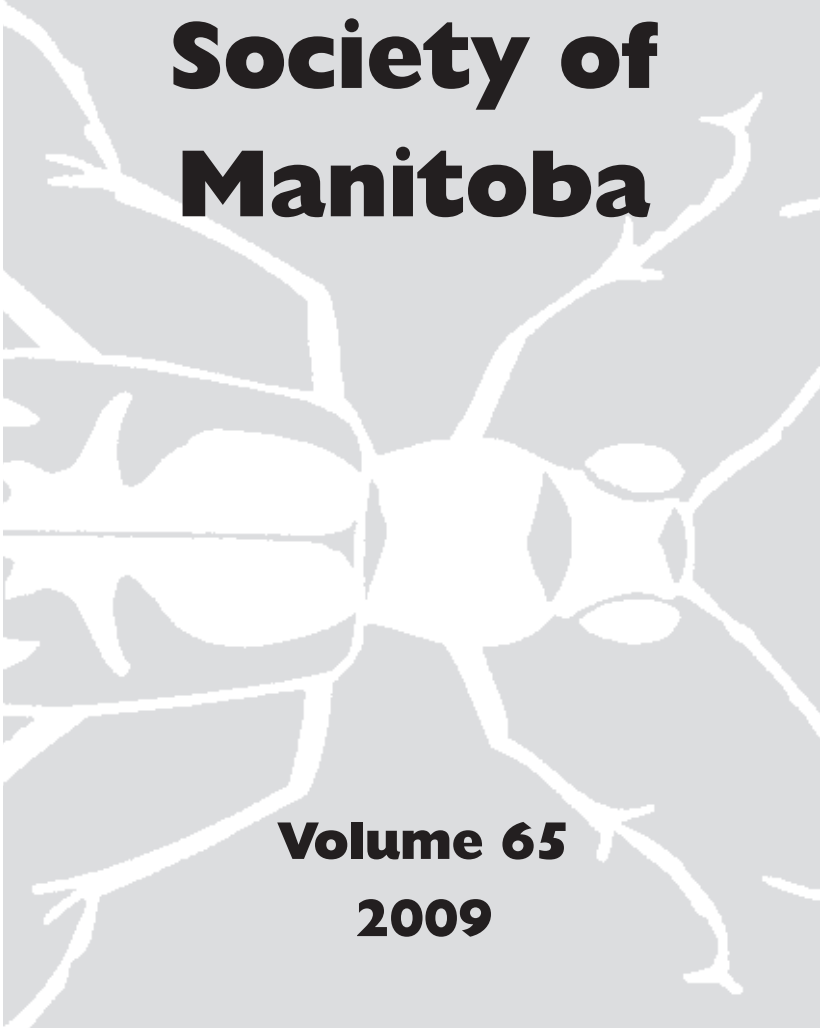


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T.D. Galloway  
Editor

**Winnipeg, Manitoba**

# Entomological Society of Manitoba

The *Entomological Society of Manitoba* was formed in 1945 “to foster the advancement, exchange and dissemination of Entomological knowledge”. This is a professional society that invites any person interested in entomology to become a member by application in writing to the secretary. The society produces a quarterly newsletter, the *Proceedings*, and has a variety of meetings, seminars and social activities. Persons interested in joining the society should consult the website at <http://home.cc.umanitoba.ca/~fieldspg>, or contact:

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# **S. CAMERON JAY (1929-2008)**

## **TRIBUTE AND BIBLIOGRAPHY**

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### **A Tribute**

Dr S. Cameron ("Cam") Jay, Emeritus Professor of Entomology, died suddenly on 28 April 2008 at the age of 79 years.

Cam was born at Lauder, Manitoba, and attended school in Hamilton, Ontario. In 1949, he graduated with the highest standing from a teacher training course at Hamilton Normal School. The next six years were spent teaching school in Hamilton. While teaching, Cam took evening courses at McMaster University, and received a B.A. in English Literature, and the Director's award for highest standing. Notwithstanding this, he had sufficient spare time to meet and marry Doreen, his wife and partner of 56 years.

In 1955, Cam resigned from school teaching, and after a brief flirtation with forest entomology, began a bachelor's degree in agricultural entomology at the University of Manitoba. Those were heady days in the Department of Entomology, with such people as Reinhart Brust, Glen McLeod, Dieter Peschken, Ted Radcliffe, Dave Smith and Maurice Tauber among the student body. Cam graduated in 1958, this time with the University Gold Medal for highest standing among B.S.A. graduates.

One summer near the end of his degree programme, he was assigned the penance of looking after the Department's apiary, a task which was particularly distasteful because Cam was frightened of bees! Mostly he watched through binoculars from a safe distance. However one day, he and Doreen set out to retrieve a swarm that had alighted on a tree branch; this bravery was founded on a textbook's statement that bees in swarms do not sting. Cam climbed the tree and tied a rope to the branch. Doreen, who was eight months pregnant, held the rope, so that when Cam sawed through the branch it could be gently lowered to the ground. All went well until the sawing was complete. Then the rope broke, the branch and swarm crashed to the ground, the swarm flew up and landed beside Cam, and Doreen abandoned Cam to his fate and took refuge in the truck. The seconds of juxtaposition of Cam and the swarm on the tree branch were momentous. Would Cam suffer first stings, and then broken bones as he fell from his perch? Or had the bees read the book? Cam was startled to find that the latter was the case, and at that moment his fascination with bees began.

Cam and Doreen moved to Guelph, which was then an outpost of the University of Toronto. There, under the supervision of Maurice Smith, Cam completed a M.Sc. on the life history of honey bees. In 1959, the Jays moved to Rothamsted, England, so that Cam could pursue Ph.D. studies on honey bee biology. This research was directed by Drs. C. Butler and J.B. Free. In 1961, Cam and Doreen and their growing family returned to Manitoba, where Cam held a faculty position in the Department of Entomology until his retirement in 1991.

During his career in the Department, Cam's first priority was teaching. His lectures in the course "Introductory Entomology" provided such an exciting introduction to the world of insects that the course was a major source of undergraduate and graduate students for the Department. In addition, Cam taught introductory and advanced courses on social insects. In 1980, as a result of nomination by his students, he was awarded the Olive Beatrice Stanton Award of the University of Manitoba for excellence in teaching.

Cam's achievements in research were also impressive, and ranged from work on fundamental aspects of bee biology through to studies directly applicable to beekeeping practice. Cam's largest efforts and biggest impacts were in the improved management of honey bees for honey production and crop pollination. Cam realized that studies on basic bee biology could be applied to help commercial beekeeping operations in North America. His early findings on growth and development of immature bees in their brood cells are very relevant to today's problems of utilization of brood by varroa mites. His discovery of the role of brood pheromones in suppressing worker ovary development provided a foundation for current pheromone research. His laboratory's basic studies of colony population growth were used to determine optimal population (package) size, the best timing of colony establishment to maximize honey production, and the factors affecting loss of bees when colonies are established or moved. These studies also showed how various management manipulations can affect queen loss, elucidated how to rear and time the introduction of queens for optimal success, and demonstrated how to winter colonies of bees on the Prairies. His studies of orientation of bees focused on how to reduce movement of bees between hives in commercial apiaries. This was a major contribution that reduced labour inputs for honey producers, increased honey production, and lowered transmission rates of parasites and pathogens. In addition to his studies of bee orientation in Canada, Cam studied the same processes in the southern hemisphere, during a sabbatical leave in New Zealand and Australia.

Cam's work on pollination with honey bees was equally diverse. In Canada, this focused on pollination of faba beans and canola, and he and his research associates developed pollination systems for the first commercial hybrid canola seed production fields in western Canada. During sabbatical leaves, he worked on coconut pollination in Jamaica and kiwifruit pollination in New Zealand.

While Cam's research focus was the biology and management of honey bees, he also responded to industry requests to tackle bee diseases such as *Nosema*, and to assess effects of mosquito control programs on bee mortality. He also worked on other species of bees with important results. For example, one of Cam's first graduate students worked on native species of bumble bees and upon graduation, joined the faculty of the University of Toronto, where further research led to domestication of bumble

bee species now used in commercial green house pollination. Cam also carried out a program that helped establish a viable leafcutting bee and alfalfa seed production industry in Manitoba.

Cam published over 75 refereed publications, and near the end of his academic career published in Annual Reviews of Entomology on one of his favourite research topics, the spatial management of honey bees on crops. In addition to his own research, he trained a total of 24 graduate students in research. Former students went on to research positions with universities or with Agriculture and Agri-Food Canada, and extension positions with several provincial governments.

Cam has had an enormous impact on Canadian beekeeping through his teaching and research and also through his extension efforts. Cam made a point of sharing his knowledge directly with beekeepers. He offered numerous courses for commercial beekeepers, and for 29 years, taught a course for hobby beekeepers. In the summer he was constantly on the 'phone to individual beekeepers to try to solve their problems and had close friendships with many of them. Again, his expertise was not restricted to Canada. He spent 15 months leading a C.I.D.A. apiculture development project in Kenya, and in that period radically changed and improved apiculture in Kenya through the introduction of the moveable frame hive. For his extension activities, he was recognised through a University of Manitoba Outreach Award, and the beekeeping industry conferred numerous local, national and international awards, including the Bee Hive Award of the Manitoba Beekeepers' Association, Honorary Life Membership in the Manitoba Alfalfa Seed Producers Association, the J.I. Hambleton Award of the Eastern Apicultural Society of North America and the Fred Rathje Memorial Award for outstanding contributions to the Canadian Bee Industry. His achievements were also recognized by the University of Manitoba Alumni Association through a Jubilee Award. In 1999, an Award of Excellence for "Outstanding Contributions to Canadian Beekeeping Development" was conferred upon him at the international beekeeping conference, Apimondia.

Cam contributed to Canadian Entomology in many ways. He served on many committees of the Entomological Society of Canada and he was an active member of the Entomological Society of Manitoba. He served as president of ESM in 1968–69. Similarly he served the Canadian Association of Professional Apiculturists as both president and committee member. For his service to Canadian Entomology and Apiculture, he was elected a Fellow of the Entomological Society of Canada in 1985.

At least as important as the formal achievements was Cam's personality. As a Department Head and colleague, he was forever supportive and cognizant of the needs and aspirations of those around him, and took endless pains to reach the best decision for all concerned. His steady influence brought consensus on many contentious issues, and so he was much sought after as a chairperson of committees and conferences. The Jay home was a centre of hospitality and camaraderie for staff and students for many years.

Cam had a quirky sense of humour and an outlook on life which was a tonic to all around him. His classes, and colleagues, were treated to a continuous barrage of "jokes," most of them real "groaners." He was known to appear in the classroom bedecked in yellow striped sweater, and appropriately appendaged – the only known



specimen of *Apis mellifera jayensis*. Also, costumed as a skunk, he would “spray” passing cars, or invade the classes of colleagues to complain about “lectures that stink.” He loved to dress in an old Santa suit and tour the neighbourhood by horse and cutter, visiting the local children. For years he rode an ancient bicycle, on which he sat rigidly upright. At various times, persons unknown “decorated” the bicycle, yet Cam always managed to preserve an air of dignity as he rode his steed to and from work amid a cloud of ribbons and flags.

Cam’s retirement was filled with activity. He and Doreen travelled widely in North America in their 5<sup>th</sup> wheeler. They operated a tree farm for many years. Cam volunteered with the Canadian Cancer Society, the Winnipeg Christmas Cheer Board, and Habitat for Humanity. The latter allowed him to indulge his penchant for building things, which extended to building an A-frame cottage, a hangar for his planes, a sun room for his house, and many minor projects.

Cam was devoted to Doreen, to their three daughters and son, and to his grandchildren. He marked his 30<sup>th</sup>, 40<sup>th</sup> and 50<sup>th</sup> wedding anniversaries by renting a road-side bill-board proclaiming his love for Doreen. Cam loved the outdoors, and shared canoeing, hiking, snowshoe or ski expeditions with his children and grandchildren, and with generations of boy scouts. Many gained their first introduction to nature during these trips, and remember them fondly, apart from the food — a gourmet cook Cam was not! Cam rebuilt a 1949 monoplane from a written-off wreck and flew it for 35 years. One of his early retirement projects was to fly to Alaska, but he turned back in the face of smoke from forest fires in Saskatchewan. More recently, he acquired an open-cockpit biplane which he flew from southern Ontario to Winnipeg — an epic journey lasting almost three weeks. Less epic were his “Flying Pizza” flights, in which he would circle an ice fishing hut in mid-winter until he was sure that it was occupied, and then land on the ice nearby, and ask the occupants if they had ordered pizza. He had a specially-marked (empty) pizza box with him, and used this ploy to “break the ice” and strike up friendships in the most unlikely places.

Cam’s light-hearted and self-deprecating manner made it easy for all to forget that he had been an outstanding student, an inspiring teacher, a researcher who made profound differences in his field, and a dedicated supporter of apiculture and entomology.

To honour these accomplishments, the Department of Entomology has established a scholarship to be awarded to a graduate student doing research in apiculture, pollination biology or the study of social insects — the areas of Cam’s studies.

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# **WILLIAM J. (BILL) TURNOCK**

## **(1929–2008):**

### **ENTOMOLOGICAL CAREER, RESEARCH CONTRIBUTIONS AND BIBLIOGRAPHY**

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Bill Turnock's career is remembered in the Newsletter of the Entomological Society of Manitoba, 2008, 35(1): 3-5, the Bulletin of the Entomological Society of Canada, 2008, 40(2): 80-82, and the Winnipeg Free Press, April 16, 2008.

### **Entomological Career**

Bill was born and grew up in Winnipeg. He received a B.Sc. in Agriculture from the University of Manitoba (1949), M.Sc. in Entomology and Forestry (1951) and Ph.D. in Plant and Animal Ecology (1959) both from the University of Minnesota. His entomological career began in the Canada Department of Forestry in 1949. He spent many seasons studying the population dynamics of forest insects at a field station by Red Rock Lake in Whiteshell Provincial Park east of Winnipeg. By 1967 Bill was head of the research section and his research in forest ecology continued until 1970, when the Winnipeg Forestry Laboratory was closed. Bill then became Science Advisor to the Ministry of State for Science and Technology, and he and his family moved to Ottawa. In 1972, Bill made the transition to agricultural research as head of a new section at Agriculture Canada in Winnipeg concerned with insect pests attacking canola, a new and rapidly expanding crop. He continued as section head until retirement in 1993. Bill was an adjunct professor in the Department of Entomology at the University of Manitoba from 1975-1983 and supervised the theses of two M.Sc. students during that period.

Bill served as President of the Entomological Society of Manitoba (1969) and the Entomological Society of Canada (1980), and was elected a Fellow of the ESC in 1983. Bill enjoyed two sabbaticals: in the Netherlands in 1966-67 and Great Britain in 1983-84. Bill lead or participated in Canadian missions to the USSR, Brazil, China, and the UNESCO programs: Man and the Biosphere and the Conference on Economic Development and Human Survival. Bill was a member of the Manitoba Environmental Council from 1973-2000, and served as chair for six years. Bill began volunteering in 1997 on the Prairie Garden Committee and participated in the publication of *The Prairie Garden*. He was also an enthusiastic member of the Friends of the Delta Marsh Field Station, where he undertook a long-term study on the ladybeetles he found on the beaches of Lake Manitoba.

## Research Contributions

Bill approached entomology as a field ecologist, beginning in forest entomology, moving to agricultural entomology, and then focussing on insect cold-hardiness late in his career and also in retirement. He was particularly interested in biological control of insect pests (Turnock and Muldrew 1971; Turnock *et al.* 1977; Turnock 1982; 1984; Turnock and Carl 1995) and pest population dynamics, particularly the role of weather and winter survival (Turnock 1972; Turnock *et al.* 1983; Turnock *et al.* 1985; Turnock *et al.* 1987). Much of Bill's early research was on the larch sawfly, the effects of weather on life history, life tables, and the importance of predation. His own favourite among the early projects was one of the first studies to demonstrate a role for avian predation in insect population dynamics (Buckner and Turnock 1965). In agriculture, Bill worked on the integrated pest management of insects that feed on canola, particularly bertha armyworm, cabbage root maggot, and lygus bugs. While Bill developed practical approaches to pest management (Turnock 1987; Turnock *et al.* 1992; Turnock *et al.* 1995), he never lost sight of the ecology of crop-pest systems (Turnock 1977).

Bill also thought about how best to conduct applied research and was a great believer in teamwork and looking at the whole "system" (Turnock 1969), with the focus on collaboration (Larch Sawfly Investigations Team, 1964). This interest in the "how to" of science took him to Ottawa in the late 1960s in a research policy role, and then back to Winnipeg to set up a canola entomology team at what was then the Winnipeg Research Centre of Agriculture Canada. He brought to the group a sense of working as a team to solve agricultural pest problems from an ecological perspective. His guidance laid the foundation to our understanding of canola pests, including research of his own and that of others in the group.

Over the last 20 years of his entomological career, Bill focussed on insect cold-hardiness. He developed strong connections with European and North American researchers active in this field. As was typical of Bill he approached the problem from an ecological and evolutionary perspective (Turnock and Boivin 1997; Turnock and Fields 2005), but collaborated with physiologists (Turnock and Bodnaryk 1991; 1993) to broaden our understanding of how insects survive winter in the north-temperate zone.

One characteristic of Bill's work was an eclectic interest in the natural world. During extensive periods in the field Bill made many unexpected observations of insect biology that intrigued him. He didn't stop there, however, he investigated, often on his own time, and eventually published on such diverse topics as insects in the diet of crows (Turnock 1975), lady beetle aggregations on lake shores (Turnock 1979), and bumble bees occurring in pheromone traps used to monitor bertha armyworm (Turnock *et al.* 2006). This research increased our understanding of insect diversity in Manitoba (Turnock *et al.* 2001) and the role of introduced species on our native fauna (Turnock *et al.* 2004).

The contributions of a diverse entomological career spanning over 50 years will continue to be useful for decades to come.



## Acknowledgements

Betty Turnock provided a collection of Bill's reprints and details on his career. Neil Holliday provided helpful comments on the manuscript.

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# *Culiseta melanura* (Diptera: Culicidae), a new record for the Manitoba mosquito fauna

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*Culiseta melanura* (Coquillett) is a bird-feeding mosquito that is known as the primary maintenance vector of eastern equine encephalitis virus (EEEV) in the eastern United States (Mahmood and Crans 1998). In North America, it occurs from Maine, southern Quebec and eastern Ontario, south to southern Florida, west to eastern Texas and north to the lower Great Lakes region and southeastern Minnesota (Darsie and Ward 2005). In Canada, *Cs. melanura* has been reported from Quebec and Ontario (Wood *et al.* 1979) and also from St. John's, Newfoundland (Nielsen and Mokry 1982; Hustins 2006). *Culiseta melanura* is primarily associated with lowland swamp or bog habitats as this species favours acidic water with a pH of 5.0 or lower (Pierson and Morris 1982). This species is multivoltine with at least two generations in Canada (Wood *et al.* 1979). Larvae overwinter and females deposit egg rafts directly onto water in lowland swamp habitats (Mahmood and Crans 1998). Females will often seek out passageways through the root mat of trees or water-filled depressions in sphagnum bogs to deposit eggs (Wood *et al.* 1979) and larvae often overwinter in these "crypts" (Pierson and Morris 1982). During the summer of 2004, adult mosquitoes were collected from different locations within and around the city of Winnipeg as part of a project to develop molecular methodologies for mosquito identification. While sorting samples, we encountered one specimen which, based on morphological characteristics, was identified as *Cs. melanura*. Molecular techniques were used to confirm this identification.

## Materials and Methods

### *Sample Collections and Preparation*

During June to September of 2004, CDC light traps and sweep nets were used to collect adult mosquitoes from a number of localities within the city of Winnipeg (i.e., King's Park, Assiniboine Park, LaBarrière Park) and at Birds Hill Provincial Park, Sandilands Provincial Forest, Seven Sisters Falls and Whiteshell Provincial Park. Following collection, mosquito specimens were dried at room temperature, pinned and identified using Wood *et al.* (1979) and Darsie and Ward (2005). The specimen

putatively identified as *Cs. melanura* was collected late August, 2004 in King's Park, Winnipeg. After identification, the specimen was transferred to a 1.5 ml Eppendorf tube for DNA extraction. For comparison, two adult specimens of *Cs. melanura*, collected in Notre Dame Provincial Park on July 30, 2004, were obtained from colleagues in Newfoundland and legs were used for DNA extraction. Four adults were also borrowed from the Canadian National Collection (CNCI) in Ottawa, Ontario.

#### *DNA preparation, amplification, and data analysis*

DNA was extracted from the specimen from Manitoba and the two specimens from Newfoundland using QIAamp DNA Mini Kit (QIAGEN Inc., Mississauga, ON, Canada). The specimens of *Cs. melanura* from the CNCI were only used to confirm the morphological identification of the Manitoba specimen. Samples were dried at room temperature for 48 hrs and transferred to 1.5 ml Eppendorf tubes. Specimens were ground up using pestle and lysed at 56 °C in 20 µl of Proteinase K (20 mg/ml) and 180 µl ATL buffer overnight. The lysate was bound to the spin column membrane, and washed twice by centrifugation. DNA was then eluted by centrifugation in 50 µl of elution buffer. Following Cornel *et al.* (1996) and Kampen *et al.* (2003), the 5.8S and 28S primers were used to amplify the ITS2 region: 5'-TGTGAACTGCAG-GACACATGAA-3' (5.8S, forward primer) and 5'-ATGCTTAAATTTAGGGGG-TAGTC-3' (28S, reverse primer). Amplification was carried out in 50-µl total volume containing 5 µl of *Taq* polymerase 10x reaction buffer (Invitrogen, Carlsbad, CA, USA), 200 µmol/L each of dATP, dTTP, dCTP, and dGTP (Invitrogen, Carlsbad, CA, USA), 1.5 mmol/L MgCl<sub>2</sub>, 40 pmol of each primer, 1.25 U (1 U = 16.67 nkat) of *Taq* DNA polymerase (Invitrogen, Carlsbad, CA, USA), and approximately 10 ng of DNA template. Amplification was performed using a Techne Genius Thermocycler (Techne Incorporated, Princeton, New Jersey) with the following temperature cycling parameters for 30 cycles for: denaturation at 93 °C for 1 min, primer annealing at 50 °C for 1 min, followed by elongation at 72 °C for 80 seconds. To assess the efficiency of amplification, 5-µl aliquots of PCR products were separated on 1.5 % agarose gels prepared with 1x TBE buffer (89 mmol/L Tris-HCL, 89 mmol/L boric acid, and 20 mmol/L EDTA), stained with ethidium bromide, and visualized using ultra violet light. PCR products were purified using Montage Life Science Kits (Millipore Corporation, Bedford, MA, USA). Double-stranded PCR products were sequenced using the cycle-sequencing protocols performed according to the manufacturer's recommendations (Perkin Elmer Applied Biosystems, Foster City, California, USA) and automated fluorescent DNA sequence analysis was performed using an ABI Prism 310 Genetic Analyzer system. DNA Star software was used to edit the nucleotide sequence, perform nucleotide alignments and for phylogenetic analysis. The Clustal W method was used for sequence data analysis. *Culiseta morsitans* (Theobald) was used as a relative species to *Cs. melanura*.

## Results

Based on observed morphological features, one specimen collected in Winnipeg was putatively identified as *Cs. melanura*. Morphological characters of this specimen

were similar to those of *Cs. melanura* specimens from Newfoundland and from the CNCI. Voucher specimens were deposited in the J.B. Wallis Museum, Department of Entomology, University of Manitoba. There were no differences in the nucleotide sequences of ITS2 (approximately 300 bp) between two *Cs. melanura* specimens collected in Newfoundland. However, there was one nucleotide difference between the specimen from Winnipeg and those collected in Newfoundland. There were 137 nucleotide differences between *Cs. morsitans* and *Cs. melanura* (Fig. 1). The relationship among the examined specimens is shown in Fig. 2.

## Discussion

With the collection of *Cs. melanura*, 51 species of mosquitoes have been recorded for Manitoba so far. Among recorded species, there are five species of *Culiseta* which have previously been reported from Manitoba and all of these species have established populations in the province. These five species include: *Cs. alaskaensis* (Ludlow), *Cs. impatiens* (Walker), *Cs. inornata* (Williston), *Cs. minnesotae* Barr and *Cs. morsitans* (Wood *et al.* 1979). Although one specimen of *Cs. melanura* was collected in this study, it seems unlikely that populations of this mosquito are established in the province. No additional specimens of *Cs. melanura* have been collected, despite continued surveillance for this species, from 2005 to 2009, by the City of Winnipeg Insect Control Branch (Taz Stuart, City of Winnipeg, personal communication). Thus the incursion of the *Cs. melanura* described in this study likely represents a chance introduction which did not result in establishment of a reproducing population. Introduction of this exotic species could have been aided by wind currents as reported for other species (Sellers and Maarouf 1993) or some other mechanism (e.g., arrival in trailers or other conveyances originating in localities where *Cs. melanura* populations are established). Given the detection of *Cs. melanura* in the current study, *Uranotaenia sapphirina* (Osten Sacken) by Stuart (2007) in Manitoba and the potential range expansion of mosquitoes in North America that is predicted to occur as a result of climate change (Patz *et al.* 1996), it would be prudent for those working on mosquitoes in Manitoba and elsewhere to monitor for further incursions of exotic mosquito species. The West Nile virus surveillance program currently in place in Manitoba, in which a network of light traps is operated throughout the southern portion of the province, should provide an adequate system for early detection of exotic and potentially important invasive mosquito species.

## Acknowledgments

We sincerely thank Dr. Jeffrey M. Cumming (Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON) and Sarah Hustins (Memorial University of Newfoundland, St. John's, NL) for providing specimens. We thank Dr. Terry Galloway (Department of Entomology, University of Manitoba, Winnipeg, MB) for confirming the morphological identification. We also thank reviewers of this manuscript for their valuable comments.



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# 65th Annual Meeting

## Entomological Society of Manitoba

Hotel Fort Garry, Winnipeg, Manitoba  
18–21 October, 2009

### Abstracts

**Abdelghany, A.Y.**<sup>a, b</sup>, Awadalla, S.S.<sup>b</sup>, Abdel-Baky, N.F.<sup>b</sup>, EL-Syrafı, H.A.<sup>b</sup>, and Fields, P.G.<sup>a</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg, MB; <sup>b</sup> Economic Entomology Department, Faculty of Agriculture, Mansoura University, Egypt

POSTER SESSION: PRESIDENT'S PRIZE

#### **The impact of insecticides on penetration into jute and polyethylene bags by two stored-product insects.**

Diatomaceous earth (DE), pea protein, methoprene, pyrethrin and DEET were applied at label rates on jute and polyethylene bags. We measured the survival of eggs and young larvae of *Stegobium paniceum* and *Lasioderma serricorne* (Coleoptera: Anobiidae). There was no difference between the species or between jute and polyethylene. DE caused the lowest mortality. The other insecticides caused 50% mortality. A second test measured the ability of adults to penetrate the bags. After 24 h, approximately 90% of insects had penetrated through the untreated bag material, whereas fewer insects penetrated through the treated bag material, DEET (12%), pyrethrin (23%), methoprene (35%), pea protein (48%) and DE (53%).

**Abdelghany, A.Y.**<sup>a, b</sup>, Awadalla, S.S.<sup>b</sup>, Abdel-Baky, N.F.<sup>b</sup>, EL-Syrafı, H.A.<sup>b</sup>, and Fields, P.G.<sup>a</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg, MB; <sup>b</sup> Economic Entomology Department, Faculty of Agriculture, Mansoura University, Egypt

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

#### **Efficacy of diatomaceous earth, pea flour, pyrethrin and methoprene for the control of stored-product beetles.**

Diatomaceous earth (DE), pea protein, methoprene and pyrethrin were compared for their toxicity and reduction of offspring production for the stored-product insects: *Stegobium paniceum* and *Lasioderma serricorne* (Coleoptera: Anobiidae). Over 90% mortality occurred at 1000 ppm DE and at 500 ppm pyrethrin. Pea flour at 1000 ppm caused 80% mortality. Methoprene at 30 ppm caused 50% mortality. Over 80% reduction in offspring production occurred at 1000 ppm DE, 1000 ppm pea flour, 30 ppm methoprene and 50 ppm pyrethrin. Food types: anise, coriander, marjoram, chamomile and wheat did not affect toxicity.

**Abram, P.K.**<sup>a</sup> and Walker, V.K.<sup>b</sup>

<sup>a</sup> Carleton University, Ottawa, ON; <sup>b</sup> Queen's University, Kingston, ON

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Testing the reproductive toxicity of engineered nanoparticles: a *Drosophila* model.**

Engineered nanoparticles (NPs) have unique physicochemical properties due to their small size, making them useful in a wide range of applications. Due to their increasing prevalence in consumer products, their potential accumulation in ecosystems has raised concerns about toxicity. Few people have examined the reproductive toxicity of engineered NPs and there are no published studies in which an insect model was used. We found ingestion of engineered NPs by *Drosophila melanogaster* can have negative impacts on longevity, female fecundity and male mating success, setting the stage for further research using *Drosophila* as a nanotoxicological model.

Aikens, K.R. and **Buddle, C.M.**

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Hide and seek in forest canopies: can arthropods find enemy free space?**

We tested the effects of predation pressure on arthropods as a function of vertical stratification in a hardwood forest in SW Quebec. Insectivorous birds were excluded by placing cages over sugar maple foliage in four strata and we measured the resulting arthropod densities; avian predation pressure increased in the upper crown. Using bait trial experiments, we documented that predation pressure by arthropods (notably ants) decreased as a function of distance from the ground. Taken together, we suggest that arthropods found little enemy-free space in our study forest.

**Ajlan, A.**<sup>a</sup>, Alhudaib, K.<sup>a</sup>, and Faleiro, J.R.<sup>b</sup>

<sup>a</sup> Department of Arid Land Agriculture, College of Agricultural and Food Sciences, King Faisal University, Al Hasa, Saudi Arabia; <sup>b</sup> Date Palm Center, King Faisal University, Al Hasa, Saudi Arabia

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Managing the problem of red palm weevil, *Rhynchophorus ferrugineus*.**

Date palm, *Phoenix dactylifera* L., is cultivated in the Middle East. In the mid-1980's, the crop became threatened by red palm weevil (RPW), *Rhynchophorus ferrugineus* (Olivier), which has been identified by the FAO of the United Nations as a "category-1" insect pest of date palm. The seasonal patterns of activity of RPW were investigated using pheromone traps; peak captures occurred from April to May and from October to November.

**Al Dhafer, H.M.**

Department of Plant Protection, King Saud University, Riyadh, Saudi Arabia

## POSTER SESSION

**Tabanidae (Diptera) of Saudi Arabia.**

Samples were collected from southern, central and eastern regions of Saudi Arabia using Malaise traps and sweep nets. Nine species of Tabanidae were identified, two for the first time from Saudi Arabia, *Hybomitra peculiaris* (Szilády) and *Atylotus pulchellus* (Loew). Therefore, the total number of Tabanidae in Saudi Arabia is 31 species. Commentary on the species recorded in this study is given. A key to the genera of Tabanidae occurring in the Arabian Peninsula is also provided. Available literature for Tabanidae in Saudi Arabia is summarized. The tabanid fauna of Saudi Arabia is more similar to that of the Palaearctic Region than that of the Afrotropical Region.

Allen, J.<sup>a</sup>, McDonald, M.R.<sup>b</sup>, and Vander Kooi, K.<sup>b</sup>

<sup>a</sup>Ontario Ministry of Agriculture, Food and Rural Affairs, Guelph, ON; <sup>b</sup>Department of Plant Agriculture, University of Guelph, Guelph, ON

## CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Optimizing spray coverage of onions for control of onion thrips, *Thrips tabaci*.**

Field trials (2007-2009) were conducted to improve spray coverage and determine if improved coverage could enhance the efficacy of insecticides for the control of onion thrips, *Thrips tabaci* Lindeman. Various water volumes (400, 500 and 600 L ha<sup>-1</sup>), spray angles (0 or 22 degrees) and surfactants were evaluated and coverage assessed with water-sensitive paper or a fluorescent dye. Spray coverage data from all years will be summarized. Using these spray coverage combinations, registered and reduced risk products were evaluated. The most effective products included Carzol (registered) and Delegate (new product). Measures to optimize spray coverage/efficacy may be product specific.

**Alsaqabi, S.M.**

King Faisal University, Dammam College of Science - Zoology Department, Saudi Arabia

## POSTER SESSION

**Description of a mite (*Uropoda* sp.) nesting with red palm weevil beetles (*Rhynchophorus ferrugineus*) (Coleoptera: Curculionidae) by scanning electron microscopy.**

I describe a mite infestation of the red palm weevil, *Rhynchophorus ferrugineus* Oliv. Uropodid mites were collected from under the wings of specimens of red palm weevil collected from infested palm farms in Eastern province of Saudi Arabia. Deutonymphs were observed, and the mites identified using scanning electron microscopy, the first time this has been done in Saudi Arabia. The purpose of using scanning electron microscopy is to clarify morphological structures which cannot be effectively observed using light microscopy.

**Andersen, G.<sup>a</sup>**, Ablard, K.M.<sup>a</sup>, Gries, R.<sup>a</sup>, Khaskin, G.<sup>a</sup>, Schaefer, P.W.<sup>b</sup>, and Gries, G.<sup>a</sup>  
<sup>a</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>b</sup> United States Department of Agriculture, Agricultural Research Service, Beneficial Insects Introduction Research, Newark, DE, USA.

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Males of the egg parasitoid, *Ooencyrtus kuvanae* (Hymenoptera: Encyrtidae), use marker pheromone to gather a harem of choosy females.**

Emerging en masse from host egg masses of gypsy moth, *Lymantria dispar*, male *Ooencyrtus kuvanae* compete for choosy females. By marking females in a pre-copulatory ritual, males secure as many females as possible for subsequent mating and become more successful in courting females that are not yet marked. The mating system of *O. kuvanae* is extraordinary in that males i) attain, and defend in absentia, a harem prior to mating, ii) deploy an individual pheromone to mark females and iii) rely on the marked females' discrimination against unfamiliar and sexually inexperienced males.

**Andreassen, L.D.<sup>a</sup>**, Kuhlmann, U.<sup>b</sup>, Mason, P.G.<sup>c</sup>, and Holliday, N.J.<sup>a</sup>

<sup>a</sup> Department of Entomology, University of Manitoba, Winnipeg, MB; <sup>b</sup> CABI Europe - Switzerland Centre, Delemont, Switzerland; <sup>c</sup> Agriculture and Agri-Food Canada, Eastern Cereal and Oilseed Research Centre, Ottawa, ON

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Ecological consequences of host size selection for the staphylinid (Coleoptera) parasitoid, *Aleochara bipustulata*.**

Previous host range testing with *Aleochara bipustulata* (L.), a candidate for introduction to manage *Delia radicum* (L.) (Diptera: Anthomyiidae), revealed that several smaller Diptera species are suitable hosts, from which relatively small adult parasitoids emerge. Using three size classes of *D. radicum* and a smaller species from the family Piophilidae, we investigated reproductive fitness of adults from small hosts to determine how likely the smaller species are to be attacked if the introduction proceeds. Assessment of quality involved comparison of developmental time and success, longevity and lifetime fecundity, egg size and ability of the parasitoid larvae to find hosts.

**Antwi-Amoabeng, D.** and Hunter, F.F.

Department of Biological Sciences, Brock University, St. Catharines, ON

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Complementary effects of sugar feeding on *Anopheles stephensi* resistance to *Plasmodium berghei*.**

Anopheline mosquitoes will typically sugar-feed before seeking blood. It has been shown that honeydew-fed *Anopheles stephensi* Liston have fewer *Plasmodium* oocysts in their midguts compared to those fed nectar. There is an up-regulation in the expression of *A. stephensi* nitric oxide synthase (AsNOS) resulting in increased production of toxic nitric oxide (NO) from L-arginine in the midguts of infected mosquitoes. L-arginine occurs more in honeydew than nectar. It is therefore hypothesized that

honeydew will better complement the immune response of mosquitoes to *Plasmodium* infection. In this study, we used a murine malaria model to test this hypothesis.

**Bahar, M.H.**, Stanley, J.N., Gregg, P.C., and Del-Socorro, A.

Cotton Catchment Communities CRC, University of New England, Armidale, NSW, Australia

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Do green lacewings (*Mallada signata*) add mortality of *Helicoverpa armigera* on transgenic *Bt* cotton?**

We studied the compatibility of a general predator, a green lacewing, to control *Helicoverpa armigera* eggs and larvae with transgenic *Bt* cotton. *Bt* cotton did not affect green lacewing performance. Green lacewings consumed statistically identical numbers of *Helicoverpa* eggs and larvae on both *Bt* and conventional cotton plants. On *Bt* cotton plants, 83% of the *H. armigera* larvae died within 72 hours. Mortality increased to 98% when lacewing larvae were present. This 'mopping-up' of surviving *Helicoverpa* on *Bt* cotton by lacewing larvae has the potential to reduce immediate pest damage but perhaps more importantly, to remove potentially *Bt*-resistant genotypes.

**Bahreini, R.**, and Currie, R.W.

Department of Entomology, University of Manitoba, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**The influence of pollen feeding on tolerance of honey bees against varroa mites.**

Pollen is the only source of protein in the diet of honey bees and affects the physiological status and health of worker bees. Therefore, pollen feeding might enhance grooming behaviour in honey bees if "healthier" bees are more capable of defending against pests. Daily mite mortality rate was greater for pollen-fed bees than for unfed newly emerged bees, but only in bee stock selected for grooming behaviour. When pollen was fed, daily bee mortality rate was similar in susceptible bees and those from stock selected for grooming behaviour.

**Baldwin, K.A.**

Natural Resources Canada, Canadian Forest Service, Great Lakes Forestry Centre, Sault Ste. Marie, ON

SYMPOSIUM: DIVERSITY IN FOREST ECOSYSTEMS

**Describing forest diversity in Canada: an introduction to the Canadian National Vegetation Classification (CNVC).**

The Canadian National Vegetation Classification is being developed as a nationally standardized classification of Canadian vegetation at various levels of generalization. The CNVC is a hierarchical vegetation-ecological taxonomy. The upper levels of the hierarchy reflect growth-form and physiognomic differences that are driven by broad climatic factors; the middle levels reflect biogeographic and broad ecological variation at the continental and regional scales, and the alliance and association levels reflect



floristic and dominance diversity in relation to local site-level ecology. Development of forest associations is nearing completion and design of mid-level units is commencing.

**Barnewall, E.C.**<sup>a, b</sup> and De Clerck-Floate, R.A.<sup>b</sup>

<sup>a</sup> University of Lethbridge, Lethbridge, AB; <sup>b</sup> Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Pre-release impact assessment of a new biological control agent for toadflax, *Linaria vulgaris*.**

*Linaria vulgaris* is a non-native, invasive plant of agricultural and natural areas in Canada. Multiple introductions of this plant to Canada are suspected, hence, any insects used for biocontrol of *L. vulgaris* will be encountering multiple host genotypes upon release. A pre-release impact assessment of a European weevil, *Rhinusa pilosa*, was conducted in quarantine using Canada-wide *L. vulgaris* populations to help determine the potential efficacy of this candidate biocontrol agent. Impacts of the stem-galling weevil were examined by comparing weevil (i.e., number of adults) and plant (i.e., above and below ground biomass) production among toadflax populations.

**Bates, L.M.** and Hall, B.D.

Department of Biology, University of Regina, Regina, SK

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Investigating the bioaccumulation of methylmercury in Saskatchewan wetland food webs.**

Deposition of atmospheric mercury to aquatic habitats is an environmental concern, because here, it can be converted to methylmercury (MeHg), a neurotoxin that bioaccumulates. Aquatic invertebrates are food resources for waterfowl and may be indicative of contamination levels. Invertebrates collected from ponds from three land use types: agricultural, grassland and organic agricultural, were analyzed for total mercury and MeHg. MeHg concentrations increased with trophic level and were highest in invertebrates from organic agricultural ponds and lowest in those from traditional agricultural ponds. Relationships between the level of contamination and the effects of land use on MeHg bioaccumulation will be discussed.

**Beaulieu, F.**

Agriculture and Agri-Food Canada, Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY  
**Of Latin, dinosaurs and mites — some hair-tearing and enchanted tales around a taxonomist's job.**

While reviewing concepts of a genus of predatory mites (*Gaeolaelaps*), I stumbled on the issue of gender agreement between generic and specific names—is *Gaeolaelaps* feminine or masculine? To (try to) answer this question and make specific names



agree with the genus' gender, I had to learn basic Latin, investigate stories about name conflicts between a mite and a dinosaur (guess who won that battle?) and also about a mythological dog that was invincible... I'll summarize these issues in my talk and conclude with advice on the use of generic names in the mite family Laelapidae, which includes important biocontrol agents.

**Ben-Chanoch, E.**, Yarden, G., and Paldi, N.  
Beeologics, LLC., Miami, FL, USA

SYMPOSIUM: APICULTURE: BEE—VIRUS INTERACTIONS

**RNAi at work in real life applications: targeting invertebrate pests and beneficial organisms' diseases.**

Beeologics ([www.beeologics.com](http://www.beeologics.com)) has established a simple and relatively inexpensive procedure to produce kilogram quantities of dsRNA homologous to target pest or pathogen sequences. "Remebee" is dsRNA produced *in vitro* and is homologous to honey bee viral sequences. The exogenously supplied Remebee mimics the natural dsRNA intermediate involved in viral replication within the honey bee. In field trials, the gene silencing mechanism induced by Remebee fed to the bees was highly effective in preventing honey bee mortality from Israel Acute Paralysis Virus (IAPV).

**Blake, A.J.<sup>a</sup>**, Dosedall, L.M.<sup>b</sup>, and Keddie, B.A.<sup>a</sup>

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**The influence of canola nutrition on the oviposition choice and larval development parameters of the cabbage seedpod weevil.**

The cabbage seedpod weevil, *Ceutorhynchus obstrictus* (Marshall) (Coleoptera: Curculionidae), is a serious introduced pest of canola, *Brassica napus* L. In an effort to understand the relationship between host plant nutrition and *C. obstrictus* preferences and its larval developmental biology, we exposed gravid females to host plants grown under differing regimes of nitrogen and sulfur. In pod choice arena and no-choice larval development experiments, plants grown with a higher supply of sulfur were preferred as hosts and provided a better environment for larval development but only in plants grown in a low nitrogen regime.

**Borkent, C.J.** and Wheeler, T.A.

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne-de-Bellevue, QC

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Monophyly of the Sciophilini (Diptera: Mycetophilidae) and generic relationships within the tribe.**

The tribe Sciophilini is a cosmopolitan group of fungus gnats currently containing over 540 species in 38 genera. I tested the monophyly of this tribe using morphological characters from multiple exemplars of all genera assigned to the tribe and type-genus exemplars from all other tribes. Multiple characters provide new limits for the monophyly of this tribe and several large clades are present within the tribe, notably the *Neuratelia*-group and *Azana*-group. Several genera do not fit within these new tribal limits (*Impleta*, *Syntemna*), or are paraphyletic within the tribe (some *Azana*-group genera). The classification will be changed to reflect monophyletic relationships.

**Bostanian, N.J.<sup>a</sup>**, Hardman, J.M.<sup>b</sup>, and Thistlewood, H.A.<sup>c</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, St. Jean-sur-Richelieu, QC; <sup>b</sup> Agriculture and Agri-Food Canada, Kentville, NS; <sup>c</sup> Agriculture and Agri-Food Canada, Summerland, BC

POSTER SESSION

**The effects of five ‘reduced risk insecticides’ on *Neoseilus fallacis* and *Galendromus occidentalis* (Acari: Phytoseiidae).**

We examined the toxicity of ‘reduced risk insecticides’ on *Neoseilus fallacis* (Garman) and *Galendromus occidentalis* Nesbitt. Imidacloprid was toxic to adults of both species and affected fecundity. Acetamiprid was very toxic to adults of *G. occidentalis* but of moderate toxicity to adult *N. fallacis*. Its effect on fecundity was more severe and persistent in *G. occidentalis* than on *N. fallacis*. Thiacloprid was harmless to adults of both species. It affected adversely only the fecundity of *N. fallacis*. Spinosad was mildly toxic to adult *N. fallacis* and harmless to *G. occidentalis*. With the exception of imidacloprid, all the insecticides have to be field evaluated.

**Bourchier, R.S.<sup>a</sup>**, Van Hezewijk, B.<sup>a</sup>, Shaw, R.<sup>b</sup>, and Tanner, R.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Lethbridge, AB; <sup>b</sup> CABI Europe - UK, Egham, Surrey, UK

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Chasing after the world’s largest female: potential establishment range of the psyllid, *Aphalara itadori*, for biological control of invasive knotweeds in Canada and the United Kingdom.**

*Aphalara itadori* has been identified as a promising biocontrol agent for Japanese knotweed, initially in the UK and now in Canada. After extensive host-range testing, a strain of *A. itadori* collected from Kyushu, Japan, has been petitioned for release in Britain. To assess the potential geographic range of *A. itadori*, developmental rates and threshold temperatures were determined and used to build a phenology model. The model was overlaid on Canadian and UK climate simulations to predict the establishment range of *A. itadori*. We conclude that temperature conditions will not limit the establishment of *A. itadori* in either the UK or Canada.

**Bowden, J.J.** and Buddle, C.M.

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Life history characteristics of three wolf spider species from the Yukon Territory, Canada.**

Reproductive traits of individuals are important as they help form the basis for adaptation to novel and changing environments. Reproductive traits can vary between species, between populations of a species and between individuals of a population. We collected wolf spiders by hand and live pit-fall trapping during the months of June and July, 2008 along a latitudinal transect in the Yukon Territory, Canada. Our objective was to investigate life history traits of three coexisting wolf spider species at a regional scale. We will seek predictors of spider fitness and assess tradeoffs between reproductive investment and body size.

Burgher-MacLellan, K.<sup>a</sup>, Williams, G.<sup>b</sup>, **MacKenzie, K.<sup>a</sup>**, and Shutler, D.<sup>c</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Kentville, NS; <sup>b</sup> Dalhousie University, Halifax, NS; <sup>c</sup> Acadia University, Wolfville, NS

POSTER SESSION

**Assessment with qualitative and quantitative real-time PCR of *Nosema apis* and *Nosema ceranae* co-infections in western honey bees (*Apis mellifera*).**

The microsporidians, *Nosema ceranae* and *N. apis*, are detected using PCR analyses, but little is known about co-infection dynamics in honey bees (*Apis mellifera* L.). We sought to detect and quantify co-infection intensities in composite colony and individual bee samples with real-time PCR. We used species-specific primers (218MITOC-FOR, 218MITOC-REV, 321APIS-FOR and 321APIS-REV) to examine co-infection intensities in bee samples. *Nosema apis*, *N. ceranae* and co-infection (5.6%, 33.3% and 61.1%, respectively) were detected with real-time PCR and results showed variation in co-infection intensity for both *Nosema* spp., indicating the usefulness of these techniques for monitoring infection.

**Bush, S.E.<sup>a, b</sup>** and Clayton, D.H.<sup>b</sup>

<sup>a</sup> University of Kansas, <sup>b</sup> Department of Biology, University of Utah, Salt Lake City, UT, USA

SYMPOSIUM: ARTHROPOD HOST-SYMBIONT RELATIONSHIPS

**The ecological basis of coevolutionary history: lessons from lice.**

Adaptive evolution may play a role in host-parasite cospeciation, but this has seldom been tested. We explored the adaptive basis of cospeciation using doves (Columbiformes) and two types of feather-lice (Phthiraptera: Ischnocera), which have cospeciated with their hosts to different degrees. By experimentally simulating host-switches, we found that lice cannot establish on novel hosts that differ in size from their native host. To determine why size matters, we measured three components of

louse fitness: attachment, feeding and escape from host defense. Our results suggest that host defense reinforces cospeciation by preventing lice from switching between hosts of different sizes.

**Campbell, J.F.**

United States Department of Agriculture, Agricultural Research Service, Grain Marketing and Production Research Service, Manhattan, KS, USA

SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**Pheromone trapping red flour beetle in structures: limitations, implementation and interpretation.**

Pheromone lures and traps are available for monitoring red flour beetle (*Tribolium castaneum*) in structures where food is processed and stored, but these traps have a number of limitations that need to be considered when implementing and interpreting monitoring programs. Even with these limitations, they are a powerful tool that is typically underutilized in commercial food facilities. In this presentation, I will cover some factors that influence response of beetles to traps and then illustrate how results of a trapping program can be applied to understand pest populations using data from flour mills.

**Campbell, K.A. and Giberson, D.J.**

Department of Biology, University of Prince Edward Island, Charlottetown, PE

POSTER SESSION

**Aquatic Hemiptera of Deroche Pond Natural Protected Area, Prince Edward Island.**

Deroche Pond Natural Protected Area (NPA) is a 375 ha reserve located on the north shore of Prince Edward Island characterized by a variety of wetland habitats. We surveyed aquatic Hemiptera in 2008 in the NPA, and found 20 species in 6 families. This included half the known PEI species, plus five species not previously recorded on PEI, and records for one genus and one family new for the maritime provinces. Despite its small size, PEI has been poorly collected for many groups and we expect to see more new provincial or regional records as collecting continues.

**Cárcamo, H.A.<sup>a</sup>, Dosdall, L.M.<sup>b</sup>, and Olfert, O.<sup>c</sup>**

<sup>a</sup> Agriculture and Agri-Food Canada, Lethbridge, AB; <sup>b</sup> Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB; <sup>c</sup> Agriculture and Agri-Food Canada, Saskatoon Research Centre, SK

CANADIAN FORUM FOR BIOLOGICAL CONTROL SYMPOSIUM

**How to integrate biological control effectively in field crop IPM programs.**

Some of the key pests of cereal crops in the prairies include wheat stem sawfly, orange wheat blossom midge and more recently, the cereal leaf beetle. Lack of insecticide control options for the wheat stem sawfly make it an ideal candidate for integration

of biocontrol with host plant resistance and cultural practices. For the wheat midge, adhering to economic thresholds and avoiding late insecticide spraying can conserve parasitoid populations. Cereal leaf beetle in North America is considered one of the few successful cases where a field crop pest has been managed primarily by biological control.

**Carleton, D.<sup>a</sup>**, Royer, L.<sup>b</sup>, Hébert, C.<sup>c</sup>, Delisle, D.<sup>c</sup>, Bauce, E.<sup>d</sup>, and Quiring, D.T.<sup>a</sup>

<sup>a</sup> Department of Biology, University of New Brunswick, Fredericton, NB; <sup>b</sup> Natural Resources Canada, Canadian Forest Service, Corner Brook, NL; <sup>c</sup> Natural Resources Canada, Canadian Forest Service, Sainte-Foy, QC; <sup>d</sup> Faculté de foresterie et géodésie, Université Laval, Sainte-Foy, QC

POSTER SESSION: PRESIDENT'S PRIZE

**The *Telenomus* species complex attacking hemlock looper (Lepidoptera: Geometridae) in eastern Quebec and western Newfoundland.**

Sentinel traps were used to elucidate the seasonal biology of parasitoids of hemlock looper eggs in eastern Canada. *Telenomus flavotibiae*, *Telenomus* sp. nov. and *Trichogramma* spp. were found only in fall sentinel traps. *Telenomus droozi* only parasitized eggs in spring sentinel traps, but *T. coloradensis* parasitized eggs in both fall and spring traps. *Telenomus coloradensis* parasitized mostly during spring, and was responsible for the majority of egg parasitism. Only *T. coloradensis* displayed a strong and positive response to host egg density. *Telenomus coloradensis* is the only parasitoid studied that might be able to regulate hemlock looper populations.

**Catton, H.A.<sup>a</sup>**, Lalonde, R.G.<sup>a</sup>, and De Clerck-Floate, R.A.<sup>b</sup>

<sup>a</sup> Unit of Biology and Physical Geography, University of British Columbia Okanagan, Kelowna, BC; <sup>b</sup> Agriculture and Agri-Food Canada, Lethbridge Research Centre, Lethbridge, AB

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Modeling population-level effects of nontarget attack on a native plant by the root weevil, *Mogulones crucifer*, a biocontrol insect for houndstongue (*Cynoglossum officinale*).**

The root weevil, *Mogulones crucifer*, released in Canada in 1997, has been a remarkably effective agent for controlling houndstongue (*Cynoglossum officinale*, Boraginaceae) on western Canadian rangelands. However, sporadic nontarget feeding and oviposition on native confamilial plants by the weevil have raised questions about the ecological risks associated with this agent, particularly in the USA. The interaction between *M. crucifer*, houndstongue and the native perennial, *Hackelia micrantha*, provides an excellent study system to model impacts of nontarget attack at the individual plant and population levels. Preliminary findings from ongoing field experiments on weevil host choice and dispersal will be presented.

**Cloutier, C.<sup>a</sup>**, Nguyen, T.T.A.<sup>a</sup>, and Michaud, D.<sup>b</sup>

<sup>a</sup> Département de Biologie, <sup>b</sup> Département de Phytologie, Université Laval, Québec, QC

## SYMPOSIUM: ENTOMOLOGICAL ISSUES IN POTATO PRODUCTION

**Studying aphid interactions with plants and potential stress factors using proteomics technology.**

Two-dimensional electrophoresis and mass spectrometry (MS), in tandem with bioinformatics reveal the entire protein complement (proteome) expressed in cells, tissues, whole organisms and at their interface in inter-organismic interactions. Proteomics must be practised with technical skill, devotion for rigorous experimentation and cautious interpretation of abundant protein identifications from MS data, obtained from widely available internet software. The application of proteomics to study insect development, reproduction, reaction to stress and interactions with plants, pathogens or parasites is presented, including our work on aphids. Protein diversity expressed in insect interactions with hosts, parasites, pathogens, or symbionts is also indicative of divergent ecology and evolution. Our work illustrates that the aphid proteome is morph-specific and responds variously to ecological stress.

**Colgan, L.J.** and Erbilgin, N.

Department of Renewable Resources, University of Alberta, Edmonton, AB

## PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Investigating induced defence in jack pine (*Pinus banksiana*) seedlings and the indirect interaction between jack pine budworm (*Choristoneura pinus pinus*) and a mountain pine beetle-associated fungal pathogen.**

The range of the mountain pine beetle (MPB) is expanding eastward into jack pine forests where it will interact with the jack pine budworm (JPB). Jack pine seedlings were either defoliated by JPB and subsequently inoculated with the MPB fungal associate, *Grosmannia clavigera*, or inoculated with *G. clavigera* and subsequently defoliated by JPB, to investigate the induction of tree defences by the initial treatment and the resulting tree susceptibility or resistance to the successive treatment. The outcome of this research is important for predicting future susceptibility of jack pine stands to MPB attacks prior to MPB establishment in jack pine forests.

**Copps, P.T.**

Orkin, Inc., Costa Mesa, CA, USA

## SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**IPM in structural pest management: an evolving concept.**

The use of IPM in agriculture is well accepted. Within the structural pest management industry, there remains disagreement regarding the definition of IPM. However, basic tenets are recognized — the use of inspection, monitoring processes and best practices. Thresholds are dependent on the nature of the facility and the needs of the client. There is a consensus within the industry that an IPM program designed to include all stakeholders can effectively reduce pest activity and limit pesticide applications. The most advanced programs involve a partnership between the contractor, property management and the client. The roles and responsibilities of all involved must be clearly defined.

**Cox-Foster, D.**

Department of Entomology, Pennsylvania State University, University Park, PA, USA

SYMPOSIUM: APICULTURE: BEE - VIRUS INTERACTIONS

**Unravelling the pathogens in honey bees undergoing colony collapse disorder.**

In 2006, honey bee colonies in the United States began to die with unique symptoms and at unprecedented numbers. I will discuss the search for the pathogens and conditions that trigger the dramatic losses of colonies and compare this to “normal losses” of colonies. The experiments described will go from molecular analysis to attempts to duplicate CCD in colonies. I will also present our latest research on how viral pathogens can be transmitted and affect multiple pollinator species, raising concern for not only honey bee health but also the health of other important pollinators.

**Craig, P.<sup>a</sup>, Cutler, G.C.<sup>a</sup>, Nams, V.<sup>a, b</sup>, and MacKenzie, K.<sup>b</sup>**

<sup>a</sup> Department of Environmental Sciences, Nova Scotia Agricultural College, Truro, NS; <sup>b</sup> Agriculture and Agri-Food Canada, Kentville, NS

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Influence of landscape and field characteristics on native bees in wild blueberry habitats.**

This research aims to identify native bee species present in Nova Scotia wild blueberry (*Vaccinium angustifolium* Ait.) fields and to determine some ecological factors associated with their diversity and abundance. Native bees were collected by pan trapping along transects to assess temporal and spatial changes in wild bee populations from field edges into field interiors. Bee population data will be analyzed in relation to non-crop vegetation quantified in fields, plant communities along field edges and macro-scale landscape structure. Additionally, stigma-pollen deposition rates are being used to correlate pollination success with wild bee diversity and/or abundance.

**Cutler, G.C.**

Department of Environmental Sciences, Nova Scotia Agricultural College, Truro, NS

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Stimulatory effects of insecticides on insects.**

Toxicologists have traditionally assumed there is a dose-response threshold above which chemical exposures induce biological effects and below which none occurs. However, there is now strong support for hormesis, a response characterized by low-dose stimulation and high-dose inhibition. I examine hormesis in insects exposed to sublethal doses of insecticide, particularly in terms of pest resurgences. While the reduction of natural enemies following insecticide treatment is the most commonly cited explanation of such resurgence, hormetic responses may be an additional or alternative mechanism.

**Danci, A.<sup>a</sup>, Takács, S.<sup>a</sup>, Drake, M.<sup>a</sup>, Schaefer, P.W.<sup>b</sup>, and Gries, G.<sup>a</sup>**

<sup>a</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>b</sup> United States Department of Agriculture, Agriculture Research Service, Beneficial Insects Introduction Research Laboratory, Newark, DE, USA

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Perfect timing: how males of the parasitoid wasp, *Pimpla disparis* (Hymenoptera: Ichneumonidae), predict the emergence of prospective mates from gypsy moth, *Lymantria dispar*, host pupae.**

Males of the parasitoid wasp, *Pimpla disparis*, arrive at parasitized gypsy moth, *Lymantria dispar*, host pupae prior to the emergence of a potential mate. We tested the hypothesis that males track the development of a prospective mate inside a host pupa, allowing them to pinpoint the time of mate emergence. Sound and Laser Doppler Vibrometer recordings of bioacoustic and vibratory signals produced by developing parasitoids in response to physical contact of host pupae by males, or in response to a paintbrush, revealed such significant changes of these signals that they appear suitable to inform males about their mate's emergence time.

**De Clerck-Floate, R.A.**, Floate, K.D., and Saunders, P.  
Agriculture and Agri-Food Canada, Lethbridge, AB

POSTER SESSION

**A test of containment efficacy using living insects in a release and recapture study.**

North American regulatory standards for the containment of arthropods in quarantine stipulate that such facilities be specially designed to prevent arthropod escapes. They are to be equipped with a vestibule light lock containing a UV or regular light trap and inner rooms with negative air pressure. To test the efficacy of various containment methods, a release and recapture study was conducted within an operational quarantine using three insect species: *Aphodius distinctus*, *Musca domestica* and *Urolepis rufipes*. The optimum method for escape prevention depended on species, so a combination UV/incandescent light trap, a pan/water trap and negative air pressure are all recommended.

de Miranda, J.R.

Department of Ecology, Swedish University of Agricultural Sciences, Uppsala, Sweden

SYMPOSIUM: APICULTURE: BEE - VIRUS INTERACTIONS

**Current state of honey bee virus research in Europe.**

I provide an overview of the current status of honey bee virus research in Europe, and a discussion of this with reference to the historical research both in Europe and worldwide. The presentation is organized thematically, covering: virus discovery and characterisation, incidence and surveys, transmission and pathology. The major European institutes involved with different aspects of honey bee virus research are identified, as well as pan-European organizations



involved in co-ordinating the research and survey efforts and in disseminating the information to the different stake-holders within the academic, professional, commercial and political sectors.

**Desai, S.**<sup>a</sup>, Eu, Y.-J.<sup>b</sup>, and Currie, R.W.<sup>a</sup>

<sup>a</sup> Department of Entomology, <sup>b</sup> Department of Plant Science, University of Manitoba, Winnipeg, MB

SYMPOSIUM: APICULTURE: BEE - VIRUS INTERACTIONS

**Inhibition of deformed wing virus (DWV) replication in honey bees by RNA interference.**

RNA Interference (RNAi) has evolved as a simple, rapid and specific method for silencing gene function. RNAi reduces transcripts by causing degradation of the target mRNA. This mechanism has recently been described in a number of species including humans, plants, animals and insects (*Drosophila*) to control viruses. In the current study, we used dsRNA to control Deformed Wing Virus (DWV) in honey bees. An RNA-dependent RNA polymerase (RdRp) region of the DWV gene was selected to construct dsRNA to target DWV replication in honey bees. If proven effective, this mechanism can be used to block DWV replication within an insect host and thus block disease transmission.

**deWaard, J.R.**<sup>a, b</sup> and Humble, L.M.<sup>a, c</sup>

<sup>a</sup> Department of Forest Sciences, University of British Columbia, Vancouver, BC; <sup>b</sup> Entomology, Royal British Columbia Museum, Victoria, BC; <sup>c</sup> Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Barcode-assisted assessments of lepidopteran diversity in British Columbia.**

The biodiversity inventory is inherently a formidable task, particularly in hyper-diverse terrestrial arthropod groups. DNA barcoding holds significant promise to assist in the onerous chore, namely by allowing the rough sorting and tentative identifications of collected material by non-specialists. We discuss our ongoing work in British Columbia employing DNA barcoding to facilitate assessments of lepidopteran diversity across several disturbance gradients. We underscore the improvements that this approach provides relative to traditional techniques, such as allowing the appraisal of multiple levels of diversity and the increased sensitivity of detection of taxa at low density.

**Dickens, J.C.**

USDA, ARS, Henry A. Wallace Beltsville Agricultural Research Center, Plant Sciences Institute, Invasive Insect Biocontrol and Behavior Laboratory, Beltsville, MD, USA

SYMPOSIUM: ENTOMOLOGICAL ISSUES IN POTATO PRODUCTION

**Chemical signals in the Colorado potato beetle.**

The nature of chemical signals used by the Colorado potato beetle, *Leptinotarsa decemlineata* (Say) (Coleoptera: Chrysomelidae), had been disputed. While CPB were known to orient to volatiles emanating from potato plants, the chemicals involved had not been identified and the existence of a volatile pheromone was a subject of controversy. I will discuss the discovery of chemical signals for CPB and characterize physiological mechanisms involved in their detection. Results from recent field tests will be presented which portend the usefulness of chemical signals in the management of endemic populations of CPB and for survey or detection of its spread.

**Dixon, D.**

Former Provincial Apiarist, Manitoba Agriculture, Food and Rural Initiatives, MB

HERITAGE LECTURE

**The history of beekeeping research in Western Canada.**

The European honey bee (*Apis mellifera*), not being native to the western hemisphere, has experienced a dramatic history of introduction and widespread commercial management for both honey production and pollination of agricultural crops. Canadian bee research scientists are recognized internationally as having played an integral role in the development of our understanding of this insect as well as the introduction of efficient commercial beekeeping practices.

The first recorded work with honey bees at a Canadian federal experimental farm occurred at the Brandon, Manitoba, Research Station in 1889. During the next 16 years, honey bees were introduced to an additional 15 federal experimental farms across Canada. The first agricultural college in western Canada, later the University of Manitoba, was established in 1877, and an experimental apiary was set up on campus by 1907. With time, the main centres for apiculture research in Canada became the Ottawa Research Farm, the University of Guelph, the University of Manitoba, the Beaverlodge Research Station and more recently, Simon Fraser University.

Although the harsh winter conditions common to much of western Canada made wintering bees a challenge, the long, hot summer days and abundance of nectar-producing plants rewarded beekeepers with large honey crops. This no doubt encouraged the close working relationship between commercial beekeepers and western Canadian bee research scientists that exists to this day.

**Du, J. and Holliday, N.J.**

Department of Entomology, University of Manitoba, Winnipeg, MB

POSTER SESSION: PRESIDENT'S PRIZE

**Responses of *Aleochara bilineata* (Coleoptera: Staphylinidae) to dimethyl disulphide.**

*Aleochara bilineata* is a staphylinid parasitoid of the cabbage maggot, *Delia radicum*. Adult beetles are attracted to pitfall traps baited with dimethyl disulphide (DMDS),

but the role of DMDS in *A. bilineata* biology has not been elucidated. In an arena with still air, adult *A. bilineata* distribution was not influenced by DMDS; however, *A. bilineata* larvae were arrested in the vicinity of the DMDS release point, a phenomenon that was more evident in full light than under red light. Release of DMDS near *D. radicum* puparia increased the probability that puparia would be attacked by host-seeking *A. bilineata* larvae.

**Dupont, J.M.** and Westwood, A.R.

Department of Biology, University of Winnipeg, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Conservation and enhancement of Poweshiek skipperling (*Oarisma poweshiek*) in Manitoba.**

The Poweshiek skipperling (Lepidoptera: Hesperidae) is an endemic tall grass prairie species listed as threatened under Canada's Species At Risk Act. The only Canadian population of the skipperling is found in southeastern Manitoba. There are limited data available on the biology and conservation of the Poweshiek skipperling in Canada. Our research is designed to fill some of these information gaps. To improve future management strategies, two key hypotheses regarding adult Poweshiek skipperling movement and habitat requirements are being examined. We hypothesize that Poweshiek skipperlings show preferential site selection within tall grass prairie and demonstrate minimal movement between sites.

**Durocher-Granger, L.**<sup>a, b</sup> and Boivin, G.<sup>a, b</sup>

<sup>a</sup> Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC; <sup>b</sup> Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Does host feeding influence sex allocation in an egg parasitoid?**

The allocation of sex by female parasitoids is influenced by the quality of the host (Host Quality Model) and the position of the host in a sequence (Precise Sex Allocation). Host feeding by females of *Trichogramma turkestanica* decreases the quality of the host for the developing immatures and also occurs mostly at the beginning of an oviposition sequence. Females allocated more males in hosts where host feeding occurred but nonetheless also allocated males as predicted by the Precise Sex Allocation model. Interestingly, host feeding influenced sex allocation although it occurs after oviposition.

**Erlandson, M.A.**

Agriculture and Agri-Food Canada, Saskatoon Research Centre, Saskatoon, SK

SYMPOSIUM: APICULTURE: BEE - VIRUS INTERACTIONS

**Viruses as biological control agents for insect pest control.**

Viruses are associated with insects in a wide range of ecological relationships: as pathogens, plant and animal viruses relying on insect vectors for transmission and as specialized symbionts that allow hymenopteran parasitoids to evade the immune system of their hosts (e.g. polydnviruses). At least 14 families of viruses have representatives pathogenic in invertebrates and some of these viruses have been investigated for potential as biological control agents of insects. Examples of viruses developed as biocontrol agents and implemented in strategies ranging from classical biological control to inundative approaches similar to conventional application of chemical pesticides will be discussed.

**Evenden, M.L.<sup>a</sup>** and Gries, R.<sup>b</sup>

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC

POSTER SESSION

**Comparison of commercially-available sex pheromone lures to monitor diamondback moth in canola.**

Five different commercially-available sex pheromone lures were compared for their attractiveness to male diamondback moth, *Plutella xylostella* L. (Lepidoptera: Plutellidae), in two season-long field-trapping experiments in canola fields throughout Alberta. Attractiveness of the lures varied and was inversely related to the amount of pheromone released as determined by GC-MS analysis of pheromone components released from the lures. The two most effective commercial lures were attractive to male diamondback moths for up to eight weeks under field conditions but were not as attractive as virgin females.

**Fairhurst, S.<sup>a</sup>**, Ablard, K.M.<sup>a</sup>, Schaefer, P.W.<sup>b</sup>, and Gries, G.<sup>a</sup>

<sup>a</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>b</sup> United States Department of Agriculture, Agricultural Research Service, Beneficial Insects Introduction Research, Newark, DE, USA.

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Mechanism and function of the post-copulatory ritual in the egg parasitoid wasp, *Ooencyrtus kuvanae* (Hymenoptera: Encyrtidae).**

Male and female *Ooencyrtus kuvanae* emerge from host egg masses of gypsy moth, *Lymantria dispar*. When a single male encounters a single female, he engages her in a pre-copulatory ritual immediately followed by copulation and a post-copulatory ritual. We tested the hypotheses that the pre-copulatory ritual puts the female into a "trance-like" receptive state and that the post-copulatory ritual "re-awakens" her. Females in trance mate multiple times with different males, whereas females with post-copulatory ritual experience do not re-mate. The post-copulatory ritual appears to "mechanically awaken" the female so that she resists mating with other males.

**Fattah-Hosseini, S.** and Allahyari, H.

Department of Plant Protection, University of Tehran, Karaj, Iran

POSTER SESSION

**Host plant resistance to greenbug, *Schizaphis graminum* (Homoptera: Aphididae), on five wheat varieties.**

Resistant plants are major factors that cause significant decreases in the population growth rate of greenbug, *Schizaphis graminum* Rond. To evaluate the potential resistance of plants against greenbug, the most important parameter of the life table, the intrinsic rate of increase,  $r_m$ , was calculated by the Wyatt and White method on five wheat varieties. The highest and the lowest value of  $r_m$  were 0.37 and 0.31, respectively. Antixenosis tests were also done. Result of the antixenosis tests were in agreement with the antibiosis test and the resistant cultivar had both antibiotic and antixenotic effects on greenbug.

**Fields, P.G.**

Agriculture and Agri-Food Canada, Cereal Research Station, Winnipeg, MB

SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**Alternatives to methyl bromide fumigation in food processing facilities.**

Methyl bromide (MB) has been used around the world to control insects in flour mills, pasta manufacturing plants and breakfast food plants. It has been so effective at controlling insects in these facilities, that there were few alternatives to MB when, in 1995, it was determined that MB should be phased-out because it was an ozone-depleting substance. Alternatives being used to replace methyl bromide include sulfuryl fluoride (ProFume), heat treatments, sanitation, phosphine combined with heat and carbon dioxide. I will discuss the success of these alternative treatments done in Canadian flour mills and pasta plants.

**Fitzsimmons, J.M.,** Burke, R.J., and Kerr, J.T.

Department of Biology, University of Ottawa, Ottawa, ON

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**A mobility index of Canadian butterfly species: tapping in to naturalists' experience.**

Mobility is an important trait in insect ecology, but its estimation through experimental methods is very difficult. We have utilized the accumulated knowledge of butterfly enthusiasts across Canada to estimate species' mobility rates. Lepidopterists volunteered to complete our survey, rating mobility rates of Canada's butterfly and skipper species. Based on responses, we have constructed the first mobility index for Canada's butterfly and skipper species. This index will be useful in testing, among other things, the relationship between mobility and body size, and whether mobility rates limit species' northward range expansion with climate change.

**Flaherty, L.<sup>a,b</sup>,** Sweeney, J.<sup>a</sup>, Morrison, P.A.<sup>a</sup>, and Quiring, D.T.<sup>b</sup>

<sup>a</sup> Natural Resources Canada, Canadian Forest Service, Fredericton, NB; <sup>b</sup> Faculty

of Forestry and Environmental Management, University of New Brunswick, Fredericton, NB

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Oviposition and performance of the exotic brown spruce longhorn beetle (*Tetropium fuscum*) on host trees of varying condition.**

In Europe, the brown spruce longhorn beetle, *Tetropium fuscum* (Fabr.) (Coleoptera: Cerambycidae), is considered a secondary pest, primarily infesting weakened or cut Norway spruce, *Picea abies* (L.) Karst. In Canada, this exotic beetle has been reported to attack several species of apparently healthy spruce (*Picea* spp.). We evaluated the effect of tree condition on oviposition, colonization success and subsequent performance of *T. fuscum* in Canada. Preliminary results indicate that *T. fuscum* can colonize apparently healthy trees in Canada, but that the insects' survival is reduced and their development time extended. Oviposition and colonization data are currently being collected.

**Floate, K.D.<sup>a</sup>** and Tiberg, K.<sup>a, b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Lethbridge, AB; <sup>b</sup> The University of Lethbridge, Lethbridge, AB

POSTER SESSION

**What happened to the coprophilous insects associated with bison?**

The eradication of bison (*Bison bison*) in North America may have reduced populations of coprophilous insects that bred in their manure. Alternatively, these insects may now breed in cattle dung. Breeding success can be affected by dung nutrient content, moisture levels and volatile chemicals that affect colonization. Experiments are underway to compare the attraction of dung insects to manure from bison versus cattle, and to compare numbers of insects developing in these different types of dung. Results to follow.

**Floate, K.D.<sup>a</sup>** and Watson, D.W.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Lethbridge, AB; <sup>b</sup> Department of Entomology, North Carolina State University, Raleigh, NC, USA

POSTER SESSION

**Introduction of exotic dung beetles into Canada to accelerate degradation of cattle dung.**

Dung-fouled pastures are poorly used by cattle, which avoid feeding on contaminated grasses. The resulting patchy grazing pattern causes economic losses for the industry such that rapid dung degradation is desired. Efforts now are underway in southern Alberta to establish populations of the coprophagous beetles, *Digitonthophagus gazella* and *Onthophagus taurus* (Coleoptera: Scarabaeidae), which are recognized for efficiently burying dung. Establishment of *O. taurus* is considered likely, given reports of populations within 300 km of the Canada/USA border. Establishment of *D. gazella* is unlikely, but is being studied to test predictions of climatic models under field conditions.

**Galka, B.<sup>a</sup>**, Saguez, J.<sup>b</sup>, Vincent, C.<sup>b</sup>, and Olivier, C.<sup>a</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Saskatoon, SK; <sup>b</sup> Agriculture and Agri-Food Canada, Saint-Jean-sur-Richelieu, QC

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Leafhoppers in Quebec vineyards: implications regarding phytoplasma diseases.**

Leafhoppers were sampled from five vineyards within Quebec in 2007 and 2008. Individuals were identified and sorted according to species and sex. Nested polymerase chain reaction (PCR) on DNA extracted from individuals revealed that few individuals may be vectors of phytoplasma which may lead to yellows diseases. Implications are discussed as to which vectors were found and their significance as potential disease vectors.

**Galloway, T.D.**

Department of Entomology, University of Manitoba, Winnipeg, MB

SYMPOSIUM: ARTHROPOD HOST-SYMBIONT RELATIONSHIPS

**Patterns in life histories of fleas (Siphonaptera).**

Most people are familiar with the cat flea, but are unaware of the wide range of life history patterns in fleas. Fleas vary in their host dependency, from those where adults spend little time on the host, to those which remain permanently attached. Female chigoe fleas undergo neosomy beneath the skin of their host. Larvae mostly reside in the nest, but some species live in the pelage of their host or penetrate beneath the skin. Larvae of some species may not even feed. Fleas may be adapted to seasonal changes, environment, host behaviour and presence of other species of fleas.

**Galloway, T.D.**

Department of Entomology, University of Manitoba, Winnipeg, MB

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Biodiversity of lice on birds and mammals in Manitoba.**

When Galloway and Danks (1991) reviewed ectoparasites in Canada, there were published records for 36 species of lice in Manitoba. They recommended entomologists collaborate with ornithologists and mammalogists. Since 1994, I have worked with personnel at the Manitoba Wildlife Rehabilitation Organization, Manitoba Conservation, Oak Hammock Marsh and Prairie Wildlife Rehabilitation Centre. Animals are salvaged, frozen and washed to collect ectoparasites. Current estimates from >7,000 hosts are 294 species of lice from birds and 32 species from mammals; >500,000 specimens. Salvaging hosts is an effective means to investigate biodiversity and ecology of lice.

**Giberson, D.J.**

Department of Biology, University of Prince Edward Island, Charlottetown, PE

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Northern collaborative entomology: collecting aquatic insects on the Coppermine River, NU.**

Nunavut communities have a large stake in monitoring water quality and biodiversity in their region, but are hampered by lack of training opportunities and lack of regional expertise. The community of Kugluktuk (formerly Coppermine) is working with university scientists to train local youth in plant identification, and aquatic insect, fish and water quality monitoring, to help build local infrastructure. I report here on my experience in training local youth in insect collection and identification, and on how this can generate biodiversity data for isolated areas of the country that would not otherwise be available or be too expensive to collect.

**Gibson, J.F.<sup>a, b</sup>** and Skevington, J.H.<sup>a</sup>

<sup>a</sup> Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON;

<sup>b</sup> Department of Biology, Carleton University, Ottawa, ON

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**The key to unlocking the Schizophora: placement of the Conopidae within the eremoneuran Diptera based on mtDNA and nrDNA.**

The Conopidae is a fascinating family of parasitoid flies. Past phylogenetic hypotheses have placed the conopids as sister to a number of brachyceran groups including the Syrphidae, the Schizophora (s.s.) and the Tephritoidea. We tested these hypotheses using a dataset composed of over 12.8 kbp of DNA sequence from ten different genes and 31 dipteran taxa. Mitochondrial, nuclear, ribosomal and protein-coding genes are all included in the analysis. The Conopidae is recovered as monophyletic with the Diopsidae as the closest sister group. A number of support measures allow a comparison of the informative quality of all genes included.

**Gillespie, D.R.<sup>a</sup>**, Nasreen, A.<sup>a</sup>, Moffat, C.E.<sup>a</sup>, Clarke, P.<sup>a</sup>, and Roitberg, B.R.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada Research Centre, Agassiz, BC; <sup>b</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Community-level effects of extreme temperature perturbation.**

The effects of the frequency and severity of high-temperature perturbation were tested in an aphid-based community consisting of pepper plants, green peach aphids and two parasitoids, *Aphelinus abdominalis* and *Aphidius matricariae*. Mesocosm communities were exposed to either daily or twice-weekly perturbations in temperature, with mid-day peaks at either 30 or 40 °C. Population growth in the aphid in both the presence and absence of parasitoids was affected primarily by the frequency of high-temperature perturbation, and was generally slower in the high-frequency treatments. The two parasitoid communities were differentially affected by the frequency of high-temperature perturbation.

**Gillespie, D.R.<sup>a</sup>**, Mason, P.G.<sup>b</sup>, Broadbent, B.<sup>c</sup>, Jenner, W.<sup>d</sup>, Andreassen, L.D.<sup>c</sup>, Haye, T.<sup>d</sup>, and Kuhlmann, U.<sup>d</sup>

<sup>a</sup> Agriculture and Agri-Food Canada Research Centre, Agassiz, BC; <sup>b</sup> Agriculture and Agri-Food Canada Research Centre, Ottawa, ON; <sup>c</sup> Agriculture and Agri-Food Canada



Research Centre, London, ON; <sup>d</sup> CABI Europe - Switzerland Centre, Delemont, Switzerland; <sup>e</sup> Department of Entomology, University of Manitoba, Winnipeg, MB

POSTER SESSION

**Defining non-target communities in arthropod biological control programs: approaches and solutions.**

Recent practice for arthropod biological control programs in Canada recommends that non-target test lists be submitted to the CFIA for comment before non-target testing begins. Although this recommendation is laudable, biological control practitioners may find it difficult to select an appropriate list of arthropods for testing, especially when the taxonomy, systematics and ecology of potential non-target species are incompletely known. Some ideas and approaches are presented for resolving this problem, based on current biological control programs for various arthropod pests in Canada.

**Gillespie, S.D.** and Adler, L.S.

Department of Plant, Soil and Insect Sciences, University of Massachusetts, Amherst, MA, USA

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Factors affecting parasitism in native bumble bees.**

Bumble bees are important pollinators in North America yet it is unclear what is driving some species' declines. Bumble bees are attacked by many parasites which can impact colony fitness. We used a multi-site survey to document the abundance of *Crithidia bombi*, *Nosema bombi* and parasitoid conopid flies and asked whether factors such as bee species or sex were associated with infection by each parasite. Abundance of all parasites was higher than has been documented in wild bees in North America. Risk of parasitism varied systematically for individual bees, and different factors were important for each parasite type.

**Girardo, S.**<sup>a, b</sup>, Kenis, M.<sup>a</sup>, and Quicke, D.L.J.<sup>c</sup>

<sup>a</sup> CABI Europe - Switzerland, Delemont, Switzerland; <sup>b</sup> Agriculture and Agri-Food Canada, Research Centre, Ottawa, ON; <sup>c</sup> Division of Biology, Imperial College London, Silwood Park Campus, Ascot, Berkshire, U.K.

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Mortality factors affecting the invasive horse-chestnut leaf miner, *Cameraria ohridella* (Lepidoptera, Gracillariidae), in Switzerland.**

*Cameraria ohridella* is an invasive species discovered in Macedonia in 1984. It has spread over most of Europe causing severe damage to the horse-chestnut. One particularity of *C. ohridella* is its capacity to reach and maintain outbreak densities rapidly. To help understand this phenomenon, life tables were constructed to assess the mortality factors affecting the leaf miner. Egg mortality reached 30%. Factors acting during the summer on larvae and pupae included predators, parasitoids and intra- and inter-specific competition. Parasitoids were mostly generalist eulophids, with very low prevalence. Ninety per cent of overwintering pupae died making the overwintering mortality the most important.

**Grant, C.R. and Westwood, A.R.**

Department of Biology, University of Winnipeg, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Assessment of insect diversity in various urban landscapes.**

Urban development across Canada is converting naturalized areas into suburban enclaves, resulting in specific habitats of arthropod groups being altered or lost. The objective of this study was to determine the level of insect diversity in three different land-use areas within the City of Winnipeg and to study the relationship between nocturnal insect diversity and the degree of urban forest development. Preliminary results show that Trichoptera abundance was not linked to urban forest structure for 2005 and 2006, whereas plant-dependent Lepidoptera showed a numerical response for 2005 and is predicted to follow the same trend for 2006.

**Gregoire, D.**

Population Ecology Group, Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, NB

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Impact of thinning and previous damage by balsam woolly adelgid on the performance of spruce budworm and balsam fir sawfly.**

Host-plant-mediated interactions create systems in which herbivorous insects may interact indirectly through their association with a single host plant. I examined the effect that gouting of balsam fir by the balsam woolly adelgid (*Adelges piceae*) on subsequent populations of two defoliators: balsam fir sawfly (*Neodiprion abietis*) and spruce budworm (*Choristoneura fumiferana*). Manipulative experiments were set up in pre-commercially thinned and adjacent unthinned stands to determine the effect of thinning on this interaction. Gouting and thinning differentially affected survival and size of the sawfly and budworm.

**Hamilton, K.G.A.**

Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa, ON

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Border conflicts - how leafhoppers can help resolve ecoregional viewpoints in Canada and the USA.**

Ecoregions are defined using different parameters and assumptions in Canada and the USA. The only composite (published in 1999) minimizes the differences but needs to be tested against an impartial data set spanning the borders. Leafhoppers, which are speciose in the northern states and southern Canada, have been extensively collected and analysed for distribution patterns. These patterns tend to follow those of their plant hosts, and therefore reflect ecoregional patterns of lower trophic levels. In general, leafhopper distribution patterns agree with the synthesis but differ in some significant details, especially on the prairies where agriculture has extensively disrupted presettlement ecosystems.

**Hansen, L.D.**

Biology Department, Spokane Falls Community College, Spokane, WA, USA

SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**Carpenter ants and their management.**

Management strategies of carpenter ants include identification of the species infesting a structure plus knowledge of the biology and behaviour of the species. Major carpenter ant species will be discussed and other ant species that may be confused with carpenter ants will be presented, particularly those causing structural damage. Tools in management will be presented and will include manipulation of the microenvironments that support the species. Advances in chemical development and new formulations will be discussed including application techniques and seasonal variations.

**Haye, T.<sup>a</sup>, Mason, P.G.<sup>b</sup>, Gillespie, D.R.<sup>c</sup>, and Kuhlmann, U.<sup>a</sup>**

<sup>a</sup> CABI Europe-Switzerland, Delémont, Switzerland; <sup>b</sup> Agriculture and Agri-Food Canada, Research Centre, Ottawa, ON; <sup>c</sup> Agriculture and Agri-Food Canada, Research Centre, Agassiz, BC

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Host specificity of *Trichomalus perfectus*: conflicts between insect and weed biological control?**

The cabbage seedpod weevil, *Ceutorhynchus obstrictus*, is a serious pest of canola in Canada. In Europe the most important natural enemy attacking the pest is the larval ectoparasitoid, *Trichomalus perfectus* (Hymenoptera: Pteromalidae). This European parasitoid shows the greatest potential for incorporation into an integrated pest management system for *C. obstrictus* in Canada. Ceutorhynchine weevils are important agents for biological control of weeds in North America. These could be negatively affected if agents released against *C. obstrictus* have a broad host preference. Here we present the first results of host range assessments for *T. perfectus* in Europe.

**Hervieux, M.<sup>a</sup>, Buddle, C.M.<sup>a</sup>, and Quiring, D.T.<sup>b</sup>**

<sup>a</sup> Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC; <sup>b</sup> Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, NB

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Larval survival of the pale-winged gray moth (*Iridopsis ephyraria*) at different crown levels.**

Many eastern hemlock (*Tsuga canadensis*) trees in southwest Nova Scotia have recently been severely defoliated by the pale-winged gray moth (*Iridopsis ephyraria*). Interestingly, defoliation is very high in the low and mid crown of mature hemlock trees but seldom occurs in the upper crown. As most eggs are laid in the upper crown, this project is an attempt to understand the possible environmental factors that can explain the downward movement of larvae once they hatch. In summer 2009, we

tested two hypotheses that attributed the vertical distribution of the species to within crown variations in microclimate and foliage quality.

**Holliday, N.J.**

Department of Entomology, University of Manitoba, Winnipeg, MB

GOLD MEDAL ADDRESS

**Views of entomological evolution.**

From a personal and several institutional viewpoints, some patterns of past change in entomology will be described. Some current challenges facing entomological institutions will be discussed, with the intent of encouraging debate about possible solutions and future directions.

**Humble, L.M.<sup>a,b</sup>, Laplante, S.<sup>c</sup>, and Terzin, T.<sup>d</sup>**

<sup>a</sup> Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC; <sup>b</sup> Department of Forest Sciences, University of British Columbia, Vancouver, BC; <sup>c</sup> Canadian National Collection of Insects, Agriculture and Agri-Food Canada, Ottawa, ON; <sup>d</sup> Biodiversity Institute of Ontario, University of Guelph, Guelph, ON

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Developing DNA barcode libraries for Cerambycidae.**

DNA barcoding uses short, standardized DNA sequences from the mitochondrial gene cytochrome oxidase 1 (COI) for species identification, and can be applied to any arthropod life stage. Barcoding requires libraries of COI sequences for all species in the target taxa, and few sequences are available for bark and wood borers. To develop a barcode library for Cerambycidae, samples from >1500 individuals representing 350 species in Canadian Forest Service reference collections were processed, yielding barcodes >500 bp long for 218 species, and partial barcodes (224–491 bp) for another eight species. We discuss the technique's limitations and potential application to regulatory and research surveillance programs for introduced species.

**Hunt, S.L.**

Department of Environmental Biology, University of Guelph, Guelph, ON

PLENARY SYMPOSIUM

**Future shock: invasive insects, climate change and Canada's forest ecosystems.**

Insects are important natural disturbance agents in Canada's forests, but non-native species that invade new, enemy-free territory can have devastating effects on forest ecosystems. As the climate changes, the ability of non-native forest insects to establish and spread in Canada will likely be improved. Canada holds 10% of the world's total forest area and more than 30% of the world's boreal forest. Beyond their commercial importance, these forests provide numerous ecosystem services such as wildlife habitat and carbon sequestration, the latter being currently of immense interest due to potential feedbacks between forests and global climate. Canada's forests play a critical role in the global carbon budget, storing vast amounts of

carbon in trees and soils. Forest carbon dynamics, and other ecosystem processes, are strongly influenced by disturbances, including insect outbreaks. Attempts to predict the future state of our forest ecosystems must include consideration of how climate change will affect invasive, non-native insects. I will discuss the results of an assessment of the threats to Canada's forests posed by non-native, invasive insects under climate change, and the potential resulting impacts on forest ecosystem structure and function, with a focus on carbon storage. Climate-envelope models suggest that several non-native pest species identified as posing a potential risk to Canada's forests would be able to expand their ranges to various degrees under different climate change scenarios. I will explore the forest ecosystems of the future under climate change and increased insect outbreak pressure, the impacts of which will be complex and potentially severe.

**Hynes, K.I.**<sup>a,b</sup> and Podemski, C.L.<sup>b</sup>

<sup>a</sup> Department of Entomology, University of Manitoba, Winnipeg, MB; <sup>b</sup> Fisheries and Oceans Canada, Freshwater Institute, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Design of a rapid bioassessment protocol for boreal shield lakes.**

Boreal lakes and streams are an important Canadian resource increasingly impacted by anthropogenic activities including forestry, mining, residential and recreational development. The use of benthic macroinvertebrate rapid bioassessment (RBA) protocols to screen large geographic areas has been a successful approach in stream biomonitoring; however, RBA protocols have not been widely developed or used in lakes. An RBA protocol is being developed to allow cost effective biomonitoring of lakes across the shield areas of Manitoba. The protocol is being tested on a set of lakes in Nopiming and Whiteshell Provincial Parks with and without shoreline cottage development.

**Iranpour, M.**<sup>a,b</sup>, Lindsay, L.R.<sup>a,b</sup>, Peixoto, L.<sup>b</sup>, and McFarlane, C.<sup>b</sup>

<sup>a</sup> Zoonotic Diseases and Special Pathogens, Public Health Agency of Canada, Winnipeg, MB; <sup>b</sup> Department of Entomology, University of Manitoba, Winnipeg, MB

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Molecular characterization of some *Aedes* and *Ochlerotatus* species (Diptera: Culicidae) occurring in Manitoba.**

Identification of mosquitoes to species level using external anatomy is sometimes challenging due to morphological similarities among some species and/or poor quality of specimens. Nucleotide sequence data and Polymerase Chain Reaction-Restriction Fragment Length Polymorphisms (PCR-RFLP) were used to characterize more than 15 species of *Aedes* and *Ochlerotatus* (Diptera: Culicidae) occurring in Manitoba. DNA was extracted from one to five individuals of each species, and this was followed by amplification of Internal Transcribed Spacer (ITS) as target DNA. Molecular data were used for characterization and accurate identification of examined species.

**Jacobs, J.**, Latraverse, A., and Work, T.T.

Département des Sciences Biologiques, Université du Québec à Montréal, Montréal, QC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**The role of insects in wood decomposition.**

Fungi are acknowledged as the main agents of wood decomposition in boreal forests. Although insects have been mentioned in this process, the mechanisms by which they facilitate decomposition are poorly understood. We approached this question with laboratory and field experiments and a large scale survey of insects and decomposition rates across natural and managed stands. Preliminary results suggest that wood-feeding insects are important for preconditioning wood for saprotrophic fungi and that many deadwood-associated insects have the ability to act as dispersal vectors for fungal propagules. However, changes in beetle communities do not have noticeable effects on wood decomposition rates.

**Johns, R.C.**<sup>a</sup>, Ozaki, K.<sup>a</sup>, Tobita, H.<sup>a</sup>, and Shimazu, S.<sup>b</sup>

<sup>a</sup> Hokkaido Research Center, Forestry and Forest Products Research Institute, Sapporo, Japan; <sup>b</sup> Forestry and Forest Products Research Institute, Tskuba, Japan

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Ecological processes driving foliage-age dietary mixing within conifers by a generalist herbivore, the Asian gypsy moth.**

Some herbivorous insects mix a variety of plant resources to obtain a suitable balance or blend of nutrients, to limit the ingestion of toxins, to accommodate changes in nutritional needs associated with juvenile development and/or to limit susceptibility to natural enemies. We investigated the extent to which these mechanisms drive foliage-age dietary mixing by Asian gypsy moth caterpillars within crowns of various conifer species in northern Japan. We will discuss results from field and laboratory studies examining the effects of foliage-age mixing versus alternative foliage-age feeding strategies on caterpillar fitness and susceptibility to nucleopolyhedrovirus.

Keeling, C.I.<sup>a</sup>, **Huber, D.P.W.**<sup>b</sup>, Henderson, H.<sup>a</sup>, Li, M.<sup>a</sup>, Clark, E.L.<sup>b</sup>, Ott, D.S.<sup>b</sup>, Fraser, J.D.<sup>b</sup>, Bohlmann, J.<sup>a</sup>, and Tria Project Team<sup>a, b, c, d, e</sup>

<sup>a</sup> University of British Columbia; <sup>b</sup> University of Northern British Columbia; <sup>c</sup> University of Alberta; <sup>d</sup> Canadian Forest Service, Natural Resources Canada; <sup>e</sup> Canada's Michael Smith Genome Sciences Centre

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**A large expressed sequence tag (EST) resource for the mountain pine beetle, *Dendroctonus ponderosae* (Coleoptera: Curculionidae: Scolytinae).**

We have generated a large expressed sequence tag (EST) resource for the mountain pine beetle, *Dendroctonus ponderosae* Hopkins, as part of a large genomics effort (thetriaproject.ca) focused on the insect, its pathogenic fungi and its pine hosts. Transcripts were sequenced from an array of insect developmental stages (larvae, pupae, adults), tissues (midgut and fatbody, heads, antennae) and physiological states (fed, starved, exposed to terpene vapours, treated with juvenile hormone III, cold

hardening). Our database consists of nearly 200,000 ESTs representing over 15,000 tentative unique genes. These data are guiding current research into bark beetle functional genomics.

**Kevan, P.G.<sup>a</sup>, Packer, L.<sup>b</sup>, Schoen, D.J.<sup>c</sup>, Ritland, K.M.<sup>d</sup>, Elle, E.E.<sup>e</sup>, Vamosi, J.C.<sup>f</sup>, Kerr, J.T.<sup>g</sup>, and Weersink, A.J.<sup>a</sup>**

<sup>a</sup> University of Guelph; <sup>b</sup> York University; <sup>c</sup> McGill University; <sup>d</sup> University of British Columbia; <sup>e</sup> Simon Fraser University; <sup>f</sup> University of Calgary; <sup>g</sup> University of Ottawa

SYMPOSIUM: POLLINATION BIOLOGY

**The Canadian Pollination Initiative: interdisciplinary insights and organization.**

NSERC-CANPOLIN is a newly funded five-year research network that offers a unique integrative approach to the study of pollinator decline. Research activities fall under four themes: Pollinators (Managed and Wild), Plants (Gene Flow, Abiotic Pollination), Ecosystems (Invasives, Competition, Conservation, Floral Biology) and Prediction & Economics. There are seven Working Groups, comprised of over 44 researchers at 26 institutions across Canada. The Network is designed to create synergy between the range of disciplines involved in pollination research and address critical information gaps in conservation, pollination economics and the expected impacts of climate and land use change.

**Kowal, V.A.** and Cartar, R.V.

Department of Biological Sciences, University of Calgary, Calgary, AB

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Responses of terrestrial arthropod communities to anthropogenic forest disturbances at local and landscape scales.**

Anthropogenic impacts are ubiquitous in Canadian forests, which have experienced a mixture of disturbance types with potentially varying effects on biodiversity. The “edge effect” that accompanies direct disturbances has great potential to change or increase the initial disturbance effect. With this project, we use terrestrial arthropod assemblages to compare the edges of three anthropogenic disturbances in a mixed-wood coniferous forest: clearcut logging, forest roads and oil and gas pipelines. We employ multi-scale analysis of environmental factors shaping assemblage structure, from the local to the landscape level, to provide insights into the effects of different forest disturbances.

**Kulbaba, M.W.** and **Worley, A.C.**

Department of Biological Sciences, University of Manitoba, Winnipeg, MB

SYMPOSIUM: POLLINATION BIOLOGY

**Selection by hawk moths on floral design in *Polemonium brandegei*.**

The most appropriate floral design for efficient pollination varies among pollinators, yet evolutionary transitions between pollinators are not well understood.

The perennial herb, *Polemonium brandegei*, is pollinated by hawk moths and hummingbirds, whereas related species are pollinated by bees and flies. To quantify selection by hawk moths, we exposed experimental populations of *P. brandegei* to captive *Hyles gallii*, a natural pollinator. We analyzed seed set and siring success as functions of sex-organ position, corolla shape, nectar volume and nectar sugar content. These data support predictions that hawk moths should favour recessed sex organs, and will be contrasted with comparable data on hummingbird pollination.

**Kwasniewska, A.<sup>a</sup>, Buddle, C.M.<sup>a</sup>, Vincent, C.<sup>b</sup>, Gaul, S.<sup>c</sup>, and MacKenzie, K.<sup>c</sup>**

<sup>a</sup> Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC; <sup>b</sup> Agriculture and Agri-Food Canada, St Jean-sur-Richelieu, QC; <sup>c</sup> Agriculture and Agri-food Canada, Kentville, NS

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Effects of host volatiles on the activity and behaviour of the blueberry maggot fly.**

The effects of volatiles extracted from host plants on the activity and behaviour of the blueberry maggot fly (*Rhagoletis mendax*) was examined under field and laboratory conditions. In natural environments, a blend of terpenes and alcohols had a rate of fly captures similar to the standard lure of ammonium acetate, and this blend was more effective for late season monitoring of the fly. Laboratory experiments were done using wind tunnels and these results differed from field experiments in that ammonium acetate and a blend of aldehydes and alcohols elicited the strongest responses. This work supports the hypothesis that host volatiles are attractive to the blueberry maggot fly.

**Lachance, S.<sup>a</sup>, Nampoothiry, P.<sup>b</sup>, and Scott-Dupree, C.<sup>b</sup>**

<sup>a</sup> Université de Guelph - Campus d'Alfred, Alfred, ON; <sup>b</sup> Department of Environmental Biology, University of Guelph, Guelph, ON

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Effects of the vapour phase of essential oils on larvae, pupae and adults of the house fly.**

Essential oils can be used as repellents, ovicides, larvicides, adulticides and feeding inhibitors for various insects. We assessed the toxicity of four doses of the vapour phase of essential oils on larval stages, pupal stages and adults of the house fly, *Musca domestica*. Fifteen essential oils were studied in the laboratory and mortality was significantly higher for most stages when treated with eucalyptus, geranium, thyme, pine, balsam fir, rosemary and lemon. Repellent characteristics of essential oils will also be presented.

**Lachowsky, L. and Reid, M.**

Department of Biological Sciences, University of Calgary, Calgary, AB



PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Over-wintering mortality of mountain pine beetles, *Dendroctonus ponderosae*.**

Natural selection usually favours equal sex ratios, yet some species have consistently biased populations. The commonly observed bias in mountain pine beetles, *Dendroctonus ponderosae*, (ca. 2:1 females:males) has often been explained by differential mortality. Due to sexual size dimorphism, smaller males are expected to have higher mortality. We brought logs from naturally infested trees into the laboratory prior to winter, and following exposure, above and below snow, to winter conditions. I will discuss how quantity, size and sex ratios of emerging beetles differ among the three treatments and also how they relate to tree characteristics that in turn determine beetle productivity.

**Lamb, R.J.** and MacKay, P.A.

Department of Entomology, University of Manitoba, Winnipeg, MB

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Is the population stability of an aphid a species trait?**

Ecologists have long assumed that population stability is a species trait, and sought explanations for why some species appear to be more stable than others. Uncertainty about how to define and measure stability have left the assumption untested. The stability of natural populations of a native aphid, *Uroleucon rudbeckiae*, is examined at three spatial scales, using three indices of stability. One index of stability is sufficiently uniform among spatial scales, among populations and over time to be considered a species trait. The commonly used index of stability proves inadequate for comparing species, but some species can be shown to exhibit different levels of stability.

**Larrivée, M.** and Kerr, J.T.

Department of Biology, University of Ottawa, Ottawa, ON

SYMPOSIUM: DIVERSITY IN FOREST ECOSYSTEMS

**Assessing and predicting global change impacts on Canadian butterfly species distributions through the Canada Global Change Transect.**

Global changes, particularly land use conversion and climate change have caused widespread and ongoing shifts in the distribution of butterflies in Canada. Accurate predictions of global change impacts are critical to future successful species and habitat conservation. Butterflies respond quickly to shifts in environmental conditions and represent excellent subjects to model and test global change impacts. Broad spatial scale models of butterfly species distributions have not predicted local and regional species occurrences accurately. The Canada Global Change Transect aims to predict global change impacts on local and regional butterfly species distributions through a nationwide network of regional butterfly monitoring transects in Canada.

**Lemmen, J.K.** and Evenden, M.L.

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

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Mechanisms of pheromone response plasticity in male ash leaf cone roller moths, *Caloptilia fraxinella* (Lepidoptera: Gracillariidae).**

*Caloptilia fraxinella* (Lepidoptera: Gracillariidae) is a pest of ornamental ash trees in Alberta. This long-lived moth undergoes a period of reproductive inactivity during which males exhibit reduced behavioural and antennal response to female sex pheromone. This pheromone response plasticity is mediated partly by juvenile hormone, which enhances pheromone response in reproductively inactive males, but not to the level observed in reproductively active males. We are investigating other mechanisms that might mediate pheromone response, including temperature and photoperiod and the biogenic amine octopamine. The effect of these factors on male pheromone response will be discussed.

**Leroux, A.M.<sup>a</sup>** and Holliday, N.J.<sup>b</sup>

<sup>a</sup> Agroecology Program, <sup>b</sup> Department of Entomology, University of Manitoba, Winnipeg, MB

POSTER SESSION: PRESIDENT'S PRIZE

**Post-release assessment of *Aphthona* spp. (Coleoptera: Chrysomelidae) for leafy spurge control in southwestern Manitoba.**

In Spruce Woods Provincial Park, releases of *Aphthona* spp. for biological control of leafy spurge, *Euphorbia esula*, began in 1983. We performed post-release assessments in leafy spurge patches where releases occurred in 2000 or 2006 and assessed the influence of burning of half of the patches in 2000 or 2006. Weekly sweep net samples of *Aphthona* spp. were taken, and leafy spurge density and biomass were recorded at flowering and at the onset of senescence. Species composition, relative population estimates and seasonal patterns of *Aphthona* spp. were assessed in relation to effectiveness of spurge control, landscape features and the introduction and management history of patches.

**Levesque-Beaudin, V.** and Wheeler, T.A.

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne-de-Bellevue, QC

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Nested patterns of beta-diversity in forest Diptera.**

We described nested patterns of diversity in temperate forest Diptera, and determined the scale contributing most to diversity. Fieldwork was carried out in June-July, 2008 in three southwestern Quebec forest fragments, using three spatial scales (tree, stand, hill). Additive partitioning showed that fly assemblages were not random at any scale. Patterns in Diptera overall, calyprates, acalyprates and abundant species were influenced most by small scales (tree, stand); patterns in rare species were dictated by site

scale. Assemblages at all sites and stands were significantly different. Environmental variables weakly supported species composition.

**Liu, S.Q.<sup>a</sup>**, McGarvey, B.D.<sup>a</sup>, Scott, I.M.<sup>a</sup>, and Pariente, S.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Southern Crop Protection and Food Research Centre, London, ON; <sup>b</sup> Institute for Chemicals and Fuels from Alternative Resources (ICFAR), Faculty of Engineering, The University of Western Ontario, London, ON

POSTER SESSION

**The insecticidal activity of bio-oil from the pyrolysis of canola, *Brassica napus*, and mustard, *B. carinata* and *B. juncea*, straw.**

Agricultural crop residue is the focus of a bio-mass conversion to bio-fuel or chemicals project. Of special interest are bio-oils with pesticidal activity. In Canada, mustard straw residue from over 200,000 ha is available. Straw samples were pyrolysed and the bio-oil was tested using the Colorado potato beetle insecticidal activity bioassay. All three *Brassica* species were bio-active, and *B. juncea* fractions obtained by liquid-liquid separation were toxic to the larvae. After HPLC fractionation, the activity was associated with the most polar fraction. GCMS analyses indicated these are not phenolic compounds and identification of the compounds is proceeding with NMR.

**Locke, M.M.<sup>a, b</sup>**, Skevington, J.H.<sup>a</sup>, and Marshall, S.A.<sup>c</sup>

<sup>a</sup> Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON; <sup>b</sup> Department of Biology, Carleton University, Ottawa, ON; <sup>c</sup> Department of Environmental Biology, University of Guelph, Guelph, ON

POSTER SESSION: PRESIDENT'S PRIZE

**Revision of Nearctic *Dasysyrphus* (Diptera: Syrphidae).**

The genus *Dasysyrphus* is taxonomically challenging. There are 43 described species, ten of which are currently recognized as Nearctic. However, the Nearctic species concepts of Thompson (unpublished) and Vockeroth are vastly different. Recent work by Doczkal, supported by Ståhls, on the *venustus* group in Europe has illustrated many new characters. Preliminary sequencing of *cox1* for *Dasysyrphus* suggests that there are many currently unrecognized Nearctic species. ITS2 and morphological data will be added to this analysis to produce an integrative taxonomic revision of this genus. Our work will be linked with ongoing work in the Old World to develop global species concepts for *Dasysyrphus*.

**Lusebrink, I.<sup>a</sup>**, Evenden, M.L.<sup>a</sup>, and Erbilgin, N.<sup>b</sup>

<sup>a</sup> Department of Biological Sciences, <sup>b</sup> Department of Renewable Resources, University of Alberta, Edmonton, AB

POSTER SESSION

**Monoterpene emission from mature pine trees subjected to different environmental conditions and treatments emulating mountain pine beetle attack.**

The chemical ecology of three interacting organisms: the mountain pine beetle (*Dendroctonus ponderosae*), its host pine trees and its fungal associates is examined. The objective is to determine the chemical response of pine trees subjected to different environmental conditions and treatments emulating beetle attack. We tested the hypothesis that monoterpene release from pine trees will vary with water regime and biological treatments: control, mechanical wounding and inoculation with a spore solution of *Grosmannia clavigera* and beetle mash. Host chemical response to treatments will ultimately be linked to beetle fitness.

**Ma, B.O.**

Simon Fraser University, Burnaby, BC

GRADUATE STUDENT SYMPOSIUM

**The role of *Anopheles gambiae* mosquitoes feeding decisions on vector-borne disease transmission.**

Female anautogenous *Anopheles gambiae* s.s. (Diptera: Culicidae) require host blood for egg production; however, these mosquitoes also use sugar, although to what extent is poorly understood. Although blood is necessary for egg production, it is inherently risky and furthermore, a poor resource for fueling flight and somatic maintenance because of its low conversion efficiency to energy reserves. Sugar, on the other hand, can be readily used to fuel somatic maintenance and flight. Thus, there is a trade-off between reproduction and survival when using these two resources. In light of complex tradeoffs between these two disparate resources, I use a combination of theory and experiments to explore the effects of a female mosquito's feeding behaviour on a mosquito's life history and the implications of these feeding decisions on disease transmission. I developed a dynamic state variable model to explore the best activity decisions for a female mosquito over her lifetime. This model explicitly considers the numerous tradeoffs between sugar and blood feeding behaviour. To validate the model, I used a wind tunnel to determine the role of energetic condition on blood host seeking and acceptance in the absence of choice. I then used a two-port olfactometer to test whether a female mosquito with different energetic condition, given a choice, will choose a sugar host over a blood host. I expand our results to consider the implications of sugar and blood on the ability for these mosquitoes to spread disease using a Ross-Macdonald modeling framework.

**MacKenzie, K.**

Agriculture and Agri-Food Canada, Kentville, NS

SYMPOSIUM: POLLINATION BIOLOGY

**Pollination of the North American *Vaccinium* crops, blueberry and cranberry.**

Pollination is a critical component of production in our native North American *Vaccinium* crops, blueberry and cranberry. Biotic agents, in particular bees, are required for pollen transfer among flowers. The diverse indigenous bee fauna found on these crops likely contributes significantly to pollination, and conservation of their populations is warranted. However, managed bees are required to ensure crop success. While honey bees form the mainstay of commercial pollination, bumble bees and

alfalfa leafcutting bees are used. Enhancement of pollination by bee pollinators should be encouraged through the incorporation of “bee-friendly” practices into crop management plans.

**MacLeod, A.** and Wheeler, T.A.

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne-de-Bellevue, QC

POSTER SESSION: PRESIDENT'S PRIZE

**Systematic revision of Nearctic *Tritoxa* (Diptera: Ulidiidae).**

The Nearctic genus *Tritoxa* is one of the most distinctive genera of picture-winged flies, because of their characteristic wing pattern. *Tritoxa* includes five described species and at least one new western Nearctic species. The biology of *Tritoxa* is poorly known, although *T. flexa* is a minor pest of commercial onions. *Tritoxa incurva* feeds on wild garlic; all species may breed in *Allium*. We have documented new species of *Tritoxa* and expanded the range of known species. Species have traditionally been distinguished by colour and wing patterns, but male genitalia, especially the surstylus, provide valuable distinguishing characters for species.

**MacQuarrie, C.J.K.** and Cooke, B.J

Natural Resources Canada, Canadian Forest Service, Northern Forestry Centre, Edmonton, AB

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Landscape scale population dynamics of mountain pine beetle.**

The influx of mountain pine beetle (MPB) into Alberta has precipitated the need for models that can predict the behaviour of the beetle in this novel environment. Fortunately, damage caused by MPB to lodgepole pine forests in BC has been mapped almost every year since the 1950s, providing a data set we can use to model population dynamics. We used clustering methods on these data to identify regions with similar outbreak histories and then modelled the population dynamics of the populations within each region. We found ten regions in BC all with differing outbreak histories, all of which exhibited non-stationary dynamics.

**Malcolm, J.R.** and Smith, S.M.

Faculty of Forestry, University of Toronto, Toronto, ON

SYMPOSIUM: DIVERSITY IN FOREST ECOSYSTEMS

**Taking the wood out (dead or alive): implications for forest insect communities.**

We provide an overview of research focused on implications of forest management for insect conservation, specifically reductions in forest age and dead wood supplies. The value of old forests, especially those with diverse supplies of downed and standing dead wood, is indicated by recent studies with carabid, syrphid, diapruid, scelionid, dipteran and hymenopteran saproxylic groups. Different species, decay classes and locations of dead wood exhibit high beta diversity and provide key habitat for specific

taxa. Recently proposed modification to clearcut harvesting, namely, multi-cohort forest management, provides evidence that such oldgrowth features can lifeboat important insect groups.

**Marriott, S.M.<sup>a</sup>**, McCorquodale, D.B.<sup>b</sup>, and Giberson, D.J.<sup>a</sup>

<sup>a</sup> Department of Biology, University of Prince Edward Island, Charlottetown, PE;

<sup>b</sup> Department of Biology, Cape Breton University, Sydney, NS

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Lost and found lady beetles: does the arrival of non-native species coincide with the decline of native species?**

Over the past century, five non-native Coccinellinae have become common and widespread in Canada, with earliest records in 1912 (*Coccinella u. undecimpunctata* Linnaeus) and the most recent in 1988 (*Harmonia axyridis* (Pallas)). The introduction of non-native lady beetles as biological control agents has met with some success, but there are now concerns about potential non-target effects on native lady beetle populations. We databased specimens of Coccinellinae from eastern Canadian collections (Newfoundland to Ontario) in order to determine if the arrival of non-native species coincides with the decline of native species using collection records.

**Mason, P.G.<sup>a</sup>**, Bennett, A.M.R.<sup>a</sup>, and Brodeur, J.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Research Centre, Ottawa, ON; <sup>b</sup> Institut de recherche en biologie végétale, Université de Montréal, Montréal, QC

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Access and benefits sharing: the implications for entomology and biological control.**

In 2010, the Access and Benefits Sharing (ABS) clause of the Convention on Biodiversity (CBD) will come into force. As a signatory, Canada and Canadians are obliged to develop policy and comply with policies of other countries to ensure that the biodiversity of each country is fairly and equitably shared amongst all of society. Informed ABS policy will be key to ensure that collection and exchange of biological specimens for scientific study can continue. For biological control, the International Organization for Biological Control (IOBC) has developed recommendations to facilitate a workable framework for policy makers and practitioners.

**McDonald, M.R.<sup>a</sup>**, Vander Kooi, K.<sup>a</sup>, and Taylor, A.G.<sup>b</sup>

<sup>a</sup> Department of Plant Agriculture, University of Guelph, Guelph, ON; <sup>b</sup> Department of Horticultural Sciences, New York State Agriculture Experimental Station, Cornell University, Geneva, NY, USA

POSTER SESSION

**Insecticide seed treatments for the management of carrot insect pests.**

Carrot rust fly (*Psila rosae*) and carrot weevil (*Listronotus oregonensis*) are major insect pests of carrots grown on muck soils in eastern Canada. Insecticide seed treat-

ments spinosad, thiamethoxam and clothianidin were evaluated in field trials in the Holland Marsh, Ontario, from 2007-2009. In 2007, spinosad (3.75 and 7.5 mg ai/100g seed) and clothianidin (5.6 and 7.5 mg a.i.) reduced carrot weevil damage. In 2008, thiamethoxam (2.5 and 3.75 mg a.i.), spinosad (7.5 mg a.i.) and clothianidin plus imidacloprid (3:1 at 11.25 mg a.i total) suppressed carrot rust fly damage. Spinosad shows promise for suppression of both pests.

**McIntosh, R.,** Gooliaff, J., and Moore, R.

Forest Service Branch, Saskatchewan Ministry of Environment, Prince Albert, SK

SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**A risk-based approach to the banded elm bark beetle: an unwelcome immigrant to Saskatchewan.**

The banded elm bark beetle, *Scolytus schevyrewi* (Coleoptera: Scolytidae) (BEBB), is an invasive beetle native to northern China, central Asia and Russia. BEBB was first detected in 2003 in Colorado but there is evidence that it was established almost ten years earlier. BEBB kills trees in the Ulmaceae, Salicaceae and Eleagnaceae. In North America, it is found in elms and is believed to be a vector of Dutch elm disease. There is a lack of knowledge of the bionomics in North America. Saskatchewan's risk-based strategic approach, including risk assessment, risk response and risk communication, is described. This approach will help guide and refine DED management in Saskatchewan.

**Mlynarek, J.J.** and Wheeler, T.A.

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne-de-Bellevue, QC

GRADUATE STUDENT SYMPOSIUM

**Phylogeny of the tribe Elachipterini (Diptera: Chloropidae).**

The acalyptrate family Chloropidae is a diverse and abundant group of true flies with many morphologically bizarre representatives. The family is divided into three subfamilies: Siphonellopsinae, Chloropinae and Oscinellinae. Two attempts have been made to classify the 3000 described species of the Chloropidae but neither is strongly supported phylogenetically. The Oscinellinae is currently divided into 12 tribes, one of which is the Elachipterini. This tribe has an almost worldwide distribution, although some genera are very limited in their range. There is also a wide range in the number of species per genus. Because of the scarcity of previous phylogenetic analyses and the age of most museum specimens, morphological characters are an appropriate data set for resolving relationships. I conducted a phylogenetic analysis of the tribe Elachipterini using an exemplar approach and morphological characters of adult specimens. Currently, Elachipterini is comprised of ten genera with over 125 described species. Based on the analyses, the monophyly of Elachipterini is supported by multiple characters. However, resolution within the tribe is less clear because of widespread homoplasy. *Elachiptera*, *Cyrtomomyia* and *Disciphus* are apparently paraphyletic because of the current recognition of some small autapomorphic genera (*Myrmecosepsis*, *Sepsidoscinis*, *Goniaspis*) and some undescribed species with inter-

mediate combinations of character states. In addition, all species of the large genus, *Melanochaeta*, that have been analysed appear to be monophyletic. As a result of this analysis, several changes in generic limits will be required to make the classification of the Elachipterini reflect the evolutionary history of the included species.

**Moffat, C.E.**<sup>a</sup> and Gillespie, D.R.<sup>b</sup>

<sup>a</sup> Unit of Biology and Physical Geography, University of British Columbia - Okanagan, Kelowna, BC; <sup>b</sup> Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Agassiz, BC

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Impacts of plant nutrition on host-parasitoid population dynamics.**

Bottom-up effects of nutrient availability on host-parasitoid population dynamics were investigated, using three rates of nitrogen in fertilizer on a simple community consisting of bell pepper, *Capsicum annuum*, the green peach aphid, *Myzus persicae*, and the parasitoid, *Aphidius matricariae*. Aphids and parasitoids showed increased population growth rates and fitness as nitrogen availability increased. Impacts of habitat fertility on tri-trophic interactions and the potential for applications in parasitoid rearing and biological control are discussed.

**Mori, B.**<sup>a</sup>, Gries, R.<sup>b</sup>, Otanni, J.<sup>c</sup>, Yoder, C.<sup>d</sup>, and Evenden, M.L.<sup>a</sup>

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>c</sup> Agriculture and Agri-Food Canada, Beaverlodge, AB; <sup>d</sup> Alberta Agriculture, Food and Rural Development, Spirit River, AB

POSTER SESSION: PRESIDENT'S PRIZE

**Development of a pheromone-based monitoring tool for the red clover casebearer (*Coleophora deauratella*) in Alberta.**

The red clover casebearer (RCC), *Coleophora deauratella* (Lepidoptera: Coleophoridae), is an introduced pest in the Peace River Region of Alberta. Infestations of RCC in clover can cause up to 99.5% seed loss. Components of the female sex pheromone were identified as (Z)-7-dodecenyl acetate and (Z)-5-dodecenyl acetate, both of which are necessary to attract male RCC. Here, we further develop this pheromone-based tool to determine the most attractive blend and dose of the two identified pheromone components to male RCC, and the trap type with the greatest efficacy for RCC capture.

**Mori, B.**, Proctor, H., and Evenden, M.L.

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

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Phoretic mites associated with the mountain pine beetle (*Dendroctonus ponderosae*) in Alberta.**

Mites associated with the mountain pine beetle (*Dendroctonus ponderosae* Hopkins) collected from northwestern Alberta were identified from beetles emerging from



lodgepole pine bolts in the laboratory, and from beetles captured in pheromone-baited traps in the field. Mite load and assemblage structure were tracked over the beetle emergence period, and variation in mite load with respect to beetle sex, size and condition was analyzed. Members of four mite families were identified: Ascidae, Acaridae, Tarsonemidae and Tydeidae. Beetle sex and condition were significantly correlated with mite load under lab conditions.

**Mostafa, A.M.** and Lowery, D.T.

Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Summerland, BC

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**Identification and life cycle of climbing cutworms (Lepidoptera: Noctuidae) from grapevines in the Okanagan Valley, BC.**

Twenty species of climbing cutworm were collected as larvae from vineyards in south central British Columbia during the spring of 2001 to 2008. *Abagrotis orbis* was the dominant species, and with *A. nefascia* and *A. reedi*, accounted for over 85% of the reared moths. Life cycle aspects of *A. orbis* were assessed under three temperatures (11, 15 and 22°C), two light regimes (16L:8D and 12L:12D photoperiod) and on two larval diets. Feeding preferences and suitability of 13 host plants were also investigated for *A. orbis* in the laboratory.

**Nagalingam, T.** and Holliday, N.J.

Department of Entomology, University of Manitoba, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Tarnished plant bug injury and damage to dry edible beans.**

In Manitoba, the tarnished plant bug, *Lygus lineolaris*, is a pest of several crops. Its feeding is concentrated on floral buds, flowers and pods and can result in abscission of reproductive structures and deformation of seeds. Observations of *L. lineolaris* on dry edible beans in Manitoba prompted concern about effects on yield quality and quantity. In plant growth rooms, we investigated the effects of feeding by *L. lineolaris* on different growth stages of navy beans by confining adult males or females, or 5th instar nymphs to single reproductive structures and characterizing short-term effects of feeding and long-term effects on yield.

Nagel, L., Robb, T., and **Forbes, M.R.**

Department of Biology, Carleton University, Ottawa, ON

SYMPOSIUM: ARTHROPOD HOST-SYMBIONT RELATIONSHIPS

**Fluctuating parasite-mediated selection and variable resistance in a specialist mite-damselfly association.**

Damselflies are host to specialist and generalist parasitic water mites. Our work over the past seven summers, on one specialist association, has revealed that parasitism

is highly variable as is apparent parasite-mediated selection on survivorship, which appears confined to females and only in some years. Resistance also varies from not being expressed in a given summer to being expressed by over 10% of individuals. This form of resistance, melanotic encapsulation, is costly in other insects. Resistance expression is not easily explained by abiotic factors but does relate (curiously) to degree of parasitism.

**Navaneethan, T.** and Ehlers, R.-U.

Faculty of Biology, University of Gent, Gent, Belgium; Institute for Phytopathology, Christian-Albrechts-University, Kiel, Germany

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Improvement of *Steinernema feltiae* application against diapausing codling moth larvae (*Cydia pomonella*).**

Codling moth is a serious pest of apples and pears in most countries where these fruits are grown. Control of diapausing cocooned larvae in cryptic habits with the entomopathogenic nematode, *Steinernema feltiae*, reduces the fruit damage in the following season by up to 70%, providing moisture conditions post application are favourable. We evaluated the  $LC_{50}$  and  $LT_{50}$  in a bark bioassay and the influence of moisture on the performance of the nematodes. The addition of the additive xanthan could significantly improve the control effect.

**Navaneethan, T.** and Mikunthan, G.

Department of Agricultural Biology, Faculty of Agriculture, University of Jaffna, Jaffna, Sri Lanka

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Small scale production of entomopathogenic fungi using low cost technology.**

The entomopathogenic fungi (EPF) are widely used as biological control agents. We evaluated a way to produce EPF using low cost technology suitable for farmers' use. Milk extracted coconut scraping (MECS), black gram husk (BGH), rice bran, rice-extract and paddy extract were evaluated. White rice and potato dextrose sago (PDS) were used as a control. Formulations were prepared using termittaria and saw dust. MECS, BGH and rice extract yielded  $1 \times 10^8$  spores/ml, almost as high as white rice and PDS ( $1 \times 10^9$  spores/ml), but at very low cost. When the rice-extract was enriched with yeast and dextrose, spore production was increased. Saw dust and termittaria maintained high spore concentrations for a long period.

**Nealis, V.**

Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC

SYMPOSIUM: PROTECTING STRUCTURES AND URBAN FORESTS

**Gypsy moth: still invasive after all these years.**

Much of the past invasion patterns of gypsy moth in eastern Canada and future risk of gypsy moth in western Canada can be understood in terms of pathways and cli-

mate suitability. As long as incipient populations are detected and remain isolated, eradication, or at least facilitated extinction, is feasible. The problem of management of gypsy moth in western Canada is illustrated through the history of management in British Columbia.

**Noronha, C.**

Agriculture and Agri-Food Canada, Crops and Livestock Research Centre, Charlottetown, PE

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Efficiency of *Trichogramma brassicae* as a biocontrol agent of the European corn borer, *Ostrinia nubilalis* (Lepidoptera: Crambidae), in potatoes.**

The European corn borer (ECB) is primarily controlled with insecticide in potatoes. However, inclement weather often delays insecticide application resulting in poor control. *Trichogramma brassicae*, an egg parasitoid, has been used successfully in corn but its efficiency has not been evaluated in potatoes. Plant architecture plays an important role in the success of *T. brassicae*. I evaluated the efficiency of *T. brassicae* to control ECB in potatoes. There was a 50% reduction in the number of holes per plant. Potato variety had a significant impact on control efficiency. Implications for use in an IPM program will be discussed.

**OConnor, B.M.**

Museum of Zoology, University of Michigan, Ann Arbor, MI, USA

SYMPOSIUM: ARTHROPOD HOST-SYMBIONT RELATIONSHIPS

**Ecological associations of mites and native bees in North America.**

Associations between mites and native North American bees are reviewed. Mites belonging to numerous families of Acari are generalist or specialist associates of many species belonging to all families of North American bees. Association types include mutualism, commensalism (phoresy), parasitism and cleptoparasitism. Species of actual or potential importance in the development of native bees as managed pollinators are discussed.

**Oghiakhe, S. and Holliday, N.J.**

Department of Entomology, University of Manitoba, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**The spatial distribution, tunnelling habits and fat content of overwintering native elm bark beetles, *Hylurgopinus rufipes* (Coleoptera: Scolytidae), in American elm trees.**

*Hylurgopinus rufipes* is the major vector of Dutch elm disease in Manitoba, and insecticidal control of overwintering beetles is an important component of the management program. Dissection of the bases of American elm trees, taken in winter from riverbank woodlands, showed that overwintering beetles were most dense in the basal 5 cm. We record, for the first time, that substantial numbers of beetles overwinter below the soil surface. Fat content of overwintering beetles declined as winter progressed.

In mark-recapture studies, movement of new adult beetles emerging from brood galleries to trees in which they overwinter is somewhat localized.

**Oghiakhe, S.** and Holliday, N.J.

Department of Entomology, University of Manitoba, Winnipeg, MB

POSTER SESSION: PRESIDENT'S PRIZE

**Temperature dependent development of immature stages of the native elm bark beetle, *Hylurgopinus rufipes* (Coleoptera: Scolytidae).**

The effect of temperature on the development and survival of the native elm bark beetle, *Hylurgopinus rufipes*, was studied by rearing beetles from eggs to adults in bark presses at five different temperatures in the laboratory. There was no brood development at 12°C; development took 61 days at 16°C and 30 days at 28°C. Data loggers between the inner phloem and xylem of American elm trees showed wide daily temperature fluctuations in sun-exposed and shaded trees; August temperatures in the former exceeded 40°C. This study will enable us to develop a model for the rate of development at different temperatures.

**Olivier, C.<sup>a</sup>**, Galka, B.<sup>a</sup>, and Floate, K.D.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Saskatoon, SK; <sup>b</sup> Agriculture and Agri-Food Canada, Lethbridge, AB

POSTER SESSION

**Identification of symbiont organisms in leafhopper vectors of phytoplasma.**

Is the ability of leafhoppers to vector plant pathogens (e.g., phytoplasmas) affected by coinfections of symbiotic bacteria? We examined this question in a survey of four leafhopper populations (66 species) collected in vineyards and crops in Canada. Genetic markers identified infections of the species '*Candidatus phytoplasma asteris*' in 15 species and infections of *Arsenophonus* and/or *Wolbachia* bacteria in 40 species. The correlation between infections of symbionts, phytoplasma and leafhopper population location is discussed.

**Otvos, I.S.**

Natural Resources Canada, Canadian Forest Service, Pacific Forestry Centre, Victoria, BC

CANADIAN FORUM FOR BIOLOGICAL CONTROL SYMPOSIUM

**How to integrate biological control effectively in forestry IPM programs.**

Forestry is ideally suited to IPM programs. Although biological control is not a panacea for solving all forest insect problems, some or all of its components can be integrated to manage forest insects. Selected examples are given where various biological control agents were used successfully in our forests. These will be illustrated from personal experience, as well as work by others in the Canadian Forest Service. A personal perspective and an example is given on a possible template for IPM of forest insects. Some of the obstacles encountered in the routine use and/or development of IPM in forestry are mentioned.

**Owen, R.E.**<sup>a</sup> and McCorquodale, D.B.<sup>b</sup>

<sup>a</sup> Department of Chemical and Biological Sciences, Mount Royal College, Calgary, AB; <sup>b</sup> Department of Biology, Cape Breton University, Sydney, NS

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Evolution of eusociality in the Hymenoptera via nest sharing between non-relatives: altruism without kin-selection.**

Eusociality (reproductive division of labour within nests) requires altruism. Parasocial nesting (sharing by members of the same generation) poses a difficulty for kin-selection because nests are often shared by non-relatives. We modeled the evolution of tolerant (i.e., nest sharing) behaviour. Two females share a nest; the first digs and incurs this cost, the second one joins deriving an altruistic benefit. The tolerance allele will spread through the population. A new mutation arising, that causes the second female to be the sole reproductive, will increase yielding a maximum of 50% eusocial nests. Kin selection and relatedness are not necessary for eusociality.

**Packer, L.** and Sheffield, C.

Department of Biology, York University, Toronto, ON

SYMPOSIUM: POLLINATION BIOLOGY

**The taxonomic, ecological and behavioural diversity of bees.**

There are almost 20,000 described bee species, in 480 genera and seven families. Not only are bees the most important pollinators on the planet, they are also excellent indicators of the state of terrestrial ecosystems. In addition to their taxonomic complexity, bees are ecologically and behaviourally diverse. They are found from sea level to 4500 m in altitude, from the equator to the arctic and from the edge of absolute deserts to the wettest of rainforests. While the honey bee has a complex social life, most bees are entirely solitary. We will survey this biological diversity and emphasize aspects relevant to bee conservation.

**Parker, D.**<sup>a</sup> and Phillips, I.<sup>b</sup>

<sup>a</sup> AquaTax Consulting, Saskatoon; <sup>b</sup> Saskatchewan Watershed Authority, Saskatoon, SK

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Saskatchewan aquatic macroinvertebrate biodiversity surveys and database: past, progress and plans.**

Saskatchewan aquatic macroinvertebrate research has a rich history spanning more than 70 years. We are assimilating this historical data with our current survey and monitoring results into an online resource for the Saskatchewan fauna. In our presentation, we highlight the online database, some of our research successes, obstacles we have encountered and outline some of our future plans.

**Parmesan, C.**

Section of Integrative Biology, University of Texas, Austin, TX, USA

## PLENARY SYMPOSIUM

**Insects and climate change: what are they telling us and where are we going?**

Insects have emerged as one of the most responsive groups to anthropogenic climate change, and some of the more noticeable societal impacts of global warming have been mediated by insects. Insects demonstrate the extremes of responses observed across the natural world. Some species have suffered population extinctions and range contractions, while others have exhibited population booms and range expansions. Responses have sometimes stemmed from a direct effect of climate, but in other cases are almost entirely driven by climatically-driven alterations of interactions among species. With detailed observational records on distributions, abundances, life histories and phenologies going back as far as 250 years, insects are also one of the best documented groups of wild species. Thus insects have also emerged as important indicator species, providing scientists with more general insights into how climate change is impacting the natural world. The next IPCC report will emphasize adaptation – meaning how society might proactively alter its behaviour, policies, growth and development to minimize potential negative impacts of climate change. In the natural world, however, species' adaptation is reactive. While some species show little adaptation to the changing climate, others have demonstrated plasticity in their behaviours and life histories and a few have undergone rapid, population-level evolution. However, to reduce future loss of species, scientists and practitioners in conservation and resource management may benefit by adopting a more proactive, interventionist stance to aid the insect world in adapting to on-going anthropogenic climate change.

**Peck, S.B.**

Department of Biology, Carleton University, Ottawa, ON

## POSTER SESSION

**Beetle diversity in the Lesser Antilles islands: how many species are really there?**

Recent extensive and intensive field work on the Lesser Antillean island of Montserrat suggests that a mean of 827 beetle species may be expected on that island. This datum makes possible the generation of hypotheses of the probable beetle species diversity on other islands of the Lesser Antilles as a function of the areas of the islands. Figures are given for the presently known, estimated total and estimated number of unknown species for each principal island. This predicts that many hundreds (if not thousands) of beetle species remain to be discovered. This is of importance to land management and conservation interests on these rapidly changing and ecologically fragile islands.

**Pelletier, Y.**

Agriculture and Agri-Food Canada, Potato Research Centre, Fredericton, NB

## SYMPOSIUM: ENTOMOLOGICAL ISSUES IN POTATO PRODUCTION

**Potato resistance to insects.**

Wild *Solanum* species, bearing tubers, can be used as a source of resistance to insect

pests of potato. Information on the behaviour and performance of the insect on the resistant plant species is required to guide the development of new germplasm successfully. Such study of the interactions between the insect and host plants provides new information on the biology of the insect. Examples of such studies on the Colorado potato beetle, the potato tuber moth and potato-infesting aphids will be presented.

**Pitt, C.<sup>a</sup>**, Seybold, S.J.<sup>b</sup>, Thommasen, A.T.<sup>a</sup>, and Huber, D.P.W.<sup>a</sup>

<sup>a</sup> University of Northern British Columbia, Prince George, BC; <sup>b</sup> United States Department of Agriculture – Forest Service, Pacific Southwest Research Station, Davis, CA, USA

POSTER SESSION: PRESIDENT'S PRIZE

**Functional characterization of California five-spined ips, *Ips paraconfusus* (Coleoptera: Curculionidae: Scolytinae), cytochromes P450 exhibiting up-regulation with feeding.**

Previous expression analyses and comparison of several *Ips paraconfusus* P450s to those in a mountain pine beetle EST library supported a possible role for these proteins in host tissue detoxification or pheromone biosynthesis. We have constructed recombinant baculoviruses for several *I. paraconfusus* P450 genes and have included a reductase for co-transfecting Sf9 insect cells for protein expression. Recombinant proteins were observed for correct folding by their characteristic CO difference spectra. Protein preparations will be exposed to substrate candidates, including various monoterpenes and products will be evaluated by GC-MS for evidence of P450-mediated oxidation of substrates.

**Poirier, L.M.**

Ecosystem Science and Management Program, University of Northern British Columbia, Prince George, BC

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Occurrence and distribution of *Coquillettidia* (= *Mansonia*) *perturbans* in northern British Columbia.**

*Coquillettidia* (= *Mansonia*) *perturbans* (Diptera: Culicidae) is generally considered to have a southerly distribution in Canada. CDC miniature light traps were used to survey adult mosquito populations at several sites in northern British Columbia. *Coquillettidia perturbans* was collected at most sites, including as far north as Fort Nelson, BC (58.6°N, 122.7°W). Other species were also found outside their known or expected ranges. These results underscore the need for continuing surveys of insect biodiversity throughout the country. Future research on the effects of climate change, vector management and other aspects of insect biology depend on accurate estimates of geographic distribution.

**Pompon, J.<sup>a,c</sup>**, Rahbe, Y.<sup>b</sup>, Calevro, F.<sup>b</sup>, Quiring, D.T.<sup>c</sup>, Goyer, C.<sup>a</sup>, Giordanengo, P.<sup>d</sup>, and Pelletier, Y.<sup>a</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Fredericton, NB; <sup>b</sup> INRA, INSA-Lyon, Villeurbanne, France; <sup>c</sup> Department of Biology, University of New Brunswick, Fredericton, NB; <sup>d</sup> Université de Picardie Jules Verne, Amiens, France

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**The relationship between xylem consumption, fecundity and the obligate symbiont in *Macrosiphum euphorbiae*.**

We measured fecundity, water content, time spent consuming phloem and xylem sap of *Macrosiphum euphorbiae* alates and apterae at different ages. Alates and apterae ingested xylem sap at the end of their life, when aphids were not dehydrated and when fecundity started to decrease. Fecundity was negatively correlated with the proportion of time spent ingesting xylem sap, over the entire reproductive life of aphids. We speculated that xylem consumption may play a regulatory role in aphid fecundity, and *Buchnera* symbionts, that provide essential amino acids required for offspring production, might be involved in this process.

**Ramanaidu, K.**<sup>a</sup>, Gradish, A.<sup>b</sup>, Scott-Dupree, C.<sup>b</sup>, and Cutler, G.C.<sup>a</sup>

<sup>a</sup> Department of Environmental Sciences, Nova Scotia Agricultural College, Truro, NS; <sup>b</sup> Department of Environmental Biology, University of Guelph, Guelph, ON

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Impacts of reduced-risk insecticides on insect pests and pollinators in wild blueberry.**

We evaluated the efficacy of several new "bio-rational" products against blueberry spanworm, *Itame argillacearia*, a key defoliator of wild blueberry, and assessed their safety to the pollinators, *Bombus impatiens* and *Megachile rotundata*. Field trials demonstrated that flubendiamide-, spinetoram- and spinosad-based products provide excellent spanworm control, and laboratory bioassays indicate that the new alternatives are as potent to the pest as traditional broad-spectrum insecticides. Bee susceptibility in the laboratory depended greatly on the active ingredient to which bees were exposed and the bee species.

**Renaud, A.**<sup>a</sup>, Savage, J.<sup>b</sup>, and Roughley, R.E.<sup>a</sup>

<sup>a</sup> Department of Entomology, University of Manitoba, Winnipeg, MB; <sup>b</sup> Bishop's University, 2600 College St., Sherbrooke, QB

GRADUATE STUDENT SYMPOSIUM

**Biodiversity of the Muscidae (Diptera) of Churchill (MB) in the context of environmental changes.**

It has been shown that some organisms are clearly affected by recent environmental changes occurring in the Arctic, but the responses of insects to these changes have not been well studied in the Nearctic Region. In Churchill (MB), ever-increasing human-related activities combined with the effects of climate warming have disturbed arctic habitats and potentially affected the biodiversity of local insects. Therefore, the study of historical changes in the distribution and abundance of some important



northern taxa, such as the fly family Muscidae, may allow us to understand better the impacts of recent environmental changes on the biodiversity of northern insects. The composition of arctic muscids was last reviewed by Hockett in 1965. The pre-1965 Churchill diversity, based on Hockett and supplemented with North American collection material, was compared to the post-1965 diversity, obtained from specimens in collection and an extensive sampling season in 2007. Preliminary results indicate that the species composition of Muscidae in Churchill has changed. One new generic and 18 new species records have been confirmed for the area and a number of previously abundant species were not collected in the 2007 inventory. More than half of the new distribution records represent northern range expansions, suggesting that the recent warming trend in the Arctic may have influenced the important changes to the biodiversity of muscid flies reported in this study.

**Renkema, J.M.<sup>a,b</sup>, Cutler, G.C.<sup>b</sup>, Lynch, D.<sup>b</sup>, MacKenzie, K.<sup>c</sup>, and Walde, S.<sup>a</sup>**

<sup>a</sup> Dalhousie University, Halifax, NS; <sup>b</sup> Nova Scotia Agricultural College, Truro, NS;

<sup>c</sup> Agriculture and Agri-Food Canada, Kentville, NS

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Management of blueberry maggot (Diptera: Tephritidae) using mulches in organic highbush blueberries.**

Zero tolerance for blueberry maggot (*Rhagoletis mendax* Curran) and few proven alternative controls result in annual insecticide use in highbush blueberries (*Vaccinium corymbosum* L.). Effects of mulches, shown to provide effective weed control and increase fertility, were studied on developing pupae. Emergence was low when 20 cm of pine needles, pulp mill biosolids, or manure/saw dust compost were placed on pupae in the laboratory and the field. In a laboratory trial, all mulches at 90% water-holding capacity resulted in lower emergence (5-20%) than at 50 or 10% water-holding capacity. Larvae pupated at greatest depths in drier, less dense pine needles. Efforts to further characterize mulch effects on pupae are discussed.

**Richardson, T.A.<sup>a</sup>, Takács, S.<sup>b</sup>, Zahradnik, T.<sup>b</sup>, Gries, G.<sup>b</sup>, Strong, W.B.<sup>c</sup>, and Lindgren, B.S.<sup>a</sup>**

<sup>a</sup> Ecosystem Science and Management Program, University of Northern British Columbia, Prince George, BC; <sup>b</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>c</sup> British Columbia Ministry of Forests and Range, Kalamalka Forestry Centre, Vernon, BC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Cues mediating clonal preference of *Leptoglossus occidentalis* in a lodgepole pine seed orchard.**

Surveys were conducted in a lodgepole pine seed orchard in British Columbia in 2008 and 2009, confirming that *Leptoglossus occidentalis* (Heidemann) favours certain clones over others. We tested the hypothesis that preference is based on physical and chemical cues from host trees. Terpenes and infrared (IR) radiation emitted from cones of favoured and unfavoured clones were measured. Analysis of variance and

*post hoc* means separation tests revealed cones of favoured clones emitted stronger IR cues and different quantities of semiochemicals than cones of unfavoured clones. Contrary to previous studies, we found that *L. occidentalis* favoured the same clones, and often the same tree, in consecutive years.

**Riel, W.G.<sup>a</sup>, Shore, T.L.<sup>a</sup>, Burnett, C.<sup>b</sup>, and Fall, A.<sup>c</sup>**

<sup>a</sup> Natural Resources Canada, Pacific Forestry Centre, Victoria, BC; <sup>b</sup> Geomemes Research Inc., Victoria, BC; <sup>c</sup> Gowlland Technologies, Ltd., Victoria, BC

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

### **Spatial risk models for mountain pine beetle in Alberta and Saskatchewan.**

The mountain pine beetle (*Dendroctonus ponderosae*) has become established east of the Rocky Mountains at several locations in western and central Alberta. To assess the risk of mountain pine beetle to Canada's boreal forest and provide guidance for forest managers in Alberta and Saskatchewan, the attributes of susceptible host stands and their landscape scale configuration and connectivity are explored.

**Robson, D.B.**

The Manitoba Museum, Winnipeg, MB

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

### **Insect visitors to the rare Western Silvery Aster (*Symphyotrichum sericeum*) plant.**

Western Silvery Aster (*Symphyotrichum sericeum*) is a nationally threatened plant. The purpose of this study was to document visitation frequency and constancy of insect visitors. Of 22 insect visitor taxa, *Bombus bifarius* Cresson was the most frequent. The overall insect visitation rate was not significantly different between *S. sericeum* and its most common co-flowering plant, *Solidago nemoralis*, but the constancy of its insect visitors was lower. The insect visitor composition changed over time with *B. bifarius* ignoring *S. sericeum* plants initially, then visiting them more frequently as the number of receptive *S. nemoralis* flowers declined.

**Rosati, J.Y. and VanLaerhoven, S.L.**

Department of Biology, University of Windsor, Windsor, ON

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

### **The effect of global climate change on range expansion of the invasive blow fly, *Chrysomya rufifacies* (Diptera: Calliphoridae): behavioural and ecological impacts within the carrion insect community.**

The effects of global climate change vary widely depending on the species and geographical location as well as the ecological system involved. *Chrysomya rufifacies* (Macquart) is an invasive species originating from Australia and the Orient, which was introduced into North America in the early 1900s, where it has continued to spread throughout the continental United States, entering into southern Ontario,

Canada during the fall season. Since its introduction into the U.S., it has become a dominant fly species collected from carrion and due to its predatory nature, it has the potential for direct negative and competitive interactions with other members within the carrion insect community.

**Roughley, R.E.**

Department of Entomology, University of Manitoba, Winnipeg, MB

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Beetles of Churchill, Manitoba.**

Various aspects of the beetle fauna of Churchill, Manitoba are examined. Three main distribution patterns are present: 1. Northern from Alaska east to Manitoba, 2. Transcontinental northern often to Greenland, 3. Churchill plus adjacent Nunavut. The most diverse families of the 500+ spp. are Carabidae (82 species) and Dytiscidae (84 species). The most common life history pattern involves 1+ aquatic life stages. The most common feeding pattern is predation. The majority of new records for Churchill are found along the Churchill River, suggesting that habitat change rather than climate change is more important for beetles.

**Roy, M.<sup>a</sup>**, Broadbent, B.<sup>b</sup>, and Chouffot, T.<sup>c</sup>

<sup>a</sup>MAPAQ, Quebec, QC; <sup>b</sup>Agriculture and Agri-Food Canada, London, ON; <sup>c</sup>Koppert Canada, Trois-Rivières, QC

CANADIAN FORUM FOR BIOLOGICAL CONTROL SYMPOSIUM

**How to integrate biological control effectively in small berry IPM programs.**

With concerns of consumers for the environment and human health, Canadian producers face the challenge of incorporating ecological approaches to manage pests using IPM. Growers of small fruit are no different. Some options appear promising when all the tools of IPM are applied in a complementary manner. For tarnished plant bug, inoculative introductions of the braconid endoparasitoid, *Peristenus digoneutis*, have increased parasitism in strawberries and adjacent refuge areas when cultural practices are integrated. In the case of spider mites, biological control strategies based on release of predatory mites offer good results when special care is given to pesticide compatibility and weed management practices.

**Royauté, R.<sup>a</sup>**, Buddle, C.M.<sup>a</sup>, and Vincent, C.<sup>b</sup>

<sup>a</sup> Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne de Bellevue, QC; <sup>b</sup> Agriculture and Agri-Food Canada, St Jean-sur-Richelieu, QC

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Steps in assessing behavioural syndromes in *Eris militaris*, an agricultural salticid spider.**

Recent developments in behavioural ecology suggest that suites of behaviours can be correlated across a range of situations (e.g., predation pressure). These "behav-

ious syndromes” can be of particular interest for agroecosystems since they could indicate whether certain spider populations may be better at regulating pests than others. Correlation between behavioural traits relevant to dispersal and response to changing environments is discussed in order to assess how different levels of human disturbance affect spiders’ performance as pest regulators in agroecosystems. We will discuss how we developed methodologies to determine behavioural syndromes in *Eris militaris*, a salticid spider common in agricultural systems.

**Sabbahi, R.** and Royer, L.

Natural Resources Canada, Canadian Forest Service, Atlantic Forestry Centre, Corner Brook, NL

POSTER SESSION

**Parasitism of eastern hemlock looper in forests of Newfoundland and Labrador.**

The hemlock looper, *Lambdina fiscellaria* (Guenée) (Lepidoptera: Geometridae), is widely distributed and is one of the most destructive defoliators of balsam fir forests in North America. Lower mid-crown branches were sampled from various locations in Newfoundland and Labrador at weekly intervals from early June to mid-August. Individual eggs, larvae and pupae were tallied from each branch and reared in the laboratory under summer conditions. Progress in the developmental stages of each individual was monitored through time. Stage-specific densities and species-specific temporal occurrence of parasitoids and parasitism incidences were determined and estimated.

**Salomon, M.**, Whitaker, K., and Avilés, L.

Department of Zoology, University of British Columbia, Vancouver, BC

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Cooperative foraging dynamics across social and subsocial spiders.**

Despite a large body of research on the evolution of sociality in spiders, there is a general lack of knowledge about the cooperative behaviours associated with different social systems. We tested the hypothesis that the extent of cooperation in the context of foraging varies with spiders’ level of social organization and relative prey size. We experimentally examined the foraging behaviours of several species of social and subsocial *Anelosimus* spiders in Ecuador, and show that inter- and intraspecific variation in cooperation reflects differences in social structure, colony size and relative prey size.

**Scott, I.M.**<sup>a</sup>, Tolman, J.H.<sup>a</sup>, MacArthur, D.C.<sup>a</sup>, and Pelletier, Y.<sup>b</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Southern Crop Protection and Food Research Centre, London, ON; <sup>b</sup> Agriculture and Agri-Food Canada, Potato Research Centre, Fredericton, NB

SYMPOSIUM: ENTOMOLOGICAL ISSUES IN POTATO PRODUCTION

**Monitoring insecticide-resistance in Colorado potato beetle populations in**

**Canada: past, present and potential approaches.**

Insecticide resistance is a recurring and growing concern for Canadian potato growers. Recent surveillance has confirmed reduced susceptibility in increasing numbers of CPB populations managed with imidacloprid (Admire 240F). Further bioassay screening has documented cross-resistance with other neonicotinoid insecticides in a subset of these populations. As current bioassay methods are labour intensive and do not identify the resistance mechanism, other monitoring techniques are required. At AAFC, we are investigating other potential tools that will expedite the detection of resistance and suggest solutions for effective, sustainable CPB management.

**Sela, I.**

Virus Laboratory, Hebrew University of Jerusalem, Rehovot, Israel

SYMPOSIUM: APICULTURE: BEE - VIRUS INTERACTIONS

**Association of colony collapse disorder with Israeli acute paralysis virus (IAPV): an RNAi approach to control IAPV and a possible role for viral integration.**

IAPV was indicated to be associated with Colony Collapse Disorder (CCD). CCD was also correlated with other stress factors of bees, such as *Varroa*, *Nosema*, chemicals, climate, etc. We will discuss the possibility that integrated IAPV sequences (not current infections) may cause CCD and the possible IAPV-derived mechanisms leading to CCD. In collaboration with Beeologics, Inc., we have devised an RNAi approach controlling IAPV in the laboratory and in the field. Large-scale clinical assays are being conducted. Prevention of mortality from IAPV and improvements of bee colonies have already been demonstrated and results will be presented.

**Sheffield, C.,** Packer, L., Gibbs, J., Dumesh, S., Best, L., and de Silva, N.  
Department of Biology, York University, Toronto, ON

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**An overview of the bees of Canada: diversity, distribution and status.**

Bees are one of the most important groups of organisms in terrestrial ecosystems due to their role as pollinators. By providing pollination services to agriculture in Canada, bees contribute millions of dollars to our economy; even greater benefits, albeit of incalculable monetary value, occur in natural communities. Despite these facts, very little is known about bee faunistics in Canada. The purpose of this presentation is to provide a summary of the diversity, distribution and taxonomic status of bees in Canada and to summarize some of the bee-related goals of the Canadian Pollination Initiative, CANPOLIN.

**Shorthouse, J. D.**

Department of Biology, Laurentian University, Sudbury, ON

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Factors influencing the distribution of gall-inducing cynipids on wild roses across Canada.**

Thirteen species of cynipid wasps of the genus *Diplolepis* induce galls on the wild roses of Canada. Galls of each species are inhabited by parasitoids and inquilines that form gall-specific component communities. Rose galls provide a unique opportunity to study the zoogeography of microhymenoptera because presence of the insects can be determined at various sites throughout the season without observing the adults. Galls sampled across Canada reveal patterns that illustrate the northeastern movement of roses and cynipids following deglaciation and the impact of factors such as northward flowing rivers of the Hudson Bay Lowlands, the Rocky Mountains, freezing winter conditions and wind.

Simonsen, T.J.<sup>a</sup>, Zakharov, E.V.<sup>b</sup>, Djernaes, M.<sup>a</sup>, Cotton, A.M.<sup>c</sup>, Vane-Wright, R.I.<sup>d</sup>,<sup>e</sup> and **Sperling, F.A.H.<sup>a</sup>**

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Integrative Biology, University of Guelph, Guelph, ON; <sup>c</sup> Chiang Mai, Thailand; <sup>d</sup> Durrell Institute of Conservation and Ecology, University of Kent, Canterbury, Kent, UK; <sup>e</sup> Entomology Department, Natural History Museum, London, UK

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Phylogeny, host plant associations and divergence time of Papilioninae (Lepidoptera: Papilionidae) inferred from morphology and seven genes.**

We reconstructed phylogenetic relationships of 25 species from 18 genera of the swallowtail subfamily Papilioninae, plus outgroups, based on 94 morphological characters and 5616 bp DNA from seven genes (16S, COI, COII, ND1, ND5, EF1-alpha and Wingless). The most notable results are: 1) the two enigmatic genera *Meandrusa* and *Teinopalpus* are sister taxa, together comprising the tribe Teinopalpini; 2) based on dispersal-vicariance analyses, past dispersal events are far more important than vicariance events for explaining current distributions and 3) fossil-calibrated molecular clock analysis gives age estimates that are generally at least 25% younger than previous vicariance-calibrated molecular clock analyses.

**Sinclair, B.J.<sup>a</sup>** and Shamshev, I.<sup>b</sup>

<sup>a</sup> Canadian Food Inspection Agency, Ottawa, ON; <sup>b</sup> All-Russian Institute of Plant Protection, St. Petersburg, Russia

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Early spring pollinators: revision of the dance-fly genus *Iteaphila* (Diptera: Empididae).**

At higher northern latitudes and montane regions, the genus *Iteaphila* Zetterstedt is one of the first pollinators active in early spring, primarily visiting flowers of *Prunus* and *Salix* and other spring flowers. Apart from these collection records, little is known about the biology of *Iteaphila*. Two species groups are recognized: the *Iteaphila setosa* group is confined to the Mediterranean Province, distributed from southern England, through southern Europe and northern Africa, to the Caucasus and Middle Asia (Uzbekistan). The *Iteaphila macquarti* group is Holarctic, with widespread species across Europe, Asia (including Japan) and North America.

**Skevington, J.H.<sup>a</sup>** and Sommaggio, D.<sup>b</sup>

<sup>a</sup> Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, ON;

<sup>b</sup> Facoltà di Agraria, Università di Bologna, Bologna, Italy

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**“If the flies can tell who’s who, why can’t we?” Attempting to revise the taxonomy of Nearctic *Chrysotoxum* (Diptera, Syrphidae).**

Species concepts of Nearctic *Chrysotoxum* have been hotly debated for years. We are re-examining morphological characters and integrating the outcome with analysis of *cox1* mtDNA. To do this, we ‘barcoded’ a selection of identified material, then examined morphological character distribution among the resulting genetic lineages. A draft key was written and specimens identified on that basis were sequenced. The key was revised three times in this way. We are now confident that we have the first reliable key to *Chrysotoxum* species. The problem is that we are still unsure whether we are circumscribing species or populations. Ecological data may be the key needed to unravel the taxonomy of this difficult group.

**Sperling, J.<sup>a</sup>**, Shpeley, D.<sup>a</sup>, Leo, S.<sup>a,b</sup>, Jenkins, M.<sup>b</sup>, and Sperling, F.A.H.<sup>a</sup>

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> City of Edmonton Environmental Services, Edmonton, AB

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

***Ixodes scapularis* and *I. pacificus* ticks in Alberta.**

Recent reports have documented the distribution of *Ixodes scapularis* and *I. pacificus* throughout southern Canada - except for Alberta. As these two tick species are recognized as the primary vectors for Lyme disease, this gap implies a low risk of Lyme disease for Alberta. However, over the last decades in the Edmonton area we have received for identification a number of ticks of these two species. Although the recent travel history of the human and other hosts of these ticks is incompletely documented, it is important to note that the putative vectors of Lyme disease have been consistently present in central Alberta.

**Stephens, A.E.A.** and Myers, J.H.

Department of Zoology, University of British Columbia, Vancouver, BC

PRESIDENT’S PRIZE ORAL: BIOLOGICAL CONTROL

**Patterns of herbivore abundance on an invasive weed: a test of the resource concentration hypothesis.**

The resource concentration hypothesis (RCH) predicts that plants in more dense stands will attract disproportionately more herbivores than plants in sparser stands. However, support for this hypothesis is mixed. Understanding how biological control agents respond to host density can be important in predicting how they will affect host dynamics. We tested the RCH for two seed-head herbivores on an invasive weed, diffuse knapweed. An appreciation of interspecific competition, herbivore densities and environmental variation is needed to explain fully the relationship between insect and plant density.

**Subramaniam, R.**<sup>a</sup>, Dossdall, L.M.<sup>a</sup>, O'Donovan, J.T.<sup>b</sup>, and Harker, K.N.<sup>b</sup>

<sup>a</sup> Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB; <sup>b</sup> Agriculture and Agri-Food Canada, Lacombe Research Centre, Lacombe, AB

CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Identifying agronomic practices that conserve and enhance natural enemies of root maggots (*Delia* spp.) (Diptera: Anthomyiidae) in canola.**

Yield losses from infestations of root maggots (Diptera: Anthomyiidae) can be severe in canola crops in central Alberta. Studies were undertaken in central Alberta to identify agronomic practices that can affect the survival and abundance of *Aleochara bilineata* (Coleoptera: Staphylinidae), which is an important natural enemy of root maggots. We manipulated tillage regime (conventional versus zero tillage), row spacing and seeding rate to assess effects on *A. bilineata* populations. Tillage and plant density had significant effects on root maggot infestations and *A. bilineata* activity density, but effects on parasitism of root maggot puparia were variable in different sites and years.

**Suthisut, D.**<sup>a</sup>, Fields, P.G.<sup>b</sup>, and Chandrapatya, A.<sup>a</sup>

<sup>a</sup> Department of Entomology, Kasetsart University, Bangkok, Thailand; <sup>b</sup> Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Biological activity of essential oil of *Alpinia conchigera* rhizome against *Sitophilus zeamais* and *Tribolium castaneum*.**

The toxicity and repellency of the essential oil of *Alpinia conchigera* rhizome were evaluated against the stored-product insect pests, *Sitophilus zeamais* and *Tribolium castaneum* adults at  $29 \pm 2^\circ\text{C}$  and  $65 \pm 5\%$  R.H. In fumigation trials, *S. zeamais* ( $\text{LC}_{50}$ , fiducial limits: 121, 114 – 129  $\mu\text{L/L}$ ) was more susceptible to essential oil of *A. conchigera* than *T. castaneum* (295, 203 – 369  $\mu\text{L/L}$ ). In contact toxicity trials, *S. zeamais* (27, 18 – 40  $\mu\text{g/mg}$ ) had similar mortality to *T. castaneum* (34, 28 – 47  $\mu\text{g/mg}$ ). When placed on filter paper, the essential oil of *A. conchigera* repelled *T. castaneum* better than *S. zeamais*.

**Tansey, J.A.**<sup>a</sup>, Dossdall, L.M.<sup>a</sup>, and Keddie, B.A.<sup>b</sup>

<sup>a</sup> Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Incorporation of novel *Ceutorhynchus obstructus* (Coleoptera: Curculionidae)-resistant canola genotypes into mixed cropping strategies and its effects on weevil spatial dynamics.**

Genotypes resistant to the cabbage seedpod weevil, *Ceutorhynchus obstructus* (Mar-



sham) have been developed through the introgression of *Sinapis alba* L. x *Brassica napus* L. Several of these genotypes express antixenosis and antibiosis resistance and are less attractive in visual and olfactory behavioural bioassays. A small plot study was used to assess incorporation of susceptible refugia into deployment strategies for resistant genotypes. Mixes reduced weevil numbers and oviposition in pods of susceptible genotypes relative to susceptible monocultures. Weevil dispersal was affected by proportions of resistant and susceptible germplasm. Results are consistent with associational resistance.

**Taylor, G.**

University of Victoria, Victoria, BC

GRADUATE STUDENT SYMPOSIUM

**Host range of a male-killing bacterium infecting filth fly parasitoids.**

The son-killer bacterium (*Arsenophonus nasoniae*) infects the blow fly parasitoid, *Nasonia vitripennis* (Hymenoptera: Pteromalidae), causing virtually all male offspring to die as eggs. Interestingly, this bacterial symbiont can be transmitted vertically (from mother to offspring) and horizontally (to unrelated *Nasonia* parasitizing the same host). This capability for horizontal transmission suggests that this symbiont may have the potential to move through a biological community and utilize diverse host species. Here I used two complementary methods to examine whether son-killer has a wider host range than was previously anticipated. First, I used *Arsenophonus*-specific primers to screen a large sample of filth flies and their associated parasitoids for infection. I found that a wide range of pteromalid wasps were infected with *Arsenophonus* spp., indicating a transfer could have occurred when these species interact with *N. vitripennis*. Second, I inoculated four species of pteromalid wasps with a strain of *A. nasoniae* that I collected and isolated from field-caught *N. vitripennis*, and measured maternal transmission efficiency and male-killing activity. This bacterium was successfully transmitted to all four species, although maternal transmission efficiency was low, and this strain did not exhibit detectable male-killing in any of the species used. I have also found that son-killer harbours a lysogenic bacteriophage that is widespread in *Arsenophonus* spp. infecting the filth fly community. The son-killer bacterium and its phage may play an important role in shaping its ecological community, and understanding their effects is crucial for establishing successful biocontrol programs for fly populations.

**Teller, J.T.**

Department of Geological Sciences, University of Manitoba, Winnipeg, MB

PLENARY SYMPOSIUM

**History of glacial Lake Agassiz and climate since the last ice age, as reflected in lake sediments.**

Today's landscape is largely the result of Pleistocene glaciation. The late-glacial and Holocene record of the past 10,000 years is recorded in the sediments of lakes, and indicates that there have been significant climatic and hydrological changes during this period. Until the ice sheet had melted from Canada, northward-draining rivers

remained dammed, and an extensive but changing fringe of lakes lay along the ice margin from the Mackenzie River basin across the Prairies to the Great Lakes and into the St. Lawrence Valley. Glacial Lake Agassiz was the largest of these lakes (and the largest lake in the world), covering a total of >1.5 million km<sup>2</sup>. Lake Agassiz influenced the climate, vegetation, and people of this vast region, and its overflow played a role in the evolution of the Great Lakes and the St. Lawrence, Athabasca and Mississippi River Valley systems. Overflow from Lake Agassiz entered three different oceans during its 5000-year history, and periodic catastrophic outbursts eroded deep valleys; these waters altered global ocean thermohaline circulation and brought about several episodes of global cooling during a period when the earth was warming. One of these bursts released 163,000 km<sup>3</sup> of freshwater in less than a year (seven times the volume of the modern Great Lakes), causing oceans to encroach rapidly onto continental margins. In the Persian Gulf, which had been dry during glacial times, this Agassiz outburst caused the ocean to flood inland >12 km in only a few months, displacing people living along the Tigris and Euphrates Rivers and, perhaps, leading to stories about a Great Flood.

Tesfaendrias, M.T., Vander Kooi, K., and McDonald, M.R.

Department of Plant Agriculture, University of Guelph, Guelph, ON

POSTER SESSION

**Integrated pest management in the Holland Marsh.**

Integrated pest management in the Holland Marsh, Ontario, has been provided by the University of Guelph, Muck Crops Research Station since 2004. Insect traps and degree day models are used to predict the different life stages of carrot weevils (*Listronotus oregonensis*), carrot rust flies (*Psila rosae*), aster leafhoppers (*Macrostelus quadrilineatus*), onion flies (*Delia antiqua*) and tarnished plant bugs (*Lygus lineolaris*). In 2008, predicted compared to actual emergence of carrot rust flies was 26 and 29 May. Similarly, for onion flies, predicted vs. actual emergence was 12 and 15 May. Results are disseminated through phone, fax or e-mail.

Thielman, A.C. and Hunter, F.F.

Department of Biological Sciences, Brock University, St. Catharines, ON

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Morphological and molecular analyses of *Anopheles* (Diptera: Culicidae) for evidence of cryptic species in Canada.**

Preliminary morphological examination of *Anopheles* mosquitoes collected from across Canada revealed the possible occurrence of cryptic species. Many anopheline species are known to be complexes of isomorphic species, the members of which often differ in their ability to transmit pathogens. They are often distinguished using cytological, molecular, biochemical, ecological, or minor morphological traits. The results of two types of analyses used to look for evidence of cryptic species in *Anopheles* mosquitoes in Canada will be presented, namely molecular analyses using ribosomal (ITS1 and ITS2) and mitochondrial (COI) sequences, as well as SEM analyses of egg morphology.

**Timms, L.**

Faculty of Forestry, University of Toronto, Toronto, ON

## GRADUATE STUDENT SYMPOSIUM

**What happens after establishment? Using gypsy moth to explore indirect impacts of invasive species on native communities.**

Invasive species are considered one of the most serious threats affecting natural environments today; however, surprisingly little research has addressed the impacts of invasive species establishment on native foodwebs. My research addresses the questions: what are the ecological impacts of an exotic species upon its establishment in a new community? Does the community shift after the invasive establishes, and if so, what are the main drivers in this realignment? With a wide host range and a large assemblage of natural enemies, the gypsy moth has broad potential to affect native North American forest insects. I assessed the structure and diversity of caterpillar communities and their parasitoids in forests with and without histories of gypsy moth outbreak. Despite predictions to the contrary, neither gypsy moth history nor current abundance were strong predictors of caterpillar community structure or parasitism. However, correlations were observed between gypsy moth and several native defoliating species. One of these relationships was a strong positive association between the gypsy moth and the forest tent caterpillar. Currently, I am investigating the presence of indirect interactions between these two species using manipulative greenhouse experiments. Previous work suggests that forest tent caterpillar defoliation may induce changes in host plant chemistry that reduce the gypsy moth's susceptibility to its virus, thereby creating a positive feedback loop between the two species. If supported, my work will help explain the positive correlation between these two, and will be one of the first studies to demonstrate the complexity of interactions between exotic and native species following invasion.

**Van Hezewijk, B.** and Bouchier, R.S.

Agriculture and Agri-Food Canada, Lethbridge, AB

## CONTRIBUTED PAPERS: BIOLOGICAL CONTROL, ECOLOGY AND BEHAVIOUR

**Are two heads better than one? The interaction between a root galler and seed-head feeder in the biological control of diffuse knapweed.**

In a manipulative field experiment, we tested the impact of the root galler, *Cyphocleonus achates*, on plant density, size, architecture, as well as seed-head number and size of diffuse knapweed. Subsequently, we tested the hypothesis that the seed-head weevil, *Larinus minutus*, was indirectly affected by the impacts of the root galler on the plant. The main effect of *C. achates* was to reduce plant height, increase lateral branching and decrease the number and size of seed-heads. In combination, these effects had a negative impact on attack rate by *L. minutus*.

**Vankosky, M.A.**<sup>a, b</sup>, Dosedall, L.M.<sup>a</sup>, and Cárcamo, H.A.<sup>b</sup>

<sup>a</sup> Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, AB; <sup>b</sup> Agriculture and Agri-Food Canada, Lethbridge, AB

## PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Exploiting the weakest link: identifying endemic predators and parasitoids of *Sitona lineatus* eggs in southern Alberta.**

Endemic natural enemies may reduce populations of the pea leaf weevil (*Sitona lineatus* L.), an emerging pest of field peas in southern Alberta. In laboratory trials, predation of pea leaf weevil eggs over 48 hours ranged from 75 to 100% by small carabid beetles such as *Bembidion quadrimaculatum*. Egg predation by larger species such as *Pterostichus melanarius* was negligible over the same exposure period. No evidence of a parasitoid of pea leaf weevil eggs has been observed. We aimed to integrate conservation biological control into an integrated pest management strategy for the pea leaf weevil in the southern prairies.

**Veilleux, J.<sup>a</sup>**, Leferink, J.<sup>b</sup>, and Holliday, N.J.<sup>a</sup>

<sup>a</sup> Department of Entomology, University of Manitoba, Winnipeg, MB; <sup>b</sup> Forestry Branch, Manitoba Conservation, Winnipeg, MB

## PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Assessment of the benefits of rapid removal of elm trees infected with Dutch elm disease.**

In a recent study, it was shown that Manitoba's main Dutch elm disease vector, *Hylurgopinus rufipes*, can complete development in newly-infected American elm trees and emerge in late summer. Therefore, conventional winter removal of newly-symptomatic trees occurs after spore-bearing beetles have left. We assessed whether rapid (summer) removal would reduce infection rates by comparing infection rates in 14 Manitoba communities, seven having switched from winter removal to rapid removal in 2004. Rates of new Dutch elm disease infections in rapid removal communities were consistently lower, suggesting that rapid removal should be incorporated into Manitoba's integrated disease management program.

**Veilleux, J.** and Holliday, N.J.

Department of Entomology, University of Manitoba, Winnipeg, MB

## POSTER SESSION: PRESIDENT'S PRIZE

**The banded elm bark beetle, *Scolytus schevyrewi*, in Canada.**

The discovery of banded elm bark beetle, *Scolytus schevyrewi*, in Colorado in 2003 and Canada in 2006 poses a challenge to established Dutch elm disease management techniques. It is not known whether or not the beetle can transmit the pathogen and if the beetle's life cycle is similar in its native habitat, Asia, and in its new habitat. We are investigating the bionomics of *S. schevyrewi* in the prairies: number of generations, overwintering stages, host trees and interactions with *Ophiostoma novo-ulmi* and with the native elm bark beetle, *Hylurgopinus rufipes*. With this information, appropriate modifications can be made to the management strategies in place.

**Vernon, R.S.<sup>a</sup>**, Herk, W. van<sup>a</sup>, Clodius, M.<sup>a</sup>, Tolman, J.H.<sup>b</sup>, and Noronha, C.<sup>c</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Pacific Agri-Food Research Centre, Agassiz, BC;  
<sup>b</sup> Southern Crop Protection and Food Research Centre, London, ON; <sup>c</sup> Charlottetown  
Research Station, Charlottetown, PE

SYMPOSIUM: ENTOMOLOGICAL ISSUES IN POTATO PRODUCTION

**Wireworms: we can control their damage, but can we kill them?**

Wireworms are an increasing threat to many crops in Canada, and most of the previously-used insecticides have now been de-registered. In potatoes, only phorate (Thimet 15G) remains, and will be de-registered in 2012. Some of the leading candidate wireworm insecticides, including certain neonicotinoids (e.g., clothianidin) and pyrethroids (e.g., tefluthrin), although providing effective damage protection in some crops, are not actually as effective at reducing wireworm populations as the formerly used organophosphates, carbamates and organochlorines. We discuss laboratory and field efficacy studies that support this claim, and describe the future of wireworm control in Canada.

**Waller, J.L.**

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

PRESIDENT'S PRIZE ORAL: BIODIVERSITY, CONSERVATION, SYSTEMATICS

**Parasitoid community shifts across the 'front' of an advancing forest tent caterpillar (*Malacosoma disstria*) outbreak in northern Alberta's boreal forest.**

I am investigating how the forest tent caterpillar (FTC) parasitoid community changes as FTC density shifts from endemic to epidemic to post outbreak levels. My research area covers 130 km<sup>2</sup> in northern Alberta's boreal forest cutting through the 'front' of a FTC outbreak, which is moving south. Over 10,000 FTC larvae and pupae were collected from which approximately 3500 parasitoids were reared. Eighteen per cent of larvae and 74% of pupae collected contained parasitoids. The majority of parasitoids were tachinid and sarchophagid flies. I will present the preliminary results of my first field season (2008) which will later be compared to data collected in 2009.

**Waller, J.L.**

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

POSTER SESSION: PRESIDENT'S PRIZE

**Parasitoid competition or, "Can parasitoids distinguish previously parasitized hosts?"**

I am investigating the forest tent caterpillar (FTC) parasitoid community in northern Alberta. Over 10,000 FTC larvae and pupae were collected in 2008, from which approximately 3500 parasitoids were reared. The majority of parasitoids were flies, with the two most common being *Arachnidomyia aldrichi* (Parker) and *Carcelia malacosomae* (Sellers). Interspecific competition was observed and investigated between these two parasitoids. I will present the surprising preliminary results of my first field season (2008) and the results of further field tests in 2009.

**Walter, D.E.**

Royal Alberta Museum and University of Alberta, Edmonton, AB

BIOLOGICAL SURVEY OF CANADA SYMPOSIUM

**Unexpected diversity in boreal forest and aspen parkland mites (Acari: Oribatida): results from the Alberta Biodiversity Monitoring Institute.**

When the Alberta Biodiversity Monitoring Institute surveys began in 2007, 132 species of oribatid mites had been reported from Alberta, mostly from the Rocky Mountains. Currently, I have records for ~300 species, including three new to North America, 16 new to Canada and 95 previously unknown in Alberta; 24–35 of these represent new species. To date, most ABMI samples and new records are from boreal forest and aspen parkland, indicating an unexpected richness in these previously poorly sampled biotic regions. Limited samples from the grasslands also indicate numerous new species.

**Wheeler, T.A.**

Department of Natural Resource Sciences, Macdonald Campus, McGill University, Ste Anne-de-Bellevue, QC

CONTRIBUTED PAPERS: SYSTEMATICS, CONSERVATION, BIODIVERSITY

**Taxonomic impediments: unravelling the taxonomic, phylogenetic and ecological diversity of chloropid flies.**

Grass flies (Chloropidae) are one of the more species-rich families of higher flies and among the two or three most ecologically varied families of Diptera worldwide. This daunting taxonomic and ecological variety may be partly to blame for the historical lack of progress in documenting the diversity of these ubiquitous flies. Using examples from our recent and ongoing taxonomic, phylogenetic and ecological studies, I will discuss the evolutionary, logistic and anthropogenic challenges involved in trying to unravel the diversity of this poorly known group of very common insects. I will also attempt to justify why we bother.

**Whitehouse, C.M.<sup>a</sup>, Strong, W.B.<sup>b</sup>, and Evenden, M.L.<sup>a</sup>**

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> British Columbia Ministry of Forests and Range, Kalamalka Forestry Centre, Vernon, BC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Multiple mating of female *Dioryctria* in British Columbia conifer seed orchards.**

Several seed and foliage-feeding species of *Dioryctria* Zeller (Lepidoptera: Pyralidae) are serious, economically important pests in conifer seed orchards. *Dioryctria* were sampled using black-light traps in *Pinus contorta*, *Picea glauca* and *Pseudotsuga menziesii* orchards in the north Okanagan Valley, British Columbia in 2008 and 2009. Specimens from within *abietella*, *auranticella*, *ponderosae*, *schuetzeella* and *zimmermani* species groups were dissected to determine mating status. Multiple mating occurred in females of all species groups collected, while remating frequency varied among the groups. Results will be discussed with reference to life history traits and the phylogenetic relationships within and among species groups.

**Wijayaratne, L.K.W.**<sup>a,b</sup>, and Fields, P.G.<sup>b</sup>

<sup>a</sup> Department of Entomology, University of Manitoba, Winnipeg, MB; <sup>b</sup> Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg, MB

PRESIDENT'S PRIZE ORAL: APPLIED AND BASIC ECOLOGY

**Diapause induction in the larvae of different populations of Indianmeal moth, *Plodia interpunctella* (Lepidoptera: Pyralidae).**

Larvae of Indianmeal moth populations from Vancouver, California, and two places in Winnipeg were tested for their diapause induction. Larvae were reared at 25°C, 16 h light for 9 days, then placed at 20°C, 8 h light for the rest of their development. Indianmeal moths diapause as late instar larvae. The percentage induced to diapause at 20°C, 8 h light was 0±0%, 7±2%, 20±10%, and 23±5% for California, Vancouver, Winnipeg 1 and Winnipeg 2 populations, respectively. For the Vancouver population, selecting for diapause for another generation increased the percentage diapausing at 20°C, 8 h light to 14%.

**Williams, N.M.**<sup>a</sup>, Winfree, R.<sup>b</sup>, and Kremen, C.<sup>c</sup>

<sup>a</sup> Department of Entomology, University of California-Davis, CA, USA; <sup>b</sup> Rutgers University, NJ, USA; <sup>c</sup> University of California-Berkeley, CA, USA

SYMPOSIUM: POLLINATION BIOLOGY

**Response of wild bees to landscape change and its implications for pollination services.**

We surveyed wild and managed bees visiting watermelon fields in two distinct regions of North America, the Mid-Atlantic and California's Central Valley. In each region we measured the species richness and abundance of flower visitors in melon fields along a landscape gradient from areas with high proportions of natural habitat to those in intensive agriculture. We also measured pollination by the different visitor taxa. Responses of pollinators and pollination service to landscape change differed strikingly between East and West. Although land use gradients were similar between regions, differences in landscape structure and farm site configuration contributed to differential responses.

**Winchester, N.N.**

Department of Geography, University of Victoria, Victoria, BC

SYMPOSIUM: DIVERSITY IN FOREST ECOSYSTEMS

**Diversity of arthropods in ancient forests: counting the uncounted.**

Threats to biodiversity are urgent matters and understanding the assembly, dynamics and structure of ecological communities, especially those containing rare taxa, are critical issues in ecological entomology. Several processes act to shape arthropod communities but it is clear that challenges to document species richness and evenness accurately in these forest communities still remain. Using analogous sampling of arboreal and terrestrial communities across different spatial scales in a temperate rainforest, I quantify the variation in species assemblages of Araneae, Oribatida, Staphylinidae and Braconidae.

**Wise, I.L.<sup>a</sup>**, Woodbeck, N.<sup>b</sup>, and Fox, S.L.<sup>a</sup>

<sup>a</sup> Agriculture and Agri-Food Canada, Cereal Research Centre, Winnipeg, MB; <sup>b</sup> Canadian Grain Commission, Winnipeg, MB

CONTRIBUTED PAPERS: APPLIED ENTOMOLOGY

**An estimate of economic losses to spring wheat caused by *Sitodiplosis mosellana* in western Canada, 2003–2008.**

Damage to wheat seed by the orange wheat blossom midge, *Sitodiplosis mosellana* (Gehin), reduces yield and seed grade. An estimate of yield losses in western Canada was calculated from the proportion of wheat degraded by the wheat midge in samples from western Canada that were sent to the Grains Research Laboratory in 2003 to 2008. The proportion of wheat degraded by midge in each seed grade was converted to yield losses by assessing the percentage of damaged wheat that is retained during harvest and then detected during grading, and from weight differences between damaged and undamaged seed in the harvested grain.

**Wist, T.J.<sup>a</sup>**, Gries, R.<sup>b</sup>, Lusebrink, I.<sup>a</sup>, and Evenden, M.L.<sup>a</sup>

<sup>a</sup> Department of Biological Sciences, University of Alberta, Edmonton, AB; <sup>b</sup> Department of Biological Sciences, Simon Fraser University, Burnaby, BC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Volatile cues for the location of *Fraxinus* hosts by female *Caloptilia fraxinella* (Lepidoptera: Gracillariidae).**

The ash leaf-cone roller, *Caloptilia fraxinella* (Lepidoptera: Gracillariidae), infests horticultural ash, *Fraxinus* spp. (Oleaceae), in Prairie urban forests. Discovery of volatile cues from ash hosts that attract gravid female moths is the first step in the development of a semiochemical-based attracticide. Six antennally-active compounds from black ash, *F. nigra*, were identified by GC-EAD. Gravid female moths oriented at a distance to black and green ash, *F. pennsylvanica*, in field and wind tunnel assays, respectively.

**Wogin, M.J.<sup>a</sup>**, Roitberg, B.R.<sup>a</sup>, Haye, T.<sup>b</sup>, and Gillespie, D.R.<sup>c</sup>

<sup>a</sup> Simon Fraser University, Department of Biological Sciences, Burnaby, BC; <sup>b</sup> CABI-Europe Switzerland, Delémont, Switzerland; <sup>c</sup> Agriculture and Agri-Food Canada, Agassiz, BC

PRESIDENT'S PRIZE ORAL: BIOLOGICAL CONTROL

**Intra-guild interactions between two parasitoids of the cabbage seedpod weevil and their effects on population dynamics and biological control.**

Studies examining effectiveness of single versus multiple species introductions in classical biological control have produced conflicting results due to the complex interactions that can occur. The cabbage seedpod weevil, an invasive pest in North America, has two European parasitoids under consideration as potential biological control agents. In order to determine the ideal parasitoid community as well as predict possible conflicts with established parasitoids in Canada, we conducted field and laboratory experiments examining the outcomes of inter-specific competitive



interactions and their effects on parasitoid populations. Results and ecological implications are discussed.

**Wohlfahrt, B.**

University of Calgary, Calgary, AB

GRADUATE STUDENT SYMPOSIUM

**Antagonistic selection on an antipredator defence: one predator type and the combined effects of prey phenotype and environment.**

Adaptations to heterogeneous environments may lead to phenotypic differentiation in closely related prey species. Predation is a strong selective factor that is known to facilitate phenotypic differentiation. In correspondence, prey species may possess a variety of different antipredator defences. However, the effectiveness of antipredator defences is not universal, and ineffective antipredator defences can lead to decreased survival. In this study, we examined the effectiveness of two morphological antipredator defences (body size and elytral maculation pattern) in four species of dytiscid diving beetles (Coleoptera: Dytiscidae) under heterogeneous environmental conditions (plant density and water colour). Dytiscid beetles represent a species rich and phenotypically diverse component of aquatic communities. From previous results, community composition of dytiscid beetles may be significantly influenced by environmental factors, such as predator presence, vegetation structure and water clarity. In correspondence with that, our results revealed that prey mortality risk generally decreased with larger body size, whereas the effectiveness of elytral maculation patterns depended on water colour and prey body size. In clear water, small maculated dytiscids had survival rates equal to larger plain beetles. However, under dark water conditions, the effectiveness of elytral maculation in larger beetles decreased to the point that it became detrimental to survival, revealing an adaptive trade-off. I suggest that interactions among biotic and abiotic factors in heterogeneous environments dominated by the same predator-type can lead to antagonistic selection on prey species' antipredator defences.

**Work, T.T.<sup>a, b</sup>, Renault, F.<sup>a, b</sup>, Jacobs, J.<sup>a, b</sup>, and Brais, S.<sup>a, c</sup>**

<sup>a</sup> NSERC/UQAT/UQAM Industrial Chair in Sustainable Forest Management; <sup>b</sup> Sciences Biologiques, Université du Québec à Montréal, Montréal, QC; <sup>c</sup> Université du Québec à Abitibi-Témiscamingue, Rouyn-Noranda, QC

SYMPOSIUM: DIVERSITY IN FOREST ECOSYSTEMS

**Managing deadwood and arthropod diversity in boreal forests under increasing demands for woody biomass feedstocks.**

With renewed interest in woody biomass feedstocks, additional mitigative measures aimed at replenishing stocks of dead wood may be needed to maintain biodiversity in managed boreal forests. Here we evaluate whether beetle communities respond differently to rapid deposition of coarse woody material (CWM) by late commercial thinning [dead wood pulse] compared to CWM deposited from gradual loss of standing retention in conifer dominated stands in western Québec. We also provide an initial assessment of beetle response to the first commercial biomass harvesting

conducted in this region and compare these responses to overall patterns in beetle diversity observed in related partial cutting trials.

**Wytrykush, D.,** Ritland, K.M., Ritland, C., and Yeuh, H.

Department of Forest Science, University of British Columbia, Vancouver, BC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Sibship structure of *Pissodes strobi* (Coleoptera: Curculionidae) in spruce stands.**

*Pissodes strobi* (Peck) is a major pest of spruce in British Columbia. Knowledge of the weevil on a small-scale stand level is extremely important to develop strategies that decrease possible resistance in *P. strobi* populations. To understand the population dynamics of *P. strobi*, three stand age classes of Sitka and Interior Spruce were sampled and 12 microsatellite loci were chosen for amplification in 429 weevil larvae. Understanding reproductive dynamics of *P. strobi* will help develop strategies for planting resistant trees to decrease the development of insect tolerance and further our knowledge of the possible coevolutionary dynamics of this system.

**Zahradnik, T.<sup>a</sup>,** Takács, S.<sup>a</sup>, Tsang, M.<sup>a</sup>, Strong, W.B.<sup>b</sup>, Bennett, R.G.<sup>c</sup>, and Gries, G.<sup>a</sup>

<sup>a</sup>Department of Biological Sciences, Simon Fraser University, Burnaby, BC; <sup>b</sup>British Columbia Ministry of Forests and Range, Kalamalka Forestry Centre, Vernon, BC; <sup>c</sup>British Columbia Ministry of Forests and Range, Saanichton, BC

PRESIDENT'S PRIZE ORAL: FOREST ENTOMOLOGY

**Use of electromagnetic foraging cues by conophytic insects.**

The western conifer seed bug, *Leptoglossus occidentalis*, and Douglas-fir cone gall midge, *Contarinia oregonensis*, seek conifer cones for feeding or oviposition, often causing significant seed losses in seed orchards. Here we present evidence from laboratory and field experiments that (i) *C. oregonensis* appears to respond to infrared (IR) radiation from Douglas-fir cones as a foraging cue and (ii) that *L. occidentalis* utilizes wavelengths of visible and UV light, in addition to IR radiation, to locate cones of white pines. Our results may help design effective traps for monitoring and/or control of both insect species in seed orchards.

***The Entomological Society of Manitoba  
gratefully acknowledges the following organizations  
which provided financial support for the  
65<sup>th</sup> Annual Meeting***

*Abel Pest Control*

*Arysta Life Sciences*

*BASF*

*Bayer Cropscience Canada Co.*

*Beemaid Honey, Ltd.*

*Canadian Grain Commission*

*Coalition to Save the Elms*

*Crop Life Canada*

*Dimo's Tool and Die, Ltd.*

*Dow Agro Sciences Canada, Inc.*

*Lotek Wireless Fish and Wildlife Monitoring*

*MacGregor Waxworks*

*Manitoba Agriculture, Food & Rural Initiatives*

*Manitoba Sustainable Development Fund*

*Manitoba Co-operative Honey Producers*

*Manitoba Rural Adaptation Council, Inc.*

*Medivet Pharmaceuticals, Ltd.*

*Orkin PCO Services*

*Poulin's Pest Control*

*Syngenta Bioline, Inc.*

*United Agri Products Canada, Inc.*

*V & L Distributors, Inc.*

# The Entomological Society of Manitoba 65<sup>th</sup> Annual Business Meeting

7 November 2009

Department of Entomology, University of Manitoba

**Attendance**

|                          |                  |
|--------------------------|------------------|
| President                | Richard Westwood |
| Secretary                | David Ostermann  |
| President-Elect          | Marj Smith       |
| Regional Director to ESC | Terry Galloway   |
| Proceedings Editor       | Terry Galloway   |
| Member-at-Large          | Lars Andreassen  |
| Noel White               |                  |
| Paul Fields              |                  |
| Bob Lamb                 |                  |
| Brent Elliott            |                  |
| Pat MacKay               |                  |
| Taz Stuart               |                  |
| Neil Holliday            |                  |
| Mahmood Iranpour         |                  |
| Jonathan Veilleux        |                  |
| John Gavloski            |                  |

**Regrets**

|                   |
|-------------------|
| Ian Wise          |
| Joel Gosselin     |
| Désirée Vanderwel |

- 1. Acceptance of Agenda.**  
Motion: Galloway/White – to accept the Agenda (Appendix A).....Carried
- 2. Acceptance of the Minutes**  
Motion: Lamb/Elliott – to accept previous Minutes of the 64th Business Meeting (14 November 2008).....Carried
- 3. Business Arising from the Minutes**  
In last year’s minutes (Appendix I) it was noted that an invitation to socialize on the “last Friday of the month” could be extended to members outside of the U of M Entomology Department. Smith indicated she’ll forward the Department’s email reminders to members. She’ll work with Wise who maintains the membership list with email addresses.
- 4. Reports – Executive**  
Motion: Holliday/Galloway – to receive reports.....Carried

**Appendix B** – President

**Appendix C** – Treasurer (presented by Smith)

The finances have gone through a financial review and found to be in good

order. The deficit this year is not a major concern given the financial position of the Society.

#### **Appendix D – Regional Director to the ESC**

The ESC would like to see an increase in membership levels. A larger membership has a louder voice. Money available from the ESC for youth encouragement wasn't accessed this year but is still available. The ESC is now offering 6-pages free to encourage publication submissions according to Fields.

#### **Appendix E – Editor of the Proceedings**

Thanks to the U of W for printing the Proceedings. The Proceedings will be sent to all ESM members and posted on the website. More research manuscripts are now searchable and available on the website thanks to Westwood. Currie has been looking into inclusion on Google Scholar.

### **5. Reports – Committees**

#### **Appendix F – Endowment Fund Board**

Changes to the endowment fund limit require approval at the membership levels (i.e. to be voted on at an Annual Business Meeting to which all members are invited). Maintenance of a limit is a requirement of the fund. There was a comment that interest rates have dropped since last year.

*Motion:* White/Lamb – to raise the endowment fund limit to \$50,000 (from \$40,000).....Carried

Thanks to Marj for her thorough work as Endowment Fund Chair. Kathy Cano will be the new Chair of the Endowment Fund and Finance Committee.

#### **Appendix G – Finance**

Thanks to Marj for her hard work as Finance Committee Chair.

#### **Appendix H –Publicity / Newsletter**

This year, the Committee has requested a budget increase from \$500 to \$600. This change reflects the increased costs of the newsletter and is to be approved by the Executive. There was a question about distribution of the newsletter by email which has come in previous years.

*Motion:* Holliday/White – to continue to issue a paper copy of the newsletter to membership and provide an electronic version on the website. ....Carried

#### **Appendix I – Social**

The Social Committee has been largely inactive due to poor turnout to past events despite significant effort. Elliott, on behalf of himself and Wolfe, asked to be replaced as Chairs. The President will select a new Chair. Thanks to Elliott and Wolfe for their hard work as the Social Committee Chairs.

#### **Appendix J – Youth Encouragement**

It was suggested that the Executive should invite the Youth Encouragement Committee Chair to a meeting. Perhaps an honorarium for the Chair would be a good idea.

**Appendix K – Archives**

**Appendix L – Scholarship and Awards**

The U of W now has a graduate program.

**Appendix M – Fundraising**

This fundraising is separate from the ESC/ESM joint meeting on Oct. 18-21, 2009.

**Appendix M – Fundraising**

**Appendix N – Scientific Program**

Thanks to the many people involved in the ESC/ESM joint meeting especially Brent Elliott and Neil Holliday. Pat McKay and Bob Lamb acted as Social Chairs for the meeting. The finances and “bottom line” won’t be fully known for a few months as bills are being paid. There were many positive comments about the meeting and it’s felt that it was a successful meeting. Smith noted that 53 registrants were ESM members.

Holliday noted that organization of the scientific program is a significant job especially in the final 2-3 months prior to the meeting but it’s felt that such organization should continue to be done locally, as much as possible, to meet the needs of the region and encourage attendance.

There’s concern about the ability of the ESM to host such a meeting in the future with a number of retirements from the U of M and AAFC expected in the coming years.

**Appendix O – Membership**

Membership is at 98.

**Appendix P – Web Page**

*Motion:* Gavloski/Lamb – to accept the reports as given. ....Carried

**6. Election Results**

|                 |                   |
|-----------------|-------------------|
| President Elect | Taz Stuart        |
| Member-at-Large | Jonathan Veilleux |

**Appendix – Q**

*Motion:* Holliday/MacKay – to destroy the ballots ..... Carried

**7. New Business**

Veilleux suggested having new ESM shirts that don’t say “University of Manitoba” and that he may work on a design. The Fundraising Committee should bring this to the Executive for approval.

**8. Moment of Silence for Deceased Members**

There was a moment of silence for ESM members Phil Barker and Andy Kolach who passed away this year.

**9. Transfer of Presidential Office – Richard Westwood to Marj Smith**

10. **Reappointment of Auditor**

It was felt that full audits are very expensive and that a financial review needs to be done of the ESM's books and the books of the joint ESC/ESM meeting.

*Motion:* Holliday/White – to appoint Nicholson Rawluk LLP to conduct a financial review of the books of the ESM and ESC/ESM joint meeting. ....Carried

11. **Other Business** – None

12. **Adjournment.** 11:45 a.m.

*Motion:* Stuart – to adjourn the meeting. ....Carried

## **APPENDIX A**

### **Agenda**

#### **The Entomological Society of Manitoba, Inc. Agenda of the Entomological Society of Manitoba 65th Annual Business Meeting**

**7 November 2009**

1. Acceptance of Agenda
  2. Acceptance of the Minutes of the last Annual Meeting (3 November 2007)
  3. Business arising from the Minutes
  4. Reports – Executive
    - President – Désirée Vanderwel
    - Treasurer – Ian Wise
    - Regional Director to the ESC – Patricia MacKay
    - Editor of the Proceedings – Terry Galloway
    - Endowment Fund Board – Marjorie Smith
  5. Reports – Committees
    - Finance – Marjorie Smith
    - Publicity/Newsletter – Mahmood Iranpour, Patricia MacKay
    - Social – Brent Elliott, Sheila Wolfe
    - Youth Encouragement/Public Education – Katrina Froese
    - Archives – Rob Roughley
    - Scholarship and Awards – Richard Westwood
    - Fund-raising – Joel Gosselin
    - Scientific Program – Mahmood Iranpour
    - Membership – Désirée Vanderwel
    - Web Page – Rob Currie
  6. Election results – Scrutineer, Colin Demianyk
  7. New business
  8. Transfer of Office
  9. Reappointment of Auditor
  10. Other business
- Adjournment



## **Appendix B**

### Entomological Society of Manitoba President's Report – Annual Business Meeting

The executive committee met on March 19, 2009 and September 17, 2009 at the University of Winnipeg. Many of the agenda items at both meetings focused on the upcoming Joint Annual Meeting of the Entomological Society of Manitoba (ESM) and the Entomological Society of Canada (ESC). Many of the executive members were also heavily involved in the organization and implementation aspects of the Joint Meeting including Marjorie Smith, Terry Galloway, Ian Wise, Richard Westwood and Lars Andreassen and briefings were tabled by various executive members on the planning components of the October 2009 meeting.

Marjorie Smith and Ian Wise continued to keep an orderly account of the Society's financial status and the executive voted in support of increasing the current Endowment Fund limit from \$40,000 to \$50,000. A motion passed to bring this recommendation to the 2009 annual business meeting.

Past President, Desiree Vanderwel, recommended two nominees for president elect and two for member-at-large. The names of the nominees were forwarded to the Secretary for the ballot process to proceed. For several years now, the ESM has been under-spending the funding allowance for the Youth Encouragement Committee. There have been several reasons for this but since 2008, it appears that the vacant chair position of the YEC has prevented the YEC from applying for funds. The chair position is now filled and the YEC has been encouraged to apply for operating funds to carry out its important activities.

For the first time, two Undergraduate Student Achievement Awards were given by the ESM to deserving applicants. In addition, both the ESM Graduate Scholarship and the Orkin/Swat Award were provided to well qualified recipients. ESM members, Pat MacKay and Terry Galloway, nominated Dr. Bob Wrigley as this year's winner of the Criddle Award and ESM executive unanimously supported this recommendation.

Finally the Joint Annual Meeting with the ESM/ESC in October, 2009 was a huge success. I have had a number of e-mails from out of province attendees who expressed their thanks to the local organizing committee for an excellent, well run meeting that exceeded their expectations. My thanks go to the many ESM members that helped organize and run the meeting. On behalf of all ESM members, I express special thanks to Neil Holliday, the scientific chair, and Brent Elliott, the local arrangements (and in charge of everything!) chair for the exceptional work they did in making the meeting a memorable occasion for all who attended.

R. Westwood, November 4, 2009

# Appendix C

## Entomological Society of Manitoba Report of the Treasurer

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**NICHOLSON RAWLUK<sup>LLP</sup>**  
CERTIFIED GENERAL ACCOUNTANTS

100 - 1780 WELLINGTON AVENUE, WINNIPEG, MB R3H 1B3  
PHONE (204) 772-6338 FAX (204) 774-5436

### REVIEW ENGAGEMENT REPORT

To the Members of:

**Entomological Society of Manitoba Inc.**

We have reviewed the balance sheet of Entomological Society of Manitoba Inc. as at August 31, 2009 and the statements of revenues and expenditures, and net assets for the year then ended. Our review was made in accordance with Canadian generally accepted standards for review engagements and, accordingly, consisted primarily of enquiry, analytical procedures, and discussion related to information supplied to us by the Society.

A review does not constitute an audit and, consequently, we do not express an audit opinion on these financial statements.

These financial statements have been prepared using the cash basis of accounting as further described in Note 2. The effects of this departure from Canadian generally accepted accounting principles on the unaudited financial statements has not been determined.

Our review indicates that, because these financial statements are prepared using the cash basis of accounting as described in the preceding paragraph, these financial statements are not in accordance with Canadian generally accepted accounting principles.

Winnipeg, Manitoba  
October 09, 2009

  
**Nicholson Rawluk LLP**  
Certified General Accountants

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.**  
**BALANCE SHEET**  
**(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)**  
**AUGUST 31, 2009**

| <b>ASSETS</b>      |                               | <u>2009</u>             | <u>2008</u>             |
|--------------------|-------------------------------|-------------------------|-------------------------|
| <b>CURRENT</b>     |                               |                         |                         |
|                    | Cash                          | \$ 1,461                | \$ 2,653                |
|                    | Canadian T-Bill fund (Note 3) | 14,648                  | 8,523                   |
|                    | Term deposits (Note 4)        | —                       | 14,000                  |
|                    |                               | <u>16,109</u>           | <u>25,176</u>           |
| <b>LONG TERM</b>   |                               |                         |                         |
|                    | Term deposits (Note 4)        | <u>32,000</u>           | <u>24,000</u>           |
|                    |                               | <u><b>48,109</b></u>    | <u><b>49,176</b></u>    |
| <b>LIABILITIES</b> |                               |                         |                         |
| <b>CURRENT</b>     |                               | nil                     | nil                     |
| <b>NET ASSETS</b>  |                               |                         |                         |
|                    | Internally restricted(Note 5) | 38,000                  | 38,000                  |
|                    | Unrestricted                  | <u>10,109</u>           | <u>11,176</u>           |
|                    |                               | <u>48,109</u>           | <u>49,176</u>           |
|                    |                               | <u><b>\$ 48,109</b></u> | <u><b>\$ 49,176</b></u> |

APPROVED BY THE BOARD:

\_\_\_\_\_ Director

\_\_\_\_\_ Director

The accompanying notes form an integral part of these financial statements

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.  
STATEMENT OF REVENUES AND EXPENDITURES  
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)  
FOR THE YEAR ENDED AUGUST 31, 2009

|                                             | <u>2009</u>       | <u>2008</u>   |
|---------------------------------------------|-------------------|---------------|
| <b>REVENUES</b>                             |                   |               |
| Annual meeting                              | \$ 760            | \$ 885        |
| Donations                                   | 1,800             | 1,600         |
| Interest income                             | 1,421             | 1,372         |
| Members fees                                | 1,410             | 1,453         |
| Miscellaneous                               | 99                | 5,984         |
| Proceedings                                 | 153               | 197           |
| Youth encouragement and public education    | 280               | 641           |
|                                             | <u>5,923</u>      | <u>12,132</u> |
| <br>                                        |                   |               |
| <b>EXPENDITURES</b>                         |                   |               |
| Awards and scholarships                     | 1,500             | 1,500         |
| General                                     | 760               | 2,541         |
| Meetings                                    | 3,370             | 6,134         |
| Newsletter                                  | 234               | 416           |
| Proceedings                                 | 1,022             | 886           |
| Youth encouragement and public education    | 104               | 31            |
|                                             | <u>6,990</u>      | <u>11,508</u> |
| <br>                                        |                   |               |
| <b>EXCESS OF REVENUES OVER EXPENDITURES</b> | <u>\$ (1,067)</u> | <u>\$ 624</u> |

The accompanying notes form an integral part of these financial statements

**ENTOMOLOGICAL SOCIETY OF MANITOBA INC.  
STATEMENT OF CHANGES IN NET ASSETS  
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)  
FOR THE YEAR ENDED AUGUST 31, 2009**

|                                       | <u>Internally<br/>restricted</u> | <u>Unrestricted</u>  | <u>2009 Total</u>    | <u>2008 Total</u>    |
|---------------------------------------|----------------------------------|----------------------|----------------------|----------------------|
| <b>Balance, beginning of the year</b> | 38,000                           | 11,176               | 49,176               | 48,552               |
| Excess of revenues over expenses      | --                               | (1,067)              | (1,067)              | 624                  |
| <b>Balance, end of the year</b>       | <u><b>38,000</b></u>             | <u><b>10,109</b></u> | <u><b>48,109</b></u> | <u><b>49,176</b></u> |

The accompanying notes form an integral part of these financial statements

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.  
NOTES TO THE FINANCIAL STATEMENTS  
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)  
AUGUST 31, 2009

NOTE 1 PURPOSE OF THE ORGANIZATION

The Entomological Society of Manitoba Inc. ("The Society") was formed to foster the advancement, exchange, and dissemination of entomological knowledge. The Society was incorporated on July 21st, 1976 under the laws of the Province of Manitoba as a non-profit organization and a registered charity under the Income Tax Act.

NOTE 2 SIGNIFICANT ACCOUNTING POLICIES

Income and expenses are recorded on the cash basis of accounting. There are no accruals of receivables or payables at the year-end. Inventory is expensed when it is purchased. Interest from investment certificates is paid out annually and interest is not accrued. Capital assets are expensed when acquired and, therefore, there is no annual amortization allowances.

NOTE 3 CANADIAN T-BILL FUND

The Canadian T-Bill fund was opened February 28th, 1997 with a principal balance of \$4,000. Additional purchases and redemptions have been made during the years. The Canadian T-Bill fund is shown at market value at year-end.

NOTE 4 TERM DEPOSITS

| <u>Certificate Number</u>            | <u>Interest Rate (%)</u> | <u>Maturity Date</u> | <u>Par Value (\$)</u> |
|--------------------------------------|--------------------------|----------------------|-----------------------|
| 900055611-0009                       | 3.200                    | Nov 16, 2010         | \$ 8,000              |
| 900055611-0010                       | 4.000                    | Nov 16, 2011         | 8,000                 |
| 900055611-0011                       | 3.850                    | Nov 9, 2012          | 8,000                 |
| 900055611-0012                       | 3.500                    | Dec 12, 2012         | 8,000                 |
| <b>Total long term term deposits</b> |                          |                      | <b>\$ 32,000</b>      |

NOTE 5 INTERNALLY RESTRICTED NET ASSETS

The Society's board of directors has internally restricted \$38,000 (August 31, 2008 - \$38,000) to be held for endowment purposes. These internally restricted amounts are not available for unrestricted purposes without approval of the board of directors.

NOTE 6 STATEMENT OF CASH FLOWS

A statement of cash flows is not included with these financial statements as the Society uses the cash basis of accounting and it would not provide any useful information that cannot be attained by the balance sheet and the statement of revenues, expenditures, and surplus.

ENTOMOLOGICAL SOCIETY OF MANITOBA INC.  
NOTES TO THE FINANCIAL STATEMENTS  
(UNAUDITED - SEE REVIEW ENGAGEMENT REPORT)  
AUGUST 31, 2009

**NOTE 7      FINANCIAL INSTRUMENTS**

The Society's financial instruments consist of cash, Canadian T-Bill fund, and term deposits. Unless otherwise noted, it is our opinion that the Society is not exposed to significant interest rate, currency, or credit risk arising from these financial instruments. The fair value of the instruments approximates their carrying values.

## **Appendix D**

### **Entomological Society of Manitoba Report of the ESC Regional Director**

I have just completed my first year as Regional Director for the Entomological Society of Manitoba on the Governing Board of the Entomological Society of Canada. During the year, I served on the Membership Committee of the ESC and reported on important events and activities undertaken by the Entomological Society of Manitoba to the Annual Board Meeting of the Entomological Society of Canada at the Joint Annual Meeting at the Hotel Fort Garry in Winnipeg on 20 October, 2009.

Paul Fields presided over the governing board meeting on 17 October, as President. Maya Evenden from the Department of Biological Sciences, University of Alberta served as 1st Vice-President and Peter Mason, AAFC Ottawa and Adjunct Professor in the Department of Entomology at the University of Manitoba, as 2nd Vice-President. These officers advanced in their Board positions at the Business Meeting on 20 October, and Michel Cusson was introduced as the new 2nd Vice-President. The next ESC Annual Meeting is a joint meeting with the Entomological Society of British Columbia at the Coast Plaza Hotel in Vancouver, 31 October to 3 November, 2010. Notices with specific information related to the meeting will be published in the March and June issues of the ESC Bulletin. The following annual meeting will be held in Halifax in 2011 in conjunction with the Acadian Entomological Society.

Congratulations to Neil Holliday who was awarded the Gold Medal from the Entomological Society of Canada for outstanding contributions to entomology. His Gold Medal Address during the opening ceremonies of the Joint Annual Meeting on 18 October was entertaining and thought provoking.

Membership in the Entomological Society of Canada continues to be an important issue. There were only 478 members in 2009, down from 497 in 2008. The most frequently asked question regarding ESC membership is, "What's in it for me?" I guess this is a valid question. After all, ESC publications are commonly available to most entomologists, even in electronic format, and to become a member may imply becoming involved, when that isn't everyone's cup of tea. However, ESC represents all entomologists in Canada, professional and amateur, at many levels. As numbers of entomologists decline, it is even more important that we support activities of the ESC, because a strong national society benefits us all. If you are not already a member of ESC, please think about what the national society means to you and consider becoming a member.

Publications of the ESC have taken a giant turn in availability. All issues of *The Canadian Entomologist* and all *Memoirs* have been produced in electronic format, available as a packet for purchase. Relatively few purchases have been made by libraries in Canada, and Board members were asked to approach the appropriate person in their local university libraries to consider purchasing the on-line versions. There has been a shortage of submissions for manuscripts for *The Canadian Entomologist*. Admittedly, the rejection rate for TCE is relatively high at 60%, but high quality manuscripts in



a very broad range of entomological topics are accepted. Members should not forget about TCE as a respectable place to publish their results. If the journal begins to miss its publication target, impact factor can be affected.

Since 1977, the Biological Survey of Canada has been an important focus for monographic analysis on the Canadian terrestrial arthropod fauna and as a means of linking researchers interested in faunal relationships in Canada. In 2009, the BSC became a federally incorporated, not-for-profit organization, the Biological Survey Foundation, managed by a Board of Directors, following termination of support by the Canadian Museum of Nature in Ottawa. The current officers of the Board consist of President Joe Shorthouse (Laurentian University), Vice-President Donna Giberson (University of Prince Edward Island), Secretary Susan Goods (Canadian Museum of Nature) and Treasurer Patrice Bouchard (Agri-Food Canada, ECORC, Ottawa). Other Board members are Robert Anderson (Canadian Museum of Nature), Doug Currie (Royal Ontario Museum), Dave Langor (Natural Resources Canada), Felix Sperling (University of Alberta) and Terry Galloway (University of Manitoba). The first Annual General Meeting of the Foundation was held at the end of recent meetings, on 21 October at the Hotel Fort Garry in Winnipeg. The goals and objectives of the BSF are similar to those of the previous BSC, and there will be a continued close relationship with ESC. Of particular note is a major research project to revisit a number of the original 58 arctic and subarctic locations included in the original Northern Insect Survey which began in 1947. Volume 1 of the Arthropods of Canadian Grasslands is in the final production stages and should be available soon, with Volume 2 to follow. This initiative was delivered a blow when the federal government made the decision to discontinue the scientific monograph series of NRC Press. This decision has had far-reaching impact, forcing the Foundation to self-publish Arthropods of Canadian Grasslands, and to publish future installments of *The Insects and Arachnids of Canada* to be integrated into *The Canadian Journal of Arthropod Identification*. A Museum Blitz at the J.B. Wallis Museum was attended by an international contingent of 18 entomologists on the evening of 19 October. Plans for future excursions are under way.

It came to my attention that no request for financial support was submitted from the Entomological Society of Manitoba in 2009. Money is available upon request for the Youth Encouragement and Public Education Committee on an annual basis from ESC. Fortunately, this money can be carried over into subsequent years and is available when accompanied by a reasonable request.

I thank the ESM membership for giving me the opportunity to serve on the Executive of ESM and the Board of ESC and I look forward to continuing in this capacity for two more years.

Terry Galloway  
Regional Director  
7 November, 2009

## **Appendix E**

### **Entomological Society of Manitoba Report of the Proceedings Editor**

Volume 64 (2008) of the Proceedings of the Entomological Society of Manitoba was distributed to members who attended the annual business meeting of the Entomological Society of Manitoba on 7 November, 2009. I thank Pat MacKay for helping with editorial stewardship for the one paper submitted for Volume 64. The Proceedings was printed by Warren Schuetz and his staff in the University of Winnipeg printshop. Volume 64 consists of 42 pages, with one submitted manuscript, the abstracts from the Annual Meeting held at the Freshwater Institute and Animal Science/Entomology Building on 13-14 November, 2008 and the Minutes of the 64th Annual Business Meeting of the Entomological Society of Manitoba held on 14 November in Room 219, Animal Science/Entomology Building. Cost of production will be presented to the ESM Executive at its next meeting.

I thank David Ostermann who provided electronic copies of the components of the Proceedings. This makes my job much easier. Rob Currie has been very prompt in getting the Proceedings Vol. 63 up on the ESM website. I submitted the PDF for Vol. 64 to Rob just yesterday.

There was a dearth of submitted papers for Vol. 64. I encourage those of you who have manuscripts that are specifically of relevance to entomology in Manitoba to consider submitting them to the Proceedings. I also encourage amateur entomologists who have new information on distribution, occurrence or taxonomy of insects in Manitoba, to consider publishing their results in the Proceedings. All manuscripts are peer-reviewed; all published papers are available as PDF's on the web and are fully accessible using on-line search engines; for several years, we have been able to publish submitted papers without page charges to the authors. Manuscripts published in the Proceedings are now accessible to more people than ever before. Things already look good for Vol. 65. I have one manuscript submitted in October, the promise of one more, and with the abstract from the Joint Annual Meeting held in 2009, the Proceedings should be substantial next year.

*Proceedings* Editor,  
Terry Galloway  
7 November, 2009

## **Appendix F**

### **Entomological Society of Manitoba Report of the Endowment Fund Board for 2008-2009**

The Endowment Fund Board met on 3 November, 2009 to review activity during the 2008-2009 fiscal year. A summary of investments and projected interest income for the fiscal year is attached (Table 1). Interest generated by the Endowment Fund provides a basis for funding the publication of the Proceedings and other Society activities. The Endowment Fund principal was \$39,000 as of 31 August, 2009 and will reach \$40,000 in November, 2009.

The principal amount of \$8,000 was reinvested on 12 December, 2008 (Table 1). This was reinvested in a four-year GIC, rather than a five-year, because the bank offered the ESM an additional half-percent interest on a four-year investment. This GIC will have to be reinvested for one year in 2012 in order to reestablish the cycle of one GIC maturing each year, as intended by the Endowment Fund Board.

GIC no. 960006276-0009, with a principal amount of \$7,000, matured on 10 February, 2009. On approval of the membership at the AGM, 14 November 2008, the \$7,000 was held in the Treasury Bill account, and reinvestment in another GIC was delayed until November, 2009. This brings all GIC activity around the same time annually and simplifies accounting. The Endowment Fund Board received approval from the ESM Executive, 17 September, 2009, to reinvest the principal with an addition amount of \$1,000 from the Treasury Bill account, to bring the total principal to \$8,000. This will bring the total investments in five GIC's up to the currently approved cap of \$40,000.

The cap of \$40,000 was approved at the Annual Business Meeting in 1998. Given the decreased income generated by lower interest rates, the Board is proposing that the cap be increased again, so that the Society will have the option of increasing the principal amount of the Endowment Fund if the financial situation allows. Therefore, we are seeking approval from the membership to increase the cap for the Endowment Fund to \$45,000.

Marjorie Smith, Chair  
Ian Wise  
Pat MacKay

**Table 1:** Account information as of August 31, 2009. Interest generated during the 2009-2010 fiscal year.

| <b>Certificate No.</b> | <b>Principal</b>   | <b>Interest Rate (%)</b>                      | <b>Maturity Date</b> | <b>Annual Interest</b> |
|------------------------|--------------------|-----------------------------------------------|----------------------|------------------------|
| 960006276-0009         | 7,000.00           | Held in Treasury Bill Account until Nov. 2009 |                      |                        |
| 900055611-0010         | \$8,000.00         | 3.20                                          | Nov.16, 2010         | \$256.00               |
| 900055611-0009         | \$8,000.00         | 4.00                                          | Nov 16, 2011         | \$320.00               |
| 900055611-0011         | \$8,000.00         | 3.85                                          | Nov 9, 2012          | \$308.00               |
| 960006276-0012         | \$8,000.00         | 3.50                                          | Dec 12, 2012         | \$280.00               |
| <b>Total</b>           | <b>\$39,000.00</b> |                                               |                      | <b>\$1,164.00</b>      |

## Appendix G

### Entomological Society of Manitoba Report of the Finance Committee for 2008-2009

The Finance Committee met on 3 November, 2009, to review the 2008-2009 financial statement and the budgets for the current and next fiscal years. The Society continues to be in good financial shape, as reflected in our available cash at the end of the fiscal year (31 August, 2009) of \$9,648 in the Treasury Bill and chequing accounts. Although there was a loss of \$1,067, most of this was due to the ESM providing the second installment (\$1,000) of the deposit for meeting rooms at the Fort Garry Hotel. The total deposit of \$2,000 will be returned to the ESM during the current fiscal year. The ESC-ESM 2009 Joint Annual Meeting is expected to turn a profit, so this will increase the income for 2009-10. The financial records of the Joint Meeting will be audited in the following fiscal year, resulting in greater than usual general expenses in 2010-11.

Marjorie Smith, Chair  
Ian Wise  
Pat MacKay

Income and expenses for fiscal year ending 31 August.

| <b>BUDGET ITEMS</b>                         | <b>2008-09</b> | <b>2009-10</b>              | <b>2010-11</b>   |
|---------------------------------------------|----------------|-----------------------------|------------------|
| <b>REVISED 3 November 2009</b>              | <b>Actual</b>  | <b>Actual and Projected</b> | <b>Projected</b> |
| <b>ASSETS</b>                               |                |                             |                  |
| T-Bill Account/Chequing                     | 9,648          | ---                         | ---              |
| Endowment Fund                              | 39,000         | 40,000                      | 40,000           |
| <b>REVENUE</b>                              |                |                             |                  |
| Membership Dues                             | 1,410          | 1,400                       | 1,400            |
| Proceedings                                 | 153            | 200                         | 200              |
| Social Committee                            | 0              | 0                           | 0                |
| Youth/Education Committee                   | 0              | 200                         | 200              |
| Donations: from YEC activities              | 80             | 100                         | 100              |
| fundraising for AGM                         | 1,800          | 0                           | 1,400            |
| student awards                              | 200            | 200                         | 200              |
| Fundraising Committee                       | 0              | 0                           | 0                |
| Meetings: ESM/AGM                           | 760            | ---                         | 800              |
| ESC-ESM 2009 JAM: return of hotel deposit   | ---            | 2,000                       | ---              |
| ESC-ESM 2009 JAM: projected surplus         | ---            | TBA                         | ---              |
| Interest: G.I.C. income                     | 1,299          | 1,140                       | 1,300            |
| T-Bill Account/Chequing                     | 122            | 35                          | 20               |
| Miscellaneous – GST rebate                  | 99             | 100                         | 1,100            |
| <b>TOTALS</b>                               | <b>5,923</b>   | <b>5,375</b>                | <b>6,720</b>     |
| <b>EXPENSES</b>                             |                |                             |                  |
| General Society Expenses                    | 760            | 800                         | 1,500            |
| Proceedings                                 | 1,022          | 1,000                       | 1,000            |
| Newsletter                                  | 234            | 600                         | 600              |
| Social Committee                            | 0              | 100                         | 100              |
| Youth/Education Committee                   | 104            | 200                         | 200              |
| Fundraising Committee                       | 0              | 0                           | 0                |
| Student Awards and Scholarships             | 1,500          | 2,100                       | 1,500            |
| Meetings: ESM/AGM                           | 2,370          | ---                         | 2,400            |
| ESC-ESM 2009 JAM: part of hotel deposit     | 1,000          | ---                         | ---              |
| Donations                                   | 0              | 0                           | 0                |
| Representation at ESC                       | 0              | 0                           | 400              |
| <b>TOTALS</b>                               | <b>6,991</b>   | <b>4,800</b>                | <b>7,700</b>     |
| <b>Net gain (loss), year ending Aug. 31</b> | <b>(1,067)</b> | <b>575</b>                  | <b>(980)</b>     |

## **Appendix H**

### **Entomological Society of Manitoba Report of the Newsletter Committee**

At the time of last year's ESM Business Meeting, the fall issue, Volume 35.2, was in the final stages of production and was then distributed with the Proceedings of the ESM on November 19, 2008, at a total cost of only \$75.22 since the mailing costs were covered under the Proceedings' budget. The winter issue, 35.3, planned for late December, 2008 or early January, 2009, was mailed February 13, 2009 at a total cost of \$161.92. Volume 36.1, planned for distribution in April or May, was not mailed until August 13, 2009, at a total cost of \$160.70. Issues 35.2, 35.3, and 36.1, respectively, contained 11, 14 and 15 pages of text, photographs and notices. Envelopes were purchased at a cost of \$33.59 out of a \$50 supplies budget. One extra mailing of a single page notice was necessary, at a cost of \$38.14, because of the late publication of Volume 36.1, and the needs of the ESC-ESM JAM Committee to have a date-specific notice planned for that issue distributed to the membership. The costs of printing and postage of an issue now routinely exceed the budgeted limit of \$150, and a small increase in that limit now seems necessary if the Newsletter is continue to be produced in the current manner. We recommend that the budget for the Newsletter be increased from \$500/year to \$600/year.

Patricia MacKay  
Mahmood Iranpour  
Co-editors, ESM Newsletter, November 2009

## **Appendix I**

### **Entomological Society of Manitoba Report of the Social Committee**

The social committee was largely inactive over the past year. We attempted to arrange for some speakers for lunch hour talks but were unable to find suitable dates or convince those solicited to participate. The impact of the Joint Meeting should not be underestimated either.

The members of the social committee feel strongly that new blood is required to reinvigorate the social committee and respectfully resign from our posts at this time. We may be willing to rejoin the committee at some point in the future, but for now we feel a change would benefit the Society. We would happily confer with the replacement(s) to aid them in understanding past efforts and desired directions of the membership based on past surveys and experience.

Sincerely,  
Brent Elliott and Sheila Wolfe

**TABLE 1: Summary of Youth Encouragement Activities by Month:  
November 2008 – October 2009**

| Month           | # Department<br>Tours/Presentations | # of Outgoing<br>Presentations | # of Children<br>Reached                  |
|-----------------|-------------------------------------|--------------------------------|-------------------------------------------|
| November, 2008  | 1                                   | -                              | 4                                         |
| December, 2008  | 2                                   | -                              | 39                                        |
| January, 2009   | 1                                   | -                              | 10                                        |
| February, 2009  | 1                                   | -                              | 15                                        |
| March, 2009     | 2                                   | 2                              | 126                                       |
| April, 2009     | 2                                   | -                              | 44                                        |
| May, 2009       | 1                                   | 3                              | 220                                       |
| June, 2009      | 12                                  | 8                              | Over 720 (exact<br>data not<br>available) |
| July, 2009      |                                     |                                |                                           |
| August, 2009    |                                     |                                |                                           |
| September, 2009 | -                                   | 1 (AITC)                       | 1,000                                     |
| October, 2009   | -                                   | -                              | -                                         |
| <b>TOTALS</b>   | <b>22</b>                           | <b>14</b>                      | <b>Over 2,178</b>                         |

Note: Activities coordinated independently by Drs. Pat Mackay, Bob Lamb, Terry Galloway and Rob Currie are included in the table.

## Appendix J

### Youth Encouragement Committee Report

This year, Youth Encouragement continued to give children the opportunity to appreciate the diversity of insects in Manitoba and around the world. The typical Youth Encouragement experience involves an introductory insect slideshow, followed by a show of pinned insects and live insects. The most popular and easily cultured live insects continue to be the Vietnamese Stick Insects and the Madagascar Hissing Cockroaches. A larger number of requests from teachers this spring led to the development of a more detailed Powerpoint Presentation and Life-Cycle Game for students Grades 4 and up.

A strong core of volunteers delivered presentations to about 1,180 children this year. Presentations took place at the Department of Entomology, at schools, and at daycares. The number of children reached has doubled compared to last year! The success of Youth Encouragement can be attributed to many volunteers, but especially to Alicia Leroux, who took on the task of coordinating and delivering around 19 presentations during the summer months as a part of her summer employment at the Department.

Youth Encouragement volunteers again took part in a number of special events, apart from regular presentations. Katrina Froese displayed and discussed insects at Fort Whyte Alive, and at the annual HerbFest at the Assiniboine Park Conservatory. Marj Smith was again at the helm of the Amazing Agriculture (AITC) apiculture station in September. She and Department of Entomology volunteers performed ten minute presentations over three days to successive groups of elementary school students, in

the end exposing over 1000 children to the concepts of bees and beekeeping.

These important contributing volunteers took the time to do presentations, fed the culture room bugs, or helped to coordinate programs: Alicia Leroux, Taryn Dickson, Leanne Peixoto, Kristin Hynes, Marj Smith, Lars Andreassen, Christie Borkowsky, Suresh Desai, Wolly Waijaratne, Rasoul Bahreini, Jonathan Veilleux, Dr. Neil Holliday, Dr. Pat MacKay, Dr. Bob Lamb, Dr. Rob Currie, and Dr. Terry Galloway

A final note: A transfer of the Youth Encouragement portfolio is now taking place. Jonathan Veilleux, a M.Sc. student of Dr. Neil Holliday, will be taking over as Chair of YE this fall (2009).

## **Appendix K**

### **Entomological Society of Manitoba Report of the Archivist**

Archives of the Entomological Society of Manitoba are held in the laboratory of Dr. R.E. Roughley in Room 213 Animal Science Building. Presently they are contained in one filing cabinet within that lab.

As always, any item which members of the ESM feel is of historical, archival importance can be submitted to Dr. R.E. Roughley for inclusion in the archives.

Rob Roughley, Chair

## **Appendix L**

### **Entomological Society of Manitoba Report of the Student Awards and ESM Scholarship Committee**

#### **Student Achievement Award:**

Awarded to a student who is in a Bachelor's degree program or recently completed a program. This award recognizes students who have shown exceptional interest in entomology as evidenced by their insect collections, insect photography, published articles of entomological interest, insect experiments and/or outstanding contributions during summer employment.



**This year there are two winners:**

Ms. Marina Beaudry. Marina is in the faculty of Science at the University of Manitoba and majoring in Zoology. Marina has taken a number of entomology courses from the Department of Entomology at the University of Manitoba and has excelled in her studies. Marina has worked during the summer with faculty in the Entomology department and has developed a keen interest in Entomology along with her academic proficiency.

Ms. Sarah Semmler. Sarah is a fourth year Biology Honours major at the University of Winnipeg. Sarah has taken entomology courses at the University of Winnipeg where she has excelled academically. Sarah is currently doing an undergraduate thesis examining the impact of grazing and burning in tall grass prairie on the nectar sources for the threatened Poweshiek skipper. Sarah has also worked as a summer student on the new CANPOLIN initiative examining pollinators in tall grass prairie habitats.

**Orkin/Swat Student Award:**

This award is designed to foster and encourage student interest in general Entomology including natural methods of insect pest control and the proper use of insecticides. Candidates must have a demonstrated interest in entomology, superior scholastic ability, high research potential, originality and industriousness in their university courses and/or summer work.

This year's winner is Alicia Leroux. Alicia has completed a degree in Zoology at the University of Manitoba and is now enrolled in the Agroecology program in the Faculty of Agriculture at the University of Manitoba. Alicia is taking a minor in entomology and is working on a biological control research project as part of her degree requirements. Alicia has worked in a number of entomological-related summer jobs including the stored product unit at Agriculture and Agri-Food Canada, sampling for ectoparasites on birds and maintaining insect colonies at the entomology department at the University of Manitoba.

**The ESM Graduate Scholarship:**

This scholarship is awarded to a student in the M.Sc. or Ph.D. program in entomology at the University of Manitoba. Students must be enrolled in their graduate program for at least 12 months prior to Oct 1 of the award year. This award recognizes superior scholastic ability, high research potential as evidenced by industriousness, good judgment, originality, a conscientious attitude and organizational ability, and excellent communication skills.

This year's winner is Ms. Tharshinidevy Nagalingham. Tharshinidevy is enrolled as a Ph.D. candidate in the Dept. of Entomology at the University of Manitoba. Tharshinidevy received her B.Sc. in 2001 from the University of Jaffna in Sri Lanka and received her MSc in 2008 from the University of Peradeniya in Sri Lanka. Tharshinidevy has numerous scholarships and academic awards from universities in Sri Lanka and the University of Manitoba. Her PhD research examines the economic impact of tarnished plant bug, *Lygus lineolaris*, on dry bean quality and production.

Desirée Vanderwel, Joel Gosselin, Rhéal Lafrenière, Taz Stuart,  
Richard Westwood, Chair, November 1, 2009

## **Appendix M**

### **Entomological Society of Manitoba 2009 Fundraising Committee Report**

The Fundraising Committee raised a total of \$1,850.00 from 14 donors to cover some of the costs of the AGM, such as bringing in the speakers from out of town.

The amount raised represents an increase of \$250 from the previous year.

The Fundraising Committee acknowledges the continued support of our sponsors in making the AGM successful in providing quality speakers for this very educational event.

Joel Gosselin,  
Chair, Fundraising Committee.

## **Appendix N**

### **Final Report for the 65th Annual Meeting of the Entomological Society of Manitoba**

The scientific program report is slightly different this year as the joint meeting of the ESC and ESM took place in Winnipeg this year. As such there was no Entomological Society of Manitoba meeting separate from the joint meeting.

As I was the local chair for the meeting, the duty for the report of the scientific program falls to me while duly noting that Neil Holliday and his scientific program committee carried out the bulk of the work pertaining to the scientific program for the joint meeting. They should be commended for both the superb effort put into arranging the program and the excellence of the content.

The plenary session, *Climate Change: From Geology to Ecology*, was an excellent session with three speakers: James Teller, Camille Parmesan and Shelley Hunt. The session was extremely well received by a large audience of approximately 200 people. In addition to the plenary session there were four President's Prize student oral paper sessions and a single poster session in the same grouping. There were nine additional symposia, three contributed paper sessions and submitted posters outside of the President's prize competition (total of approximately 45 posters). Don Dixon gave an excellent presentation on the History of Beekeeping in Western Canada as the Heritage Lecture.

Total attendance at the meeting was approximately 230 individuals, primarily full registrants with a smattering of single day and single session attendees. The final financial tally is still underway but it is expected that the meeting will turn a profit.

It should be noted that all of the volunteers did an excellent job. It should also be noted that any of a number of volunteers are likely to be retired by the time the ESC meeting comes around to Manitoba to host again. Unless the Department of Entomology (and/or AAFC for that matter) is reinvigorated, either through a National Entomological Centre of Excellence or some other means, it is unlikely that the ESM will have sufficient bodies to run the national meeting in 2017 (2016?) when it is due to return. Many of the volunteers carried out several duties and were often un-credited for efforts made.

Brent Elliott  
General Chair  
ESC/ESM Joint Annual Meeting  
Winnipeg, MB 2009

## **Appendix O**

### **Entomological Society of Manitoba Report of the ESM Membership Committee**

There are currently 98 members in the ESM, compared to 97 in November of last year. I would like to thank Ian Wise (Treasurer) for his careful record keeping of the membership.

Désirée Vanderwel, Chair.

## **Appendix P**

### **Entomological Society of Manitoba Web Site Report**

The Entomological Society of Manitoba operates a website that is hosted through the University of Manitoba through the courtesy of Paul Fields who allows us to use the public access portion of his account. The website contains information about the Society and its committees, dates of meetings, programs for meetings, and provides links to other sources of entomological resources on the web.

Copies of the newsletter and proceedings are typically posted shortly after they are released through the traditional mail routes once they are supplied to the webmaster. Electronic copies of the Proceedings up to 2007 are posted and papers that are published in the proceedings are also available on the site in the form of PDF-reprints. These papers are picked up by many search engines and thus provide a wide exposure for the published research. Some difficulty has been experienced by users in trying to access PDF's; however, Computer Services does not seem to have a resolution for this problem. Downloading the files onto a local computer can be more effective than

accessing them “on line”. Richard Westwood kindly scanned some of the older papers in the Proceedings so the collection now dates back to 1989.

Information (links, etc.) was updated on the site when requested by the executive and/or by people visiting the site. Links to the ESM website were established for the Joint Annual Meeting with the Entomological Society of Canada. The web page(s) for the ESC portion were designed and coordinated by Taz Stuart. Any suggestions for additions or changes to the website should be forwarded to Rob Currie, Department of Entomology, University of Manitoba.

Rob W. Currie, ESM Webmaster

## **Appendix Q**

### **Entomological Society of Manitoba Election Report 2009**

Total ballots returned – 40

Total ballots spoiled – 0

Results:

President-elect: Taz Stewart

Member-at-large: Jonathan Veilleux



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