

PROCEEDINGS OF THE 67th ANNUAL MEETING OF THE



Entomological Society of Alberta

October 3 – 5, 2019

Elkwater, Alberta

Entomological Society of Alberta Board of Directors 2019	3
Annual Meeting Committees 2019.....	3
Program of the 67 th Annual Meeting of the Entomological Societies of Alberta and Saskatchewan.....	4
Abstracts	13
Index to Authors.....	29
Minutes of the Entomological Society of Alberta Fall Board Meeting.....	32
Minutes of the Entomological Society of Alberta 67 th Annual General Meeting.....	35
Secretary's Report	39
Treasurer's Report and Financial Statements.....	40
ESC Regional Director's Report	45
Northern Director's Report	47
Central Director's Report	50
Southern Director's Report	52
Honorary Membership Nomination.....	56
President's Address.....	57
Frederick S. Carr Award Nomination.....	58
Photos	62
Entomological Society of Alberta's Membership List	64

The Entomological Society of Alberta

The Entomological Society of Alberta (ESA) was organized November 27, 1952, at a meeting held in Lethbridge, Alberta, as an affiliate of the Entomological Society of Canada. A certificate of incorporation was obtained under the *Societies Act* on February 19, 1953.

The membership of about 70 paid-up members at that time consisted mainly of Dominion (Federal) entomologists at the Science Service Laboratories in Lethbridge (now Lethbridge Research and Development Centre of Agriculture and Agri-food Canada), Suffield Research Station, the Forest Zoology Laboratory in Calgary, and students and staff from the University of Alberta.

The object of the ESA shall be to foster the advancement, exchange, and dissemination of the knowledge of insects in relation to their importance in agriculture, horticulture, forestry, public health, industry, the environment, and for its own sake, among the people of the province of Alberta.

Membership is open to anyone interested in Entomology. Annual dues are \$20.00 (\$10.00 for students). Membership application is available at <https://entsocalberta.ca/about-the-esa/become-a-member/>

Entomological Society of Alberta Board of Directors for 2019

ESA Officers (1 year terms)

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Annual Meeting 2019 Committees

Co-Chairs: Hector Cárcamo (Entomological Society of Alberta) and Iain Phillips (Entomological Society of Saskatchewan)

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**6th Joint Annual Meeting
Entomological Societies of Alberta and Saskatchewan
October 3-5, 2019**

Elkwater Lodge, Elkwater, Cypress Hills

PROGRAM

THURSDAY OCTOBER 3

Executive board meeting: 5:00 – 7:00 pm

Registration and Mixer: 7:00 – 10:00 pm

FRIDAY OCTOBER 4: MEETING BEGINS AT 8:00 AM

7:00 – 8:00 am BREAKFAST (on your own) Buglers at the hotel is open

7:15 – 8:00 am Registration will be open

8:00 – 8:10 am: Introduction and Welcome

Organizing Committee Welcome: Hector Cárcamo

Entomological Society of Alberta President: Lisa Lumley

Entomological Society of Saskatchewan President: Daniel Wiens

8:10 – 11:30 AM - GEORGE BALL SYMPOSIUM – Moderators: Aaron Bell & Tyler Wist

* Before the title denotes a student presentation; presenter name is underlined

8:10 – 9:00 **Keynote speaker – Our Quarter: entomology of the prairie homestead. David Larson.**

9:00 – 9:30 **Faunistic entomology, post-glacial biogeography, and the legacy of Professor George E. Ball. John Acorn. University of Alberta.**

- 9:30 – 9:45 **BREAK**
- 9:45 – 10:15 **Beetles, books and Ball: the context and style of George Ball’s influence on insect systematics.** Felix Sperling. Department of Biological Sciences, University of Alberta, Alberta.
- 10:15 – 10:45 **Wireworm research in the Prairies: past & present, similarities & differences.** Wim Van Herk. Agassiz Research and Development Centre, British Columbia.
- 10:45 – 11:00 **Ants in Alberta, and Canada: An Update.** James Glasier. Fish and Wildlife Specialist MNA.
- 11:00 – 11:15 ***Moth biodiversity survey of southeastern Alberta.** Leah Jackson and Sperling, F. University of Alberta, Department of Biological Sciences, Edmonton, AB.
- 11:15 – 11:30 ***Testing for Evidence of the Large-X Effect in Spruce Budworm and related *Choristoneura*.** Marnie Wright and Sperling, F.A.H. Department of Biological Sciences, University of Alberta, Edmonton, AB.
- 11:30 – 1:00 **LUNCH (on your own, Buglers at the hotel is an option)**

1:00 – 2:45 pm ORAL PRESENTATIONS: SESSION 1 – Moderators: Berenice Romero & Heather Proctor

* Before the title denotes a student presentation; presenter name is underlined

- 1:00 – 1:15 ***Elucidating the Distribution of a Non-Native Species of Katydid in Alberta Using Bioacoustics.** Alexandre Caouette. Department of Biological Sciences, MacEwan University, Edmonton, AB.
- 1:15 – 1:30 ***Population genetic structure of forest tent caterpillar in relation to larval host, forest zones and geography.** Kyle Snape^{1,2}, Roe, A.D.², and Sperling, F.A.H.¹
¹Department of Biological Sciences, University of Alberta, Edmonton, AB. ² Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, ON.
- 1:30 – 1:45 ***Seasonal migration of corixids (Hemiptera: Corixidae) as a linkage between wetland and river ecosystems.** Stephen Srayko¹, Jardine, T.², Phillips, I.¹, and Chivers, D.¹. ¹ Department of Biology, 112 Science Place, University of Saskatchewan, Saskatoon, SK. ²School of Environment and Sustainability, 117 Science Place, University of Saskatchewan, Saskatoon, SK.
- 1:45 – 2:00 ***Influence of larval diet on disease prevalence in the forest tent caterpillar, *Malacosoma disstria* (Lepidoptera: Lasiocampidae).** Flavio Preti¹ and Evenden, M.²
¹Biological Sciences Building B205, University of Alberta, Edmonton, AB. ²Biological Sciences Building CW405, University of Alberta, Edmonton, AB.

- 2:00 – 2:15 ***Mass attack threshold and optimal attack density of mountain pine beetle (*Dendroctonus ponderosae* Hopkins) in Alberta pines.** Antonia Musso¹, Shegelski, V¹., Carroll A.L.², and Evenden, M.L.³ ¹CW 312 Biological Sciences Building University of Alberta, Edmonton AB. ²3034 – 2424 Main Mall University of British Columbia, Vancouver BC. ³CW405 Biological Sciences Building University of Alberta, Edmonton AB.
- 2:15 – 2:30 **Plenty of fish? Mate choice depends on perceived mating opportunities in mountain pine beetles.** Kavanagh, M. and Mary Reid. Biological Sciences, University of Calgary, Calgary, AB.
- 2:30 – 2:45 **Effects of insect pests and diseases in short rotation hybrid willow plantations.** Seung-II Lee, Pohl, G., Myrholm, C., Tomm, B., Ramsfield, T. and Krygier, R. Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, AB.
- 2:45 – 3:00 **BREAK**

3:00 – 5:00 pm ORAL PRESENTATIONS: SESSION 2 – Moderators Ishita Patel & Boyd Mori

* Before the title denotes a student presentation; presenter name is underlined

- 3:00 – 3:15 ***Distribution and infestation parameters of the quill mite *Betasyringophiloidus seiuri* in flight feathers of the Ovenbird (*Seiurus aurocapilla*).** Alexandra Grossi and Proctor, H. Department of Biological Sciences, University of Alberta, Edmonton, AB.
- 3:15 – 3:30 ***Trying to fit in: testing Harrison's Rule in Proctophyllodes feather mites.** Andrew Cook¹ and Proctor, H.² ¹CW312 Student Services, Biological Sciences Building, Edmonton, AB. ² CW405 Biological Sciences Building, Edmonton, AB.
- 3:30 – 3:45 ***Variability in the microbiome of Winter tick, *Dermacentor albipictus*.** Janet Sperling, Normandeau, J., MacDonald, Z., Merrill, E., Sperling, F. and Magor, K. Departments of Biological Sciences & Renewable Resources, University of Alberta. Edmonton, AB.
- 3:45 – 4:00 **Are differences in genitalia, ornamentation and seta length in males and female *Trouessartia* feather mites the product of sexually antagonistic coevolution?** Heather Proctor¹ and Byers, K.² ¹Department of Biological Sciences, University of Alberta, Edmonton, AB. ²Department of Zoology, University of British Columbia, Vancouver, BC.
- 4:00 – 4:15 ***Eating Scared.** Stephanie De Heij and Willenborg, C. University of Saskatchewan, Agriculture Building. 51 Campus Drive, Saskatoon, SK.

- 4:15 – 4:30 ***Effect of landscape structure on abundance, infestation and parasitism rate of cabbage seedpod weevil in Canola in the Prairies.** Piratheepa Jegatheeswaran¹, Cárcamo, H.², Johnson, D.¹, Meers, S.³, Vankosky, M.² and Tansey, J.⁴ ¹Department of Geography, University of Lethbridge, 4401 University drive W., Lethbridge, AB. ²Agriculture and Agri-Food Canada, Lethbridge Research center, PO Box 3000, Lethbridge, AB. ³Alberta Agriculture and Forestry, Crop Diversification Centre South, Brooks, AB. ⁴Production Technology, Ministry of Agriculture, 125-3085 Albert Street, Regina, SK.
- 4:30 – 4:45 ***The development and refinement of bioclimatic and forecasting models for insect pests in Canadian agroecosystems.** Dylan Sjolie^{1,2}, Vankosky, M.¹ and Willenborg, C.² ¹Saskatoon Research and Development Centre, 107 Science Place, Saskatoon SK. ²University of Saskatchewan, 51 Campus Drive, Saskatoon SK.
- 4:45 – 5:00 **Ebb and Flow: Tracking populations of the invasive weevils, *Ceutorhynchus obstrictus* and *Sitona lineatus* in Western Canada.** James Tansey¹, Vankosky, M.², Meers, S.³, Weiss, S.², Barkley, S.³, and Peru, C.¹ ¹Saskatchewan Ministry of Agriculture, ²Agriculture and Agri-Food Canada, ³Alberta Agriculture and Forestry.
- 5:00 – 5:10 **GROUP PHOTO**

6:00 – 7:00 pm POSTER SESSION

* Before the title denotes a student poster

Wireworm pests in spring wheat in southern Alberta, Canada. Haley Catton¹ and Van Herk, W.² ¹Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre 5403 – 1 Ave S, Lethbridge, AB. ²Agriculture and Agri-Food Canada, Agassiz Research and Development Centre 6947 Lougheed Way, Agassiz, BC.

Launch of the Massive Open Online Course: Bugs 101, Insect-Human Interactions. Maya Evenden and Domnich, I. Dept. Biological Sciences, University of Alberta, Edmonton, AB.

Surveying for potato psyllid (*Bactericera cockerelli*) in southern Alberta, Saskatchewan, and Manitoba, and detection of *Candidatus Liberibacter solanacearum*, zebra chip pathogen of potatoes. Dan Johnson¹, Kawchuk, L.², Meers, S.³, Henrickson, A.², Kalischuk, M.², Lynn, J.², Bisht, V.⁴, and Wahab, J.⁵ ¹University of Lethbridge, Lethbridge, AB. ²Agriculture and Agri-Food Canada, Lethbridge, AB. ³Alberta Agriculture and Rural Development, Brooks, AB. ⁴Manitoba Agriculture, Food & Rural Development, Carman, MB. ⁵Agriculture and Agri-Food Canada, Saskatoon, SK.

***Functional response of two generalist predators *Pterostichus melanarius* Illiger (Crabidae) and *Coccinella septempunctata* (Coccinellidae) on Diamondback moth.** Sharavari Kulkarni¹, Cárcamo, H.A.² and Evenden, M. L.³ ¹B217 Biological Sciences Building University of Alberta, Edmonton AB. ²Agriculture and Agri-Food Canada, Lethbridge, AB. ³CW405 Biological Sciences Building University of Alberta, Edmonton AB.

Will the ‘real’ *Dentizetes rudentiger* Hammer 1952 please wave a leg? Lisa Lumley, Royal Alberta Museum, 9810 103a Ave NW, Edmonton, AB.

Investigating swede midge, *Contarinia nasturtii*, host plant interactions: a multi-pronged approach. Boyd Mori^{1*}, Hladun, S.¹, Soroka, J.S.¹, Olfert, O.O.¹, Nambara, E.², Hegedus, D.D.¹ and Erlandson, M.A.¹
¹Agriculture and Agri-food Canada, Saskatoon Research and Development Centre, 107 Science Place, Saskatoon, SK. ²University of Toronto, Department of Cell and Systems Biology, 25 Willcocks St., Toronto, ON. *Present Address: University of Alberta, Department of Agricultural, Food and Nutritional Science, Edmonton, AB.

***A Survey of Pollinators Contributing to Fava Success in Saskatchewan.** Samantha Morrice, and Prager, S. Department of Plant Sciences, College of Agriculture and Bioresources, University of Saskatchewan, Saskatoon, SK.

***The Impact of Pea Leaf Weevil Damage and Management on Subsequent Nitrogen Availability and Crop Performance.** Patty Reid¹, Cárcamo, H.², Daniels, S.², Wijerathna, A.³, Evenden, M.³ and Tidemann, B.¹
¹Agriculture and Agri-Food Canada Lacombe, 6000 C&E Trail, Lacombe, AB, T4L 1W1 ²Agriculture and Agri-Food Canada Lethbridge, 5403 – 1 Ave South, Lethbridge, AB, T1J 4B1 ³University of Alberta, Department of Biological Sciences, 11455 Saskatchewan Drive, Edmonton, AB, T6G 2E9

***Antennal length of male *Caloptilia fraxinella* (Lepidoptera: Gracillariidae) captured in pheromone-baited traps in Edmonton, Alberta.** Katie Schulze¹, Santos, M.². and Evenden, M.¹ ¹Department of Biological Sciences, University of Alberta Edmonton, AB. ²Faculdade de Tecnologia e Ciências: Salvador, Bahia, Brazil.

***Toxicity and Effects of *Cannabis sativa* Oils on *Bombus impatiens*.** Jacqueline Verhallen and Prager, S. Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK.

Status of *Aphodius fimetarius/pedellus* complex in Canada. Diana Wilches¹, Coghlin, P.¹, Smith, A.² and Floate, K.¹. ¹ Agriculture & Agri-Food Canada, Lethbridge, AB. ² Canadian Museum of Nature, Ottawa, ON.

***The effectiveness of different Insecticides for controlling Pea Aphids in lentil and faba bean.** Ninxing Zhou¹, Wist, T.², and Prager, S.M.¹ ¹Dept. of Plant Sciences, College of Agriculture and Bioresources, University of Saskatchewan, 51 Campus Dr. Saskatoon, SK. ²Agriculture and Agri-Food Canada. Saskatoon, SK.

7:00 – 9:30 pm BANQUET FOLLOWING BY ESA AWARDS AND EVENING PRESENTATION

Cam Goater: “Zombie ants, endemic landsnails, and more: Cypress Hills as a biodiversity Hotspot”
Moderators: Danielle Stephens and Diana Wilches

SATURDAY OCTOBER 5: MEETING BEGINS AT 8:30 AM

7:30 – 8:30 BREAKFAST (on your own) Buglers at the hotel is open

8:30 – 11:30 am ORAL PRESENTATIONS: SESSION 4 – Moderators Stephen Srayko and Andrew Cook

* Before the title denotes a student presentation; presenter name is underlined

- 8:30 – 8:45 ***Pea aphid fecundity and biosis on wild and cultivated lentil species.** Ishita Patel, Prager, S. and Vandenberg, A. Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK.
- 8:45 – 9:00 ***Effects of overwintering length and temperature on pea leaf weevil (Coleoptera: Curculionidae) survival and oviposition.** ~~Asha Wijerathna~~¹, Evenden, M.L.¹, and Càrcamo, H.A.² ¹Department of Biological Sciences, University of Alberta, Edmonton, AB. ²Agriculture and Agri-Food Canada, Lethbridge, AB.
- 9:00 – 9:15 ***Semiochemical-based population monitoring of pea leaf weevil, *Sitona lineatus* L. (Coleoptera: Curculionidae) in Alberta, Canada.** Siena Acha¹ and Evenden, M.L.² ¹CW-205 Biological Sciences Building University of Alberta, Edmonton, AB. ²CW-405 Biological Sciences Building University of Alberta, Edmonton, AB.
- 9:15 – 9:30 ***The abundance and diversity of ground beetles (Coleoptera: Carabidae) captured in semiochemical-baited traps targeting the pea leaf weevil, *Sitona lineatus* L. (Coleoptera: Curculionidae) in pulse crops on the Canadian Prairies.** Maggie MacDonald and Evenden, M. University of Alberta, 116 St & 85 Ave, Edmonton, AB.
- 9:30 – 9:45 ***Of leafhoppers and phytoplasmas: host-choice behaviour of *Macrostelus quadrilineatus* in the Canadian Prairies.** Berenice Romero and Prager, S. Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK.
- 9:45 – 10:00 **Horizontal gene transfer of “Parasitoid Killing Factor” genes among multiple virus families and insect hosts shapes lepidopteran larval susceptibility to parasitoids.** Martin Erlandson^{1,2}, Sieminska, E.², Harris, S.¹, Baldwin, D.¹, Hegedus, D.D.¹, Nakai, M.³, Theilmann, D.A.⁴ et al. ¹Agriculture and Agri-Food Canada, Saskatoon Research Center, 107 Science Place, Saskatoon, SK. ²Department of Biology, University of Saskatchewan, 112 Science Place, Saskatoon, SK. ³Institute of Agriculture, Tokyo University of Agriculture and Technology – Saiwai, Fuchu, Tokyo 183-8509, Japan ⁴Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Summerland, BC.
- 10:00 – 10:15 **BREAK**

10:15 – 11:15 am ORAL PRESENTATIONS: SESSION 4 – Moderators Dylan Sjolie & Piratheepa Jegatheeswaran

* Before the title denotes a student presentation

- 10:15 – 10:30 **Discovery of the *Culicoides sonorensis*, a vector of Bluetongue virus, in Ontario.**
Adam Jewiss-Gaines, 445B Halifax St, Regina, SK.
- 10:30 – 10:45 **Collecting on the Edge of Everything: Part II.** Bette Beswick¹ and Swann, John². ¹63 Lott Creek Hollow, Calgary, AB. ²ABI Environmental Services 3911 Varsity Dr NW, Calgary, AB.
- 10:45 – 11:00 **Preliminary results from a province-wide wild bee monitoring program in Alberta.**
Meghan Evans¹ Cartar, R.V.,² and Prescott, D.R.C.³ ¹Alberta Native Bee Council. ²University of Calgary. ³Alberta Environment and Parks.
- 11:00 –11:15 **Passive traps can be poor samplers of bee abundance: sobering insights from pan traps in the rough fescue grasslands.** Ralph Cartar¹, Wonneck, M.², and Evans, M.M.³
¹University of Calgary ²Agriculture & Agri-Food Canada ³Alberta Native Bee Council.
- 11:15 – 12:15 **ENTOMOLOGICAL SOCIETY OF ALBERTA – ANNUAL GENERAL MEETING**
- 12:15 pm **MEETING ADJOURNED – Please feel free to explore Cypress Hills park!**

Sponsors and Donations



Michael Dolinski

Cameron Goater

George Ball Symposium speakers (in order of presentation)

Keynote speaker

Our Quarter: entomology of the prairie homestead.

Larson, D.

The role of the small holding in the development and maintenance of prairie insect biodiversity.

- 1. Faunistic entomology, post-glacial biogeography, and the legacy of Professor George E. Ball.**
Acorn, J. University of Alberta, Alberta.

The legacy of George Ball in Alberta extended over 65 years, and his earlier contributions were just as profound as those that followed. He trained many graduate students in faunistic entomology, such that each species within a broader taxon was properly understood not only in terms of its place in the classification and phylogeny of its group, but also in terms of its habitat, feeding ecology, current distribution, and glacial refugial origin. Studies of this nature were rigorous, meticulous, and foundational, and many are still in use today. A shift toward experimental and hypothesis driven science has displaced faunistic research from graduate programs, into the realm of field guides and online identification resources. Simultaneously, a more nuanced view of biogeographic events during and since the Wisconsin glacialiation has complicated our understanding of the biogeographic origins of the current entomofauna, while molecular techniques have improved the resolution of such questions. It is likely that, with continued public interest in both biodiversity conservation and the biotic consequences of climate change, faunistic expertise will continue to enjoy strong disciplinary relevance, even if it is also undervalued by many of today's biologists.

- 2. Beetles, books and Ball: the context and style of George Ball's influence on insect systematics.**
Sperling, F.A.H. Department of Biological Sciences, University of Alberta, Alberta.

George Ball's passing earlier this year left a huge gap in our entomological community. But we are still fortunate to have so many of his beetles, books and continuing influences. By themselves, the many books he accumulated in his library illustrate his astonishing intellectual breadth and they continue to benefit new generations. But they also demonstrate his seminal role at the intersection of classical taxonomy and numerous successive waves of new technical and conceptual developments in systematics. His lasting legacy is thus not only his celebrated lineages of academic descendants, but a style of scholarship and interactions that brought out the best in countless colleagues, students and friends.

- 3. Wireworm research in the Prairies: past & present, similarities & differences.**
Van Herk, W. Agassiz Research and Development Centre, British Columbia.

Wireworm research in Canada began in 1920's with the pioneering work of K.M. King in Saskatchewan and E. H. Strickland in Alberta. Virtually all we know of the biology and management of native pest elaterids in Canada is based on the work of these pioneers, and of those whose careers they influenced. After a nearly two-decade hiatus, wireworm research in Canada resumed in earnest in the late 1990's, but focussed mostly on

the introduced *Agriotes* species. Only in recent years has work resumed on native pest species. Meanwhile both agricultural practices, and pest management approaches have undergone significant changes. In this talk we discuss some of the key Canadian wireworm researchers from the 1930's to 1970's and some of their main findings, as well as the current pest situation and research needs.

ABSTRACTS (alphabetical order by first author)

4. **Semiochemical-based population monitoring of pea leaf weevil, *Sitona lineatus* L. (Coleoptera: Curculionidae) in Alberta, Canada.**

Achal, S.S.¹ and Evenden, M.L.²

¹CW-205 Biological Sciences Building University of Alberta, Edmonton, AB. ²CW-405 Biological Sciences Building University of Alberta, Edmonton, AB.

The pea leaf weevil, *Sitona lineatus* L. (Coleoptera: Curculionidae) is an economically important pest of field pea (*Pisum sativum*) and faba bean (*Vicia faba*). The pea leaf weevil is native to Europe and North Africa, but has expanded its range to North America and other pulse growing regions. The pea leaf weevil was first established in southern Alberta, Canada in 1997, and populations have since spread into central and northern Alberta. Current monitoring methods use adult feeding damage on the host plant to indirectly estimate populations. Semiochemical-based monitoring is an alternative method that can be used to delineate populations in the expanded range. This study aims to delimit the range expansion of pea leaf weevil in northern Alberta. We trapped adult weevils in pitfall traps baited with male aggregation pheromone (4-methyl-3,5-heptanedione) during the 2 adult activity periods in 2018 and 2019 in pulse growing regions of central and northern Alberta. In addition, we compare the number of weevils captured in pheromone-baited traps to notching damage on field pea and faba bean crops at the same sites. A preliminary analysis showed that pea leaf weevil trap capture differs between pea and faba bean crops. Further analyses will determine the effect of year, season, and pheromone treatment on trap capture of pea leaf weevils. Findings from the study add to the current knowledge of pea leaf weevil range expansion and will lead to the development of an alternative monitoring tool to sample this pest for an integrated pest management strategy.

5. **Collecting on the Edge of Everything: Part II**

Beswick, B.¹ and Swann, J.²

¹63 Lott Creek Hollow, Calgary, AB. ²ABI Environmental Services 3911 Varsity Dr NW, Calgary, AB.

At the 2015 ESA conference, we described the launch of our invertebrate collecting program at Beauvais Lake Provincial Park, located in the southwest corner of the province. This presentation will provide an update. We will describe our continuing field program and some of the challenges we've encountered, what we've collected, and what remains to be done.

6. **Elucidating the Distribution of a Non-Native Species of Katydid in Alberta Using Bioacoustics.**

Caouette, A.

Department of Biological Sciences, MacEwan University, Edmonton, AB.

Accumulating evidence has shown that climate change is causing shifts in species distributions. For species that produce audible vocalizations, bioacoustics may provide a useful tool to better understand how animals are responding to the pressures of climate change. Recently, *Roeseliana roeselii*, a species of Orthoptera native to Europe, was discovered near Edmonton, Alberta, outside of its naturalized range in Eastern North America. This discovery presents a unique opportunity to elucidate the provincial distribution of *R. roeselii* by using bioacoustics software. This project will use automated audio recognition software to sort through province-wide field recordings from the Alberta Biodiversity Monitoring Institute

(ABMI). I recorded *R. roeselii* individuals from several locations in Alberta to create a recognizer algorithm. With this algorithm, I will be able to sort through several thousand ABMI recordings taken across the province in hopes to gain a wider breadth of *R. roeselii*'s distribution. This project will lay the groundwork for research looking into both the range expansion of *R. roeselii* and range changes of other acoustic insects in North America.

7. Passive traps can be poor samplers of bee abundance: sobering insights from pan traps in the rough fescue grasslands.

Cartar, R.V.¹, Wonneck, M.², and Evans, M.M.³

¹University of Calgary ²Agriculture & Agri-Food Canada ³Alberta Native Bee Council.

We often sample communities of bees using passive traps (pan or blue vein) coloured to attract bees to their deaths. Such traps integrate catches over many days and can provide large samples of local biodiversity. But do these traps directly reflect local bee abundance? We might assume that a large catch of bees reflects high local bee abundance, but what if it instead reflects low local flower abundance, or some combination of the two? We tested this premise in rough fescue grasslands of SW Alberta, relating 1-day catches in pan traps to walking transect counts of the abundances of flowers and bees at flowers. When flower abundance was low, there was a strong positive relationship between bee abundance in traps and at flowers. But bee abundance in traps and at flowers were unrelated when flower abundance was intermediate, and negative when flowers were abundant. In a world rich with flowers, bees ignored the passive traps. The take-home message: across a wide range of flower abundances, bee abundance in a trap did not positively reflect bee abundance (at flowers). Perhaps we should also measure local resources when estimating bee abundance using passive, attractive traps (or switch to malaise traps).

8. Wireworm pests in spring wheat in southern Alberta, Canada.

Catton, H.¹ and Van Herk, W.²

¹Agriculture and Agri-Food Canada, Lethbridge Research and Development Centre 5403 – 1 Ave S, Lethbridge, AB. ²Agriculture and Agri-Food Canada, Agassiz Research and Development Centre 6947 Lougheed Way, Agassiz, BC.

Wireworms are the subterranean larval stage of click beetles (Coleoptera: Elateridae), and are known as crop pests around the world. Wireworms are chewing pests that consume cereal and root crops in the seed and seedling stage, thinning crops and reducing yield. There are currently no effective chemical controls available for this pest in Canada, which has approximately 20 species of pest wireworm. Species composition varies by region. Wireworms have multi-year life stages, living several years in the soil, and therefore may respond to previous crop rotations. We sampled wireworms and click beetles weekly from spring to harvest in 12 commercial spring wheat fields in the Lethbridge area in southern Alberta, Canada for each of 2017 and 2018 (=24 fields total). To be eligible for sampling, study fields had to be suspected of having a wireworm problem by the farmer, be seeded to spring wheat in the year of sampling, and have one of the following rotations in the previous two years: cereal-cereal, cereal-canola, canola-cereal, pulse-canola. Here we report preliminary results on wireworm species compositions, specimen sizes, and timing of insect activity.

9. Trying to fit in: testing Harrison's Rule in Proctophyllodes feather mites.

Cook, A.¹ and Proctor, H.²

¹CW312 Student Services, Biological Sciences Building, Edmonton, AB. ²CW405 Biological Sciences Building, Edmonton, AB.

Vane-dwelling feather mites (Sarcoptiformes: Analgoidea, Pterolichoidea) are obligate symbionts of birds, living on the surface of flight feathers and consuming oil and fungal spores for food. Although these symbionts are known from almost all families of birds and can attain high densities on their hosts, many questions remain about how they partition space among and within feathers, and whether particular aspects of feather structure correlate with mite body size. In my thesis work I am exploring how vane-dwelling mites in the genus *Proctophyllodes* (Analgoidea: Proctophyllodidae) partition wing feathers on spring migrants in Alberta, looking for correlations between mite body size and feather microstructure, and testing whether mite size and host body sizes are positively correlated (Harrison's Rule). I am using both laboratory- and field-based approaches to document abundance and orientation of mites on the wing of living birds, and to compile the first dataset of feather microstructure measurements in North American birds.

10. Eating Scared.

De Heij, S.¹ and Willenborg, C.¹

¹University of Saskatchewan, Agriculture Building. 51 Campus Drive, Saskatoon, SK.

Virtually all animals are on the menu of another, and this affects their behavior. This holds true for insects as well, including those that are considered beneficial in agriculture. So how does an insect's interaction network with potential predators affect its behavior? And how can this affect its biocontrol potential? That is what I am exploring in the case of carabid beetles (Coleoptera: Carabidea) in regards to their contribution to weed seed loss in agricultural fields.

11. Horizontal gene transfer of "Parasitoid Killing Factor" genes among multiple virus families and insect hosts shapes lepidopteran larval susceptibility to parasitoids.

Erlandson, M.A.^{1,2}, Sieminska, E.², Harris, S.¹, Baldwin, D.¹, Hegedus, D.D.¹, Nakai, M.³, Theilmann, D.A.⁴ et al.

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Tritrophic interactions among insect hosts, parasitoid wasps and viruses are complex and diverse. Understanding these associations is critical to an understanding of the evolutionary arms race that has driven the specialization of parasitoid species and the evolution of host defence strategies. Typically the interaction between parasitoids and viruses exploiting the same lepidopteran host is a competitive one and the survival of the parasitoid larvae is dependent on the timing of parasitization and/or infection. However, we recently identified and characterized a new protein family, Parasitoid Killing Factor (PKF),

that is expressed in some invertebrate DNA viruses and have also been identified in a number of noctuid host species. *In vivo* and *ex vivo* assays demonstrated that PKF proteins from *Mamestra configurata alphabaculovirus*, *Mythimna separata entomopoxvirus* and *Heliothis virescens ascovirus* 3j inhibit the development of and kill parasitoid wasp larvae of specific species from the Microgastrinae family. Interestingly, PKFs identified in *Spodoptera exigua* have conserved function and specificity against specific microgastrine parasitoids suggesting that PKFs play a role in host defences against parasitoids and thus parasitoid-host specificity. Phylogenetic and genomic analyses revealed evidence for *pkf* gene flow between viruses as well as viruses and lepidopteran hosts. The present work is significant as it provides new insights into the dynamic interactions among natural enemies of insect hosts, specifically the evolutionary path of insect and virus interactions.

12. Preliminary results from a province-wide wild bee monitoring program in Alberta.

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Despite an interest in the potential decline of wild bee species, there was no province-wide monitoring of these important pollinators in Alberta. The Alberta Native Bee Council oversaw a collaborative effort among numerous government organizations, researchers and volunteers to implement a province-wide, repeatable sampling of wild bees at 100 locations throughout Alberta with blue vane traps in the summer of 2018. Our efforts yielded over 20,000 *Bombus* specimens. Within these we added a bumble bee species to the record for Alberta (*Bombus sandersoni*), confirmed records of *Bombus bohemicus*, a SARA listed species (the first since 1997), and mapped out the distribution of *Bombus occidentalis* and *Bombus terricola* (both species of conservation concern). The work will result in the compilation of a comprehensive bee species inventory for Alberta. We anticipate that sampling will be repeated every five years, to assess changes in populations over time.

13. Launch of the Massive Open Online Course: Bugs 101, Insect-Human Interactions.

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Bugs 101 is a Massive Open Online Course (MOOC) that was launched on the Coursera platform in June 2019. The course content focuses on insect-human interactions, and also introduces learners to insect evolution, biology and ecology. The course has 12 modules each containing several lessons and culminating in a quiz at the end. The first four modules introduce insect diversity, morphology, biology and locomotion. The next four modules focus on ecosystem functions provided by insects including decomposition, herbivory, pollination and disease vectors. The final group of four modules focuses on ways that humans directly interact with insects through sustainable management of insect pests, conservation of threatened insect populations, and insects as inspiration in music, art, science and literature. Throughout the course, there are 26 interviews with experts on a range of topics from forensic entomology to insects in art. Several interactive learning objects are incorporated into the course so that students can engage with the course material. The course is available for free to a wide range of learners from around the world. There were 5688 students enrolled in the class with over 3752 active learners 2 months after its launch.

14. Ants in Alberta, and Canada: An Update.
Glasier, J.R.N. Fish and Wildlife Specialist MNA.

Knowledge of ants in Alberta and Canada has been on the increase in the past several years. More people are paying attention to the ant species which are running around our feet and more are looking at their ecology. Here I present an update on the ant species of Alberta, with a few new discoveries, the first records of introduced species outside of buildings, and a quick overview of the ants found in the province. I also present some information on the ant species of Canada. Finally I conclude with small projects I am working on, and ask some open ended questions that need further study.

15. Distribution and infestation parameters of the quill mite *Betasyringophiloidus seiuri* in flight feathers of the Ovenbird (*Seiurus aurocapilla*).
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Quill mites (Acariformes: Syringophilidae) are permanent parasites that live and reproduce inside the hollow calamus of feathers. They feed by using their long chelicerae to pierce the wall of the quill to reach the living tissues surrounding the base of the feather. Ovenbirds are host to the quill mite *Betasyringophiloidus seiuri* (Clark), which has been reported to inhabit 'flight feathers', but there is currently no information on the prevalence of infestation of individual flight feathers and if quill parameters influence which feathers become infested. We exhaustively examined the flight feathers from the wings and tails of 21 dead Ovenbirds. Nine birds had at least one feather infested with mites. Of these, seven had only wing feathers infested, one had both wing and a single tail feather infested, and one had a single tail feather infested. Intensities of mites ranged from 2 – 135.6 in a single feather with a mean of 28.4. There was a strong positive correlation between quill volume and mean mite intensity. Feathers that had quill walls thicker in some areas than the mites' extended chelicerae had lower prevalences than feathers with walls consistently thinner than the length of the chelicerae.

16. Moth biodiversity survey of southeastern Alberta.
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The great abundance and attractiveness of Lepidoptera has meant that their biodiversity is frequently used to assess ecosystem health. Previous work has disproportionately focused on macro moths, but has documented micro moths less fully. The aim of my study is to build a baseline and current species list for macro and micro moths that will subsequently allow an evaluation of anthropogenic effects on species diversity of prairie habitats. I will identify recently collected specimens to assess the species richness of southeastern Alberta, and ask whether it differs from historical moth diversity documented in museum collections. Throughout the 2019 season, adult moths were collected at the Dunmore Vehicle Enforcement Branch along the TransCanada highway east of Medicine Hat, mainly at diffused light-emitting diode balloon lights and also with occasional aerial netting. A nearby residential area in Medicine Hat as well as Cypress Hills Provincial Park was also sampled using aerial nets and light traps. Changes in agriculture and infrastructure, the spread of invasive species and climate will be considered in the analysis. Assessment of Alberta's unique prairie biodiversity can shed light on the conservation efforts needed to preserve this valuable ecosystem.

17. Effect of landscape structure on abundance, infestation and parasitism rate of cabbage seedpod weevil in Canola in the Prairies.

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Cabbage seedpod weevil (*Ceutorhynchus obstrictus*) is an important invasive pest of Canola. Larvae and adult cause serious damage to canola. Biological control is being researched as an option to manage this weevil. Parasitism rates in southern Alberta are very low compared to records in Europe where *Trichomalus perfectus* is considered the most effective parasitoid. This parasitoid has been reported from Quebec where it seems to reduce pest levels. Hence, it could be a potential classical biocontrol agent of cabbage seedpod weevil in the Prairies. Several studies have shown that efficacy of parasitoids in biological control is linked with landscape structure. For example, non-crop habitats surrounding fields may affect the abundance of pest, natural enemies and efficacy of natural pest control as demonstrated in Europe. Thus our research aims to understand the effects of landscape structure on the abundance of cabbage seedpod weevil, crop damage and its parasitism. To assess this effect, variable landscapes (simple to complex) have been selected and their structure and configuration is being documented by surveys, then digital maps will be constructed. The proportion and diversity of land covers will be related to cabbage seedpod weevil abundance from sweep net sampling and parasitism rates and weevil damage from pod collections. The results will elucidate the effect of landscape structure on the abundance of cabbage seedpod weevil, crop damage and its parasitism and improve sustainable management of this pest.

18. Discovery of the *Culicoides sonorensis*, a vector of Bluetongue virus, in Ontario.

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In 2013 and 2014, insect trapping at sheep farms throughout Ontario using standard CDC light traps yielded high numbers of biting midges (Diptera: Ceratopogonidae). Many of these midges were taxonomically identified as *Culicoides sonorensis*, the primary North American vector insect for Bluetongue virus (BTV) and Epizootic Hemorrhagic Disease virus (EHDV). Molecular analysis was performed on specimens, confirming this identification. Prior to this, *Culicoides sonorensis* was not suspected to occur in Ontario and was largely associated with the western provinces of British Columbia and Alberta. Shortly after this discovery, both BTV and EHDV had their first reported occurrences in Ontario. As this species is notably difficult to identify from its close sister species, *Culicoides variipennis*, three gene regions (CO1, ITS1, and EF1 α) were analyzed from specimens of both species for comparison in hopes of finding a useful genetic marker. Results showed that CO1 and ITS1 were nearly identical between both species, but an analysis of EF1 α revealed significant differences within introns. This information may be used to assist with proper molecular determination between these two species in the future and allow us to further understand the true geographic range they inhabit.

19. **Surveying for potato psyllid (*Bactericera cockerelli*) in southern Alberta, Saskatchewan, and Manitoba, and detection of *Candidatus Liberibacter solanacearum*, zebra chip pathogen of potatoes.**

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The potato psyllid, *Bactericera cockerelli* (Hemiptera: Trioziidae) feeds on plants in the family Solanaceae. It can transmit the pathogenic bacterium '*Candidatus Liberibacter solanacearum*' (Lso), which presents as zebra chip disease of potato. Zebra chip has been documented in commercial fields in the United States, Mexico, Central America, and New Zealand. We surveyed southern Alberta, Saskatchewan, and Manitoba, during 2014-2017, at typically about 40-60 locations per year, with reduced sampling in 2018. No potato psyllids were found in 2014. We found small numbers in Alberta during 2015, 2016, and 2017, in Saskatchewan and Manitoba beginning in 2016. In southern Alberta, the range expanded throughout the potato growing area to 70% of 45 sampled fields. Sequence analysis of cytochrome oxidase from individual potato psyllids confirmed the presence of Central and Western haplotypes. Lso-positive potato psyllids were detected from four locations in Alberta in 2017. Sequence of the Lso 16S rDNA indicated the Canadian pathogen closely resembles hapA from WA, ID, and OR. Best management practices are being developed to prevent occurrence of ZC in Canada. A single Lso positive postharvest Russet Burbank potato tuber exhibiting necrotic symptoms was recovered beside a field in southern Alberta, with no further detections.

20. **Plenty of fish? Mate choice depends on perceived mating opportunities in mountain pine beetles.**
Kavanagh, M.¹ and Reid, M.¹

¹Biological Sciences, University of Calgary, Calgary, AB.

When mating opportunities are more abundant, animals are expected to be more selective in choosing mates. We tested whether choosiness of male mountain pine beetles, *Dendroctonus ponderosae*, increased with perceived mating opportunities signaled by exposure to different pheromone blends and by the male's own body condition. Choosiness was measured as the time taken to enter the breeding gallery of an unmated female and the amount of time a male stayed in the gallery. We found that males in better body condition and those exposed to pheromones signaling an abundance of unmated females tended to be slower to join an unmated females and faster to depart. Male mountain pine beetles appeared to exhibit opportunity-dependent mate choice.

21. **Functional response of two generalist predators *Pterostichus melanarius* Illiger (Crabidae) and *Coccinella septempunctata* (Coccinellidae) on Diamondback moth.**

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Diamondback moth (DBM), *Plutella xylostella* L. is a serious pest of cruciferous crops globally. In western Canada, moth influx with wind currents from the United States can result in significant economic damage to canola. This study aims to evaluate the functional response of two common generalist predator species

found in canola fields, *Pterostichus melanarius* which feeds on DBM larvae and *Coccinella septempunctata* that preys on eggs of DBM. Predation of fourth instar DBM by field-collected *P. melanarius* was observed at 5 different larval densities (5,10,20,30,40) for 24 h. Similarly, predation on DBM eggs by field collected adult *C. septempunctata* was observed at 5 different densities (5, 10, 20, 40, 60). The preliminary results of predation and functional response will be discussed.

22. Effects of insect pests and diseases in short rotation hybrid willow plantations.

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¹Natural Resources Canada, Canadian Forest Service

Short-rotation tree plantations show great promise for use in land reclamation, biosolid waste treatment, and biomass and biofuel production. Willows (*Salix* spp.) are one of the commonly used trees for the biomass production because they are fast-growing and rapidly resprout from coppices after harvest. Despite the popularity of hybrid willow plantations, the effects of insects and diseases on various willow hybrids are not well studied. We investigated insects and disease occurrence in 15 different hybrid willow clones in plantations near Calgary and Camrose, Alberta. The purposes of the study were 1) to identify insect pests and diseases associated with genetically diverse willow clones; 2) to compare incidence and severity of pests; and 3) to provide a recommendation of willow clones that are more resistant to pests. The willow hybrid clone 'Owasco' (*Salix viminalis* × *S. miyabeana*) was observed to be a suitable host for the largest number of pest species, while 'Vim5027' (*S. viminalis*) was severely defoliated by *Calligrapha verrucosa* (Coleoptera: Chrysomelidae).

23. Will the 'real' *Dentizetes rudentiger* Hammer 1952 please wave a leg?

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One female specimen of a new genus and species, *Dentizetes rudentiger*, was first discovered by Marie Hammer on August 13, 1948 at the railway station in Jasper, Alberta. Hammer described the species in 1952, and included in the descriptors are that the species is "dark brown, the length 0.56 mm, the breadth 0.40 mm". Valerie Behan-Pelletier redescribed *D. rudentiger* in 1986 from additional specimens collected in subarctic western North America, including specimens from Jasper National Park. Behan-Pelletier noted that the holotype cannot be located and that the specimens she examined were smaller. Recent alpine collections by the Alberta Biodiversity Monitoring Institute have revealed two morphotypes that differ in colour and size, and that key to *D. rudentiger*. Upon close examination, it appears that the larger, dark brown specimens (morphotype 1) most closely match the original description, and the smaller, lighter yellow specimens (morphotype 2) most closely match the redescription. However, are the limited recorded differences sufficient to deem that *Dentizetes* morphotype 1 is *D. rudentiger*, and the redescribed *D. rudentiger* is a new species?

24. The abundance and diversity of ground beetles (Coleoptera: Carabidae) captured in semiochemical- baited traps targeting the pea leaf weevil, *Sitona lineatus* L. (Coleoptera: Curculionidae) in pulse crops on the Canadian Prairies.

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The pea leaf weevil (PLW), *Sitona lineatus* L. (Coleoptera: Curculionidae), is a significant pest of field pea, *Pisum sativum* L. (Fabaceae), and faba bean, *Vicia faba* L. (Fabaceae), that has recently invaded the Canadian Prairie Provinces. Semiochemical-based monitoring can detect population spread and local movements of PLW in the Prairie Provinces but results in significant carabid bycatch including capture of the invasive *Pterostichus melanarius* Ill. (Coleoptera: Carabidae) that is native to Europe. *Pterostichus melanarius* was first recorded in Edmonton and is now widespread throughout Alberta and has dominated most habitat types. Dispersal by flight promotes high proportions of macropterous *P. melanarius* in newly colonized populations compared to high proportions of brachypterous individuals in established populations. The objective of this study is to survey carabid diversity and abundance of bycatch in monitoring traps that target PLW, and compare differences in carabid assemblages between crop type, trap bait, and region. We further examine the morphology of *P. melanarius* from different regions in Alberta to determine the proportion of long and short wing morphs and make inferences about spread and dispersal of this invasive species.

25. Investigating swede midge, *Contarinia nasturtii*, host plant interactions: a multi-pronged approach.

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The swede midge (SM), *Contarinia nasturtii* (Diptera: Cecidomyiidae), is a serious pest of cruciferous vegetable and canola crops in Europe and eastern North America. It poses a significant threat to canola production in the Canadian prairies. Larval feeding results in swollen and distorted leaves, shoots, and buds, and reduces yield. Crop yield losses due to SM infestations have been as high as 85% in Canada. Efficient control strategies are lacking for SM. Control using insecticides is difficult due to their short residual activity, multiple overlapping SM generations, and the internal feeding nature of the larvae. Host plant resistance presents itself as a possible alternative control strategy. Here, we take a multi-pronged approach to investigate SM host plant resistance with a focus on interactions at the insect-plant interface which include: i) laboratory bioassays of cruciferous weeds and a nested-association mapping population of *B. napus* to identify the degree of SM susceptibility/resistance; ii) transcriptomic analyses of SM larvae; and iii) transcriptomic and plant hormone analyses of *B. napus* following SM infestation. The results of these experiments will offer insight into the plant defense system in response to SM infestation and may aid in the search for alternative sources for resistance to SM.

26. A Survey of Pollinators Contributing to Fava Success in Saskatchewan.

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Pollination by, and community structure of, native bees in fava bean (*Vicia faba* L.) fields is poorly studied. Studies relating pollinators to yield in fava beans are rather limited, and there are no published studies in Canadian cropping systems. While some literature suggests that honey bees (*Apis mellifera*) and long tongued bumble bees (*Bombus* spp.) are the prominent pollinators in fava fields, other studies have shown

them to be less effective. To date, no studies have been conducted on the community structure of native bee populations in fava fields. There have also been no studies on fava bean pollination by native bees in North America. As a first step to determine and manage pollination in Canadian fava bean crops, a survey of the bee community in Saskatchewan fava bean fields was conducted. In this study, I investigated changes in bee community structure over the course of time in fava fields in three sampling periods. Data presented will highlight trends in bee diversity within Saskatchewan fava fields.

27. Mass attack threshold and optimal attack density of mountain pine beetle (*Dendroctonus ponderosae* Hopkins) in Alberta pines.

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Mountain pine beetle (MPB), *Dendroctonus ponderosae* Hopkins (Coleoptera: Curculionidae; Scolytinae), has expanded its range into Alberta where it has attacked evolutionarily naïve lodgepole (*Pinus contorta*) and jack pines (*Pinus banksiana*). Using pheromone-mediated mass attack during an epidemic, MPB are capable of overwhelming vigorously defended trees. If too many beetles attack a tree, brood success diminishes as there is competition for under-bark resources. Current understanding of MPB mass attack dynamics originates from studies performed in the historic range, where the mass attack threshold is ≈ 40 beetles/m² and optimal attack density is ≈ 60 beetles/m². Evolutionarily naïve lodgepole and jack pines have different defences compared to lodgepole in the historic range. We manipulated attack densities in lodgepole and jack pines in the field to describe mass attack dynamics in Alberta by measuring the number of parental and larval galleries formed by MPB at various densities. Mass attack threshold and optimal attack densities appear to be lower in Alberta lodgepole pine and jack pine compared to the historic range, however this varied by year in lodgepole pine. Understanding mass attack dynamics of MPB in Alberta will allow us to predict the long-term population dynamics of MPB in its expanded range.

28. Pea aphid fecundity and biosis on wild and cultivated lentil species.

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Lentil (*Lens culinaris*) is a valuable crop for Western Canada. It provides ecological benefits through crop rotations and also improves soil quality due to its ability to fix nitrogen. Pea aphid (*Acyrtosiphon pisum*) causes significant yield loss in lentil both directly by feeding and indirectly by being viral disease vectors. Although cultivated lentil is grown commercially worldwide, its wild relatives are native to the Mediterranean region and have a wide range of morphological characteristics that are potentially useful in the cultivated lentil. Notably, some wild lentil species have their leaves and pods covered with trichomes, while in cultivated lentil trichomes are significantly reduced on the leaf surface and are absent on the pods. This experiment examined if trichomes influence pea aphid fecundity and biosis by comparing its growth on the wild lentil species, *L. tomentosus* (LT), and cultivated lentil (LC). It was found that although the time taken to reach reproductive maturity remained similar on both lentil species, more adult aphids produced nymphs on hairy pods of LT. On LC, most adults produced nymphs elsewhere on the plant. Additionally, aphid mortality was higher on LC. These results suggest that lentil trichomes might not deter pea aphids, and that cultivated lentil might have characteristics that negatively influence aphid fecundity.

29. Influence of larval diet on disease prevalence in the forest tent caterpillar, *Malacosoma disstria* (Lepidoptera: Lasiocampidae).

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Forest tent caterpillar (FTC), *Malacosoma disstria* Hübner (Lepidoptera: Lasiocampidae), is an important ecological disturbance factor affecting deciduous hardwood trees in North America. Disturbance is greater during outbreaks; a cyclical phenomenon in which large numbers of FTC larvae cause extensive defoliation to host trees. Variation in FTC larval diet is known to affect resource allocation to flight and reproduction in adult moths. Furthermore, differences in phytochemistry among host plants can alter insect resistance to pathogens. It is unknown, however, whether larval diet of FTC can alter insect susceptibility to the microsporidium *Nosema disstriae*. We are testing for differences in resistance to microsporidia infection due to variation in larval diet. FTC egg masses were collected from populations in Ontario and Alberta. Four feeding treatments were used to rear larvae under laboratory conditions. Feeding treatments included: 1) a synthetic diet (Addy 1969) (SD); 2) a reduced amount of synthetic Addy diet (SD-); synthetic diet with 1% lyphosized trembling aspen (*Populus tremuloides* Michx, family Salicaceae) foliage (SDA); or a reduced amount of synthetic diet with 1% lyphosized trembling aspen (SDA-). Both healthy larvae and larvae infected with microsporidia (+) were reared on identical diets (SD+, SD-, SDA+, SDA-). Microsporidia-infected larvae were fed *Nosema disstriae* spores at the third instar. Larval survival, time to pupation, time to eclosion, cocoon weight, moth weight, and sex were determined and compared among treatments. An interaction between pathogens and larval diet may inform control efforts of FTC. Results will be discussed.

30. Are differences in genitalia, ornamentation and seta length in males and female *Trouessartia* feather mites the product of sexually antagonistic coevolution?

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Mating behaviour that benefits one sex doesn't always benefit the other. Males may achieve higher reproductive success by compelling females to mate sooner, longer or more often than is in their own best interest. In such cases, females may evolve counter-adaptations to thwart males. Features that make it more difficult for males to hold onto or inseminate females have arisen repeatedly in insects (e.g., gerrids, dytiscids, bedbugs). Here we describe sexually dimorphic structures in feather mites of the genus *Trouessartia* (Analgoidea: Trouessartiidae) and test for evidence that they are the product of sexually antagonistic selection. We used light and scanning electron microscopy to examine *Trouessartia* from 52 spp. of avian hosts. We found that females had more pronounced dorsal ornamentation and longer dorsal *h1* setae than conspecific males. Female external spermaduct length was positively correlated with the massiveness of the male's genitalia. Degree of dorsal ornamentation and dorsal 'spininess' were not positively correlated with male sucker size, and so these features may not be involved in making impeding the male's grip on females. We conclude that there is some evidence for sexually antagonistic coevolution in genitalia in *Trouessartia*, but not in dorsal ornamentation or *h1* seta size.

31. Of leafhoppers and phytoplasmas: host-choice behaviour of *Macrostes quadrilineatus* in the Canadian Prairies.

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Phytoplasmas are fastidious bacteria associated with several diseases in plants, affecting crop yield and resulting in important economic losses in Canadian agriculture. The phytoplasma subgroup responsible for causing Aster Yellows disease is primarily transmitted by migratory populations of Aster leafhoppers (*Macrostes quadrilineatus* Forbes). Despite having a low incidence in canola fields in the Prairies (<0.01%), Aster Yellows outbreaks have been recorded in 2001, 2007, and 2012, with the 2012 outbreak being much more severe than the previous ones. In addition, other crops have been found to be infected with phytoplasmas. Yet little is known about the host choice behaviour of Aster leafhoppers and whether this can be affected by infection with phytoplasmas. To address this problem, two-choice bioassays with Aster leafhoppers will be conducted under various experimental conditions, using crops and weeds commonly found in Saskatchewan.

32. Antennal length of male *Caloptilia fraxinella* (Lepidoptera: Gracillariidae) captured in pheromone- baited traps in Edmonton, Alberta.

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Caloptilia fraxinella (Lepidoptera: Gracillariidae) is a nuisance and aesthetic pest of ornamental green ash, *Fraxinus pennsylvanica* (Oleaceae), that was first detected in Edmonton in 1999. These moths overwinter as adults and emerge to mate in early spring, at which time females produce and males respond to sex pheromones. Previous studies illustrate phenotypic plasticity in pheromone response of males that depends on physiological state. It is not known, however, if variation in pheromone responsiveness exists among reproductively active males. It is possible that males invest more in antennal length with presumably more pheromone receptors to better detect mates. The objective of this study is to determine if antennal length of male *Caloptilia fraxinella* varies among males captured in traps baited with different pheromone doses or with moth population density. Sex pheromone-baited unitraps, baited with 1 µg, 10 µg, 100 µg and 1000 µg doses, were placed in horticultural green ash trees at 8 sites throughout southern Edmonton in the summer of 2018. A random sub sample (n=4) of males was removed from traps and their wings and antennae were dissected and measured. This study will provide further insight into the plasticity of pheromone communication of this long lived moth.

33. The development and refinement of bioclimatic and forecasting models for insect pests in Canadian agroecosystems.

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Bioclimatic and forecast models are important components of the integrated pest management toolbox. Unfortunately, rigorous, validated models are not available for key pests of field crops on the Canadian prairies. The objective of my proposed thesis project is to identify abiotic (soil moisture content,

temperature) factors that affect the development and survivorship of several important insect pests in Canadian agroecosystems: cabbage seedpod weevil (*Ceutorhynchus obstrictus*), pea leaf weevil (*Sitona lineatus*), wheat stem sawfly (*Cephus cinctus*), and bertha armyworm (*Mamestra configurata*). New insights and interactions arising from my project will be incorporated into bioclimatic models and serve to increase the availability of forecasting tools for prairie producers. Here I present planned experimental designs and preliminary data for this project.

34. Population genetic structure of forest tent caterpillar in relation to larval host, forest zones and geography.

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The forest tent caterpillar (FTC, *Malacosoma disstria*) is a major deciduous forest defoliator throughout Canada, but we lack a clear understanding of the relationship between population structure and regional variation in host use in this species. In Ontario, FTC is commonly associated with sugar maple and aspen. Earlier studies have shown fitness and life history differences between maple-feeding and aspen-feeding FTC populations. We asked whether maple feeding populations of FTC differ genetically from aspen feeding populations, using ddRAD methods to survey genome-wide single nucleotide polymorphisms. We found no consistent differences between FTC feeding on different hosts within the same geographic region. However, FTC populations were genetically differentiated between boreal and deciduous forests, with even greater differences between eastern and western Canada.

35. Variability in the microbiome of Winter tick, *Dermacentor albipictus*.

Sperling, J.¹, Normandeau, J.¹, MacDonald, Z.¹, Merrill, E.¹, Sperling, F.¹ and Magor, K.¹

¹Departments of Biological Sciences & Renewable Resources, University of Alberta. Edmonton, AB.

Tick microbiomes are usually considered to be highly diverse, but recent literature has questioned the basis for this diversity. Methodological artifacts are now suspected to be major contributors to such microbiome diversity measures. Our study aimed to assess the nature of bacterial diversity in a simplified system chosen for its reduced number of ecological variables. Winter ticks, *Dermacentor albipictus*, were collected from one host, elk, and a restricted geographic range at Ya Ha Tinda Ranch, in the foothills of Alberta. Despite our restricted sampling design, we found low species richness for the major components of the microbiome, but high within-population variability of the most common bacteria in the system. *Francisella*, and more generally Francisellaceae, dominated the bacterial microbiome of winter ticks, while *Pseudomonas*, *Ehrlichia* and *Asinibacteria* occurred in appreciable but variable numbers. A large number of other bacterial taxa were present in low and unpredictable numbers. This finding is consistent with other studies that describe high functional redundancy in tick microbiomes, which may result in enhanced ecological resilience and adaptability.

36. Seasonal migration of corixids (Hemiptera: Corixidae) as a linkage between wetland and river ecosystems.

Srayko, S.¹, Jardine, T.², Phillips, I.¹, and Chivers, D.¹

¹Department of Biology, 112 Science Place, University of Saskatchewan, Saskatoon, SK. ²School of Environment and Sustainability, 117 Science Place, University of Saskatchewan, Saskatoon, SK.

Linkages between spatially separated water bodies in the form of migratory insects have the potential to greatly influence ecosystem functioning and food web dynamics. Migratory insects that act as food web subsidies can also be instrumental to fish production in lotic ecosystems. We have identified a potentially important subsidy in the form of migrating corixids (Hemiptera: Corixidae) that move from wetlands into the North and South Saskatchewan Rivers during the fall. Results from 2015 and 2016 indicate that corixid migration begins in late September, marked by tremendous increases in abundance in the rivers and decreased abundances of migratory corixid species in wetlands. A shift in species composition also occurs as wetland migrants arrive in the rivers. The stable isotope of sulphur was used to trace this migration between the two habitats. Gut content analyses show that goldeye (*Hiodon alosoides*), mooneye (*Hiodon tergisus*), longnose sucker (*Catostomus catostomus*) and white sucker (*Catostomus commersoni*), make heavy use this forage subsidy. This study could underscore a need for the integrated conservation of both wetland and river habitats by characterizing a linkage that exists between these spatially separated ecosystems.

37. Ebb and Flow: Tracking populations of the invasive weevils, *Ceutorhynchus obstrictus* and *Sitona lineatus* in Western Canada.

Tansey, J.¹, Vankosky, M.², Meers, S.³, Weiss, R.², Barkley, S.³, and Peru, C.¹

¹Saskatchewan Ministry of Agriculture, ²Agriculture and Agri-Food Canada, ³Alberta Agriculture and Forestry.

Accidental introduction has led to established and spreading populations of the important canola pest, the cabbage seedpod weevil, *Ceutorhynchus obstrictus* (Marsham), and the important pea pest, the pea leaf weevil, *Sitona lineatus* L. in Western Canada. Population dispersal and prevalence are monitored through collaboration of multiple Provincial and Federal agencies. Recent surveys have indicated continued spread, but reduced numbers of both insects. We describe survey and sampling efforts and suggest some factors that could be contributing to reduced numbers.

38. Toxicity and Effects of *Cannabis sativa* Oils on *Bombus impatiens*.

Verhallen, J.¹ and Prager, S.¹

¹Department of Plant Sciences, University of Saskatchewan, Saskatoon, SK.

Cannabis sativa (Hemp) is wind pollinated crop known to produce volatile terpenes as well as cannabinoids such as Δ^9 -tetrahydrocannabinol (THC) and cannabidiol (CBD). These cannabinoids are known to cause behavioural effects in many animals including humans and these effects haven been well studied. However, while insects are known to not have the same cannabinoid receptors as mammals, the effects of cannabinoids on insect behavior have not been greatly explored. As a first step to performing behavioral analyses, it is necessary to determine relative levels of toxicity. A dose response curve was constructed using *Bombus impatiens* and three *Cannabis* oils containing varying levels of CBD and THC. Oils that contained less CBD were found to be highly toxic compared to oils with higher levels of CBD and

control. Based on the dose-response curve, a sublethal dose was also found and used to evaluate the amount of movement *B. impatiens* exhibited an hour after being dosed with oils or control. The more toxic oils were also found to make the insects less active while the less toxic oil caused the insects to become hyperactive. Further research on the toxicity and effects of cannabis oils on other insects is needed to determine if there are potential practical applications of cannabis oils in pest management or they may pose a threat to pollinators when grown in large scale field production.

39. Effects of overwintering length and temperature on pea leaf weevil (Coleoptera: Curculionidae) survival and oviposition.

Wijerathna, A.¹, Evenden, M.L.¹, and Càrcamo, H.A.²

¹Department of Biological Sciences, University of Alberta, Edmonton, AB. ²Agriculture and Agri-Food Canada, Lethbridge, AB.

The pea leaf weevil (PLW), *Sitona lineatus* L. is an invasive pest of field pea and faba bean. Cold hardiness is an essential component for winter survival as it expands its range in North America. Pea leaf weevil does not undergo obligatory diapause but resumes feeding on perennial legumes if conditions are suitable. Here, we investigate the effects of overwintering duration and temperature on PLW survival and oviposition in the laboratory. Reproductively inactive weevils collected in the fall were overwintered in the dark at 5°C and 10°C during 10 or 20 weeks. Survival was recorded at the end of the overwintering period. Weevils that survived the various overwintering treatments were subsequently introduced in pairs to pots containing two faba bean plants. After 14 days, the number of feeding notches on plants and the number of eggs laid were counted in each pot. Weevil survival, oviposition and feeding are compared between the two different overwintering temperatures and the two overwintering periods. An understanding of overwintering survival and effects that overwintering length and temperature have on oviposition will provide insight into the future invasion success of PLW in its expanding range.

40. Status of *Aphodius fimetarius*/pedellus complex in Canada.

Wilches, D.¹, Coghlin, P.¹, Smith, A.² and Floate, K.¹.

¹Agriculture & Agri-Food Canada, Lethbridge, AB. ²Canadian Museum of Nature, Ottawa, ON.

Aphodius fimetarius (Coleoptera: Scarabaeidae) is a dung beetle native to Europe, Asia and northern Africa. Now common across southern Canada and the United States, subtle variation in colour and morphology hinted that this single species might actually comprise a complex of two co-occurring cryptic species. This suspicion was confirmed by Miraldo et al (2014) using a combination of COI gene sequences, chromosome number, and seasonal phenology. They concluded that the species previously recognized in Canada as *A. fimetarius* is actually *A. pedellus*, but had only morphological data and only from six Canadian specimens. To better confirm the status of this species complex in Canada, we undertook a more detailed examination of Canadian specimens using a combination of morphological characters and COI gene sequences. Our results support some of the key findings of Miraldo et al. (2014), but contrast in that we identify both *A. pedellus* and *A. fimetarius* in Canada. The sole reliance on morphological determinations may overlook the presence of *A. fimetarius*. In the future, we plan to use different primers and genes to further validate our findings.

**41. Testing for Evidence of the Large-X Effect in Spruce Budworm and related *Choristoneura*.
Wright, M.A.¹ and Sperling, F.A.H.¹**

¹Department of Biological Sciences, University of Alberta, Edmonton, AB.

The large-X effect is the observation that genes that affect postzygotic isolation are disproportionately located on the X chromosome. Originally observed in *Drosophila*, evidence for this effect has been found in other animals, including Lepidoptera. Unlike *Drosophila* and many other model organisms, female Lepidoptera are heterogametic. Within Lepidoptera, the Tortricidae are of interest because of the fusion of the ancestral X chromosome with an autosome. The well-studied spruce budworm (SBW) species complex in Tortricidae is of economic interest, and some of the traits that separate species in this group are already known or suspected to be X-linked. Existing resources for the SBW complex include a draft genome assembly, ddRAD sequences from studies on population structure and phylogeny, and a recently published linkage map for *Choristoneura fumiferana*. Through bioinformatic analysis of these resources using sliding window comparisons of divergences in homologous genomic scaffolds at varying genetic distances, we can quantitatively examine the distribution of species differences across the chromosomes of these moths. Preliminary progress on these analyses will be presented.

**42. The effectiveness of different Insecticides for controlling Pea Aphids in lentil and faba bean.
Zhou, N.¹, Wist, T.², and Prager, S.M.¹**

¹Dept. of Plant Sciences, College of Agriculture and Bioresources, University of Saskatchewan, 51 Campus Dr. Saskatoon, SK. ²Agriculture and Agri-Food Canada. Saskatoon, SK.

In pulse crops, aphids can result in both direct damage from feeding and indirect damage through transmission of viruses such as Pea Seed-borne Mosaic Virus (PSbMV). Saskatchewan lacks management tools required to control increasingly common aphid infestations. This project will test the efficiency of three insecticides, Matador (Lambda-cyhalothrin), Voliam Xpress (Lambda-cyhalothrin and chlorantraniliprole) and Exirel (Cyantraniliprole) in controlling pea aphids on Faba bean (CDC Snowdrop) and lentil (CDC Maxim) under field conditions at two locations (Saskatoon Farm site and Llewellyn site). Three insecticides were sprayed at different pea aphid pressures throughout the season. The number of pea aphids were counted per sweep in lentil and per plant in faba bean. The counting was done before spray, two days and ten days after application of insecticides. Overall, both Matador and Voliam Xpress showed more effective control in pea aphids than Exirel.

Index to Authors

Author	Abstract Number (bold indicates presenting author)
Achal, S.S.	4
Acorn, J.	1
Baldwin, D.	11
Barclay, S.	37
Beswick, B.	5
Bisht, V.	19
Byers, K.	30
Caouette, A.	6
Cárcamo, H.	17, 21, 39
Cartar, R.V	7, 12
Carroll, A.L.	27
Catton, H.	8
Chivers, D.	36
Coghlin, P.	40
Cook, A.	9
DeHeij, S.	10
Domnich, I.	13
Erlandson, M.A.	11, 25
Evans, M.M.	7, 12
Evenden, M.L.	4, 13 , 21, 24, 27, 29, 32, 39
Floate, K.	40
Glasier, J.R.N.	14
Grossi, A.	15
Hladun, S.	25
Harris, S.	11
Hegedus, D.D.	11, 25
Henrickson, A.	19
Jackson, L.	16
Jardine, T.	36
Jegatheeswaran, P.	17
Jewiss-Gaines, A.	18
Johnson, D.	17, 19
Kalischuk, M.	19
Kavanagh, M.	20
Kawchuk, L.	19
Krygier, R.	22
Kulkarni, S.S.	21
Lee, S.I.	22
Lumley, L.	23
Lynn, J.	19

Author	Abstract Number (bold indicates presenting author)
MacDonald, M.	24 , 35
Magor, K.	35
Meers, S.	17, 19, 37
Merrill, E.	35
Mori, B.A.	25
Morrice, S.	26
Musso A.E.	27
Myrholm, C.	22
Nakai, M.	11
Nambara, E.	25
Normandeau, J.	35
Olfert, O.O.	25
Patel, I.	28
Peru, C.	37
Phillips, I.	36
Pohl, G.	22
Prager, S.	26, 28, 31, 38, 42
Prescott, D.R.C.	12
Preti, F.	29
Proctor, H.	9, 15, 30
Ramsfield, T.	22
Reid, M.	20
Roe, A.D.	34
Romero, B.	31
Santos, M.	32
Schulze, K.	32
Shegelski, V.	27
Sieminska, E.	11
Sjolie, D.	33
Smith, A.	40
Snape, K.	34
Soroka, J.S.	25
Sperling, F.A.H.	2 , 16, 34, 35, 41
Sperling, J.	35
Srayko, S.	36
Swann, J.	5
Tansey, J.	17, 37
Theilmann, D.A.	11
Tomm, B.	22
Van Herk, W.	3 , 8
Vandenberg, A.	28
Vankosky, M.	17, 33, 37

Author	Abstract Number (bold indicates presenting author)
Verhallen, J.	38
Wahab, J.	19
Weiss, R.	37
Wijerathana, A.	39
Wilches, D.	40
Willenborg, C.	10, 33
Wist, T.	42
Wright, M.A.	41
Wonneck, M	7
Zhou, N.	42

Minutes of the Board Fall Meeting of the Entomological Society of Alberta

October 3, 2019

Elkwater Lake Lodge, Conference Room, 401 4 Street, Elkwater, Alberta T0J 1C0

Present: Lisa Lumley, Caroline Whitehouse, Bette Beswick, Mary Reid, Sarah McPike, Diana Wilches, Jennifer Klutsch, Haley Catton, Boyd Mori, Hector Càrcamo, Micky Ahn.

Regrets: Jennifer Retzlaff

1. Meeting Call to Order by president Lisa Lumley at 5:25 PM
2. Approval of Agenda, Criddle Award item added, moved by Bette Beswick, seconded by Mary Reid; Passed.
3. Approval of Minutes of May 2, 2019 spring executive teleconference meeting. Motion to approve by Mary Reid, seconded by Diana Wilches; Passed.
4. Old Business
 - a. Archives (Hector Càrcamo)
 - i. Update on donating more items to the Archives including bound volumes of the Proceedings. Hector informed the group that Douglas Craig donated a complete bound copy of the entire Proceedings of the Entomological Society of Alberta up to the early 1990's; it came from the University of Alberta Strickland Library. It is currently stored at the Lethbridge Research and Development Centre Insect Collection (museum). It will be transferred to the rest of our archives residing at the Provincial Archives in Edmonton in the future.
 - b. Bylaw revisions (Bette Beswick)
 - i. Update on registering bylaws with Alberta Registry. Bette informed the group that this needs to be done to make the changes official and she will take care of this.
 - c. Conference proceedings
 - i. Update on 2017 and 2018 proceedings (Tonya Mousseau). Tonya has indicated (via Lisa) that she will not stand for re-election. Bette Beswick volunteered to stand for the position.
 - ii. Update on proceedings missing from google drive site (Hector Càrcamo). Lisa informed the group that Tonya has completed the 2017 Proceedings but not 2018. Also 2013 and 2014 were not done by Amanda St Onge. The new editor (Bette), upon request to the secretary (Hector) will be given access to the Google drive to look for the various items to try to put together the missing proceedings.
 - d. Website (Micky Ahn)

- i. Update on adding membership forms to website. Micky informed the group that he has found a number of options for online platforms that will incorporate up to five forms in our website. He is looking at options that will include software like excel; also without transaction costs and will take award applications.
 - ii. Any feedback on the new website from the board? All agreed that the new website has a modern very pleasing look and Micky is to be congratulated and thanked for his dedication to making us look better online. The photos provided by Dan Johnson are superb and members are invited to send their favourite photos to be added to Micky.
- e. Outreach grants from ESC (Lisa Lumley)
 - i. Update and discussion on allocation of funds. Application to get \$1600 from the ESC was turned down, but they provided feedback on the need to resubmit it with more specific information on how the funds will be used. There was a discussion on the need to fill the outreach position and a candidate has been identified who is interested (Ilam). This position can participate in the grant writing and involve the Regional Directors to find concrete activities that can benefit the local communities and promote entomology. A suggestion was made to get 3 outreach kits and store each one at the local region at a designated site. A banner could also be made and Mary Reid mentioned she knows a graphic artist who could do it. Lisa will take the lead to send a new draft of the grant proposal.
- f. AGM Arrangements
 - i. Nominations for Board positions (Sarah McPike). Ilan Dominic was suggested as the new Outreach Director. A VP needs to be recruited; Caroline W. will look for one. Mary Reid will not stand for re-election for the Central Director position. Bette will stand for election to the position of Editor of the Proceedings.
 - ii. Anything anyone wants to discuss prior to presenting at the AGM? Haley Catton is looking for the original affiliation document with the ESC at the request of Neil Holliday, but so far no one knows of one.
- 5. New Business
 - a. Discussion on allocation of more than 5 student travel awards for 2019 (Hector Càrcamo). It was agreed that this year all 7 applicants will get a travel award because we received some donations, for example from Mike Dolinski and also we saved expenses when our invited after dinner speaker, Cam Goater, offered to pay for some of the expenses himself.
 - b. ESC/ESA JAM 2020 (Haley Catton). Haley informed us that the preparations are on schedule and she will present a more detailed update at the AGM. Kevin Floate and Rose De Clerck-Floate are the Co-Chairs of the scientific program. The keynote speaker will be Laura Lavine. Micky is working on the website that should be up in two weeks time. Ken Fry is the Chair of Fundraising assisted by a professional fundraiser Jeff

- Powell. The financial target will be to make 30K so 225 people should attend. There is a trip planned to the Tyrrell museum, which should prove to be a big attraction.
- c. Surplus revenue (~1500) to buy modest lunch at AGM (Hector and Caroline). The registration for the “mini joint meeting” exceeded expectation (around 90) so there is about \$1500 surplus expected for the ESA after ESS takes their share. All agreed that a modest lunch (sandwiches requested by Boyd) will be served to attract more participants during the AGM on Saturday.
 - d. GIC funds, continue re-investing? Discuss potential other uses. (Caroline Whitehouse). Caroline passed on the good news that the society has 16K in a GIC but makes very little interest and was wondering if it should be used to support more activities or invested elsewhere. Bette suggested that we do not need to discuss at this point but only be prepared to answer questions if people ask at the AGM. It seems that we are under the 55K savings allowed for non profit societies.
 - e. New Business: Criddle Award by the ESC. The ESC reminded us that during the JAM the local society (ESA) needs to select a candidate. Bette will talk to Felix Sperling who is in charge of Awards.
6. Meeting Adjournment; motion to Adjourn by Mary Reid at 6:55.

Entomological Society of Alberta 67th Annual General Meeting Minutes

5 October 2019

Elkwater Lodge, Conference Room, Elkwater, Cypress Hills, AB

List of attendees:

Ahn, Micky	Grossi, Alexandra
Beswick, Bette	Klutsch, Jennifer
Benedict, Tobin	Lumley, Lisa
Caouette, Alexandre	McPike, Sarah
Càrcamo, Hector	Mori, Boyd
Cartar, Ralph	Musso, Antonia
Catton, Haley	Pohl, Greg
Cook, Andrew	Proctor, Heather
Eberhardt, Terry	Reid, Mary
Evans, Megan	Sperling, Felix
Frost, Carol	Sperling, Janet
Fry, Ken	Wilches, Diana
Gabert, Keith	Whitehouse, Caroline

1. President Lisa Lumley called the meeting to order at 12:00 pm
2. Approval of agenda: **Moved** to accept by Greg Pohl, **Seconded** by Bette Beswick, carried. Agenda in **Appendix 1**
3. Approval of minutes of 2018 AGM as circulated by email: **Moved** to accept by Caroline Whitehouse, **Seconded** by Greg Pohl; carried.
4. Report from Secretary (Hector Càrcamo); **see appendix 2.**
5. Report from Treasurer and presentation of audited 2018 financial statement (Caroline Whitehouse); **see appendix 3.**
6. Appointment of society financial auditors: Antonia Musso and Alexandra Rossi, **accepted.**
7. Report from Webmaster: Micky Ahn was congratulated for his excellent work deploying the new web site for the society. All agreed that it is a great improvement over the old site and has a modern look. Micky mentioned that he welcomes more photographs to add to the current display, which were graciously provided by Dan Johnson. He also would welcome mini-articles on any entomological topics from our membership to increase outreach impact of our web site. Next step will be to add functionality to the site to allow registration and membership payments and abstract submission forms.
8. Report from Directors:
 - a) Director to ESC (Haley Catton): **see appendix 4.**
 - b) Northern Director (Jennifer Klutsch): **see appendix 5**
 - c) Central Director (Mary Reid): **appendix 6.** Mary has completed her term and will not stand for re-election; the membership thanked her for her excellent service to the society.
 - d) Southern Director (Diana Wilches): **see appendix 7.**

- e) Outreach Director (Vacant): no report. Some discussion that this position is very important to advance outreach by linking the work of the social media director and the webmaster. A member from Edmonton has expressed interest and will stand for election, see below.
 - f) Social Media Director: no report received. An email from Jennifer Retzlaff to president Lisa Lumley indicated an increase of Facebook page membership from 198 to 223. There were 48 posts and 96 comments. Jennifer indicated there is room for more activity and would welcome items for posting such as notices from members. Some discussion that there is a very active facebook page "Alberta Bugs and Insects" with over 3000 members, run by Lyle. Unlike our facebook page, this group is open. The decision to make ours private was made to avoid excessive spam not related to entomology. Felix Sperling reminded the group that there is a diversity of online portals as not all feel comfortable posting photos in Facebook because of intellectual property concerns.
9. Report from Editor. Tonya Mousseau informed Lisa Lumley that the 2016 issue is complete and the 2018 is almost ready. She is ready to step down and will be happy to work with the new Editor to complete the four Proceedings required: 2013, 2014, 2018 and 2019. Bette Beswick is prepared to take this task and will stand for nomination. Hector Càrcamo offered to help her with the backlog.
 10. Business arising from previous meetings
 - a) New bylaws update. Bette Beswick will register our revised bylaws with the appropriate provincial registry to make them official.
 11. Nominations and Elections. Bette Beswick volunteered to lead the nominations and calls for candidates from the floor. The following Slate was elected by Acclamation because the positions were uncontested:

Officers (1 year terms):

President: Sarah McPike (Nominated by H. Càrcamo, motion to accept nomination by Ken Fry, Seconded by C. Whitehouse)

Vice President: Terry Eberhardt (Nominated by C. Whitehouse, Motion to accept nomination by Ken Fry, Seconded by Megan Evans)

Secretary: Hector Càrcamo (Nominated by C. Whitehouse, Motion to accept nomination by Ken Fry, Seconded by Mary Reid)

Treasurer: Caroline Whitehouse (Nominated by Mary Reid, Motion to accept nomination by Haley Catton, Seconded by Greg Pohl)

Directors (3 year terms):

Director to the ESC: Boyd Mori (Nominated by H. Càrcamo, Motion to accept nomination by Greg Pohl, Seconded by Diana Wilches)

Central Director: Tobin Benedict (Nominated by Mary Reid, Motion to accept nomination by Caroline Whitehouse, Seconded by Greg Pohl)

Outreach Director: Ilan Domnich (Nominated by Lisa Lumley, Motion to accept nomination by C. Whitehouse, Seconded by H. Càrcamo)

Proceedings Editor: Bette Beswick (Nominated by Haley Catton, Motion to accept nomination by Mary Reid, Seconded by Greg Pohl)

The following positions have continuing terms indicated in parentheses:

Southern Director: Diana Wilches (2020)

Northern Director: Jennifer Klutsch (2021)

Social Media Director: Jennifer Retzlaff (2020)

12. The following Resolution from Greg Pohl was presented: Given that the 2019 Sixth Joint meeting between the Entomological Societies of Alberta and Saskatchewan was a resounding success, we express our gratitude to the following: Hector Càrcamo as chair of the organizing committee, Diana Wilches and Danielle Stephens, scientific program chairs, and Caroline Whitehouse for registration. In addition, we thank Bette Beswick who chaired the awards committee, Sarah McPike chaired the nomination committee and was successful in fundraising, Micky Ahn for his work with the website and, Tyler Wist was taking photos. Moved by Greg Pohl, seconded by Lisa Lumley, Passed.
13. New Business
 - a) JAM 2020 organization (Haley Catton). The venue will be the Carriage House Inn. This is a good location and quite affordable. Cochairs for the Science Program will be Kevin Floate and Rose De Clerck-Floate. Bette Beswick will chair the LOC. Ken Fry and Geoff Powell will be in charge of fundraising and Caroline Whitehouse will serve as treasurer. The ESC management firm will handle registrations. The goal is to raise a profit of \$30,000 to be split 50% with the ESC and ESAb. Laura Levine has been recruited as one of the keynote speakers. A trip to the Tyrrel Museum is planned for 17 October. Next steps include launch of the website, which is needed to start fundraising. Comments from the floor were very positive and Haley was commended and thanked for her hard work and keeping up with the schedule to organize this large meeting.
 - b) Nomination of Honorary Member: Dr Ken Fry. Letter of nomination (**Appendix 8**) was read by Lisa Lumley who moved for acceptance. Hector Càrcamo seconded and the motion was carried unanimously and followed by a round of applause and words of gratitude by Ken.
14. President's Address (**appendix 9**). Lisa Lumley read an inspiring and touching speech relating the importance of the Entomological Society of Alberta as a community for insect enthusiasts to share in a friendly spirit – a kind of second family for many of us.
15. Adjournment, moved by Megan Evans at 1:45 pm

2019 Annual General Meeting Appendices: Agenda and Reports

Appendix 1

Draft Agenda

Entomological Society of Alberta Annual General Meeting Agenda – 12:00 (TBC) 5 October 2019

Elkwater Lodge, Conference Room, Elkwater, Cypress Hills, AB

1. Call to Order (Lisa Lumley)
2. Approval of agenda
3. Approval of minutes of 2018 AGM
4. Report from Secretary (Hector Càrcamo)
5. Report from Treasurer and presentation of audited 2018 financial statement (Caroline Whitehouse)
6. Appointment of society financial auditors (Caroline Whitehouse)
7. Report from Webmaster (Micky Ahn)
8. Report from Directors:
 - a) Director to ESC (Haley Catton)
 - b) Northern Director (Jennifer Klutsch)
 - c) Central Director (Mary Reid)
 - d) Southern Director (Diana Wilches)
 - e) Outreach Director (Vacant)
 - f) Social Media Director (Jennifer Retzlaff)
9. Report from Editor (Tonya Mousseau)
10. Business arising from previous meetings
 - a) New bylaws update (Bette Beswick)
11. Nominations and Election (Sarah McPike)
12. Resolutions
13. New Business
 - a) JAM 2020 organization (Haley Catton)
 - b) Nomination of Honorary Member
14. President's Address
15. Adjournment

Appendix 2

Secretary's report to the 2019 ESA AGM

This year was a busy one for the secretary. Our inbox got 113 emails, but the majority (~75%) had to do with internal society matters or the organisation of the 6th Joint Meeting of the ESA and ESS. Here I highlight items related more to community outreach contacts.

This year we had 3 media requests:

- CBC Calgary: mosquitos
- Edmonton Journal – Painted Ladies, Pollinators
- Global Calgary - Slugs

Class Presentations: Grade 2 in Edmonton and Calgary

Advertisements for graduate students or research assistant or faculty positions in Quebec, Manitoba, Saskatchewan and Alberta (about half dozen)

Mentorship requests

One for young lady in Calgary area

Miscellaneous “bug” questions:

- Bees protection
- Maple bug confused with lily leaf beetle
- Tiny bug in Saskatoon (too small to id)
- Request for insect model for artist making giant insect sculpture
- Request about buying Trichogramma wasps for biocontrol in greenhouse
- Query about where to get pseudoscorpions for varroa mites

In summary the position of secretary provides an opportunity to get a broad perspective of what is in the minds of the entomological community and the public and it is not excessively onerous in terms of time commitment...(should anyone be keen to take my job...)

Submitted by Hector Càrcamo

Appendix 3
Treasurer's Report
Annual General Meeting – to 1 October 2019

Prepared by Caroline Whitehouse

Member Status 2018		
Type	In good standing	Delinquent but on the books
Free library	20	--
Library	--	1
Honourary	3	--
Regular	39	27
Retired	1	1
Student	29	31
Total	92	60

AGM 2018 overview – Edmonton, AB

Registration	8,640.00
Expenses - meeting	(7,513.07)
Expenses – speaker	(190.00)
Awards	(2,500.00)
Donation – Mike Dolinski	250.00
Net	(1,813.07)

AGM 2018 attendance

Day	1
Non-member	1
Regular	20
Student/retired	20
Total	42

Member Status 2019		
Type	In good standing	Delinquent but on the books
Free library	20	--
Library	1	1
Honourary	2	2
Regular	33	33
Retired	--	2
Student	27	39
Total	83	74

Estimated AGM 2019 attendance

Day	9
Regular	44
Student/retired	28
Banquet	12
Total	93

Income Statement
Entomological Society of Alberta
Reporting period: 2018-01-01 to 2018-12-31
Created: 2019-09-05

<u>Accounts</u>	<u>Balance</u>
Revenue	
Interest - Bank Account	3.56
Interest - GIC Term Deposits	283.60
Dividends - Common_shares	27.76
Membership Dues	1,140.00
AGM - Registrations and Banquet Ticket Sales	8,640.00
Donations	250.00
Total Revenue	10,344.92
GROSS PROFIT	10,344.92
Operating Expenses	
Awards, Grants & Scholarship Donations	2,500.00
AGM - Room Rental & Hosting	7,513.07
AGM - Speaker Expenses	190.00
Paypal Fees	257.38
Postage and delivery	1.89
Total Operating Expenses	10,462.34
NET PROFIT	(117.42)

Approved by Auditor:

Jennifer Klutsch

Printed name

M Klutsch

Signature

27 Sept 2019

Date

Approved by Auditor:

Carol Frost

Printed name

Carol Frost

Signature

27 sept 2019

Date

Balance Sheet
Entomological Society of Alberta
As of: 2018-12-31
Created: 2019-09-05

<u>Account</u>	<u>Balance</u>
Asset	
Cash on Hand	9,863.28
Common Shares	812.28
Paypal	77.38
GIC Term Deposits	16,041.81
Total Assets	26,794.75
 Liability	
Total Liabilities	-
 Equity	
Previous Year(s) Earnings	27,029.07
Current Year Earning	(234.32)
Total Equity	26,794.75
 Total Liabilities and Equity	26,794.75

Income Statement

Entomological Society of Alberta

Reporting period: 2019-01-01 to 2019-08-31

Created: 2019-10-01

<u>Accounts</u>	<u>Balance</u>
Revenue	
Interest - Bank Account	0.84
Membership Dues	170.00
AGM - Registrations and Banquet Ticket Sales	150.00
Total Revenue	320.84
GROSS PROFIT	320.84
 Operating Expenses	
AGM - Room Rental & Hosting	500.00
Paypal Fees	3.53
Postage and delivery	36.13
Proceedings printing	150.00
Total Operating Expenses	689.66
NET PROFIT	(368.82)

Balance Sheet
Entomological Society of Alberta
As of: 2019-08-31
Created: 2019-10-01

<u>Account</u>	<u>Balance</u>
Asset	
Community Plan-1	9,533.90
Common Shares	812.28
Paypal	37.94
GIC Term Deposits	16,041.81
Total Assets	26,425.93
 Liability	
Total Liabilities	-
 Equity	
Previous Year(s) Earnings	26,554.12
Current Year Earning	(368.82)
Total Equity	26,185.30
 Total Liabilities and Equity	26,185.30

Appendix 4
2019
Entomological Society of Alberta
Regional Director to the Entomological Society of Canada (ESC) Report
September 26, 2019

The ESC Board of Directors met in person in November 2018 in Vancouver, by phone in January, April, and June 2019, and again in person in Fredericton in August 2019. The normal time for a Joint Annual Meeting (JAM) is October. The timing was odd this past year since the 2018 JAM was late (November) and the 2019 was early (August).

1) Joint Annual Meetings (JAMs)

- a) The 2019 JAM was held on 18-21 August in conjunction with the Canadian Society of Ecology and Evolution in Fredericton, NB. Theme = "Naturally Connected". Attendance was great with over 640 people!
- b) The 2020 JAM will be held on 18-21 October in Calgary, AB at the Carriage House Inn. Theme = "2020 Vision"

Local Organizing Committee is as follows: Haley Catton (General Chair), Rose De Clerck-Floate and Kevin Floate (Scientific Co-Chairs), Ken Fry (Fundraising Chair), Bette Beswick (Local Organizing Chair), Caroline Whitehouse (Treasurer).

- c) Future JAMS:
 - i) 2021: Ontario, dates and location to be determined.
 - ii) 2022: Vancouver BC, Nov 13-16, held jointly with the Entomological Society of America.
 - iii) 2023 Saskatchewan, dates and location to be determined.
- d) Starting in 2020, the ESC is instituting a Code of Conduct to be followed at the JAMs. Details are still being ironed out by the ESC Board, but the code will address harassment and appropriate behaviour by attendees, and have legal implications.

2) News

- a) The ESC has instituted a new membership category targeted at amateur entomologists. The "Entomology Enthusiast" category has reduced fees, but retains access to The Canadian Entomologist. The ESC is hopeful to attract new members to this category.
- b) June 8, 2019 was Canada's first annual National Insect Appreciation Day! This event provided encouragement for outreach events, school activities, and media coverage.
- c) ESC will be asking for submissions to a short blog series called "Canada's Coolest and Cruellest Insects".

3) Resources

- a) A new database of public education and outreach resources is now on the ESC website.
<http://esc-sec.ca/entomology-resources/education-and-outreach/>

Reminder that esc-sec.ca also has links to the national insect identification service, a database of common names, and a directory of entomology in Canada.

- b) A one-time \$1,000 grant for public outreach was available to each regional society in 2019. (*Did anyone in Alberta apply?*). Reminder that \$200 is available annually to each regional society for public outreach and education efforts.

4) Strengthening relationship between ESC and Regional Societies

- a) In February 2019 a second annual phone meeting occurred between the ESC Executive Council (President, 1st Vice-President, 2nd Vice-President, Past-President), ESC Treasurer and Secretary, the Presidents of Regional Societies, and Regional Directors from each society. The purpose of this meeting was to explore strengthening the bonds between the national society and regional societies. There is now greater representation of each society on all member society websites.
- b) ESC is searching for the original affiliation documents with each regional society. An official request will come from the ESC Secretary asking for this document.

5) ESC Board of Directors & Officers (2019-2020)

Board of Directors:

- a) President: Gail Anderson (BC)
- b) 1st Vice-President: Bill Riel (BC)
- c) 2nd Vice-President: Felix Sperling (AB)
- d) Past-President: Kevin Floate (AB)
- e) Directors-At-Large: Deepa Pureswaran (2020, QC), Suzanne Blatt (2021, NS), Christine Noronha (2022, PEI)
- f) Regional Directors: Brian Van Hezewijk (ESBC), Boyd Mori (ESAB), James Tansey (ESS), Kateryn Rochon (ESMB), Alex Smith (ESO), Étienne Normandin (SEQ), Peggy Dixon (AES)

Officers:

- g) Student and Early Professional Representative: Rachel Rix (NS)
- h) Treasurer: Joel Kits (ON)
- i) Secretary: Neil Holliday (AB)
- j) Bulletin Editor: Cedric Gillott (SK)
- k) Assistant Bulletin Editor: Donna Giberson (PEI)
- l) Webmaster: Jordan Bannerman (MB)
- m) The Canadian Entomologist Editor-in-Chief: Dezene Huber (BC)
- n) Social Media Administrators: Morgan Jackson (ON), Angela Gradish (ON)

This report marks the end of my 3-year term as ESAB's Regional Director to ESC. Thank you for the experience, it has been so great getting to know you all and work with you all. Pending election at the ESAB AGM, Boyd Mori is expected to take this role on in the future.

Submitted by Haley Catton

Regional Director ESC

September 26, 2019

Appendix 5

ESAB Fall Meeting 2019 – Northern Director Report

Compiled and submitted by Jennifer Klutsch, University of Alberta

Congratulations to many recent graduates in entomology, including:

- Vincent Del Bel Belluz, MSc, graduated from UofA, supervised by John Spence, and worked on ground beetle assemblages of western Alberta, January 2019
- Nick Grocock, MSc, graduated from UofA, supervised by Maya Evenden, January 2019
- Amanda Jorgensen, MSc, graduated from Maya Evenden's lab in January 2019 working on biology and monitoring tools of *Sitodiplosis mosellana*
- Kelsey Jones, MSc, graduated from Maya Evenden's lab and worked on "Influence of Semiochemical Cues on the Mountain Pine Beetle Flight and Subsequent Effect of Flight on Host Colonisation Processes" April 2019
- Emily Durkin, PhD, graduated from UofA in 2018, supervised by Lien Luong, and worked on evolutionary ecology of parasitism using a facultatively parasitic mite and fly-host system
- Tyler Nelson, MSc, graduated from Felix Sperling's lab at UofA and worked on eastern spruce budworm (*Choristoneura fumiferana*)
- Stephen Trevoy, MSc, graduated from Felix Sperling's lab and worked on genomics of mountain pine beetle (*Dendroctonus ponderosae*) in Alberta.
- Altaf Hussain, PhD, graduated from Nadir Erbilgin's lab at UofA in August 2019 working on spatial characteristics of volatile communication of mountain pine beetle (*Dendroctonus ponderosae*)
- Violet (Shiyang) Zhao, PhD, from Nadir Erbilgin's lab in May 2019 and worked on susceptibility of lodgepole pine to mountain pine beetle (*Dendroctonus ponderosae*) and secondary insects
- Melanie Mullin, MSc, graduated from Nadir Erbilgin's lab in July 2019 and worked on mountain pine beetle (*Dendroctonus ponderosae*) and host tree interactions
- Federico Riva defended his PhD with John Acorn and Scott Nielsen at UofA on the effects of anthropogenic and natural disturbances on boreal forest butterflies, in December of 2018

Student Award news:

Zac MacDonald (PhD candidate with John Acorn and Scott Nielsen at UofA) received the Hanski Prize for his paper in *Oecologia*, entitled "Decoupling habitat fragmentation from habitat loss: butterfly species mobility obscures fragmentation effects in a naturally fragmented landscape of lake islands"

Additions to Northern Alberta's Entomology Community!

Congratulations to Dr. Boyd Mori who started as assistant professor at UofA in Agricultural Entomology! He is advertising for prospective students who can contact him if interested (bmori@ualberta.ca).

Student recruitment and project assistance requests:

Boyd Mori and Hector Càrcamo (@AAFC_Canada) are recruiting an MSc student to study alfalfa weevil insecticide resistance, population genetics and/or biological control agents. See: <https://emploisfp-psiobs.cfp-psc.gc.ca/psrs-srfp/applicant/page1800?poster=1357055>

Lien Luong at UofA is recruiting an MSc student.

Slug Survey (slugs@ualberta.ca) in Lien Luong's lab at UofA requested live slugs this last summer: "We are at it again this year! We are once again collecting slugs throughout Alberta to survey for parasites of slugs. If you have live slugs to contribute to our survey, let us know!" @SlugSurvey

Alumni news:

Evenden lab

Dr. Ronald Batallas, invertebrate laboratory coordinator, Dept Biological Sciences, University of Alberta

Nick Grocock, seasonal mountain pine beetle technician, Alberta Agriculture and Forestry

Amanda Jorgensen, laboratory technician, Agriculture and Agri-food Canada, Beaverlodge AB

Kelsey Jones, laboratory technician, Agriculture and Agri-food Canada, Winnipeg, MB

Sarah McPike, biological sciences technologist, City of Edmonton

Boyd Mori, Assistant Professor, Agriculture, Food and Nutritional Sciences, University of Alberta

Sperling lab

Rowan French finished her BSc Honours project August 2019 and has now gone directly to a PhD at University of Toronto. Rowan won the undergrad award from ESAB two years ago and already did substantive research projects on cerambycid beetles, spruce budworms and tiger beetles as an undergrad.

Erbilgin lab

Dr. Jonathan Cale recently completed his post-doc with Nadir Erbilgin and Justine Karst and joined Canopy Growth as the Research Entomologist in London, Ontario.

Loung lab

Emily Durkin, PhD, is currently a postdoc at the University of Florida.

Bugs101 update – Maya Evenden:

Our Bugs 101 MOOC was launched on June 28, 2019. As of September, there are 6095 enrolled learners from 126 countries! Thanks to everyone who participated. I will be giving more details on the MOOC in a poster at the ESAB.

Entomological events in the Northern Region:

Alberta Lepidopterists' Guild - Lisa Lumley:

The Alberta Lepidopterists' Guild (ALG) held a workshop on *Colias* butterfly identification, organized a summer field trip to Medicine Hat, and hosted several curation parties for its members. In addition, members of the ALG participated in butterfly counts across the province and in other public outreach events including Butterfly Day at the University of Alberta Botanic Garden, moth nights at Wagner Bog and in Strathcona County, and the Bug Jamboree at Ellis Bird Farm.

Royal Alberta Museum - Tyler Cobb:

Since reopening our doors to the public, the Invertebrate Zoology teams at the Royal Alberta Museum have had an active year in entomological pursuits. The new and improved "Bug Gallery" is once again bustling with activity, offering safe, close-up encounters with living invertebrates from around the world and a multitude of educational opportunities.

Behind the scenes, Invertebrate Zoology research teams have been very busy this year. For example, in partnership with the Alberta Biodiversity Monitoring Institute, efforts to sample oribatid mites and aquatic invertebrates from across the province continue to pay off. The mite team (Lisa Lumley, Ashley Thorsen, Victoria Giacobbo) has already discovered seven new species records (1 described, 6 undescribed) among last summer's soil samples. The aquatic invertebrates team (Rob Hinchliffe, Cheryl Tebby, and Alex Lapierre) has published two papers reporting on a water boatmen species (Corixidae: *Corisella inscripta*) and a beetle (Chrysomelidae: *Neohaemonia melsheimeri*) species previously undetected in Alberta and is currently working on updated regional keys to Ephemeroptera of Alberta, Corixidae of Alberta, and Haliplidae of Western Canada. In addition, assistant curator, Matthias Buck, has been making great progress on the checklist of Apoid Wasps in support of the "Hymenoptera of Canada, Alaska and Greenland" project, spearheaded by colleagues at the Canadian National Collection in Ottawa. The Invertebrate Zoology team at the Royal Alberta Museum has also been very active with public outreach through events such as the Elk Island National Park Bioblitz (in July), guest lectures at the University of Alberta, and other public presentations (e.g., Buffalo Lake Naturalist Club).

Appendix 6

Central Director report September 2019

Entomological Society of Alberta

Submitted by Mary Reid, University of Calgary

University of Calgary

- Dr. Jan Ciborowski recently joined the University of Calgary from the University of Windsor as the Industrial Research Chair in wetlands reclamation. He works primarily on aquatic invertebrates, with a current focus on northeast Alberta. He has worked extensively in Kananaskis in the past.
- Dr. Paul Galpern lab: Our lab at University of Calgary has continued its mission to sample the bees, spiders, harvestmen and Carabidae of Alberta's croplands. Our collection now houses 170,000 identified, curated, and databased specimens, all added since 2015. With the exception of a few troublesome groups, identifications are mostly at the species level. In this list are more than 300 species of bees collected during 6000 trapping events at 400 locations between Lethbridge and Grande Prairie. We are indebted to Lincoln Best for identifications, and the two months of each year he has spent working with us. Our PhD student Danielle Clarke has also just finished a second summer in the alpine, and her bumble bee genomics work draws from material collected between Revelstoke, Jasper, Kananaskis, Banff and points in between. We are working quickly to get our database online and accessible to the public. Until then, please contact Paul Galpern directly if you have questions about records, or are looking for specimens.
- Dr. Mindi Summers and others have launched a University of Calgary biodiversity webpage and it would be wonderful if others were interested in submitting resources and logging new records into iNaturalist: <https://biodiversity.ucalgary.ca/>. They are also beginning to digitize other groups of insects and are looking for interested collaborators (mindi.summers@ucalgary.ca).
- **Alberta Native Bee Council Study:** Alberta-wide snapshot of native bee diversity (Megan Evans, Ralph Cartar, Dave Prescott)

Using blue vein traps deployed across the summer of 2018, we obtained collections from 37 locations in Alberta's forests, ranging from Talbot Lake in the N, to Adam's Creek in the NW, to Castle Mountain Resort in the SW, and spanning an elevational gradient of 1.8 km.

This is still a work in progress. The work of processing bees continues, simultaneously enhanced and limited by the citizen science aspect of the research. We relied on students and volunteers (n=19) to process specimens. As expected, we obtained enormous volunteer support primarily from members of the Alberta Native Bee Council, mostly in the Crownsnest Pass, Calgary, Red Deer, and Edmonton. Undergraduate students from the University of Calgary, and a few interested Calgarians, contributed much to the pinning and labelling efforts.

So far, we have pinned and labelled ~9,600 bumble bee specimens, with another roughly 1,000 (from one site) left to pin. We have identified ~2,100 of these, so far. All of the "bycatch" from the traps, including the bees other than bumble bees, are now safely stored in alcohol in mason jars in the University of Calgary's collections, awaiting attention. These represent an important resource, both for documenting biodiversity in all of Alberta's bees, and in allowing for a historical comparison, given future sampling.

- Dr. Samuel Robinson recently completed his PhD working under the supervision of Ralph Cartar and Shelley Hoover. His thesis is entitled "Central-place foraging, crop yield, and population change in bees: A study in canola agroecosystems". Sam will be starting a post-doc with Paul Galpern.
- Dr. Ralph Cartar retired in July 2019.

Olds College (Ken Fry)

- The Annual Bug Jamboree held at the Ellis Bird Farm was a success on August 10, 2019 with many families visiting with entomologists and naturalists to discover the wonders of insects.
- The Olds College Arthropod Collection was host to 15 separate tours of kindergarten to grade four students with a total of 300 students, parents and teachers enjoying the collection.
- The Society to Prevent Dutch Elm Disease projects on Elm Bark Beetle monitoring and Invasive Alien species surveillance were continued province-wide with traps processed at Olds College. National monitoring programs for the Emerald Ash Borer and Japanese Beetle were participated in with trapping on the Olds College Campus.

The Bighill Creek Preservation Society (Cochrane) undertook a first survey of aquatic invertebrates in the spring-charged creek, led by Tobin Benedict.

Appendix 7

SOUTHERN DIRECTOR'S REPORT FALL 2019

ENTOMOLOGICAL SOCIETY OF ALBERTA

Submitted by Diana Wilches (AAFC-Lethbridge)-October 3rd, 2019

JOB/STUDENT OPPORTUNITIES:

- **MSc student opportunity available at the University of Alberta (start date January 2020):** Alfalfa weevil insecticide resistance, spatial distribution and biological control field studies. The student will be hired through Agriculture and Agri-Food Canada's Research Affiliate Program, will need to conduct fieldwork in southern Alberta, and will be based at the Lethbridge Research and Development Centre in the summer. Contact: Boyd Mori (AAFC, Saskatoon, boyd.mori@canada.ca) and Hector Càrcamo (AAFC, Lethbridge, hector.carcamo@canada.ca)

NEW STUDENTS:

A warm welcome to the Entomological Society of Alberta to the following new students:

- **Piratheepa Jegatheeswaran** started her MSc at the Department of Geography of the University of Lethbridge. She will be working on Landscape effects on cabbage seedpod weevil abundance, damage and parasitism. Supervisors: *Dan Johnson* (University of Lethbridge) and *Hector Càrcamo* (AAFC-Lethbridge).
- **Sydney Backmeyer** started her MSc in September at the Department of Biological Sciences of the University of Lethbridge. She is studying the effect of faecal residues on insects breeding in dung of cattle treated with parasitocides and antibiotics. Supervisors: *Cam Goater* (University of Lethbridge) and *Kevin Floate* (AAFC-Lethbridge).
- **Kaileigh Nelson** started her Phd in January 2019 at UBC Okanagan in Kelowna supervised by *Rose De-Clerck Floate* (AAFC-Canada) and co-supervised by *Jason Pither* (UBC Okanagan). Kaileigh will be studying the effects of climate change (specifically moisture and nitrogen levels) on the efficacy of spotted knapweed biological control using *Larinus* spp seed weevils. The field-based part of her thesis will be undertaken in BC, but will also be conducting greenhouse experiments in our lab at the AAFC Lethbridge Research & Development Centre.

GRADUATING STUDENTS:

Congratulations to Giselle Bezanson, Sunil Shivananjappa, Shelby Dufton, Samuel Robinson and Arash Kheirodin who successfully completed and defended their theses on field work done in southern Alberta:

- **Arash Kheirodin** defended his Phd thesis: *“Effects of Landscape Structure and Natural Enemies on the Abundance of Cereal Leaf Beetle, Oulema melanopus L. (Coleoptera: Chrysomelidae), in Wheat Fields in Southern Alberta”*. Department of Entomology. August 14th. Supervisors: *Alejandro Costamagna* (University of Manitoba) and *Hector Cárcamo* (AAFC- Lethbridge).
- **Sunil Shivananjappa** defended his MSc thesis: *“Induction and Termination of Diapause in Khapra beetle, Trogoderma granarium”*. Department of Biological Sciences. August 12th, 2019. Department of Biological Sciences, University of Lethbridge. Supervisors: *Kevin Floate* (AAFC, Lethbridge), *Paul Fields* (AAFC, Morden) and *Robert Laird* (Dept. Biol. Sci., University of Lethbridge).
- **Shelby Dufton** defended her MSc thesis: *“Assessing the Impacts of Natural Enemies and Canopy Structure on Orange Wheat Blossom Midge, Sitodiplosis mosellana (Diptera: Cecidomyiidae), in the Peace River Region of Alberta”*. April 17th, 2019. Department of Biological Sciences, University of Lethbridge. Supervisors: *Jennifer Otani* (AAFC, Beaverlodge), *Kevin Floate* (AAFC, Lethbridge) and *Robert Laird* (University of Lethbridge).
- **Giselle Bezanson** defended her MSc thesis: *“Assessing the Effect of Habitat, Location and Bait Treatment on Dung Beetle (Coleoptera: Scarabaeidae) in Southern Alberta, Canada”*. March 27th, 2019. Department of Biological Sciences, University of Lethbridge. Supervisors: *Kevin Floate* (AAFC, Lethbridge) and *Cam Goater* (University of Lethbridge)
- **Samuel Robinson** defended his Phd thesis: *“Central-place foraging, crop yield, and population change in bees: A study of canola agroecosystems”*. June 20th, 2019. Department of Biological Sciences, University of Calgary. Supervisors: *Ralph Cartar* (University of Calgary) and *Shelley Hoover* (Alberta Agriculture and Forestry)

NEWS:

- We wish the best to **Vincent Hervet** who left Alberta in April to start a new position as Scientist in Stored Products Entomology at Agriculture and Agri-Food Canada, Morden Research and Development Centre, Manitoba.
- Congratulations to **Diana Wilches** who was hired in July by AAFC, Lethbridge as an indeterminate research technician to work with Kevin Floate.
- Congratulations to **Rose De-Clerk Floate** who converted the lead singer of the Arkells (Max Kerman) to entomology during their flight from Calgary to Lethbridge. The Arkells is a Canadian rock band that was in the lined up for Whoop-up days in Lethbridge, before performing Max gave the Lethbridge Bug Lady (Rose) a shout out in local media!. See the interview: <https://globalnews.ca/video/5807706/arkells-prepare-to-hit-stage-at-whoop-up-days>

EVENTS:

- **John Swann** and **Bette Beswick** made a presentation at the Beauvais Lake Provincial Park amphitheatre on Saturday August 24 to an audience of about 50 people. We described our 6-year insect collecting program in the park and presented some of the results. John made up 6 beautiful display boxes that drew a lot of interest.
- **Bette Beswick** volunteered in the Pincher Creek's *Day on the Creek* event on May 29. It is organized by the Waterton Biosphere Reserve, Town of Pincher Creek, Alberta Parks and Livingstone Range School Division. About 700 students were rotated through a range of activities including Incredible Insects where they talked with about 150 Grade 2 students about insects (the theme this year was "Supper").
- In late May, **Bette Beswick** spent a couple of days with volunteers who are implementing a Malaise trap program at the Big Hill Creek Conservation Area near Cochrane. She showed them how they are doing their project at Beauvais Lake Provincial Park so they can initiate their own monitoring project.
- **Megan Evans** held a workshop to build bumble bee domiciles with the Lethbridge Bee Enthusiasts on March 27th, 2019 at the Helen Schuler Nature Centre, Lethbridge, Alberta.
- **Diana Wilches** presented on Orchid bees to the Lethbridge Bee Enthusiasts group (20 people) on April 24th in Lethbridge, Alberta.
- The **Alberta Birds of Prey Foundation** in Coaldale, Alberta, hosted the **9th Insect Discovery Day** on August 3rd, 2019. The attendance of hundreds of people of all ages attested to its success. Activities included catching and identifying aquatic and terrestrial insects, demonstrations of beneficial insects, and displays detailing parasites transmitted by insects (See pictures below). The stick bugs drew the attention of the crowds and the few brave ones in attendance handled the hissing cockroaches. Entomologists from the Entomological Society of Alberta collaborated with the Alberta Birds of Prey Foundation to organize the event. Many thanks go out to the 12 plus volunteers without whom the event would not have been possible. See media release: <https://www.bridgcitynews.ca/news/its-bug-day-at-birds-of-prey>



9th Insect Discovery day on August 3rd, 2019. Left: Kevin Floate engaging the participants by examining the catch in a sweep net. Right: Future young beekeeper checking out the queen bee.

Appendix 8

Honorary Membership Nomination

September 3, 2019

Dr. Hector Cárcamo, Secretary

Entomological Society of Alberta

Re: Honorary member nomination for Dr. Ken Fry

We are writing to nominate Dr. Ken Fry for an honorary membership in the Entomological Society of Alberta. Ken has been a dedicated entomologist in Alberta for over 25 years.

Ken obtained a B.Sc. specializing in entomology from the University of Alberta before attending the University of Guelph to complete an M.Sc. He returned to the University of Alberta to complete a Ph.D. with Dr. Douglas Craig. His doctoral research focused on the physico-chemical influences in food-particle capture and handling by culicid and simuliid larvae to assist with the development of species-specific control measures.

Ken was a research scientist with the Alberta Research Council for nine years before moving to Olds College. He is the Coordinator for Horticulture, the Vice President of Academics, and an entomology instructor at the college. His research continues to focus on the biological control of insect pests and integrated pest management. He curates the insect collection at Olds College and participates in the Invasive Alien Species Surveillance program (Society of Prevent Dutch Elm Disease), among other programs. He actively engages with students, the general public and other groups on topics like biological control and integrated pest management. In 2008 he co-authored, along with Doug Macaulay and Don Williamson, Garden Bugs of Alberta: gardening to attract, repel and control.

Not only has Ken been a member of the society for more than two decades, he has actively participated to further our activities. He was the Vice-President in 1998 and President in 1999, led the organizing committee for the 2000 meeting held in Edmonton and 2007 and 2013 meetings held in Olds, and served as the secretary for our society for a decade (2007 – 2017). Given Ken's significant accomplishments and extensive participation in the society we are delighted to nominate him as an honorary member of ESAb.

Regards,

Caroline Whitehouse
Lisa Lumley
John Swann

Appendix 9

ESA President's Address

First, I would like to extend a huge thank you to everyone who has helped to organize this meeting. In particular, Hector Cárcamo for all of his efforts as chair of the organizing committee, Diana Wilches and Danielle Stephens for putting together the scientific program, and Caroline Whitehouse for registration. In addition, there were many activities quietly happening in the background. Bette Beswick chaired the awards committee, Sarah McPike chaired the nomination committee and was successful in fundraising, Micky Ahn kept the website updated, Tyler Wist was the photographer, many members helped moderate sessions, and the staff at Elkwater Lake Lodge offered their hospitality. A round of applause to everyone who contributed to a successful meeting.

I would also like to thank the executive for their work over the past year. Everyone has worked so well together, and I'm particularly thankful to Caroline Whitehouse, Hector Cárcamo, and Bette Beswick for their historical knowledge of the society. I would also like to acknowledge the contributions of Haley Catton, who will be vacating her position as our representative to the national society and focusing on spearheading the JAM 2020, to Tonya Mousseau who will be vacating her position as the Proceedings Editor, and to Mary Reid who has completed her term as Central Director. A warm welcome to new incumbents to the executive: Boyd Mori, Terry Eberhardt, Tobin Benedict and Ilan Domnich, as well as to Bette Beswick for taking on the Proceedings Editor position.

This meeting has brought together many memories of entomological firsts for me. From my first full time entomology job with Ken Fry, who has just gained honorary member status – to the very first Alberta Lepidopterists' Guild moth night that I attended where I recall Doug Macaulay, who won the Carr Award last night, enthusiastically naming species coming to the sheet – to my first day of grad school in which Dr. George Ball, who we honoured yesterday, was the first person that I met and talked with on my walk in to university. There are more, but the point here is that I am deeply grateful to be a part of such a strong, diverse entomological community here in Alberta. Each of us in this room likely has a similar set of memories, of those that have inspired us to turn to entomology as a career and to continue to progress in the profession. Each of you have had a positive influence on me, whether you know it or not, even just by attending and participating in these meetings. When we strive to connect, contribute, and be involved, this community is more than handing out business cards. It's really a second family, a place to form strong and lasting friends, colleagues, and collaborations. Let us continue in these positive ways, to inspire and strengthen many more generations of entomologists.

With that, I will end by saying thank you for allowing me to serve as your president in 2019. May we continue to retain and exude the pure innocent joy that comes from the love of bugs.

Lisa Lumley
October 5, 2019

Frederick S. Carr Award Nomination

To: Awards Committee, Entomological Society of Alberta, 3 September 2019

Dear Awards Committee and Directors, ESAB;

We would like to nominate A. Douglas Macaulay for the 2019 Entomological Society of Alberta Carr Award. Mr. Macaulay has been heavily involved in entomology in Alberta for more than twenty years. Although he has been employed at times as an entomologist, we are nominating him solely on the basis of his volunteer contributions to entomology in Alberta, which are legion.

Mr. Macaulay's amateur insect biodiversity work was already underway in the 1990's, and he was a founding member of the Alberta Lepidopterists Guild in 1999. Beginning in 2001, he contributed substantially as a volunteer to bio-inventory expeditions organised by Alberta Parks, culminating in several reports documenting Lepidoptera and Odonata distributions in Wildland Provincial Parks. More recently he has carried out Lepidoptera survey work in several Provincial Parks, and provided 18 reports to Alberta Parks detailing his findings (Macaulay 2002-2016, see below). He continues to update several of these on a semi-annual basis. Through this volunteer work, he has discovered at least 35 new Alberta records of moths. He also co-authored the description of a new species, *Dodia tarandus* (Schmidt & Macaulay 2009). His volunteer research contributions earned him co-authorship on a recent checklist of the Lepidoptera of Canada (Pohl et al. 2018). Additionally, he has co-authored three popular insect guide books: Garden Bugs of Alberta (Fry et al. (2008), Garden Bugs of British Columbia (Elmhirst et al. (2008), and Garden Bugs of Ontario (Foster et al. 2008).

Besides all this survey and scholarly work, Mr. Macaulay also regularly does entomological outreach with the public through talks and guided walks about insects.

Based on all these activities, we hope you will agree that Mr. Macaulay is an excellent candidate for the Carr Award.

Sincerely,

Greg Pohl and Felix Sperling

List of D. Macaulay Reports and Publications:

Elmhirst, J., Fry, K.M., and Macaulay, A.D. 2008. Garden Bugs of British Columbia. Lone Pine Press, Edmonton, AB. 224pp.

Foster, L., Fry, K.M., and Macaulay, A.D. 2008. Garden Bugs of Ontario. Lone Pine Press, Edmonton, AB. 224pp.

Fry, K.M., Macaulay, A.D., and Williamson, D. 2008. Garden Bugs of Alberta. Lone Pine Press, Edmonton, AB. 224pp.

Macaulay, A.D. 2002. Survey of Odonata in the Canadian Shield Natural Region of Northeastern Alberta. II. 2001 Survey of the La Butte Creek and Fidler Greywillow Wildland Parks. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB.

Macaulay, A.D. 2003. Survey of Odonata in the Canadian Shield Natural Region of Northeastern Alberta. II. 2002 Survey of Colin-Cornwall Wildland Parks. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB.

Macaulay A.D. 2004. Survey of Lepidoptera of the Wainwright Dunes Ecological Reserve, Alberta. Report prepared for the Alberta Lepidopterists' Guild, Edmonton, AB, 6 pp. Also available at http://www.biology.ualberta.ca/old_site/uasm/alg/projects/inventory_faunal.html

Macaulay, A.D. 2005. Survey of the Odonate Fauna in Birch Mountains Wildland Park. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB.

Macaulay, A.D. 2006. Survey of the Lepidoptera fauna from the Holmes Crossing Ecological Reserve, the Fort Assiniboine Sandhills Wildland Park, and nearby areas. Report prepared for the Alberta Lepidopterists' Guild, Edmonton, AB, 26 pp. Also available at http://www.biology.ualberta.ca/old_site/uasm/alg/downloads/HolmesLepReport06DEC06.pdf

Macaulay, A.D. 2007a. Lepidoptera list of the Peace River Parkland subregion in northwestern Alberta. Report prepared for the Alberta Lepidopterists' Guild, Edmonton, AB, 16pp.

Macaulay, A.D. 2007b. Survey of the Odonate Fauna in Kakwa Wildland Park. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB.

Macaulay, A.D. 2008a. Survey of the Odonate Fauna in Willmore Wilderness Park. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB. 13pp.

Macaulay, A.D. 2008b. Survey of the Lepidoptera fauna in Wilmore Wilderness Park. Report prepared for Alberta Tourism, Parks and Recreation, Resource Management Coordination Branch, Alberta Natural Heritage Information Centre, Edmonton, AB.

29 pp. + appendices. Available at:

http://www.albertaparks.ca/media/3194950/LepidopteraOfWilmoreWildernessPark07_11JAN09_2_.pdf

Macaulay, A.D. 2009. Lepidoptera survey of the Peace River Parkland subregion in northwestern Alberta. Report prepared for Alberta Tourism, Parks and Recreation, Resource Management Coordination Branch, Alberta Natural Heritage Information Centre, Edmonton, AB. 16 pp. + appendices. Available at:

<http://www.albertaparks.ca/media/3195302/PreliminaryListLepidopteraPeaceRegion10APR08.pdf>

Macaulay, A.D. 2016a. Survey of the Lepidoptera of Dinosaur Provincial Park. Alberta Species at Risk Report No. 157. Alberta Environment and Parks. Edmonton, AB. 26pp. Available at: <http://aep.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/invertebrates/documents/SAR157-LepidopteraDinosaurParkMay2017.pdf>

Macaulay, A.D. 2016b. Survey of Lepidoptera of Writing-on-Stone Provincial Park. Alberta Species at Risk Report No. 158. Alberta Environment and Parks, Edmonton, AB. 35pp. Available at: <http://aep.alberta.ca/fish-wildlife/species-at-risk/species-at-risk-publications-web-resources/invertebrates/documents/SAR158-LepidopteraWritingOnStone-May2017.pdf>

Macaulay, A.D. 2016c. Survey of Lepidoptera of the Wainwright Dunes Ecological Reserve. Alberta Species at Risk Report No. 159. Alberta Environment and Parks, Edmonton, AB. 31pp. Available at: <http://aep.alberta.ca/fishwildlife/species-at-risk/species-at-risk-publications-web-resources/invertebrates/documents/SAR159-LepidopteraWainwrightDunes-May2017.pdf>

Macaulay, A.D., Dunne, S. 2001. A checklist of the moths (macro-lepidoptera) of the Weldwood Forest Management Area. Report prepared for Weldwood of Canada Limited, Hinton, AB; Alberta Lepidopterists' Guild, Edmonton, AB, 17pp. Also available at:

http://www.biology.ualberta.ca/old_site/uasm//alg/downloads/WWFinal01DEC03.pdf

Macaulay, A.D., Dunne, S. 2004. Survey of the Odonate Fauna in Caribou Mountains Wildland Park. Unpubl. Report, Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB.

Macaulay, A.D., Pohl .G.R. 2002. Survey of Lepidoptera in the Canadian Shield Ecoregion of northeastern Alberta. II. 2001 survey of La Butte Creek and Fidler/Greywillow Wildland Parks. Report prepared for Alberta Community Development, Parks and Protected Areas Division, Alberta Natural Heritage Information Centre, Edmonton, AB, 61pp. Also available at

http://www.biology.ualberta.ca/old_site/uasm/alg/projects/inventory_faunal.html#boreal

Macaulay, A.D., Pohl, G.R. 2003. Survey of Lepidoptera in the Canadian Shield Ecoregion of northeastern Alberta III. 2002 survey of Colin-Cornwall Lakes Wildland Park. Report prepared for the Alberta Natural Resources Service and Alberta Community Development, Parks and Protected Areas Division, Alberta Natural Heritage Information Centre, Edmonton, AB, 44pp. Also available at http://www.biology.ualberta.ca/old_site/uasm/alg/projects/inventory_faunal.html#boreal

Macaulay, A.D., Pohl, G.R. 2005. Survey of the Lepidoptera fauna in Birch Mountains Wildland Provincial Park. Report prepared for the Alberta Community Development, Parks and Protected Areas Division, Alberta Natural Heritage Information Centre, Edmonton, AB, 13pp. + appendices. Also available at http://www.biology.ualberta.ca/old_site/uasm/alg/projects/inventory_faunal.html#subarctic

Pohl, G.R., Landry, J.F., Schmidt, B.C., Lafontaine, J.D., Troubridge, J.T., Macaulay, A.D., van Nieukerken, E.J., DeWaard, J.R., Dombroskie, J.J., Klymko, J. and Nazari, V., 2018. Annotated checklist of the moths and butterflies (Lepidoptera) of Canada and Alaska. Pensoft Series Faunistica No 118, 580pp.

Schmidt, B.C., Macaulay, A.D. 2009. A new species of *Dodia* Dyar (Noctuidae, Arctiinae) from central Canada. *ZooKeys* 9: 79-88.

Schmidt, B.C., Macaulay, A.D., Pohl, G.R. 2004. Survey of Lepidoptera in the Sub-Arctic Ecoregion of northeastern Alberta. I. 2003 survey of Caribou Mountains Wildland Park. Report to the Alberta Natural Resources Service and Alberta Natural Heritage Information Centre, Parks and Protected Areas Division, Alberta Community Development, Edmonton, AB. 42pp.

Conference Photos



David Larson, Keynote speaker – Our Quarter: entomology of the prairie homestead

Two of the George Ball Symposium Speakers



Beetles, books and Ball: the context and style of George Ball's influence on insect systematics
Felix Sperling



Faunistic entomology, post-glacial biogeography, and the legacy of Professor George E. Ball
John Acorn

The Evenden lab from the University of Alberta was well-represented, with eight presentations/posters.



back row: Asha Wijerathna, Katie Schulze, Maggie MacDonald, Flavio Preti
front row: Sharavari Kulkarni, Antonia Musso, Maya Evenden and Siena Achal.

Entomological Society of Alberta 2019 Membership List

Last Name	First Name	Institution	Location
Honorary Members			
Byers	Bob	Agriculture and Agri-Food Canada	Lethbridge, AB
Shemanchuk	Joseph		Lethbridge, AB
Regular Members			
Acorn	John	University of Alberta	Edmonton, AB
Bahreini	Rassol	Alberta Agriculture and Forestry	Edmonton, AB
Barkley	Shelley	Alberta Agriculture	Brooks, AB
Barr	William	City of Edmonton	
Bercha	Robert		Calgary, AB
Best	Lincoln		
Beswick	Bette		Calgary, AB
Brandt	Randall	Agriculture and Agri-Food Canada	Lethbridge, AB
Briere	Charity		Red Deer
Brumec	Vesna		
Cale	Jonathan	University of Alberta	Edmonton
Cárcamo	Héctor	Agriculture and Agri-Food Canada	Lethbridge, AB
Cartar	Ralph	University of Calgary	Calgary, AB
Catton	Haley	Agriculture and Agri-Food Canada	Lethbridge, AB
Coker	Alex		
Cuny	Robert	Lakeland College	Lloydminster, AB
Daniels	Sheree	Agriculture and Agri-Food Canada	Lethbridge, AB
DeClerck-Floate	Rosemarie	Agriculture and Agri-Food Canada	Lethbridge, AB
Domnich	Ilan		
Eberhardt	Terry		Cochrane
Evans	Megan	University of Calgary	Calgary, AB
Evenden	Maya	University of Alberta	
Flaherty	Leah	Grant MacEwan University	St. Albert
Floate	Kevin	Agriculture and Agri-Food Canada	Lethbridge, AB
Friesen	Kevin	Grant MacEwan University	Edmonton
Frost	Carol	University of Alberta	Edmonton
Fry	Ken	Olds College	Olds, AB
Fulkerth	Christine	Olds College	Olds, AB
Gabert	Keith	Canola Council	Innisfail, AB
Galpern	Paul		
Gavin	Michael		
Giacobbo	Victoria	Royal Alberta Museum	Edmonton, AB
Gomez	Christina		
Hilchie	Gerald	University of Alberta	Edmonton, AB
Hoover	Shelley	Agriculture and Rural Development	
Hossain	Mohammad		
Johnson	Dan	University of Lethbridge	
Judge	Kevin		
Klutsch	Jennifer	University of Alberta	Edmonton
Kristalovich	Myles		Calgary

Last Name	First Name	Institution	Location
Longair	Robert	University of Calgary	Calgary, AB
Lumley	Lisa	Royal Alberta Museum	Edmonton, AB
Marshall	Valerie	University of Alberta	Edmonton
McGowan	James	Lavellan Pest Solutions Inc	Calgary, AB
Meers	Scott	Alberta Agriculture	Brooks, AB
Mousseau	Tonya	Mount Royal University	Calgary, AB
Oliver	Mark		Calgary, AB
Pittel	Hilary	Royal Alberta Museum	Edmonton
Pohl	Greg	Canadian Forest Service	Edmonton, AB
Proctor	Heather	University of Alberta	Edmonton, AB
Reid	Mary	University of Calgary	Calgary, AB
Sheffied	Cory		
Sjolie	Dylan	University of Alberta	Edmonton, AB
Smith	Alexander		Edmonton, AB
Sperling	Felix	University of Alberta	Edmonton, AB
Stoyke	Godo		Edmonton, AB
Swann	John	University of Calgary	Calgary, AB
Thomson	Don		Calgary
Thorsen	Ashley	Royal Alberta Museum	Edmonton, AB
Thyssen	Adrian	University of Alberta	Edmonton, AB
Velasco	Felipe		Calgary, AB
Vickruck	Jess	University of Calgary	Calgary, AB
Whitehouse	Caroline	Alberta Agriculture and Forestry	Edmonton, AB
Retired Members			
Dolinski	Michael		Edmonton, AB
Holmberg	Robert	Centre for Science	Athabasca, AB
Student Members			
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Ahn	Micky	University of Alberta	Calgary, AB
Batallas	Ronald	University of Alberta	Edmonton, AB
Bezanson	Giselle	University of Lethbridge	Lethbridge, AB
Campbell	Erin	University of Alberta	Edmonton, AB
Canuel	Maddison	University of Calgary	Calgary, AB
Correal Wilches	Diana Maria	Agriculture and Agri-Food Canada	Lethbridge, AB
Dufton	Shelby		
Dupuis	Julian Rowe		
Fjordbotten	Krista	University of Lethbridge	Lethbridge, AB
French	Rowan	University of Alberta	Sherwood Park, AB
Ghavami	Hadi		
Glass	Haley		
Goulding	Megan		
Grocock	Nicholas		
Guevara Rozo	Sydne	University of Alberta	
Hervet	Vincent		Lethbridge, AB
Holmes	Gregory	University of Athabasca	Lethbridge, AB
Ivanova	Mariya		Calgary, AB

Last Name	First Name	Institution	Location
Jones	Kelsey		
Jorgensen	Amanda		
Kutby	Rola	University of Calgary	Calgary, AB
Lachowsky	Leanna	University of Calgary	Calgary, AB
Lebunasin Arachchige	Pasan		
Lemke	Emily	Thompson Rivers University	Kamloops, BC
Leo	Sarah	University of Lethbridge	Lethbridge, AB
MacDonald	Maggie	University of Alberta	Edmonton, AB
MacDonald	Zachary	University of Alberta	Edmonton, AB
Mader	Caitlin		
McLean	Mary Ann	St. Mary's University	Calgary
Mcpike	Sarah	University of Alberta	Edmonton
Meehan	Matthew		
Murphy	William	University of Calgary	Calgary
Musso	Antonia	University of Alberta	Edmonton
Nelson	Connor	University of Alberta	Edmonton
Nelson	Tyler	University of Alberta	Edmonton, AB
North	Calnek	Olds College	Olds, AB
Oliver	Tom		Calgary, AB
Pain	Rebecca		
Perry	Alexander		
Preti	Flavio	University of Alberta	Edmonton
Punko	Rosanna	University of Manitoba	Westlock, AB
Retzlaff	Jennifer	University of Calgary	Calgary, AB
Robinson	Samuel	University of Calgary	Calgary, AB
Ross	Michael		
Shegelski	Victor	University of Alberta	Edmonton, AB
Shivananjappa	Sunil	University of Lethbridge	Lethbridge, AB
Snake	Kyle	University of Alberta	Edmonton, AB
Sosiak	Christine	Department of Renewable Resources	
Sperling	Janet	University of Alberta	Edmonton, AB
St. Onge	Amanda	University of Alberta	Edmonton, AB
Thompson	Benjamin	University of Alberta	Parkland County
Trevoy	Stephen	University of Calgary	Edmonton, AB
Waytes	Riley	University of Calgary	Calgary, AB
Wingert	Brittany	University of Alberta	Edmonton, AB
Worthy	Sydney	University of Alberta	Sherwood Park, AB

Library	Institution	Location
Archives, Entomological Society of Alberta	Agriculture and Agri-Food Canada	Lethbridge, AB
Athabasca University College Library	Athabasca University College	Athabasca, AB
Augustana University College Library	Augustana University College	Camrose, AB
Cameron Library	Cameron Library	Edmonton, AB
Colorado State University Libraries	Colorado State University Libraries	Fort Collins, CO
Concordia University College Library	Concordia University College	Edmonton, AB
Glenbow Alberta Institute	Glenbow Alberta Institute	Calgary, AB

Library	Institution	Location
Grande Prairie Regional College Library	Grande Prairie Regional College	Grande Prairie, AB
Lakeland College Library	Augustana University College	
Lethbridge Research Centre	Agriculture and Agri-Food Canada	
Medicine Hat College Library	Medicine Hat College	Medicine Hat, AB
N.A.I.T. Library	Northern Alberta Institute of Technology	Edmonton, AB
National Library of Canada	National Library of Canada	Ottawa, ON
Northern Forestry Centre Library	Canadian Forest Service	Edmonton, AB
Olds College Library	Olds College	Olds, AB
Provincial Museum and Archives	Provincial Museum and Archives	Edmonton, AB
Red Deer College Library		
S.A.I.T. Library	Southern Alberta Institute of Technology	Calgary, AB
Strickland Library	University of Alberta	Edmonton, AB
University of Calgary Library	University of Calgary	Calgary, AB
University of Lethbridge Library	University of Lethbridge	Lethbridge, AB