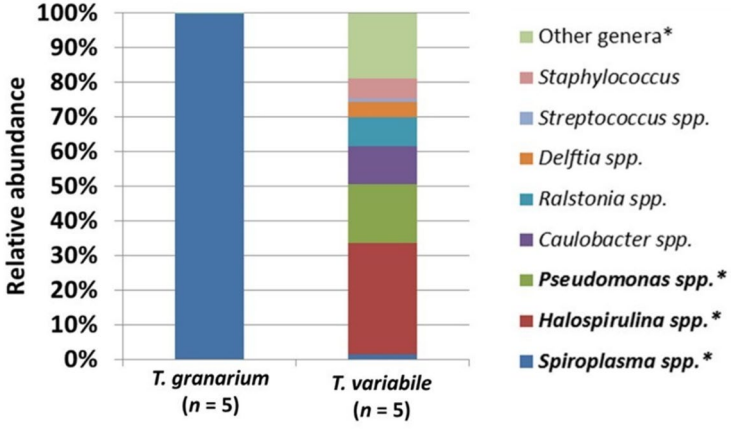

Figure 2. Mean relative abundance of common bacteria (ca. 14,000 to 19,000 seq./specimen) in *T. granarium* and *T. variabile* adults reared under the same conditions and diet. The asterisks indicate significant differences between the two species (Wilcoxon rank sum test; $P < 0.05$). The members of the core microbiome with high relative abundances (with a mean relative abundance higher than 3%, and present in at least two samples) are in bold.

incidental commensals, reproductive manipulators, pathogens or provide host protection (Anbutsu and Fukatsu 2011). For Question 2, I found that the microbiome of *T. granarium* varied across life stage, mainly reflecting changes in the relative abundance of *Spiroplasma* (Fig. 3). Actively-feeding life stages such as larvae have lower relative abundances of *Spiroplasma* than do pupae and adults. This difference could reflect the ingestion of bacteria with food. However, I also found *Spiroplasma* in surface sterilized eggs, which suggests there is a vertical transmission (from mother to the progeny) of *Spiroplasma* in *T. granarium* (Wilches et al. 2018). For Question 3, I found that high temperatures reduced the relative abundance of *Spiroplasma*, but did not observe an effect of low temperatures (Fig. 4) (Wilches et al. 2018). Optimal growth of *Spiroplasma* occurs at 26 to 30°C (Anbutsu and Fukatsu 2011), which may explain its reduction in insects exposed to 50°C.

Despite the economic importance of *T. granarium*, to my knowledge this is the first study assessing its microbiome and the presence of *Spiroplasma*. It is still unknown if *Spiroplasma* has any effects on *T. granarium* or if it is present in other populations of this insect. The colony of *T. granarium* is a thriving colony and it is unlikely that the strain of *Spiroplasma* in its microbiome is pathogenic. In addition, because of its low relative abundances in feeding life stages, it does not

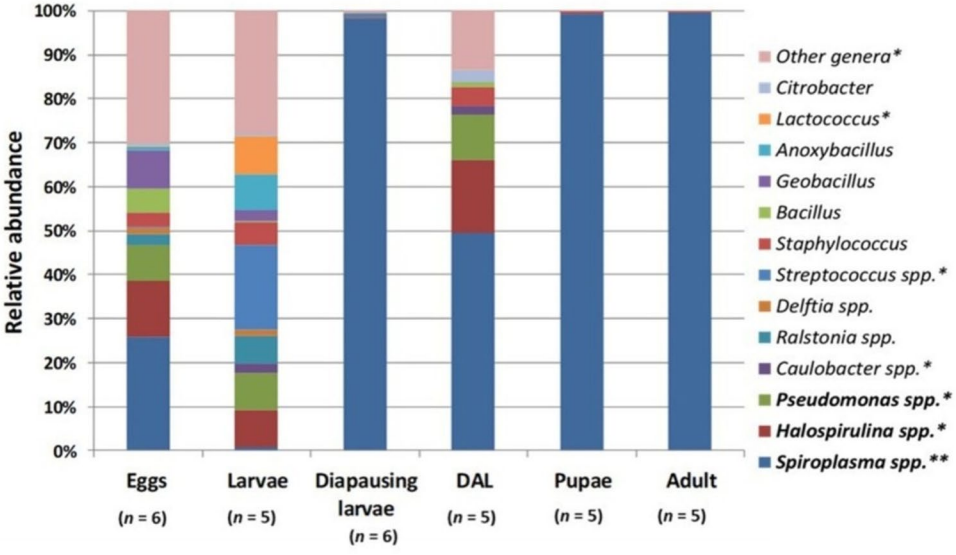

Figure 3. Mean relative abundance of common bacteria (ca. 17,800 to 19,966 seq./specimen) in the microbiome of different life stages of *T. granarium*: Eggs, larvae, diapausing larvae, diapausing larvae acclimated to cold, pupae and adults. Asterisks indicate significant differences between the two species (Wilcoxon rank sum test; $P < 0.05$). Members of the core microbiome with high relative abundances (with a mean relative abundance higher than 3%, and present in at least two samples) are in bold.

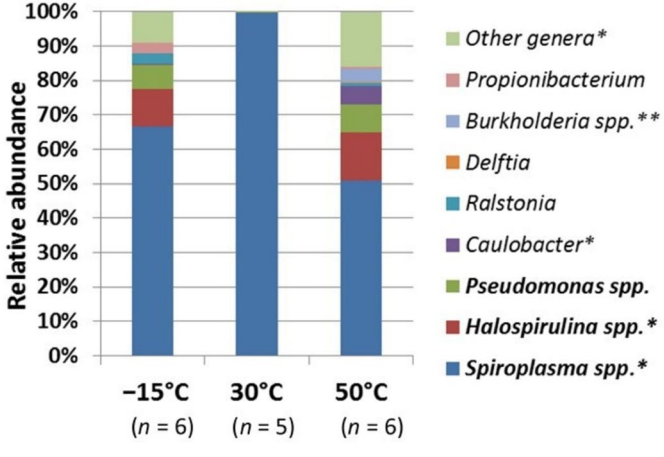

Figure 4. Mean relative abundance of common bacteria (ca. 17,521 to 19,965 seq./specimen) in the microbiome of *T. granarium* adults exposed to different temperatures: –15, 30 and 50°C). Asterisks indicate significant differences between the two species (Wilcoxon rank sum test; $P< 0.05$). Members of the core microbiome with high relative abundances (with a mean relative abundance higher than 3%, and present in at least two samples) are in bold.

seem to be involved in nutrition (Wilches et al. 2018). Further studies are needed to understand the association of *Spiroplasma* and *T. granarium*, and to evaluate the potential of using these bacteria to improve or develop new methods of control against this insect pest.

Conclusions

The successful design and application of methods of control against *T. granarium* require an understanding of its biology. When assessing the use of extreme temperatures to control *T. granarium,* one should consider the effects of acclimation and diapause, which according to the results of my research greatly increase thermal tolerance. Based on these results, the control of *T. granarium* with low temperatures should target diapausing-acclimated larvae, whereas the use of high temperatures should target diapausing larvae. Low-temperature control of diapausing-acclimated larvae (99% mortality) requires an exposure of 571, 279, 220, 51 and 9 days at 0, −5, −10, −15 and -20°C, respectively. Because of the long periods needed to control *T. granarium* at low temperatures, reducing temperatures to below the lowest supercooling point of −27°C for diapausing acclimated larvae may be the best way to control this insect with low temperature. At high temperatures, the control of diapausing larvae requires 288 h at 45°C, 6 h at 50°C, 1.1 h at 55°C, and 1 h at 60°C. The time required to control diapausing-acclimated larvae at low temperatures and diapausing larvae at high temperatures should suffice to control all other life stages of this pest.

My research also identified high quantities of *Spiroplasma* bacteria in *T. granarium*, which might affect the insect's biology and tolerance to extreme conditions. The identification of *Spiroplasma* in *T. granarium* is a starting point and opens a new field of questioning while attempting to understand this specific interaction and its applications. Further research is needed to understand and manipulate *T. granarium* biology, in order to develop, integrate, and apply different control tactics for this pest.

Acknowledgments

I thank my MSc thesis supervisors Dr Kevin Floate, Dr Paul Fields, and Dr Robert Laird for the opportunity for me to take on this project and for their continued support and encouragement at every step in its development. Dr Haley Catton and Dr Chad Laing provided guidance on statistical and bioinformatic analyses. Dr Muhammad Sagheer provided insect material for the establishment of *T. granarium* colonies. This project was funded by Agriculture and Agri-Food Canada (Grant Number: 38717027) and NSERC Discovery Grant (RGPIN -2015-05486).

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Samuel Ralph Loschiavo (1924 – 2018)

Sam Loschiavo died on 9 April 2018 after a short illness at the age of 93, after a long and fruitful career as an entomologist, husband, father and community activist.

Sam was born on 28 June 1924 in Transcona, Manitoba, to Frank and Catherine Loschiavo, immigrants from Italy. He earned his BSc, MSc and PhD from the University of Manitoba. While at the University of Manitoba, he served in the Canadian Officers Training Corps in preparation for joining the Royal Canadian Air Force.

He began his career in entomology in 1946 at the age of 22 as a summer student helping with the survey and insecticide trials of grasshoppers in Saskatchewan. He had a brief foray into European elm bark beetle behaviour research at the University of Wisconsin (1961-62), before spending the rest of his entomological career studying the little brown beetles that so successfully infest stored products. His MSc thesis (University of Manitoba, 1950) was on the sublethal effects of DDT on the confused flour beetle. His PhD thesis (University of Manitoba, 1964) was on the influence of some extracts of brewers' yeast and cereal products on aggregation and feeding behavior of the confused flour beetle. From 1950 to 1956, he worked in Ottawa on the use of DDT to control flour mill insects, sublethal effects of fumigants, and insect food preferences. He returned to Winnipeg in 1957 as a Research Scientist at the then Agriculture Canada. He served as Section Head of the Stored Product Section from 1982-1984. He retired from Agriculture and Agri-Food Canada in 1987.

His scientific work was productive and varied ranging from insecticides, insect behaviour, detection, nutrition, anti-feeding compounds and attractants. He authored or co-authored 77 scientific papers in 19 different peer-viewed scientific journals and obtained 1 US and Canadian patent. One of his many achievements was the invention of the probe pitfall trap (Loschiavo and Atkinson 1967) that is used today in many forms around the world (Canada, USA, China, India and Europe). He did pioneering work on insect nutrient and feeding behaviour. He showed that insects could be used in bioassays to estimate nutritive value of cereals (Loschiavo et al. 1969).

Sam was very involved in both the Entomological Society of Manitoba and Entomological Society of Canada. He served as President of the Entomological Society of Canada (1980), was a member of the steering committee for the 17th International Congress of Entomology, was named as a Fellow of the Entomological Society of Canada (1981) and elected as an Honorary Member of the Entomological Society of Canada (1988). He was also made an Honorary Member of the Entomological Society of Manitoba in recognition of his many contributions to the Society, serving as its President (1988), as Secretary for several years, as Editor of the Proceedings, and as a trustee of the Endowment Fund. In 1961, Sam was one of four Agriculture Canada stored product entomologists to receive a lifetime appointment as an Honorary Research Professor at the University of Manitoba. This association enabled the Agriculture Canada group to become internationally recognized for training of graduate students in stored product entomology.

Sam served on many community organizations and was a founder or co-founder of many, including the still very successful, Folklorama. He was chair of several committees, and vice-president of the Citizenship Council of Manitoba and the Folk Arts Council of Manitoba. He served on the Board of Directors for Citizens Against Impaired Driving, Manitoba Opera Association, Villa Rosa, Manitoba Grants Advisory Council, and the Manitoba Historical Society.

In 1991, he received a Citation for Citizenship from the Government of Canada in recognition of his work in the cause of citizenship and volunteerism. In 2000, he received Canada's highest civilian honour, being named to the Order of Canada. In 2002 he was awarded the Queen's Golden Jubilee medal and in 2012 the Queen's Diamond Jubilee medal.

Paul Fields and Noel White
Winnipeg, Manitoba

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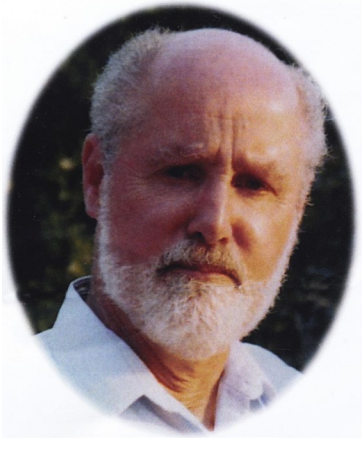

Bruce Sword Heming (1939 – 2018)

Youthful exuberance, artistic talent, superb penmanship, thrips specialist, embryologist, histology, author, great sense of humour, colleague—these are amongst thoughts that come to mind about Bruce Sword Heming.

Bruce was born 1 December 1939 in Ithaca, New York, with his twin brother Paul. He grew up in Whittier, California where his father had a teaching position until the family moved to Guelph, Ontario. Bruce's undergraduate degree began at the Ontario School of Agriculture, as it was known then (subsequently in 1964 to become the University of Guelph), where he completed a 4-year honours degree leading to a BSc in Agriculture.

In 1947 the Division of Entomology and the Division of Botany and Plant Pathology, Canada Department of Agriculture, in conjunction with the Defense Research Board, Canada Department of National Defense, began a joint project, the "Northern Insect Survey" (NIS). This was to investigate entomological aspects and problems in Northern Canada—the Cold War was deeply involved in that enterprise. As summer employment in the early 1960s and towards the end of the NIS, Bruce spent a number of years with various groups involved in the survey. There was no question these episodes cemented his attraction to entomology. He was exposed to such notables as Phillip Corbet, Antony Downes, Don Oliver and Frank McAlpine, to name but a few. These forays to the North were clearly enjoyable and influential times for Bruce, and contributed to his wide command of insect identification and natural history. He always had a story or two to recount on his times with the NIS.

Bruce moved on to North Carolina State University, Raleigh, to do a PhD, supervised by W.V. Campbell, an agricultural entomologist. Bruce graduated in 1968; the subject of his dissertation—development of reproductive systems in thrips. Those insects were a major pest at the time. For summer employment at this time, Bruce worked as a "flag boy" doing tests of aerial sprays of insecticides. He told many stories of standing out in fields and being drenched with insecticides of various kinds and other episodes of student life in rural North Carolina. Hair-raising by modern standards!

Bruce joined the Department of Entomology, University of Alberta, in 1968, literally straight out of his PhD. In those days, inclusion of postdoctoral fellowships in career trajectories was uncommon. His seminar during the interview process was memorable and not just for the content. At the finish, he went to release the projector screen—it got away from him, wound up too rapidly, jumped off its hooks and crashed down on his head, literally knocking him to the ground. After he staggered to his feet, he is reputed to have said "You had better hire me now". And the Department of Entomology did! Bruce always had a great sense of humour.

Bruce was a superb teacher and everybody in the Department knew that because his voice carried rather too well down the corridors. Bruce's lectures were never 'dry' and there was a famous last day of lectures when the students all put up umbrellas that they had brought along to protect them from the enthusiastically projected showers of saliva. That year too, at the Christmas Party, Bruce was awarded a Plexiglas face shield with a windscreen wiper on the inside! All done in fun and well appreciated. More seriously, Bruce scored two teaching awards for his abilities. His course on insect development and embryology was classic, in large part, because he continued to use a chalk board and 35 mm slides well into the PowerPoint™ era. Students appreciated the more relaxed rate of knowledge transfer and that certainly resulted in one of the awards. Furthermore, Bruce did the laboratory sessions himself and past students still comment about having a well-informed and enthusiastic professor on hand during the practical aspects of the course—very rare nowadays.

Bruce was a gifted histologist and his published work, based on his PhD thesis, garnered him the second C. Gordon Hewitt Award in 1976. The images from his histological sections were, in large part, instrumental in his teaching being authoritative, thence memorable. Of importance in Bruce's career was his ability to illustrate by hand the inner workings of the insects on which he worked. He had an innate knack with shading and making structures appear 3-dimensional. This all without taking a drawing course in his life! An enviable talent. A considerable number of his original illustrations are deposited in the Strickland Library, University of Alberta.

Talking to Bruce about his work was always enjoyable, informative and sometimes dangerous—Bruce's conversations were often accompanied by vigorous hand gestures—thence numbers of glasses of wine were mopped up and replaced. His enthusiasm over some of the images of thrips he took using the Cambridge, S4, SEM in the Department of Entomology was infectious and why not—this image (see Fig. 1) of a thrips rampant is iconic. Then try to imagine how *you* would describe the workings of bladder feet of thrips—the word "bloop" could be usefully employed, as he did with relish. That latter work was an eye-opener if ever there was one.

Figure 1. SEM image of an adult *Haplothrips verbasci*.

Bruce's first sabbatical leave was in 1974 to the Agricultural University, Wageningen, Holland, to work with R. H. Cobben. A PhD student there, Karin van Battum, caught his eye and they were married in 1976. Both Bruce and Karin were very keen on the outdoors and spent much time, along with their two sons, Arthur and Steven, camping. A second sabbatical was in 1990, at the University of Manitoba, Winnipeg, with E. Huebner and with whom he later published.

In 1976, Bruce inherited the histological slides of Jake Rempel and Norm Church, Saskatchewan, the basis for their papers on the detailed embryology of *Lytta viridana*, a meloid beetle. Bruce produced the tenth in that series, completing the investigation.

Another aspect of Bruce's ability as a teacher was that he kept meticulous lecture notes and these were *always* up-to-date, so much so that he commented one day that he should put them together and produce a book. With consistent nagging encouragement from his colleagues this was, indeed, eventually done. So, in 2003 he produced "Insect Development and Evolution" (Heming, 2003), a 400-page work published by Comstock Publishing, Cornell University Press. This was literally a work of love. Bruce tried and succeeded, in large part, in using original illustrations done by others to introduce the various aspects of the work. Not all were freely available and it cost him

some thousands of dollars to obtain permissions to reach his enviable goal! This in itself was a monumental task. In addition, writing the book was a full-time endeavour and during that time Bruce did not publish conventional papers, a lapse into broad scholarship that cost him his NSERC grant!

Bruce's "Insect Development and Evolution" was an unusually thorough overview of insect development and its evolution, covering comprehensively the diversity of developmental processes, using morphology, comparative and experimental embryology, plus information from the then burgeoning molecular genetics. Covered logically was gametogenesis, embryonic growth, post-embryonic development and metamorphosis; producing a fulsome view of life cycles all within an evolutionary framework. Such an arrangement was favorably received and the book has even been recommended as a model for such studies.

Reviews of the book were effusive—"Well written and illustrated", "exceptional", "the best comprehensive survey of insect development biology available to date." and also "a worthy successor to 'The Biology of Drosophila' my treasured bible for many years." In short, the book was an ideal synthetic coverage of the subject matter at that time and place.

In large part because of the book, in 2003, Bruce was awarded honorary membership in the Arthropodan Embryological Society of Japan. Then, in 2004 he was invited, fully funded, to attend the annual meeting of that society. Having just, however, recovered from a heart attack, it was deemed inadvisable to do so. Bruce always regretted that, for at the time, Japanese embryologists were world leaders in the field. He considered their recognition a huge compliment.

Apart from being considered highly by the embryological community, Bruce kept his love of thrips and was well respected by thysanopterists. Indeed, he collected thrips widely in Alberta and accumulated specimens from North America and around the world. These, some 11,000 beautifully mounted and labeled slides are now deposited in the Strickland Museum, University of Alberta. So, it is not surprising that given his histological work plus mounting and examination of the above slides, Bruce actually wore out parts of his treasured Wild M20 research microscope!

Retiring in 2005, Bruce remained active and spent much time keeping abreast of the burgeoning embryological literature, now mainly molecular in nature. Indeed, he kept the 'References' file of his book up-to-date, knowing full well that he would not be producing a second edition, often lamenting that there was just "too much stuff now".

Bruce was exceptionally generous in providing help to fellow entomologists, ranging from advice, to donations of actual specimens and reviewing manuscripts. Indeed, after he retired he continued to be valued highly as a reviewer. How many people do you know who would look up a citation to see if it has been referred to correctly because of a dim recollection of the paper, or inability to fit the statement in with the authors' overall understanding? Few and far between—but this was common for Bruce because he was deeply interested in getting things right.

Bruce died suddenly and unexpectedly of a heart attack on the evening of the 22nd of July, 2018. As Omar Kayyám wrote (*ca*. 1160AD) "The moving finger writes; and, having writ, moves on....." and we are left with a wonderful legacy from Bruce Sword Heming.

Doug Craig
University of Alberta

(Numbers of people assisted with this article. Comments if any, however, may be addressed to <d.craig@ualberta.ca>. A comprehensive list of Bruce's publications can also be obtained.)

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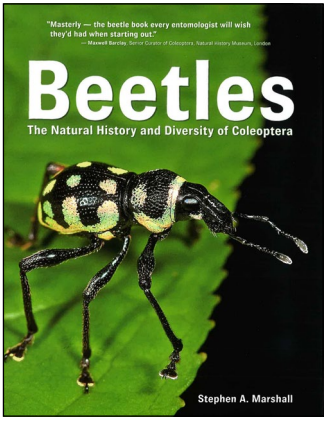
Beetles. The Natural History and Diversity of Coleoptera. Marshall, S.A. 2018. Firefly Books, Richmond Hill, ON. 425 pp. ISBN 978-0-228-10069-0. CAN$95.00, hardcover.



Most of those beginning their entomological careers at the University of Guelph with Dr Steve Marshall can recall a few key details: his encyclopedic knowledge of Canadian species and genera (from all orders, but especially Diptera); his goal that everyone he encounters develops the same desire to understand the taxonomic and ecological diversity of insects; his ability to generate the clearest, the best illustrated, the most logical – the most usable – dichotomous identification keys; and lastly, his giant binders of colour slides of insects of all types taken all over the world, from his backyard to Australia and back. The binders have since been supplemented, and, to some degree, replaced, by hard drive after hard drive of high quality, digital images of insects.

In addition to helping make Marshall a great undergraduate professor and graduate supervisor, all of these components have combined to make him an author of some truly great insect diversity textbooks. His first such book was "Insects. Their Natural History and Diversity". Published in 2007, with an updated second edition in 2017, this text tackled family and subfamily level diversity of all insects in Eastern North America. The second book was "Flies: The Natural History and Diversity of Diptera" published in 2012. This text tackled global family level diversity. The latest volume, published this year, is "Beetles: The Natural History and Diversity of Coleoptera."

Similar to the previous two volumes, the new Coleoptera book takes the approach of expansive detail, richly illustrated, all in service to functionality. Almost every page is supplemented with Marshall's full colour, macro photography of beetles. The most bizarre, specialized, and mundane beetle morphologies are featured throughout. At a total of 4,500 photographs, this may actually be the most illustrated of Marshall's books to date. This emphasis on photography, however, does not come at the expense of scientific detail.

"Beetles" begins with five chapters on the basic morphology, life history, and ecological relationships of coleopteran species. Being a diverse order with over 400,000 described species, this is no small task. The roles of beetles as agricultural pests, human health risks, predators, parasitoids, mimics, and pollinators are all discussed in detail. Part two of the book lays out the current classification of beetles as well as phylogenetic theories. Each of the subgroups is treated in turn with brief discussion of the morphology, distribution, and life history of each of the global families, subfamilies, and usually tribes. Each of these taxonomic treatment chapters is followed by a lengthy section including photos of key species from around the world. These pages, with nine photos in plate and detailed captions below have become the hallmark of Steve Marshall's textbooks. The photos, almost all taken by Marshall himself, are all so beautiful that any random page of the book could contribute enough photos to fill a calendar.

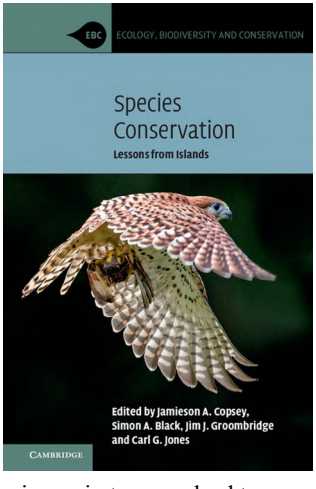
The final section of the book is comprised of a chapter on collecting, preparing, and photographing beetle specimens and a series of dichotomous identification keys. While the entire book is incredibly useful, it is these final two chapters that make this book the essential starting point for anyone beginning a hobby, or career, in Coleopterology. The dichotomous keys themselves are of a slightly different format from those produced by Marshall in the past. Gone are the branching lines linking miniature drawings and choices between morphological structures.

Instead the choices are laid out as a series of paired choices linking to numbered couplets, all richly illustrated with annotated photographs. This different format does not detract from the usability of the key. Similar to those of past books, the keys are arranged as a series of keys, such that, with practice, users will come to know which subkey to start with for certain new specimens (e.g., skip the Adephaga and Curculionidea and go straight to Elateroidea). The only criticism perhaps, is the lack of direct reference to previous pages featuring descriptions and photographs of each beetle family. While this feature is included in Marshall's "Diptera" book, the "Beetle" book requires moving from the key, to the index, and back to various previous pages in order to check for photographs of a family in question.

With a large format and 425 pages, "Beetles" is a full-on textbook, large enough to sit on the desk, next to the microscope, for weeks or years. The beauty of the photographs could lead it to be placed on coffee tables anywhere. The keys, descriptions, and illustrations make this book a valuable tool for interested entomologists, like myself, with less experience putting a family name to every Coleopteran to come across their desk. Perhaps most importantly, however, with a passionate introduction to the wonder and diversity of beetles, clear instructions on how to obtain beetles in the wild, and then a powerful tool to identify what you find, this book will undoubtedly launch thousands of future beetle research programmes.

Dr. Joel Gibson
Royal BC Museum
Victoria, BC

Species Conservation. Lessons from Islands. Copsey, J.A., Black, S.A., Groombridge, J.J., and Jones, C.G., editors. 2018, Cambridge University Press, Cambridge, UK. xix + 377 pp. ISBN 978-0-521-72819-5. CAN $47.31, paperback.



When I decided to review this book (which was in part motivated by my experiences in Hawaii last February https://cinnabarreflections.wordpress.com/2018/03/05/a-naturalist-in-hawaii-part-iii-attack-by-the-aliens/), my hope was that it would primarily describe a variety of conservation projects, successful or not, on islands throughout the world. While that is in part true, the main purpose of the book is to provide guidance on how to run a successful conservation project. Hence, many chapters read like instruction manuals for how to plan and implement conservation projects which may or may not be on islands. Having said that, there is no question that islands provide particularly important examples of how relatively minor missteps can lead to dramatic consequences for the endemic flora and fauna. While the objective of the book is clearly valuable if you are looking to engage in a specific conservation project, it makes for a somewhat uninspiring read if your primary interest is to learn about successful and failed conservation efforts of a variety of organisms. The final five chapters are particularly aimed at the practitioner, rather than biologists at large. The book is also almost exclusively focused on terrestrial vertebrates, which makes it somewhat less interesting if entomology is of particular interest.

Finally, there seems to be a particular focus on Mauritius and Hawaii, where several of the chapter authors appear to have gained experience from successful conservation projects.

The book is divided into twelve chapters. Most chapters contain fact boxes, which exemplify particular projects, or cover a variety of tools or issues relevant to conservation work. Each chapter is summarized with specific key points, followed by the references for that chapter. The book also contains an index for easy access to information on specific species or islands. It is illustrated by a number of colour plates, which are duplicated within the chapters as black and white figures in my copy.

Chapter 1 covers a variety of issues on how island biology has been viewed, and how these issues have inspired important concepts in biology, for example, Darwin and Wallace's natural selection theory, Macarthur and Wilson's island biogeography, and Mayr's biological species concept. Chapter 2 covers evolutionary peculiarities associated with islands, for example, dwarfism and extinction, which are discussed in fact boxes. Chapter 3 deals with genetic constraints specific to islands such as bottlenecks, genetic drift, and inbreeding. Chapter 4 deals with the nature, causes and effects of biological invasions to islands, issues that are becoming increasingly serious in the Anthropocene, and shows no sign of declining. I recently discussed this particular issue with my colleague, Professor Ross Miller, University of Guam, and what he told me gave me no reason for optimism regarding our ability to stop the worldwide movement of organisms. Chapter 5 discusses various methods of documenting population change, covering everything from fossil and museum records to genetic indicators and traditional ecological knowledge.

The remaining seven chapters cover practical approaches to species conservation. I have to confess that I found these chapters difficult to plough through, most likely because I am not involved directly in any specific conservation project. Chapter 6 deals with project organization, Chapter 7 addresses management of island threats (e.g., prioritization, eradication, and feasibility studies), and Chapter 8 discusses effective leadership, including leadership theory. The remaining four chapters deal with various aspects of practical conservation. Chapter 9 covers the "journey" from planning to implementation, discussing issues like the effects of a lack of knowledge of what is driving the decline. Chapter 10 deals with restoration and recovery, including case studies of New Zealand short-tailed bats, Mauritius orange-tailed skink, Mauritius parakeet, and New Zealand hihi. Chapter 11 covers the human side of conservation work, for example, "selling" the project to locals, and changing behaviours harmful to the conservation target. The final chapter looks at the overall objectives of a conservation project and ways to achieve these, essentially synthesizing the information provided in the book.

In summary, this book is aimed at practitioners of species conservation. Much of the discussion of organizational issues in the second half of the book would be useful regardless of the location of a conservation project since it is more about the logistics of project management than anything specific to islands.

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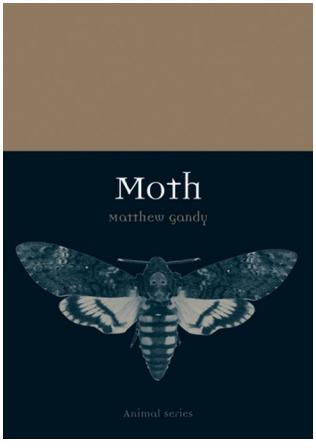
Nanaimo, British Columbia

Moth. Gandy, M. 2016. Reaktion Books, London, UK. 238 pp. ISBN 978-1-78023-585-1. £12.95, paperback.



As with most of the books in the Reaktion series, *Moth* by Matthew Gandy is a very interesting read. This book not only provides the basic biology and natural history of moths but also information on how humans have perceived this group of insects throughout history. Gandy divides this book into nine chapters and a timeline to moths, a select bibliography and a list of associations and websites relevant to moths. Each of these chapters could be a stand-alone pamphlet or even expanded into a book of its own.

The first chapter called "Multitudes" covers the basic biology, evolution, and diversity of moths. It goes into detail, contrasting them with their butterfly cousins. It includes many facts about proper identification, the metamorphosis process, and human-moth interactions in the realm of pest management. It makes reference to moths in art, such as literature and painting, a theme that goes through the whole book. The second chapter, "Appelations", focuses on moth taxonomy and how moths have been named through history. This chapter delves deeply into the taxonomic literature. It flows nicely into the third chapter, "Aurelians", that goes into detail about the history of moth study through time from Aristotle to the twentieth century. It intertwines scientific study with important literary writers who have used moths in their stories. The fourth chapter, "Drawn to the Flame", is quite self-explanatory, discussing the notion of why insects are attracted to light, illustrating this idea with artistic depictions. The next chapter, "Visitations", continues to develop the theme of moths in various art forms including movies. This is followed by Chapter 6 on the diversity of colouration in moths in the aptly named "Any Colour You Like", and Chapter 7, "Pretenders", on the other forms of crypsis, mimicry and other strategies that adults and larvae have evolved to survive. Gandy then goes into silk production in moths and its influence on human culture throughout the world in "Spinners and Monsters". The book concludes with a very brief chapter, "Lines of Flight", that tries to give a synopsis of human fascination with moths. There is also a "timeline of moths" as an addendum that points out the really important points in moth evolution. This section was impressive yet disappointing in that the timeline includes only 21 points, surely insufficient to cover the evolution of moths from their first fossil record to today.

This book is enjoyable to read because it offers many facts that could wind up in trivia-quiz evenings! One of its main strengths is that the book is written with an historical human/social focus on how moths have been perceived through time. It includes beautiful illustrations that highlight well what the author wanted to transmit to the reader. There are a few inaccuracies in the book especially having to do with the phylogeny of noctuids (in Chapter 1) but that is a minor issue, considering the focus of the book, and should not eclipse the strengths of this book.

It is difficult to pinpoint an audience for this book. Moth enthusiasts should definitely have it on their bookshelves, as well as people who like random facts and those who enjoy reading about human perceptions of organisms through time. So, this book can attract a very broad audience and can be used as good tool for scientific communication. I really liked the lists of associations and websites included at the end of the book which enable the book to serve as a guide to find the resources one would need to obtain additional information. In conclusion, I'm happy to have it in my library.

Julia J. Mlynarek
Agriculture and Agri-Food Canada
Harrow Research and Development Centre.

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Formatting of the book review should follow the example given in the "Guidelines for Authors of *Bulletin* Articles", available from the *Bulletin* Editor. A scan of the book cover (jpeg or tiff format, about 500 kb) should be submitted with the review.

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.

La présentation des revues de livres doit suivre le modèle 'Directives aux auteurs pour les articles du *Bulletin*', lesquelles sont disponibles auprès de l'Editeur 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

Allison, J.D. and R.T. Cardé, R.T. [Eds.]. 2016. Pheromone communication in moths: Evolution, behavior and application. University of California Press. ISBN: 978-0-520-27856-1.

Curtain, C.G. and Allen, T.F.H. [Eds.]. 2018. Complex Ecology: Foundational perspectives on dynamic approaches to ecology and conservation. Cambridge University Press. ISBN: 9781108235754.

Dale, M.R.T. 2017. Applying graph theory in ecological research. Cambridge University Press. ISBN: 9781316105450.

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

Mullen, G. and Durden, L. [Eds.]. 2018. Medical and Veterinary Entomology, 3rd edition. Elsevier. ISBN: 9780128140437.

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]

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

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

The Society will hold an online ballot to select candidates for a Societal Director and Director at Large. The selected candidates will then be presented as a slate for formal election by members at the Annual Meeting in Fredericton in August. Nominations for these positions must be signed by three active members of the Society and be received by the Secretary of the Entomological Society of Canada, Neil Holliday, by 28 February 2019 (see inside back cover for contact details).

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

La Société tiendra un vote en ligne afin de sélectionner des candidats pour les postes de directeur sociétal et de conseiller. Les candidats sélectionnés seront ensuite présentés à la réunion annuelle à Fredericton en août pour une élection formelle par les membres. Les nominations pour ces postes doivent être signées par trois membres actifs de la Société et être reçues par le secrétaire de la Société d'entomologie du Canada, Neil Holliday, au plus tard le 28 février 2019 (voir le troisième de couverture pour les informations de contact).

Call for Nominees: ESC Achievement Awards
Appel à candidature: Prix d'excellence de la SEC

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

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

Gold Medal and C. Gordon Hewitt Award

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

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

Médaille d'or et prix C. Gordon Hewitt

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

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

chapters, patents; editorial activities; teaching history, numbers of graduate students, teaching awards; value of grants; involvement in ESC; active involvement and/or memberships in other Societies; entomological extension/ community involvement; organizing of symposia or meetings; 3. A current curriculum vitae; and 4. The name of the nominator and at least one seconder. The documentation should stress the particular achievement or achievements to be considered and not merely the general competences of the nominee. Other seconders may merely state their support, without documentation, in a letter of endorsement of the nomination. The Committee will not prepare the documentation nor conduct research connected with it. Please send nominations by e-mail to the Chair of the Achievement Awards Committee, Gail Anderson (ganderso@sfu.ca), no later than **31 December 2018**.

le nombre d'articles dans des revues avec évaluation par les pairs, livres, chapitres de livres, brevets; activités éditoriales; historique d'enseignement, nombre d'étudiants gradués, prix d'enseignement; valeur des subventions; implication au sein de la SEC; implication active et/ou adhésion à d'autres Sociétés; implication dans la communauté entomologique et vulgarisation; organisation de symposiums ou de réunions; 3. Un curriculum vitae à jour; et 4. Le nom de la personne qui soumet la nomination et au moins une personne qui l'appuie. La documentation devrait mettre en évidence le ou les accomplissements particuliers à considérer, et pas seulement les compétences générales du nominé. D'autres personnes peuvent aussi manifester leur appui, sans documentation, dans une lettre de soutien de la nomination. Le comité ne préparera aucune documentation et ne fera aucune recherche en lien avec la nomination. Merci d'envoyer vos nominations par courriel au président du comité des prix d'excellence, Gail Anderson (ganderso@sfu.ca), au plus tard le **31 décembre 2018**.

Honorary Members of the Entomological Society of Canada

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

Collectively, Honorary Members are not to comprise more than 10 members or 1% of the active membership of the Society. Nominations should be supported by at least five members of the Society, and are to be sent by e-mail to the Chair of the Achievement Awards Committee, Gail Anderson (ganderso@sfu.ca) no later than **31 December 2018**.

Membres honoraires de la Société d'entomologie du Canada

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

Collectivement, les membres honoraires ne peuvent pas totaliser plus de 10 membres ou 1% des membres actifs de la Société. Les nomination doivent être appuyées par au moins cinq membres de la Société, et doivent être envoyées par courriel au président du comité des prix d'excellence, Gail Anderson (ganderso@sfu.ca), au plus tard le **31 décembre 2018**.

Fellows of the Entomological Society of Canada

Fellows are deemed to have made a major contribution to entomology, and are to be Active Members of the Society at the time of nomination. Their contribution may be in any area (e.g., research, teaching, application or administration), and may be judged on the basis of contribution to and stimulation of the work of others, as well as by direct personal effort.

Collectively, Fellows may not comprise more than 10% of the active membership of the Society. Nominations should be supported by at least four members of the Society, and are to be sent by e-mail to the Chair of the Achievement Awards Committee, Gail Anderson (ganderso@sfu.ca), no later than **31 December 2018**.

Fiduciaires de la Société d'entomologie du Canada

Les fiduciaires sont considérés comment ayant apporté une contribution majeure à l'entomologie et doivent être des membres actifs de la Société au moment de la nomination. Leur contribution peut se situer dans n'importe quel domaine (p.ex. recherche, enseignement, application ou administration), et ils seront jugés selon leur contribution et la stimulation du travail des autres, ainsi que par leurs efforts personnels.

Collectivement, les fiduciaires ne peuvent pas totaliser plus de 10% des membres actifs de la Société. Les nominations doivent être appuyées par au moins quatre membres de la Société, et doivent être envoyées par courriel au président du comité des prix d'excellence, Gail Anderson (ganderso@sfu.ca), au plus tard le **31 décembre 2018**.

Wanted: Applicants for the Bert & John Carr Award

The Bert and John Carr Award was created in 2010 (see ESC *Bulletin*, June 2010 [p.102] or September 2010 [p. 170]) to support research activities by individuals who study insect faunistics, or the natural history and taxonomy of Canada's insect fauna. Preference is given to applications by amateurs, but those by students and others will be considered. Applications should consist of: 1.The name and address of the applicant; 2. A statement of the research activity to be undertaken, including a cost estimate of up to $500; and 3. A current curriculum vitae. Applications are to be sent by e-mail to the Chair of the Achievement Awards Committee, Gail Anderson (ganderso@sfu.ca) no later than **31 December 2018**.

Recherchés : Candidats pour le prix Bert & John Carr

Le prix Bert et John Carr a été créé en 2010 (voir le bulletin de la SEC, juin 2010 [p.102] ou septembre 2010 [p.170]) afin de soutenir des activités de recherche par des individus qui étudient la faunistique des insectes ou l'histoire naturelle et la taxonomie de la faune entomologique du Canada. La préférence sera donnée aux candidatures provenant d'amateurs, mais les candidatures d'étudiants ou d'autres individus seront considérées. Les candidatures devront inclure : 1. Le nom et l'adresse du candidat; 2. Un énoncé sur les activités de recherche qui seront entreprises par le candidat, incluant le coût estimé jusqu'à 500$; et 3. Un curriculum vitae à jour. Les candidatures doivent être envoyées par courriel au président du comité des prix d'excellence, Gail Anderson (ganderso@sfu.ca), au plus tard le **31 décembre 2018**.

ESC Annual Photo Contest Winners

The ESC Publications Committee is pleased to announce the winners of the Annual ESC Photo Contest and thank the entrants for their participation. The winning photos will be enjoyed by ESC members throughout the year as they will be used to decorate the covers of our publications, *The Canadian Entomologist* and *Bulletin*.

The top entries are:

1st Place Andrea Brauner: Female ambush bug (*Phymata* sp.), Centreville, Ontario.
2nd Place Tim Haye: Portrait of a tiger beetle, *Cicindela campestris*, Delémont, Switzerland.
3rd Place Julien Saguez: The western bean cutworm, *Striacosta albicosta*, is becoming a major concern for producers in Ontario and in Quebec. Colorful egg mass on a corn leaf collected in Saint-Anicet, Quebec.

Entomologist in Action Ward Strong: Tabanid collecting device: No alpine entomological survey is complete without this patented device. Lillooet, British Columbia.

Honourable Mentions

Debra Wertman, for her picture of a golden buprestid (*Buprestis aurulenta*) on Hornby Island, British Columbia.
Bob Lalonde, for his image of a beewolf (*Philanthus multimaculatus*) in Kelowna, British Columbia.
Matthias Buck, for his photo of an anchor stink bug (*Stiretrus anchorago*) collected in the Okaloacoochee Slough State Forest, Florida.
Brent Sinclair, for his shot of a brown marmorated stink bug (*Halyomorpha halys*) from London, Ontario, where its overwintering biology is being studied.

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

Maya Evenden
Chair, Publications Committee

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/.

The Entomological Society of Canada Scholarship Fund

Neil Holliday, Chair, Scholarship Fund Trustees

In his Gold Medal address in October 1973, Professor Brian Hocking of the University of Alberta proposed that the Entomological Society of Canada (ESC) establish a fund to provide scholarships for students of entomology (Hocking 1973). In 1974, the Society successfully established the Entomological Society of Canada Scholarship Fund as a registered charity. The initial objective was to raise a capital fund sufficient to provide investment income to support the award of an annual postgraduate scholarship of $2000 to $3000. To this end, the December 1974 ESC *Bulletin* contained a call for donations to the newly–established fund. Until the fund was sufficient to support the intended award, an annual scholarship of $500 was funded from general Society revenues; the first such award was made in 1976. By 1985, cumulative donations had reached the point at which the capital in the fund provided sufficient investment income to cover the cost of two postgraduate awards, each of $2000, award values that have not changed since. In 1989, the first Entomological Society of Canada Research Travel Grant was awarded, and from 1990 onward, two such grants, each of up to $2000, have been awarded. Both research travel grants and postgraduate scholarships, normally a total of $8000 annually, are paid from the original scholarship fund which, to distinguish it from other funds, is now termed the "Annual Scholarship Fund".

In 1991, in memory of Dr Keith Kevan, his family made a major donation to the Scholarship Fund. ESC decided to establish a separate scholarship named the Keith Kevan Scholarship and to accept donations designated specifically for support of this "named" scholarship. Since the first award in 1993, the Keith Kevan Scholarship has been offered in odd-numbered years. Five other "named" scholarships have followed. In 2000, colleagues of Dr John Borden established a fund to honour John's many contributions to entomology in Canada. After some years, the fund had become sufficient for its investment income to support the award of the John H. Borden Scholarship, which has been offered annually since 2007. In 2004, the Biological Survey of Canada Scholarship was established and first awarded; it is offered in even-numbered years, alternating with the Keith Kevan Scholarship. In 2015, Dr Lloyd M. Dosdall Memorial Scholarships were first awarded; these scholarships were initiated by a major donation from Lloyd's widow, Teresa, and honour Lloyd's many contributions to applied and aquatic entomology. In 2016, the first Danks Scholarships were awarded, as the result of a major donation by Dr and Mrs Hugh Danks in memory of their son David. The six "named" scholarships have several features in common. Each of them rewards excellence of graduate students working in specific aspects of entomological endeavour (see http://esc-sec.ca/student/student-awards/ for details). Each of them can accept donations designated for the individual fund through https://members.esc-sec.ca/donations/. Each of them is tracked separately so that investment income accrues separately for each fund. That tracking reveals that each fund is financially sound: the scholarships awarded are covered completely by the investment income from the fund, with a surplus for reinvestment as a hedge against inflation.

Compared to the "named" funds, the Annual Scholarship Fund is less financially secure. In the late 1980s it attained the initial objective of having sufficient assets to generate investment income to cover the costs of the postgraduate scholarships awarded from it. But since the addition of the Research Travel Awards as expenditures to be paid from this fund, that objective has not been met. On average, annual income from investment returns, new donations, and the enormously valuable contribution from the student-run Silent Auction are, between them, just sufficient to prevent the assets of the Annual Fund from decreasing. However, the three sources of income are

not sufficient to build the Fund to the point where its annual payments are covered by investment income, nor do they allow an increase in awards to compensate for the effects of inflation. The buying power of the $2000 to $3000 scholarship mentioned as the target in J. McLintock's presidential report of 1974 (McLintock 1974) is now about $10 000 to $15 000. The vision of our ESC predecessors was that ESC postgraduate awards would be not only prestigious but also a major contribution to the support of recipient students.

The Annual Scholarship Fund needs help if it is to be a sustainable source of worthwhile awards in the future. The trustees of the ESC Scholarship Fund are investigating ways of increasing investment income from the Fund. That is only part of the solution as, in an increasingly uncertain investment environment, there is a limit to what can be achieved without jeopardizing the security of the investments. At current rates of investment return, an infusion of an additional $70 000 is needed to bring the principal up to the point at which the investment income would just exceed current annual requirement for $8000 to disburse as scholarships and awards. If that—the originally intended surplus of investment income over required disbursements—were achieved, income from further donations and the Silent Auction would allow the fund to build so that we can begin to make the scholarships the highly significant financial awards that the 1974 ESC Board intended them to be. An infusion of $70 000 sounds like a lot, but it is attainable. If every regular ESC member donated $50/year and every early professional member donated $25/year, the target would be reached in just over 5 years. All donations are tax deductible, and all donors, unless they request anonymity, are listed in the ESC *Bulletin*; please consider donating by going to https://members.esc-sec.ca/donations/. Leaving money to the Annual Scholarship Fund in a will is another way to contribute to the future health of the Fund; please consider it.

When Brian Hocking proposed the scholarship fund in 1973, he observed that "The survival of societies, like that of species, may well depend on the effectiveness of their concern for the next generation". That his vision has borne fruit can be ascertained by checking past ESC *Bulletins* for scholarship winners, and noting how many of them have gone on to contribute greatly to Canadian entomology or to the ESC. Let us perpetuate that vision by our donations, our bequests, or our support of the Silent Auction.

References

Hocking, B. 1973. Colloidal suspense. Bulletin of the Entomological Society of Canada, **5**: 104–106.
McLintock, J.R. 1974. President's report. Bulletin of the Entomological Society of Canada, **6**: 123–126.

Using your ESC member account to its full potential

After logging in to your ESC account, there are plenty of resources available to members. On your right sidebar, you will find all the information you need about your account. Click on Profile Home to edit and verify your work, home, and mailing address. The Manage Profile tab gives you quick access to invoices, editing your bio, registering for events and more; this is also the first page you will see upon logging in. Please disregard the Messages tab, as this is not an activated component of any ESC membership. Click on Groups if you are a subscriber and wish to view *The Canadian Entomologist*. The Membership Info tab allows you to view invoices and make payments. And if you wish to invite a friend or colleague to join ESC, click on the Refer a Friend tab.

You can also click the header tabs to return to the ESC homepage, make a donation, or to access the Members Area. You will find financial statements, journals, helpful links, and more in the Members Area!

For further questions regarding the ESC member website, please contact info@esc-sec.ca.

Entomological Society of America – International Branch
Virtual Symposium 2019

Did you ever think of participating in a meeting and networking with colleagues from around the world without leaving your office? Introducing the Second Annual Virtual Symposium organized by the International Branch (IB) of Entomological Society of America (ESA).

This event will feature both video (invited speakers) and poster presentations focused on three themes: Plant-Insect Interactions (April 8, 2019), Medical Entomology (April 9, 2019) and Biological Control (April 10, 2019). There will also be a general poster session for participants whose research is not covered by these three themes.

Poster submissions are being accepted until **January 28, 2019**. Submit your research online today! https://esa.confex.com/esa/2019intl/cfp.cgi

Virtual poster submissions require an online submission fee of $25 USD. Submissions will be considered complete once the submission application has been completely filled out and once payment has been received by the ESA.

Both ESA members and non-members are encouraged to present research and attend the meeting. There are no fees to attend the meeting without submitting a research poster. Consider joining this affordable event "on-line" in April 2019, and consider becoming a member of the IB-ESA.

For further information and updates:
https://www.entsoc.org/international/2019-virtual-symposium
Julien Saguez, Co-chair, Plant-Insect Interactions (April 8, 2019) saguezj@yahoo.com
Charles Vincent, Co-chair, Plant-Insect Interactions (April 8, 2019) charles.vincent2@canada.ca
Isobel Ronai, Co-chair, Medical Entomology (April 9, 2019) isobel.ronai@sydney.edu.au
Muhammad Haseeb, Co-chair, Biological Control (April 10, 2019) muhammad.haseeb@famu.edu

THE CANADIAN PHYTOPATHOLOGICAL SOCIETY

LA SOCIÉTÉ CANADIENNE DE PHYTOPATHOLOGIE

CPS.SCP News

Vol 62 (3) September 2018

https://phytopath.ca/wp-content/uploads/2018/10/CPS-SCP-News-62-3-September-2018.pdf

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13th International Congress of Orthopterology
Agadir, Morocco, 24-28 March 2019
http://www.ico2019morocco.com/

1st International Molecular Plant Protection Congress
Adana, Turkey, 10-13 April 2019
http://www.imppc2019.org/

Joint Meeting of the Entomological Society of Canada, the Acadian Entomological Society and the Canadian Society for Ecology and Evolution
Fredericton, 18-21 August 2019
http://csee-esc2019.ca

46th Apimondia International Apicultural Congress
Montréal, 8-12 September 2019
http://www.apimondia2019.com/

14th International Symposium: Ecology of Aphidophaga (IOBC-Global Working Group meeting)
Montreal, 16-20 September 2019
http://www.aphidophaga14.uqam.ca

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

Joint Annual Meeting of the Entomological Society of Canada and the Entomological Society of Alberta
Calgary, 18-21 October 2020

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.

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E-mail: info@esc-sec.ca
www.esc-sec.ca/

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

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ISSN: 0071-0741

Submission deadline for the next issue: 31 January 2019

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.

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www.esc-sec.ca/

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

Envoyer vos soumissions à:
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ISSN: 0071-0741

Date de tombée pour le prochain numéro: 31 janvier 2019

Officers of affiliated Societies, 2018-2019
Dirigeants des Sociétés associées, 2018-2019

Entomological Society of British Columbia

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1st Vice President:	Tammy McMullan
2nd Vice President:	Wim van Herk
Past President	Jenny Cory
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Abbotsford, BC, V3G 2M3
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E-mail: Tracy.Hueppelsheuser@gov.bc.ca
http://entsocbc.ca

Entomological Society of Alberta

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Webmaster	Micky Ahn
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Agriculture et Agroalimentaire Canada
5403 - 1 Ave S. Lethbridge, Alberta T1J 4B1
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E-mail: esalberta@gmail.com
http://www.entsocalberta.ca

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Past President	Cory Sheffield
Treasurer	Tyler Wist
Newsletter Editor	Nicole Pillipow
Secretary	Iain Phillips

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

Entomological Society of Manitoba

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President-Elect	Erica Smith
Past President	John Gavloski
Treasurer	Kathy Cano
Newsletter Editors	Marjorie Smith and Jordan Bannerman
Editor (Proceedings)	Terry Galloway
Webmaster	Rob Currie
Secretary	Sarah Semmler

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

Entomological Society of Ontario

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

The last word / Le dernier mot

Cedric Gillott, Editor / Rédacteur

Happy Anniversary, *Bulletin*

With this issue, we celebrate 50 years of publishing the *Bulletin*.

The idea of a publication containing the Society's news and other items of general interest to members, allowing *The Canadian Entomologist* to focus solely on publishing peer-reviewed research papers, had been floated for some years. It came to fruition in March 1969 with Pat Pielou as the first Editor. As Pat was already Editor of both *TCE* and the *Memoirs*, the *Bulletin* Editor's position was quickly assumed (in the second issue!) by Doug Eidt whose first editorial laid out the kinds of materials acceptable for publication.

In the *Bulletin*'s first year, only two issues appeared, in part due to the cost of production (around 1000 complimentary copies, snail-mailed to all members and institutions subscribing to *TCE*). However, at the Governing Board's request, since 1970 four issues per year have been produced.

A long-standing difficulty for *Bulletin* editors has been to persuade francophones to contribute material in their first language, this despite a note as early as Volume 2 that "Contributions in French are welcome." Perhaps curiously, the first evidence of bilingualism in the *Bulletin* (Volume 3[1]) was a reply *in French* from the Canadian Government to a letter *in English* sent by President W.F. Baldwin on Population Limitation and Resource Use. It took almost a decade (Volume 9[1]) for us to have a bilingual cover, and in the same issue the announcement of the newly established ESC Postgraduate Award was in both official languages.

The first bilingual article appears to have been

Joyeux anniversaire, *Bulletin*

Avec ce numéro, nous célébrons les 50 ans de publication du *Bulletin*.

L'idée d'une publication contenant les nouvelles de la Société et autres éléments d'intérêt général pour les membres, permettant à *The Canadian Entomologist* de se concentrer uniquement sur la publication d'articles scientifiques révisés par les pairs, flottait depuis quelques années. L'idée s'est concrétisée en mars 1969 avec Pat Pielou comme premier éditeur. Alors que Pat était déjà éditeur de *TCE* et des *Mémoires*, le poste d'éditeur du *Bulletin* a rapidement été reprise (dès le 2e numéro!) par Doug Eidt dont le premier éditorial présentait le type de matériel acceptable pour publication.

Durant la première année du *Bulletin*, seulement deux numéros ont été publiés, en partie à cause du coût de production (autour de 1000 copies gracieusement offertes, envoyées par la poste à tous les membres et institutions inscrites à *TCE*). Cependant, à la demande du conseil d'administration, quatre numéros par ans ont été produits depuis 1970.

Une difficulté de longue date pour les éditeurs du *Bulletin* a été de persuader les francophones de fournir du matériel dans leur langue maternelle, cela malgré une note dès le volume 2 disant que « Les contributions en français sont les bienvenues ». Curieusement peut-être, la première évidence de bilinguisme dans le *Bulletin* (Volume 3 [1]) était une réponse *en français* du Gouvernement canadien à une lettre *en anglais* envoyée par le président W.F. Baldwin sur la limitation de la population et l'utilisation des ressources. Il a fallu presqu'une décennie (Volume 9 [1]) pour que nous ayons une page couverture bilingue, dans le même numéro que l'annonce dans les deux langues officielles pour les bourses pour études graduées nouvellement offertes.

Le premier article bilingue semble avoir été « *B.t.* on the go – Le *B.t.* à la rescousse », bien que ce soit un communiqué de presse d'Environnement Canada. Même les annonces

"*B.t.* on the go – Le *B.t.* à la rescousse", though this was from an Environment Canada press release. Even announcements of our annual meetings were initially only in English, with the first bilingual version appearing in 1980 for the meeting in Quebec. However, consistent use of both English and French versions of JAM announcements did not begin until about the 1990s.

The *Bulletin* remained a black-and-white publication until Paul Fields became Editor in 2003, when he introduced both colour images inside the newsletter (a coloured cover did not appear until 2005) and an online version, the result of a survey showing some 50% of members would prefer to read the *Bulletin* in this format. In fact, 2003 was a banner year for the *Bulletin*, as Paul also introduced the *Student Wing* (now *STEP Corner*) and two new series, *Lab profile* and *Tricks of the Trade*.

Production costs were a recurring concern for the Society over the years, and with the electronic version already in place, it was a logical progression (and significant economy!) to cease production of the hard-copy version of the *Bulletin* at the end of 2013.

Though the modern *Bulletin* continues to largely follow the original guidelines laid out by Doug Eidt, obviously with the passage of time, contributors and contributions have changed. Over the decades, we have seen some marvelous long-running series, both humorous and serious. Some of my favorites include: *Vignettes of Entomology* (Paul Riegert) (first appeared June 1984), *Net, Shovel and Axe* (sometimes *Screen*!) (Paul Riegert and others) (March 1997), *Moth Balls* (Andy Bennett) (March 2004), the cartoon series *The Adventures of Ento-Man* (text by Andy Bennett, drawings by Gaétan Moreau) (June 2005), and *Dear Buggy* (the *Bulletin's* advice column, starring Chris MacQuarrie as the Agony Aunt) (June 2008). As well, we have enjoyed many great articles (now under the heading of Special Features) on the research and scientific interests of graduate students, as well as early and seasoned professionals.

I urge readers, young and old, to sample some of the archived Bulletins (all available online at http://esc-sec.ca/publications/bulletin/) to confirm what a great idea it was to introduce a Society newsletter 50 years ago!

pour nos réunions annuelles étaient originalement en anglais seulement, la première version bilingue apparaissant en 1980 pour la réunion à Québec. Cependant, l'utilisation systématique des versions en anglais et en français pour les annonces de la réunion annuelle n'a pas commencé avant les années 1990.

Le *Bulletin* est demeuré une publication en noir et blanc jusqu'à ce que Paul Fields devienne éditeur en 2003, lorsqu'il a introduit la couleur à l'intérieur du bulletin (la couverture en couleur n'est apparue qu'en 2005) et dans la version en ligne, le résultat d'un sondage démontrant que 50% des membres préféraient lire le *Bulletin* dans ce format. En fait, 2003 a été une année bannière pour le *Bulletin*, puisque Paul a également introduit l'*Aile étudiante* (maintenant le *Coin de la relève*) et deux nouvelles rubriques, *Profil de labo* et *Trucs et astuces*.

Le coût de production a été une inquiétude récurrente pour la Société, et avec la version électronique déjà en place, c'était une progression logique (et une économie significative!) de cesser la production de la version papier du *Bulletin* à la fin de 2013.

Bien que le *Bulletin* moderne continue de suivre largement les lignes directrices originales énoncées par Doug Eidt, avec le passage du temps, les contributeurs et les contributions ont évidemment changées. Au fil des décennies, nous avons vue quelques séries merveilleuses, autant humoristiques que sérieuses. Certaines de mes préférées incluent : *Vignettes of Entomology* (Paul Riegert) (pour la première fois en juin 1984), *Net, Shovel and Axe* (parfois *Screen*!) (Paul Riegert et autres) (mars 1997), *Boules à mites* (Andy Bennett) (mars 2004), la série de bandes dessinées *Les aventures d'Ento-homme* (textes par Andy Benett, dessins par Gaétan Moreau) (juin 2005) et *Cher Bibitte* (la rubrique des conseils du *Bulletin*, mettant en vedette Chris MacQuarrie en tant que Agony Aunt) (juin 2008). Nous avons également apprécié plusieurs excellents articles (maintenant dans la section *Articles spéciaux*) sur la recherche et les intérêts scientifiques des étudiants gradués, ainsi que des professionnels jeunes et chevronnés.

J'exhorte les lecteurs, jeunes et vieux, à échantillonner certains des Bulletins archivés (certains sont disponibles en ligne sur http://esc-sec.ca/fr/publications/bulletin/) afin de confirmer quelle excellente idée fut d'introduire le bulletin de la Société il y a 50 ans!

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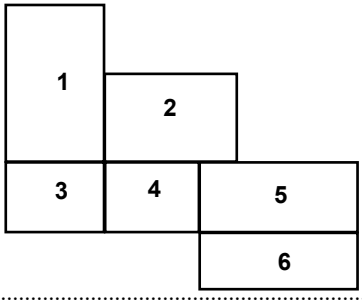

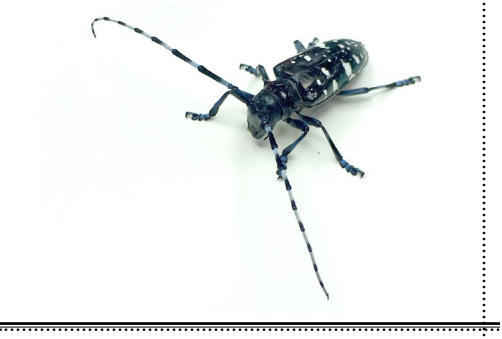

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Front cover/Plate supérieur:

1 *Glyptapanteles militaris* (Hymenoptera: Braconidae). In 2017, many armyworm moth (*Mythimna unipuncta*; Lepidoptera: Noctuidae) larvae were parasitised by *Glyptapanteles militaris*. Cocoons were collected in wheat fields and reared until adult emergence. This photograph shows the head of an adult of the beneficial insect [Shawville, Québec, Canada]

Glyptapanteles militaris (Hymenoptera : Braconidae). En 2017, de nombreuses chenilles de la légionnaire uniponctuée (*Mythimna unipuncta*; Lepidoptera : Noctuidae) ont été parasitées par le parasitoïde *Glyptapanteles militaris*. Les cocons ont été récoltés dans des champs de blé à Shawville et ont été élevés jusqu'à l'émergence des adultes. Cette photo montre la tête d'un adulte de cet insecte bénéfique [Shawville, Québec, Canada]
[Photo: Julien Saguez]

2 Eight-spotted skimmer (*Libellula forensis*; Odonata: Libellulidae), perching on a twig near the outflow to a large marsh pond [Sergeant Bay Provincial Park, British Columbia, Canada]
La libellule *Libellula forensis* (Odonata : Libellulidae) posée sur une brindille près de l'écoulement d'un grand étang marécageux [Parc provincial Sergeant Bay dans le sud-ouest de la Colombie-Britannique, Canada]
[Photo: Donna Giberson]

3 A *Hybomitra* (Diptera: Tabanidae) [Kokanee Glacier Provincial Park, British Columbia, Canada]
Une *Hybomitra* (Diptera : Tabanidae) [Parc provincial de Kokanee Glacier en Colombie-Britannique, Canada]
[Photo: Ward Strong]

4. A foraging *Villa* (Diptera: Bombyliidae) [Kelly Lake, British Columbia, Canada]
Un *Villa* (Diptera : Bombyliidae) qui butine [Kelly Lake, Colombie-Britannique, Canada]
[Photo: Bernard Roitberg]

5. Flower longhorn, *Cortodera subpilosa* (Coleoptera: Cerambycidae), 21 June 2016 [Wagonwheel Road, Kootenay Boundary, British Columbia, Canada]
Le longicorne *Cortodera subpilosa* (Coleoptera : Cerambycidae), 21 juin, 2016 [Wagonwheel Road, Kootenay Boundary, Colombie-Britannique, Canada]
[Photo: Adam Blake]

6. When camouflage fails—a nymph of the stink bug *Palomena prasina* (Hemiptera: Pentatomidae) [Delémont, Switzerland]
Quand le camouflage échoue—une nymphe de la punaise verte, *Palomena prasina* (Hemiptera : Pentatomidae) [Délémont, Suisse]
[Photo: Tim Haye]

Back cover/Plate inférieur:
A live female Asian longhorned beetle (*Anoplophora glabripennis*; Coleoptera: Cerambycidae) [Insect Production and Quarantine Laboratory in the Great Lakes Forestry Centre, Sault Ste. Marie, Ontario, Canada]
Une femelle longicorne asiatique vivante (*Anoplophora glabripennis*; Coleoptera : Cerambycidae) provenant [Laboratoire de production d'insectes et de quarantaine au Centre de foresterie des Grands Lacs à Sault-Sainte-Marie en Ontario, Canada]
[Photo: Amanda Roe]