

Société d'entomologie du Québec

Société d'entomologie du Canada
Entomological Society of Canada

18-22 novembre 2006

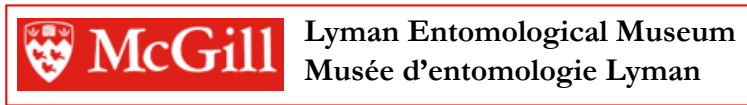
Holiday Inn Midtown
Montréal, Québec



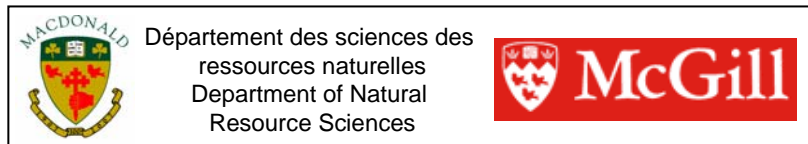
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FÉDÉRATION DES APICULTEURS DU QUÉBEC

**Société d'entomologie du Québec – Société d'entomologie du Canada
Réunion conjointe - 18-22 novembre 2006**

**Société d'Entomologie du Québec – Entomological Society of Canada
Joint Annual Meeting - 18-22 November 2006**

Bienvenue – Welcome

Au nom de la Société d'entomologie du Canada, je vous souhaite la bienvenue à la réunion annuelle conjointe avec la Société d'entomologie du Québec. Les organisateurs ont travaillé d'arrache pied pour faire en sorte que les participants puissent jouir d'une grande variété de présentations scientifiques et de discussions en plus de nous fournir des occasions de socialiser et de visiter plusieurs endroits à Montréal. Je vous souhaite une très bonne réunion.

On behalf of the Entomological Society of Canada, welcome to our joint annual meeting with the Entomological Society of Quebec. The conference organizers have worked hard to ensure that all conference participants can enjoy a variety of scientific presentations and discussions as well as have substantial opportunity to socialize and visit some of the many sites in Montreal. Have a great meeting.

Dan Quiring, Président, ESC-SEC

Comité Organisateur – Organizing Committee

Charles Vincent

Responsable principal et relations avec l'hôtel - General chair and hotel related matters

Jacques Brodeur

Levée de fonds - Fund raising

Chris Buddle

Correspondance scientifique, résumés et équipements audio-visuels - Scientific correspondence, abstracts, audio-visuals

Michel Cusson

Trésorerie, suivi des finances et administration - Treasurer, finance tracking and administration

Johanne Landry

Coordination du banquet - Banquet coordination

Pierre Lemoyne

Arrangements locaux, photographies et programme connexe - Local arrangements, photographs & side program

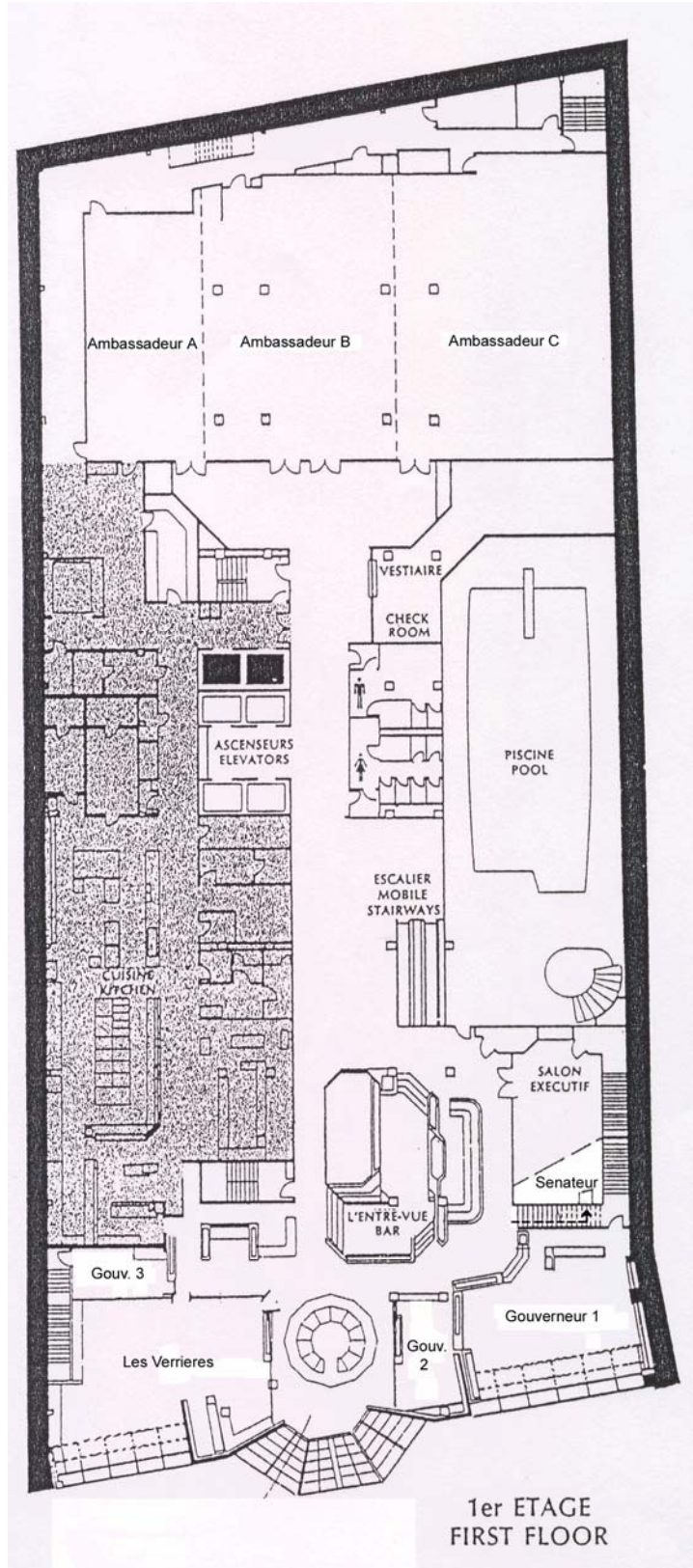
Thierry Poiré

Webmestre - Webmaster

Terry Wheeler

Programme scientifique et décorations - Scientific program and student awards

Holiday Inn Midtown, Montreal



Directives pour les présentateurs / Instructions to speakers

Présentations orales

Présentations régulière ou étudiantes: la durée maximale des présentations sera de 12 minutes et on allouera 3 minutes supplémentaires pour les questions. Les présentateurs doivent se conformer à ces directives car il y aura plusieurs présentations simultanées lors du Congrès. Présentations lors de symposia : l'horaire et la durée des présentations seront déterminés par le responsable du programme scientifique et les organisateurs de symposia.

A l'arrivée à l'Hôtel Holiday Inn, **les conférenciers sont priés de soumettre leur(s) présentation(s) sous forme électronique à la table d'inscription.** Nous accepterons les documents en PowerPoint sur système d'exploitation Microsoft-Windows. Les conférenciers doivent soumettre leur(s) présentation(s) sur CD ou clé USB : **prière de bien identifier vos noms sur vos CD et vos clés USB.** Le comité d'organisation chargera les présentations sur les ordinateurs portables aux sessions appropriées, de sorte que les présentateurs ne pourront utiliser leur ordinateur personnel. Les CD et clé USB seront remises aux présentateurs lorsque les présentations auront été installées sur les ordinateurs du congrès. Les présentateurs sont responsables de s'assurer que leur présentation est fonctionnelle sur Microsoft PowerPoint (2003 et +) pour Windows et que leur CD ou clé USB est compatible avec des ordinateurs portables de type PC. Pour tout arrangement particulier, prière de contacter Chris Buddle.

Oral presentations

Regular oral presentations and student competition: presentations are to be 12 minutes long and there will be three additional minutes allocated for questions. Presenters must adhere to these guidelines as there will be concurrent sessions at the meeting. Symposium presentations: scheduling and length of presentations will be arranged through consultation with the Program Chair and symposium organizers.

Upon arriving at the Holiday-Inn for the conference, **speakers are asked to submit their presentations at the registration desk.** We will be accepting Powerpoint presentations, for use on Windows-based Personal Computers; speakers are encouraged to submit either a CD-ROM or USB memory stick; **speaker's name should be labeled clearly on the CD or memory stick.** The organizing committee will be loading presentations onto laptops for each of the sessions, so you will not be able to use your own computer. The CD-ROM and/or memory sticks will be returned after presentations are loaded onto conference computers. It is the speaker's responsibility to ensure the format of the presentation will work with Microsoft Powerpoint (2003 version) for PCs, and that the CD-ROM or memory stick is readable on PC laptops. If you require special arrangements, please contact Chris Buddle.

Affiches

Les posters peuvent être fixés aux panneaux par des bandes de Velcro (fournies sur place) ou par des punaises. L'endroit d'affichage sera divulgué sur place.

Pose des affiches – dimanche 09h00-15h00 – Les Verrières
Enlèvement des affiches – mardi 16h30-18h00

Posters

Posters will be attached to poster boards by either Velcro tape (provided on-site) or by pins. Location for each poster will be designated upon arrival at the meeting site

Poster set-up - Sunday 09h00-15h00 – Les Verrières
Poster take-down – Tuesday 16h30-18h00

Bonne nouvelle...accès gratuit aux Muséums Nature Montréal sur présentation de votre carte de congressiste du colloque SEC-SEQ.

Good news ... registered participants of the JAM (ESC-SEQ) 2006 will have free access to Muséums Nature Montréal upon showing their Conference badges.

Jardin botanique de Montréal situé au 4101, rue Sherbrooke Est, station de métro Pie IX

Heures d'ouverture : 9 h à 17 h (**fermé le lundi**)

Site internet : www.ville.montreal.qc.ca/jardin

The **Montreal Botanical Garden** is located at 4101 Sherbrooke St. East, Pie IX Metro station

Opening hours : 9- 17 h (**closed on Monday**)

Web site : www.ville.montreal.qc.ca/jardin

Les 10 serres d'exposition à visiter :

- Grande serre d'exposition
- Hacienda
- Jardin céleste
- Serre d'accueil Molson
- Serre des bégonias et des gesnériacées
- Serre des plantes tropicales humides
- Serre des fougères
- Serre des orchidées et des aracées
- Serre des plantes tropicales économiques
- Serre des régions arides

There are 10 exhibits (greenhouses) to visit :

- Grand Hall
- Hacienda
- Celestial garden
- Molson greenhouse
- Begonias and Gesneriaceae
- Tropical plants (humid areas)
- Ferns
- Orchids and Araceae
- Tropical plants of economic importance
- Arid regions

Insectarium de Montréal situé au 4581, rue Sherbrooke Est, station de métro Pie IX

Heures d'ouverture : 9 h à 17 h (**fermé le lundi**)

Site internet : www.ville.montreal.qc.ca/insectarium

The **Montreal Insectarium** is located at 4581 Sherbrooke St. East, Pie IX Metro station

Opening hours : 9- 17 h (**closed on Monday**)

Web site : www.ville.montreal.qc.ca/insectarium

A visiter :

- Salle Diversité
- Cités grouillantes
- Infozone
- Couloir des arthropodes

Exhibits to visit:

- The Diversity Room
- Buzy Cities
- Infozone
- Arthropod corridor

Biodôme de Montréal situé au 4777, av. Pierre-de-Coubertin, station de métro Viau.

Heures d'ouverture : 9 h à 17 h (**fermé le lundi**)

Site internet : www.ville.montreal.qc.ca/biodome

The **Montreal Biodome** located at 4777 Pierre-de-Coubertin avenue, Viau Subway station.

Opening hours: 9-17 h (**closed on Monday**)

Web site : www.ville.montreal.qc.ca/biodome

Les écosystèmes à visiter :

- La forêt tropicale
- La forêt laurentienne
- Le Saint-Laurent marin
- Le monde polaire

Ecosystems to visit :

- The Tropical forest
- The Laurentian forest
- The St. Lawrence marine ecosystem
- Polar ecosystem

Bonne visite!

Biographie d'André Beaudoin – Gagnant du prix Criddle 2006

André Beaudoin est né à Montréal en 1962, où il a grandi en développant un intérêt marqué pour les insectes. Toutefois, ce n'est qu'en 2001 qu'il a transformé cet intérêt en un passe-temps sérieux, après avoir accepté un poste de chercheur scientifique au Service canadien des forêts (SCF) à Québec. Ses recherches en télédétection et géomatique, en plus de ses liens avec des entomologistes du SCF, ont dès lors alimenté sa passion pour en faire un loisir à la fois scientifique et de communication.

André est membre actif et représentant de l'Association des entomologistes amateurs du Québec (AEAQ) depuis 2003, association au sein de laquelle il œuvre auprès de son collaborateur, Yves Dubuc. André a grandement contribué à la dynamisation de la scène entomologique amateur dans la région de Québec et au-delà. En peu de temps, il a contribué avec énergie et enthousiasme au rayonnement de l'entomologie auprès du grand public et, en particulier, auprès des jeunes.

Au-delà de sa collection personnelle de Lépidoptères du Québec, qui intègre des spécimens très rares de migrants, tous capturés par lui-même, on compte parmi ses principales réalisations : l'organisation au sein de l'AEAQ de nombreuses conférences et d'excursions entomologiques pour le public et les élèves des écoles élémentaires, la réalisation, avec la collaboration d'entomologistes amateurs, d'inventaires documentés entre autres dans les réserves écologiques du *Ministère du développement durable, de l'environnement et des parcs*, et la promotion de l'utilisation d'outils géomatiques accessibles pour des fins entomologiques (GPS, *Google Earth*, images de télédétection). Finalement mentionnons aussi des ateliers et conférences de l'AEAQ qu'il donne régulièrement, diverses contributions écrites et une entrevue à une émission radiophonique populaire animée par Marie-France Bazzo à Radio-Canada.

Biography of André Beaudoin – 2006 Criddle Award Winner

André Beaudoin was born in Montréal in 1962, where he grew up and developed an early interest for the world of insects. However, it was only in 2001, after accepting a position as a research scientist at the Canadian Forest Service (CFS) in Quebec City, that his interest for insects developed into a serious hobby. At the CFS, André works in the area of remote sensing and geomatics, but he acknowledges that his interactions with CFS entomologists have helped feed his passion for entomology and turn it into both a scientific and communication hobby.

André has been an active member and regional representative of the Association des entomologistes amateurs du Québec (AEAQ) since 2003, along with Yves Dubuc. In that capacity, André has played a key role in the recent enhancement of the Association's activities in the Québec City region and beyond. During this short time span, André poured his energy and enthusiasm into the promotion of entomology within the general public, with special attention given to the younger adepts of this discipline.

Beside his personal collection of butterflies and moths, which includes some very rare migrant species collected by himself, André's main achievements include: the organization of numerous AEAQ talks and entomological excursions, the coordination and implementation, involving many amateur entomologists, of insect inventories, particularly in ecological reserves of Québec, under permits issued by the *Ministère du développement durable, de l'environnement et des parcs*, and the promotion of accessible geomatic tools for entomological purposes (*Google Earth*, GPS, free remote sensing images, etc.). His contributions also include AEAQ workshops and talks he gives regularly, various articles on insects and, finally, an interview on a French CBC radio show hosted by Marie-France Bazzo.

Horaire - Schedule

Samedi le 18 novembre - Saturday 18 November

07h30-17h00 Inscription – Registration – *Foyer Gouverneur*

09h00-17h00 Réunion du conseil d'administration de la SEC - ESC Governing Board meeting –
Gouverneur 1

**Symposium 1 - Ecological Impacts of Non-Native Insects and Fungi on Terrestrial Ecosystems
Sponsored by the Canadian Forest Service, Canadian Food Inspection Agency and The Biological
Survey of Canada (Terrestrial Arthropods) – *Salon Sénateur*
Organizers and Moderators – *David Langor and Jon Sweeney***

08h00 **Jon Sweeney**
Welcome/Introduction to the Symposium

08h05 **Daryl Seip**
Implementing an invasive alien species strategy for Canada

08h25 **David Langor, L. DeHaas**
Diversity of non-native arthropods in Canada

08h45 **Sandy Liebhold**
Ecological impact of invasive insects on forest ecosystems

09h10 **Judy Loo**
Ecological impact of invasive fungi on forest ecosystems

09h35 Pause – Break – *Foyer Gouverneur*

10h00 **Sandy Smith, N. Rudzik**
Impact of an introduced scolytid, *Tomicus piniperda*, on native scolytids and natural enemy
complexes

10h20 **Owen Olfert, B. Elliot**
Ecological impact of invasive insects on agricultural ecosystems - Wheat Midge Case Study.

10h40 **Lloyd Dosdall, G.A.P. Gibson, O.O. Olfert, P.G. Mason**
Ecological and economic impacts of the invasion of western Canada by the cabbage seedpod
weevil (Coleoptera: Curculionidae).

11h00 **Dylan Parry**
Does the Pandora's Box paradigm apply to parasitoids in classic biological control?

11h25 **Dave McCorquodale**
The legacy of lady beetles (Coleoptera: Coccinellidae): the unintended effects of (un)intentional
introductions.

11h50 Diner - Lunch

13h20 **John Spence**
Invasive species under your nose and in your backyard: the secret wars of ground beetles

13h45 **Jan Addison**

Impacts of invasive earthworms on Canadian forest ecosystems

- 14h10 **Jacques Régnière**, J. Logan, J. Pitt
Modeling the spread and ecological impact of invasive species.
- 14h35 **Dan Simberloff**
We can eliminate invasions or live with them! – High tech and low tech success stories.
- 15h00 Pause – Break – *Foyer Gouverneur*
- 15h30 Panel Discussion

Dimanche le 19 novembre - Sunday 19 November

- 07h45-09h00 Inscription – Registration – *Foyer Gouverneur*
- 07h45-17h00 Téléchargement des Présentations – Loading Presentations – *Gouverneur 2*
- 09h00-15h00 Pose des affiches – Poster set-up – *Les Verrières*
- 08h30 Mot de bienvenue, prix de la SEC - Welcome and ESC awards – *Ambassadeur B/C*
- 09h00 Médaille d'or - Gold Medal Address – *Ambassadeur B/C*
- 10h00 Pause – Break – *Les Verrières*

Symposium 2 - Graduate Student Symposium – Ambassadeur B/C *Organizers and Moderators – Chris Borkent and Greg Smith*

- 10h30 **Michael Kasumovic**, M. C. B. Andrade
Male development tracks rapidly shifting sexual versus natural selection pressures
- 11h00 **Yan Boulanger**, L. Sirois, C. Hébert
Insects and fire-killed trees: an "ignited" couple!
- 11h30 **Owen Lonsdale**, S. A. Marshall
Deciphering the Past: Reconstructing the Phylogeny of the Clusiidae (Diptera) Using Multiple (and Sometimes Conflicting) Data Sets
- 12h00 Diner – Lunch
- 13h30 **Anita Stjernberg**, R.E. Roughley
The Impact of Rotational Seasonal Grazing on the Invertebrates of Mixed-Grass Prairie, Using Ground Beetles (Carabidae) and Spiders (Araneae) as Bioindicators
- 14h00 **Robert Laird**
The diversity of indirect effects between soil fungi and insects
- 14h30 **Véronique Martel**, G. Boivin
Diversity in male parasitoids' reproductive strategies
- 15h00 Pause – Break – *Les Verrières*
- 15h30 – 17h00 Affiches - Posters (authors in attendance) – *Les Verrières*

- 18h30-19h30 Réception des étudiants - Student Mixer – *Ambassadeur A*
- 19h30-21h30 Réception générale - Opening Reception – *Ambassadeur B/C*

Lundi le 20 novembre - Monday 20 November

07h45-17h00 Téléchargement des Présentations – Loading Presentations – *Gouverneur 2*

Prix du président - President's Prize – Session 1 – *Ambassadeur C*

- 08h45 **Hume Douglas**
The diversification of the cardiophorine clade of click beetles (Coleoptera: Elateridae)
- 09h00 **Tonya Mousseau**, D. S. Sikes
Phylogeography of *Nicrophorus nepalensis* Hope 1831 (Coleoptera: Silphidae).
- 09h15 **Sean Bromilow**, F. Sperling
Conservation and genetics of the Peace River grassland butterflies
- 09h30 **Marjolaine Giroux**, T. A. Wheeler
Systematics and phylogeny of the subgenus *Sarcophaga* (*Neobellieria*) Blanchard (Diptera: Sarcophagidae)
- 09h45 **Aynsley Thielman**, F. F. Hunter
Anopheles (Diptera: Culicidae) systematics in Ontario: cytogenetic methods and results
- 10h00 Pause – Break – *Les Verrières*
- 10h30 **Amy Moores**, T. A. Wheeler, J. Savage
The effects of habitat size and surrounding land-use on selected families of bog-dwelling Schizophora (Diptera: Cyclorrhapha) in the southeastern Quebec and northern Vermont region
- 10h45 **Jeff Ogden**, D. J. Giberson
Aquatic insects in boreal streams of the Cape Breton Highlands, Nova Scotia: relationships with physical habitat and forest history
- 11h00 **Amélie Grégoire Taillefer**, T. A. Wheeler
Influence of peat mining and restoration on diversity of Brachycera (Diptera) in ombrotrophic peatlands in southeastern Quebec, Canada
- 11h15 **Matthew Bowser**, J. Morton, P. Doak, D. Wagner
Monitoring and modeling terrestrial arthropod biodiversity on the Kenai National Wildlife Refuge, Alaska
- 11h30 **Christopher O'Connor**, T. T. Work
Carabid response to natural disturbance-based silviculture across three boreal forest ecosystems in western Québec
- 11h45 **Evan Esch**, J. Jacobs, J. R. Spence
Food limitation of ground beetle (Coleoptera: Carabidae) communities in relation to activity, density, and insect mass
- 12h00 Diner - Lunch

- 13h30 **Colin Bergeron**, J.R. Spence, J. Volney
Landscape level association between trees and ground dwelling beetles
- 13h45 **Sophie Rochefort**, J. Brodeur
Species diversity and seasonal abundance of arthropods in turfgrass ecosystems
- 14h00 **Stéphane Bourassa**, J. R. Spence, H. A. Cárcamo, F. J. Larney
A comparison of ground beetle assemblages (Coleoptera: Carabidae) in fields grown under sustainable and conventional farming practices.
- 14h15 **Jeremy Hummel**, L. M. Dosdall
Ground beetle (Coleoptera: Carabidae) abundance and diversity in canola:wheat intercrops
- 14h30 **Sean LeMoine**
Vegetation structure and invertebrate diversity in agriculture: a look at ground beetles (Family: Carabidae) in hayfields.
- 14h45 **Jennifer Rosati**, S. VanLaerhoven
The effect of habitat and seasonal variability on blow fly species diversity
- 15h00 **Chris Borkent**, E. Schlinger
Pollination in the genus *Eulonchus* (Diptera: Acroceridae): Flower visiting behaviour, pollen loads, and mate detection.
- 15h15 Pause – Break - *Les Verrières*
- 15h30 **Andrea Patenaude**, R. E. Roughley
Assessing bee-o-diversity in mixed-grass prairie habitats
- 15h45 **Jay Biernaskie**, R. J. Gegear
Bumble bee patch departure: learning the mean patch size
- 16h00 **Diana Sharpe**, J. Perry, L. Rowe
Female Resistance Behaviour in the 2-spot Ladybird, *Adalia bipunctata*: Ecological Determinants and Consequences for Male Mating Success
- 16h15 **Jennifer Perry**, L. Rowe
Eating the spermatophore and female reproduction in a ladybird beetle (Coleoptera: Coccinellidae)
- 16h30 **Anne Lizé**, Anne Marie Cortesero(1), Anne Atlan(2) and Denis Poinot(1)
Parental conflict over kin recognition in *Aleochara bilineata* larvae
- 16h45 **Tanya Latty**
Changes in mate choice with age and mating history in *Tenebrio molitor*
- 17h00 **Mick Wu**, G. Boivin, J. Brodeur, L.-A. Giraldeau
Morphology and behavioural interactions between aphids and their parasitoids: a comparative study.

Prix du président - President's Prize – Session 2 – Ambassadeur B

- 08h45 **Tyler Reid**, M. Reid

- Dispersal of the mountain pine beetle (*Dendroctonus ponderosae*) in thinned and non-thinned forest habitats.
- 09h00 **Greg Smith**, A. Carroll, S. Lindgren
Interactions between endemic mountain pine beetles and a potential bark beetle competitor.
- 09h15 **Kate Van Rooyen**
Effects of site and crown level in density-defoliation relationships of the eastern blackheaded budworm (*Acleris variana*) in a cultured balsam fir (*Abies balsamia*) forest.
- 09h30 **Jonathan Leggo**
Tradeoffs in allocation of resources to foliage or wood growth following defoliation of black spruce, white spruce, and balsam fir
- 09h45 **Sunday Oghiakhe**, N. J. Holliday
Effect of time of tree removal on potential of *Hylurgopinus rufipes* to transmit Dutch elm disease pathogens from newly-symptomatic American elm trees in Manitoba
- 10h00 Pause – Break - *Les Verrières*
- 10h30 **Christina Elliott**, M. L. Evenden
The effect of flight on the mating behaviour and fecundity of female *Choristoneura conflictana* (Lepidoptera: Tortricidae)
- 10h45 **Michel Saint-Germain**, C. M. Buddle, P. Drapeau
Substrate selection by larvae in highly variable hosts restricts the importance of oviposition site in saprophagous wood-boring beetles (Coleoptera: Cerambycidae).
- 11h00 **Philippe Boucher**, L. Sirois, F. Dufresne, C. Hébert
Stratégies de dispersion d'une fourmi en forêt boréale
- 11h15 **Chris MacQuarrie**, D. Langor, J. Spence
Mortality factors influencing a newly established invasive species – *Profenusa thomsoni* in Alaska
- 11h30 **Jeffrey Boone**, D. T. Quiring, S. M. Smith
Enemy-free space and food quality influence the foraging strategy of an insect herbivore.
- 11h45 **Rob Johns**
Intratree heterogeneity drives the sex-biased foraging behavior of a specialist herbivore
- 12h00 Diner - Lunch
- 13h30 **Elsa Etilé**, Y. Mauffette
Feeding behaviour of a generalist lepidopteran larva on four of its hosts
- 13h45 **Lauren Pinault**
Influence of intraplant heterogeneity on feeding patterns of the pale-winged gray moth, *Iridopsis ephyraria*
- 14h00 **Lars Andreassen**, P. G. Mason, U. Kuhlmann, N. J. Holliday
Fundamental host range of a European natural enemy of *Delia radicum*.
- 14h15 **Kim Riley**, N. J. Holliday, U. Kuhlmann, J. Whistlecraft
Using mustard seed meal as a cultural control method to increase the abundance of natural enemies of *D. radicum*

- 14h30 **Kathryn Dau-Schmidt**, C. Noronha, D. Giberson
European Corn Borer (*Ostrinia nubilalis*) in Potatoes, the not so Final Frontier
- 14h45 **Nathalie Roullé**, E. Lucas, G. Domon,
The influence of landscape structure on the aphids biological control in corn
- 15h00 **Wade Jenner**, N. Cappuccino, P. Mason, U. Kuhlmann
Natural field mortality of the invasive leek moth
- 15h15 Pause – Break - *Les Verrières*
- 15h45 **Onour Moeri**, J.P. Cuda, W.A. Overholt, S. Bloem, J.E. Carpenter
Use of the F1 Sterile Insect Technique (F1SIT) as a Tool for Host Range Testing in Weed Biological Control.
- 16h00 **Anne-Marie Bouchard**, J. Brodeur, J. McNeil,
The lily beetle: a threat to indigenous lilies?
- 16h15 **Michel Girard**
Effets de trois pollinisateurs introduits, de la canneberge cultivée (*Vaccinium macrocarpon* Aiton), sur le poids, le volume, la mise à fruit et le taux de pollinisation des fruits, dans les cannebergières commerciales des Bois-Francs.
- 16h30 **Jacinthe Tremblay**, J. Brodeur, É. Lucas, D. Cormier
Woodlands adjacent to apple orchards: is there a link between vegetal diversity and obliquebanded leafroller populations?
- 16h45 **Olivier Aubry**, É. Lucas, D.I. Cormier, G. Chouinard
Host selection by the parasitoid *Trichogramma minutum* on two tortricids eggs
- 17h00 **Arnaud Sentis**, W. Vickery, É. Lucas
Ponte optimale, prédation intraguilde et pucerons myrmécophiles, cocktail explosif pour la cécidomyie *Aphidoletes Aphidimyza* (Rondani)
- 17h15 **Geneviève Labrie**, D. Coderre, É. Lucas
La prédation intraguilde par la coccinelle asiatique *Harmonia axyridis* peut-elle expliquer son succès d'invasion?

Prix du président - President's Prize – Session 3 – Ambassadeur A

- 08h30 **Ayman Mostafa**, N. J. Holliday
Effect of lygus bugs (Hemiptera, Miridae) on buckwheat crops in Manitoba
- 08h45 **Geneviève Legault**, J. Boisclair, K. A. Stewart,
Kaolin Clay, a New Approach to Control the Striped Cucumber Beetle (*Acalymma vittatum*).
- 09h00 **Jean Pierre Kapongo**
Using bumble bees to deliver multiple biocontrol agents for insect pest and disease control
- 09h15 **Thi Thuy An Nguyen**, D. Michaud, C. Cloutier.
Response of herbivore insects to biotic and abiotic stress: global functional approach using proteomics
- 09h30 **Magali Merx-Jacques**, E. Despland, J. Bede
Nutritional regulation in the beet armyworm caterpillar, *Spodoptera exigua*

- 09h45 **Jayaranjan Anthonypillai**, J. N. McNeil
Accumulation and allocation of lipids in migrant and non-migrant adult females of the true armyworm, *Pseudaletia unipuncta*. (Lepidoptera: Noctuidae)
- 10h00 Pause - Break
- 10h30 **Jean-Frédéric Guay**, D. Michaud, C. Cloutier
Symbiotes bactériens, stress thermiques et résistance aux parasitoïdes chez le puceron du pois / Symbiotic bacteria, heat stress and pea aphid resistance to parasitoids
- 10h45 **Sigrun Kullik**
Bt corn and seed-applied insecticides in the management of the black cutworm (*Agrotis ipsilon* (Hufnagel))
- 11h00 **Zaid Jumean**, L. Faezel, C. Wood, T. Cowan, M. Evenden, G. Gries
Do larvae of Oriental fruit moth and Indianmeal moth produce an aggregation pheromone?
- 11h15 **Melanie McClure**, W. Francke, J. N. McNeil
Pillow-talk: Mating signals confer reproductive isolation in *Aphidius ervi* and *Aphidius nigripes*
- 11h30 **Asieh Rasoolizadeh**, C. Béliveau, M. Cusson
Predicted vs expressed polydnavirus genes: the case of the *Tranosema rostrale* ichnovirus (TrIV) in its spruce budworm host
- 11h45 **Miriam Daniels**, H.J. Newbury, J.S. Bale, R. Lind, J. Pritchard
Investigating the translocation of xenobiotics: from spray droplet to insect target
- 12h00 Diner - Lunch
- 13h30 **Nicole McKenzie**, G. W. Otis, B. Helson, D. Thompson
Evaluation of the Efficacy of Imidacloprid Trunk Injections for Control of the Emerald Ash Borer
- 13h45 **David Lagacé**
Ecophysiology of monarch butterfly spring migration
- 14h00 **Adrienne Brewster**, G. W. Otis
A protocol for estimating the cost-effectiveness of exhibit butterflies based on mark-recapture lifespan estimates, behaviour and cost
- 14h15 **Leah Flaherty**
Opposite effects of plant module size and galler density on gall initiation success
- 14h30 **Karen Hawkin**, P. Fields
The efficacy of *Tribolium* pheromone traps in flour mills
- 14h45 **Brian O. Ma**, B. D. Roitberg
The impact of sugar availability on the foraging behaviour of *Anopheles gambiae* s.s. (Diptera: Culicidae) mosquitoes of different energetic condition and bloodmeal status
- 15h00 **Curtis Russell**, F. F. Hunter:
Analysis of the possible attraction of *Culex pipiens* to humans in the Golden Horseshoe.
- 15h15 Pause - Break - *Les Verrières*
- 15h45 **Roger J. Kroeker**, F. F. Hunter

Community structure of Nearctic treehole and container breeding mosquitoes (Diptera: Culicidae)

- 16h00 **Sean McCann**, C.C. Lord
Senescence and physiological parameters influence fecundity of *Culex quinquefasciatus* Say
- 16h15 **Amy Sharp**, F. F. Hunter
Mermithid-infected black flies (Diptera: Simuliidae): an examination of sexual determination and developmental stage.
- 17h30-18h30 Assemblée générale annuelle de la SEQ - SEQ Annual General Meeting – *Ambassadeur C*
- 20h00-24h00 Réception du président - President's Reception – *Ambassadeur A*

Mardi le 21 novembre - Tuesday 21 November

07h45-17h00 Téléchargement des Présentations – Loading Presentations – *Gouverneur 2*

Symposium 3 - Arachnology: A tribute to Charles Dondale – *Ambassadeur A*
Organizers and Moderators – Nadine Dupérré and Pierre Paquin

- 08h45 **Joey Bowden**, C.M. Buddle
The effects of latitude on spider species diversity north of 60.
- 09h15 **Chris Buddle**
Monitoring spider diversity in SW Quebec forests: field techniques, taxonomy and three years of data.
- 09h30 **Matthias Foellmer**, J. Moya-Laraño
Sexual size dimorphism in spiders: patterns and processes.
- 10h00 Pause – Break - *Les Verrières*
- 10h30 **Pierre Paquin**
Systematics and biogeography of the *Cicurina brevis* group (Araneae: Dictynidae).
- 11h00 **Gail Stratton**
A phylogeny of the large wolf spiders from North America; are we making progress?

Communications générales - Contributed Papers – Session 1 – *Ambassadeur B*

- 09h15 **Zhang Jianhua**, Y. Pelletier, C. Goyer
Insecticide and water stress induced glycine-rich protein gene expression
- 09h30 **Sophie Vandermoten**, C. Béliveau, S. Sen, F. Francis, E. Haubruge, M. Cusson
Identification of a new aphid isoprenyl diphosphate synthase
- 09h45 J. T. Kicks, J.-P. Parent, S. M. Macfie, **Jeremy N. McNeil**
The performance of herbivorous insect species on a cadmium-tolerant crucifer.
- 10h00 Pause – Break - *Les Verrières*
- 10h30 **Vince Nealis**

Foraging risks for western spruce budworm

- 10h45 **Lorraine Maclauchlan**, L. Rankin
Impact of mountain pine beetle, *Dendroctonus ponderosae* Hopkins, in young stands
- 11h00 **Tanya Latty**, M. Reid
Aggregation in the Mountain pine beetle: does it pay to be first?
- 11h15 **Bill Riel**, T. Shore, A. Fall
Spruce Beetle in the Yukon
- 11h30 **Ward Strong**, G. Grant, J. Millar
Pheromone and life history traits of *Dioryctria abietivorella*
- 11h45 **Richard Trudel**, R. Lavallée, C. Guertin
Méthode de lutte potentielle contre le charançon du pin blanc à l'aide de *Beauveria bassiana*
- 12h00 Diner - Lunch

Communications générales - Contributed Papers – Session 2 – Ambassadeur C

- 08h45 **Aziz Ajlan**
Using Biotechnology Techniques to Detect Whitefly Strains Transmitted Geminiviruses in Saudi Arabia
- 09h00 **Rosemarije Buitenhuis**, L. Shipp, G. Murphy, S. Jandricic, M. Short
Fatal attraction – Trap plants against western flower thrips in greenhouse ornamentals
- 09h15 **Andrew Chow**, K. M. Heinz
Are Two Predators Better than One? Combining a Predatory Mite and a Predatory Bug for Control of Western Flower Thrips on Greenhouse Roses
- 09h30 **Hélène Chiasson**, N. J. Bostanian, C. Vincent
FACIN, a key player in a new class of essential oil based insecticides
- 09h45 **Paul Fields**
Alternatives to methyl bromide fumigations in flour mills.
- 10h00 Pause – Break - *Les Verrières*
- 10h30 **Emma Despland**
Scaling relationships and ontogenetic changes in caterpillar aggregation
- 10h45 **Robert Lamb**, P. A. MacKay
Persistence and stability, at four spatial scales, for populations of an aphid on its native host plant
- 11h00 **Donna Giberson**, S. Burian
Notes on the life cycle of a fast growing arctic mayfly, *Baetis bundyae*, with an update of the mayflies of Nunavut
- 11h15 **David Bruce Conn**, D. A. Conn
Reproduction, Feeding, and Changing Distribution of Brachycentrid and Hydropsychid Caddisflies (Trichoptera) in the Upper St. Lawrence River
- 11h30 **Jennifer Heron**

Challenges to Invertebrate Conservation in BC

11h45 **David Langor**, J. Hammond, G. Pohl
Ecological land classification as a surrogate for arthropod biodiversity

12h00 Diner - Lunch

Symposium 4 - New Trends In Potato Protection – Ambassadeur A
Organizers and Moderators – Philippe Giordanengo and Yvan Pelletier

13h15 **Philippe Giordanengo**
Opening comments

13h20 **Christine Noronha**
Mechanical control of the European Corn Borer, *Ostrinia nubilalis* (Hubner) (Lepoptera: Pyralidae) in potatoes

13h40 **Bob Vernon**, W. van Herk
Wireworm control in potato crops: Will efficacy trials used for organophosphates work for neonicotinoids?

14h00 **Gilles Boiteau**, J. Watmough, Y. Leclerc, J.D. Picka
Renewed potential for the use of crop rotation in the management of the Colorado potato beetle.

14h20 **Jianhua Zhang**, Y. Pelletier, C. Goyer
A low density reverse Northern array used to study gene expression in *Leptinotarsa decemlineata* (Say) under environmental stresses

14h40 **J.-F. Silvain**, S. Dupas, O. Dangles, X. Lery, J.-L. Zeddam
Gelechiid moths, a major threat for potato cultivation in South-America

15h00 Pause – Break - *Les Verrières*

15h20 **Dominique Michaud**
Transgenic potato lines for pest control – Current advances and future trends

15h40 **Julien Saguez**, F. Dubois, C. Vincent, J.-C. Laberche, P. Giordanengo
Chitinase inhibitors : An appropriate strategy to manage aphids

16h00 **V. Le Roux**, C. Vincent, S. Dugravot, E. Campan, P. Giordanengo
Pommes de terres sauvages résistantes aux pucerons : antixénose ou antibiose?

16h20 **Yvan Pelletier**
Wild tuber-bearing *Solanum* species; A source of insect resistance.

16h40 **Laurence Brunissen**, S. Dugravot, A. Cherqui, C. Vincent, P. Giordanengo
Changes in the feeding behavior of *Myzus persicae* and *Macrosiphum euphorbiae* on previously infested potato plants

Symposium 5 – Biocontrol in Canada: Partners and Potential – Ambassadeur B
Sponsored by the Canadian Forum for Biological Control
Moderator – Kevin Floate

12h55 Opening remarks

- 13h00 **Lesley Cree**
Challenges and opportunities presented by an invasive alien species strategy for Canada.
- 13h25 **Leslie Cass**
AAFC's Pest Management Centre: update on the Pesticide Risk Reduction Program and Biopesticide Initiative activities.
- 13h50 **Jean-Louis Schwartz**, R. Laprade
The Biocontrol Network: a Canadian example of the importance of networking
- 14h15 **Richard Ward**
Association of Natural Biocontrol Producers (ANBP) – Who we are and what we do
- 14h40 Pause – Break - *Les Verrières*
- 15h00 **Rob S. Bouchier**
Biological control success - holding hands for public good eh.
- 15h25 **Sandy M. Smith**, P. de Groot
“The Beetles Have Arrived”: Recent case studies on invasive alien insects in our forests
- 15h50 Round-table discussion
- 16h10 CFBC Annual General Meeting
- 17h10 End

Communications générales - Contributed Papers – Session 3 – Ambassadeur C

- 13h30 **Christopher Friesen**, R. Westwood
Community and Environmental Variables and the Relationship to Pollinator Visitation in the Endangered Western Prairie Fringed Orchid (*Platanthera praeclara*)
- 13h45 **Jon Sweeney**, J. Klimaszewski, T. Work, J. Price
Effect of harvesting on rove beetle species diversity in Acadian red spruce stands.
- 14h00 **Michel Saint-Germain**, P. Drapeau, C. M. Buddle
Host-use patterns of adults and larvae of saproxylic wood-feeding Coleoptera in black spruce and aspen.
- 14h15 **Joshua Jacobs**, T. Work, J. Spence
Recovery of Carabid communities to variable retention harvesting.
- 14h30 **Kathleen Aikens**, S. M. Townsend, A. A. M. MacDonald, C. G. Majka, D. B. McCorquodale
Diversity in a dairy pasture: do Carabidae and Staphylinidae communities respond to different management practices?
- 14h45 **Tara Sackett**, C. M. Buddle, C. Vincent
Spider colonization of apple orchards
- 15h00 Pause – Break – *Les Verrières*
- 15h30 **Bernard LaRue**, C. Gaudreau, G. Charpentier
Blackfly phylogeny through DNA sequencing? A critical study.

- 15h45 **M. Javahery**
The evolution of some heteropteran true land bugs
- 16h00 **Jan Klimaszewski**, N. Gouix
Aleocharine rove beetles of Canada and Alaska – rapid progress in our knowledge (Coleoptera, Staphylinidae)
- 16h15 **Guy Charpentier**, C. Charbonneau, R. Côté
Toxic effects of azadirachtin and of simpler epoxy-alcohols on *Galleria mellonella* (Lepidoptera) larvae and on three insect cell lines.
- 16h30-18h00 *Enlèvement des affiches – Poster take-down - Les Verrières*
- 17h00-18h00 Assemblée générale annuelle de la SEC - ESC Annual General Meeting – *Ambassadeur C*
- 19h00 Cocktails et Banquet – Cocktails and Banquet – *Ambassadeur A/B/C*

Mercredi le 22 novembre - Wednesday 22 November

Symposium 6 - Canopy Arthropod Ecology – Ambassadeur B *Organizer and Moderator - Christopher Buddle*

- 08h30 **Christopher Buddle**
Welcome and opening comments
- 08h35 **Neville Winchester**
Islands in the sky: The beast, the impediment, and whirlpools in the pattern of arboreal community ecology
- 09h00 **Rob Johns**
Ecological processes shaping the foraging behaviors and associated performance of herbivorous insects within tree crowns
- 09h25 **Frédéric Beaulieu**, D.E. Walter, H.C. Proctor, R.L. Kitching
Habitat distribution of predatory mites in Australian forests: arboreal specialists, suspended soil generalists, or rainforest floor avoiders?
- 09h50 Pause – Break - *Foyer*
- 10h15 **Sandy Smith**
Canopy research on arthropods in temperate maple-dominated forests: From descriptions to mechanisms in 10 years
- 10h40 **Maxim Larrivée**, C.M. Buddle
Diversity patterns at multiple spatial scales of canopy spiders found on sugar maple and American beech in hardwood forests
- 11h05 **Terry Erwin**
Monitoring changes in canopy arthropod populations through time in the western Amazon Basin, Yasuni area, Ecuador
- 11h50 **Christopher Buddle** (Moderator)
Wrap-up and discussion

Communications générales - Contributed Papers – Session 4 – Ambassadeur C

- 08h30 **Dave Gillespie**, P. G. Mason, L. M. Dosdall, P. Bouchard, G. A. P. Gibson,
A retrospective analysis of classical biological control release against cabbage seedpod weevil,
Ceutorhynchus obstrictus.
- 08h45 **Tim Haye**, P. G. Mason, L. M. Dosdall, U. Kuhlmann
Mortality factors of the cabbage seedpod weevil, *Ceutorhynchus obstrictus*, in its area of origin
- 09h00 **Peter Mason**, U. Kuhlmann, H. Hinz, R. De Clerck-Floate, L. M. Dosdall, J. Brodeur, O. Olfert, A. McClay
Avoiding conflicts between insect and weed biological control: selecting non-target species for host specificity testing of cabbage seedpod weevil parasitoids
- 09h15 **Tara Gariepy**, U. Kuhlmann, C. Gillott, M. Erlandson
Pests, Parasitoids, and PCR: A Novel Approach to Evaluating the Host Specificity of Candidate Biocontrol Agents
- 09h30 **Kenna MacKenzie**, B. Lees, D. Moreau
Managing root weevils in strawberry with entomophagous nematodes
- 09h45 **Susan Bjornson**, T. Saito
Hippodamia convergens used for biological control: more than meets the eye
- 10h00 Pause – Break - Foyer
- 10h30 **Marie-Pierre Mignault**
Pests of concern for CFIA in horticulture: an overview
- 10h45 **Jennifer Otani**
Clover insect pests - an European flare for damage?
- 11h00 **Marc Rhainds**, J. Brodeur, M. Roy
Soybean aphid in Québec: Vive la différence !
- 11h15 **Chrystel Olivier**, T. Lowery, L. Stobbs
Phytoplasma diseases on grapevine
- 11h30 **Allison Henderson**
Sexual communication of *Exophthalmus jekelianus* (Coleoptera: Curculionidae) (White) on coffee in Costa Rica.
- 11h45 **Julie Soroka**, M. Gruber, J. Holowachuk, L. Grenkow
'Hairy' Canola Meets Flea Beetles (*Phyllotreta* spp.): Host Plant Resistance in Action
- 12h00 Diner - Lunch
- 13h30 Réunion du conseil d'administration de la SEC – ESC Governing Board meeting – Ambassadeur B
- 13h30 Comité scientifique de la Commission biologique du Canada - Biological Survey of Canada Scientific Committee meeting – Ambassadeur A

Affiches - Posters

Prix du président - President's Prize Student Posters – Les Verrières

- P1 **Pamela Horsley**, R. S. Anderson, T. A. Wheeler
Revision of the Mexican and Central American Genus *Trachyphloeomimus* (Coleoptera: Curculionidae, Entiminae)
- P2 **Julia Mlynarek**, T. A. Wheeler
Systematics of *Goniaspis* and implications for higher classification of Chloropidae (Diptera)
- P3 **James Kuchta**, J. Savage
A Taxonomic Revision of the New World Fauna of *Mesembrina* Meigen (Diptera: Muscidae) with Description of the first Neotropical Species
- P4 **Claudia Copley**, R. Bennett, S. Perlman
Phylogenetic analysis of North American *Cybaeus* spp. (Araneae: Cybaeidae) utilizing morphological and molecular characteristics
- P5 **Christine Gaudreau**, V. Charbonneau, B. LaRue, G. Charpentier
Étude moléculaire de la diversité génétique chez les simulies.
- P6 **Mylène St-Onge**, B. LaRue, G. Charpentier
Identification moléculaire des mermithides (nématodes) parasites de mouches noires (Diptera : Simuliidae)
- P7 **Charles Stephen**, C. M. Buddle
First focused survey of harvestmen (Arachnida: Opiliones) in Québec beech-maple forests
- P8 *annulé - cancelled*
- P9 **Alida Mercado**, C. M. Buddle
Seven introduced ground beetles (Coleoptera: Carabidae) in Québec: their distribution and potential range expansion since 1975.
- P10 **Sheena M. Townsend**, K. R. Aikens, A. MacDonald, C. G. Majka, D. B. McCorquodale
Beetles, Bovines and Biodiversity: An inventory of Coleoptera in an eastern Canadian dairy pasture
- P11 **Annie Hibbert**, P. Drapeau, T. Work, T. A. Wheeler
Diversity and abundance of saproxylic Diptera emerging from coarse woody debris in Abitibi-Témiscamingue, Québec
- P12 **Annie Webb**, C. M. Buddle, P. Drapeau
The effect of remnant boreal forest habitats on saproxylic beetle assemblages in landscapes subjected to harvesting
- P13 **Andrea Déchêne**, C. M. Buddle
Effects of alternative silvicultural practices on litter mite assemblages in Quebec's mixed-wood boreal forest
- P14 **Zachary Sylvain**, C. M. Buddle
Effects of Stand Type on Oribatid Mite Assemblages in Southern Quebec
- P15 **Philippe Boucher**, L. Sirois, C. Hébert
Ants' colonisation of woody debris after wildfires

- P16 **Laura Timms**, S. M. Smith
Does gypsy moth invasion affect the natural mortality of native caterpillars?
- P17 **Sarah Chabot**, R. Lavallée, Y. Mauffette
Influence of the egg laying period of *Pissodes strobi* on the new brood emergence: Evaluating the consequences of being late.
- P18 **Maryse Barrette**, G.-M. Wu, L.-A. Giraldeau, J. Brodeur, G. Boivin
The importance of behavioural components in the estimation of fitness and fitness gain rate
- P19 **Sandra Gillespie**
Parasite and parasitoid prevalence in wild bumblebees of Massachusetts
- P20 **Connie Chan**, B. Lyons, J. D. Shorthouse
Biology of the Bronze Birch Borer (*Agrilus anxius*) (Coleoptera: Buprestidae) in a gradient of industrially disturbed lands near Sudbury, Ontario
- P21 **Chris MacQuarrie**, D. Langor, E. Hosten, S. Digweed, A. Soper, J. Spence, J. Kruse
Release and possible establishment of *Lathrolestes luteolator* as a biological control agent of Ambermarked birch leafminer (*Profenusa thomsoni*) in Alaska
- P22 **Michael Cardinal-Aucoin**, P. Albert, E. Bauce
Electrophysiological and Behavioural Responses of the Spruce Budworm (*Choristoneura fumiferana* (Clem.)) to Various Concentrations of Tannins Observed in Sylvicultural Thinning
- P23 **Simon Daoust**
Electrophysiological and behavioural responses of spruce budworm
- P24 **Brian Mader**
Electrophysiological and behavioural responses of spruce budworm larvae *Choristoneura fumiferana* (Clem.) to the hydrophobic components of white spruce (*Picea glauca*).
- P25 **Zhe Shi**, E. Despland
Is Trypsin Inhibitor a Plant Defence against the Forest Tent Caterpillar (*Malacosoma disstria*)?
- P26 **Genevieve Boisjoli**, E. Étilé, Y. Mauffette
Impact de périodes de jeûne sur le fitness de la Livrées des forêts
- P27 **Elisabeth Reichert**, T. Johnson, E. Rojas, R.S. Anderson, T.A. Wheeler
Potential weevil biocontrol agent for *Miconia calvescens*, the "Purple Plague" of Hawaii.
- P28 **Jane Allison**, W. Jenner, N. Cappuccino, P.G. Mason
Oviposition and Feeding Preference of *Acrolepiopsis assectella* Zell. (Lepidoptera: Acrolepiidae)
- P29 **Louise Voynaud**, É. Lucas, J. Brodeur
Influence du site d'établissement d'une colonie de pucerons sur la prédation intraguilde
- P30 **Olivier Aubry**, É. Lucas, D. Cormier
Facteurs de mortalité du parasitoïde *Trichogramma minutum* en verger de pommiers
- P31 **Annabelle Firlej**, P.-A. Girard, M. Brehélin, D. Coderre, G. Boivin
The immune response of the coccinellid *Harmonia axyridis* to parasitism by *Dinocampus coccinellae*
- P32 **Lisanne Morcos**, E. Despland

- Are we there yet? Collective locomotion in a social caterpillar
- P33 **Bensadia Fatiha**, C. Vincent, Y. Mauffette
Les tannins influencent-ils le développement de la tordeuse?
- P34 **Michelle Franklin**, J. Myers
Determination of the population structure of the cabbage looper, *Trichoplusia ni* in greenhouse and field crops as a tool in reducing resistance to the microbial insecticide, *Bacillus thuringiensis*
- P35 **Rachid Sabbahi**, C. Guertin
Efficacité du champignon entomopathogène *Beauveria bassiana* contre les populations de la punaise terne, *Lygus lineolaris*, dans la culture du fraiser.
- P36 **Kate Bergen**, W. G. Dilantha Fernando, N. J. Holliday
Effects on insect pests of treatments to induce systemic resistance in canola
- P37 **Olivier Morisset**, S. Todorova, F. Pelletier, D. Cormier, G. Chouinard, É. Lucas
Effet du virus de la granulose sur le carpocapse de la pomme (*Cydia pomonella*)
- P38 **Jamal Ziani**, Y. Mauffette, C. Vincent, C. Guertin
Application de *Beauveria bassiana* contre la punaise terne *Lygus lineolaris* dans les vignobles

Affiches réguliers - Regular Posters - Les Verrières

- P39 S. Pinna, **Eric Lucas**
Effet de la maturité des habitats urbains sur le succès d'invasion du carabe exotique *Carabus nemoralis* Müller
- P40 **Frédéric Beaulieu**, K. W. Wu
Phytophagous mites of Canada
- P41 C. Milewski, S. McNulty, **Janet Mihuc**
The Adirondack All-Taxa Biodiversity Inventory: full of possibilities
- P42 **Jose Fernandez**
Biodiversity of parasitic wasps (Hymenoptera: Ichneumonidae) in the highest mountains of a tropical island and its Nearctic relatives: are they related?
- P43 **Marie-Ève André**, S. Laberge-Gaudet, T. T. Work
Taxonomic tools for paleoentomology in boreal forests
- P44 **Timothy Work**, A. Hibbert, L. Imbeau
Insects associated with nests of the American Kestrels, Northern Saw-whet and Boreal owls
- P45 **Allison Henderson**, P. Fargey
Arthropod Conservation in Canada: Recovery Strategy Development for the Mormon Metalmark, *Apodemia mormo*
- P46 **Mahmood Iranpour**, R. Lindsay, A. DiBernardo
Molecular identification of West Nile virus vectors and possibility of cross contamination among sorted mosquito samples
- P47 **Enric Frago**, J. Selfa, J. Pujade-Villar, M. Guara, R. Currás, J. Martín-Cano
Data on the parasitoid complex of *Euproctis chrysorrhoea* (Linnaeus) in a Mediterranean environment.

- P48 **Enric Frago**, E. Bauce, C. Tremblay
Nutrition-related stress carries over to spruce budworm, *Choristoneura fumiferana* (Lepidoptera : Tortricidae), progeny.
- P49 **Jennifer-Aniki Arnold**
Je ne t'aime plus, tu es trop mûre...
- P50 **Jonathan-X St-amand Lusignan**, Y. Mauffette
L'arbre est-il toujours plus vert à coté
- P51 **Robert Graham**, C. J. Lucarotti
Culture-independent characterisation of microbiota isolated from natural populations of sawflies
- P52 G.K. Kyei-Poku, M. Giladi, O. Mokady, E. Zchori-Fein, P. Coghlin, **Kevin Floate**
Wolbachia in wasps parasitic on filth flies (Diptera: Muscidae) with emphasis on *Spalangia cameroni* (Hymenoptera: Pteromalidae)
- P53 **Christelle Robinet**, D. Gray, A. M. Liebhold.
Mating success driven by individuals isolation in space and time
- P54 **Maya Evenden**
Plasticity of male moth response to sex pheromone in the ash leaf cone roller, *Caloptilia fraxinella* (Lepidoptera: Gracillariidae)
- P55 **Gaétan Racette**, N. J. Bostanian, J. M. Hardman, J. Franklin, J. Lasnier
An inventory of predacious mites in Quebec commercial apple orchards where IPM programs are implemented
- P56 **Bruno Fréchette**, G. Chouinard, J. Brodeur, F. Vanoosthuyse, D. Cormier, É. Lucas
Impact of aphidophagous predators on natural control of apple aphid populations
- P57 **Héctor A. Cárcamo**, C. Klima, T. Entz, B. Beres
Sample size required to estimate *Cephus cinctus* (Hymenoptera: Cephidae) egg infestation, larval damage and parasitism by *Bracon cephi* (Hymenoptera: Braconidae).
- P58 **Tom Lowery**, G. Judd, S. Triapitsyn
Host Plant Associations for *Anagrus* Parasitoids of leafhoppers in the Okanagan Valley, BC.
- P59 **Bruce Broadbent**, T. Baute, P. Mason
Impact of Predators on Soybean Aphid in Ontario
- P60 **Patricia Vickers**, D. T. Lowery,
Aphid Transmission Efficiencies for the Ontario Isolate of Plum Pox Virus
- P61 **Lori Bittner**, P. Vickers, T. Lowery
Inhibition of Aphid Transmission of Plum Pox Virus with Foliar Applications of Horticultural Oils.
- P62 **Chrystel Olivier**, B. Galka
Epidemiology of Aster Yellow's disease in oilseed and cereal crops in Saskatchewan, 2001 – 2006
- P63 M. Reekie, **Kenna MacKenzie**, B. Lees
Is Cranberry Tipworm (Diptera, Cecidomyiidae, *Dasineura oxycoccana*) a new pest of lowbush blueberry?

- P64 **Pierre Lemoyne**, C. Vincent, S. Gaul, K. MacKenzie, D. M. Nash
Determining the supercooling point of the blueberry maggot (*Rhagoletis mendax* Curran) from Quebec and Nova Scotia.
- P65 **Jennifer Otani**, H. Cárcamo
How cold is too cold for *Lygus keltoni*?
- P66 **Isabelle Lauziere**, F. Mitchell, S. Sheather
Species diversity, distribution and abundance of xylem fluid feeding Hemiptera in Texas vineyards
- P67 **Louis Simard**, J. Brodeur, G. Bélair, J. Dionne
Distribution, Abundance, and Seasonal Ecology of the Annual Bluegrass Weevil (Coleoptera: Curculionidae) on Golf Courses in Québec, Canada
- P68 **Béliveau, Catherine**, D. Stewart, R. G. Rutledge, M. Cusson
Characterisation and expression studies of two lepidopteran farnesyl diphosphate synthase homologs.
- P69 **Dominique Fleury**, N. J. Bostanian, Y. Mauffette, C. Vincent
The residual toxicity of two insecticides on three field populations of *Lygus lineolaris* collected along the St-Lawrence valley in eastern Canada
- P70 J. Breton, A. Ameline, Y. Pelletier, **Philippe Giordanengo**
Effet toxicologique du tau-fluvalinate sur le Doryphore, *Leptinotarsa decemlineata* (Say) dans le nord de la France / Toxicological effect of tau-fluvalinate on the Colorado potato beetle, *Leptinotarsa decemlineata* (Say) in the North of France
- P71 **Gilles Boiteau**, C. Noronha
Reduced risk insecticides for the control of *Ostrinia nubilalis* Hubner on potato.
- P72 **Julien Saguez**, A. Cherqui, S. Lehraiki, C. Vincent, J. C. Laberche, P. Giordanengo
Le MTI2 est-elle une méthode fiable pour la lutte contre les pucerons? / Is MTI2 a reliable method to manage potato aphids?
- P73 **Michael Smirle**, J. Cossentine, C. Zurowski, L. Jensen
Impact of Spinosad on an Endoparasitoid in Late Instar Obliquebanded Leafrollers
- P74 **Francine Pelletier**, F. Vanoosthuyse, D. Cormier, G. Chouinard, S. Todorova, É. Lucas
Compatibilité du virus de la granulose et des trichogrammes pour lutter contre le carpocapse de la pomme / Compatibility of granulosis virus and trichogrammatid wasps for the control of codling moth in apple orchards
- P75 **Caroline Provost**, C. Vincent, J. Valéro
Essais du Virosoft CP4 en verger biologique

Résumés - Abstracts

Jan Addison, School of Environment and Sustainability
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V9B 5Y2

Impacts of invasive earthworms on Canadian forest ecosystems

In Canada it is generally accepted that most indigenous earthworms did not survive glaciation, and that the majority of the worms now inhabiting Canadian soils are relatively recent introductions. Consequently, except for relatively small areas where relict native earthworm populations have survived, Canadian soils and their resident biotas have developed in the absence of earthworms. Although exotic earthworms are generally considered to be beneficial in agricultural soils, experience in other countries has shown that their impacts in less disturbed habitats may not always be benign. This presentation will examine the potential impacts of invasive earthworm species on Canadian forest soils.

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Diversity in a dairy pasture: do Carabidae and Staphylinidae communities respond to different management practices?

Reducing intensity of agricultural management may mitigate biodiversity loss. To investigate the effects of differential grazing treatments on insect diversity, ground-dwelling Coleoptera (Carabidae and Staphylinidae) were sampled from a Nova Scotia dairy pasture May to October 2005. Objectives included establishing patterns of diversity and phenology and assessing impact of different management regimes on species richness and abundance. No significant difference in rarefied species richness was observed across treatment, though dominance consistently and significantly increased with management intensity. Two carabid species demonstrated potential as indicators of agricultural management.

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Using Biotechnology Techniques to Detect Whitefly Strains Transmitted Geminiviruses in Saudi Arabia

The major cause of crops loss in Saudi Arabia is whitefly, *Bemisia tabaci*. Inspection conducted to determine the prevalence of whiteflies-transmitted geminiviruses. Depending on the crop, season and whitefly prevalence, yield losses range from 20-100%. Visual inspection and ELISA screening indicated that the viruses were existing in the major crops cultivation and production regions. Virus identification based upon differential hosts, mechanical, whitefly transmission and polymerase chain reaction (PCR). Virus-vector relationship done to evaluate the minimum acquisition period (AAP) and inoculation access period (IAP) as well as transmission efficiency.

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Oviposition and Feeding Preference of *Acrolepiopsis assectella* Zell. (Lepidoptera: Acrolepiidae)

The leek moth, *Acrolepiopsis assectella* (Zell.), a new exotic species in eastern Ontario and western Quebec, causes up to 40% damage to *Allium* spp. crops. No choice experiments indicated that oviposition preference and larval survival of leek moth declined as the phylogenetic distance from the preferred host, *Allium ampeloprasum* var. *porrum* L., increased. This suggests that leek moth is a specialist feeder on closely related *Allium* spp. although the strength of this preference may decline as the motivation to oviposit increases. Leek moth may thus use closely related novel hosts as temporary refuges if the preferred host plant is unavailable.

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Taxonomic tools for paleoentomology in boreal forests

Ground beetles are among the most diverse groups of macroarthropods found in leaf litter. Nonetheless, little is known about their paleoecology in boreal forests. Taxonomic difficulties identifying body parts found in paleo-samples have limited their inclusion in these studies. On the other hand, positive identifications of beetles can be made using elytra and pronota in cores that date back 8000 years. Here we present an identification key based on elytra and pronota for the fauna of the FERLD that can be used to rapidly identify species in sediment carrots. Currently more than 30 species can be identified with the key.

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Fundamental host range of a European natural enemy of *Delia radicum*.

Introducing the staphylinid parasitoid *Aleochara bipustulata* might be an option for controlling cabbage root maggot in Canadian canola. However, *A. bipustulata* must be demonstrably specific to the pest to proceed. Larvae of *Aleochara* species enter puparia of Diptera Muscomorpha, where they feed as ectoparasitoids. We investigated *A. bipustulata*'s host range by exposing puparia to parasitoid larvae and recording whether the non-target species was attacked and suitable for development. Eighteen Diptera species were selected for testing based on the likelihood *A. bipustulata* would encounter them in nature, and whether

they are beneficial species. The testing results will be presented and discussed.

Jayaranjan Anthonypillai, Jeremy N. McNeil. University of Western Ontario

Accumulation and allocation of lipids in migrant and non-migrant adult females of the true armyworm, *Pseudaletia unipuncta*. (Lepidoptera: Noctuidae)

True armyworm females emerge with undeveloped ovaries and under summer conditions sexual maturation takes about a week. In contrast, under fall conditions, maturation requires several weeks, and it has been hypothesized that this delay is associated with migration. I investigated total lipids and the fatty acid composition of triacylglycerides in fat body and ovaries, as well as flight propensity and fuel use, as a function of age and rearing conditions in virgin females. The data will be discussed in the context of lipid utilization in the tradeoff between reproduction (egg development) and fuel for migratory flight.

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Je ne t'aime plus, tu es trop mûre...

Cette étude porte sur l'influence de la maturation du feuillage de différentes essences foliaires sur le comportement de quête alimentaire de la livrée des forêts. Des feuilles provenant de trois hôtes (érable à sucre, bouleau blanc et chêne rouge) furent disposées sur des modèles d'arbres miniatures. Des larves de livrée furent déposées sur ces arbres et les périodes de temps allouées à leurs déplacements, consommation et repos furent notées. Il fut observé que la livrée se désintéresse progressivement du feuillage de chêne rouge et d'érable à sucre en fonction de sa maturation. Toutefois, l'insecte semble porter un intérêt constant pour le feuillage de bouleau blanc durant la saison.

Olivier Aubry¹, Eric Lucas¹ Daniel Cormier²; ¹UQÀM; ²IRDA

Facteurs de mortalité du parasitoïde *Trichogramma minutum* en verger de pommiers

Le parasitoïde oophage *Trichogramma minutum* Riley (Hymenoptera : Trichogrammatidae) est utilisé en lutte biologique sous forme de lâchers inondatifs, notamment dans la lutte contre les lépidoptères ravageurs des cultures. Des cartes en carton (trichocartes) contenant des œufs parasités d'*Ephestia kuehniella* Zellers sont utilisées pour le lâcher des parasitoïdes. Les trichogrammes sont alors soumis à différents facteurs abiotiques et aux prédateurs. Nous avons estimé la perte de parasitoïdes lors d'un lâcher inondatif en verger de pommiers. La perte est due aux facteurs abiotiques (notamment la pluie) pour environ 8% et aux prédateurs (fourmis, acariens prédateurs, larves de chrysopes) pour 10%.

Olivier Aubry¹, Eric Lucas¹, Daniel Cormier², Gérald Chouinard²; ¹UQÀM; ²IRDA

Host selection by the parasitoid *Trichogramma minutum* on two tortricids eggs

Trichogramma minutum Riley is an oophagous parasitoid of Tortricidae in apple orchards. Following an inundative release of this species, we investigated in laboratory and field experiments the ability of this species to choose between two

hosts attacking pome fruits: the codling moth (CM), *Cydia pomonella* L. and the obliquebanded leafroller (OBLR), *Choristoneura rosaceana* Harris. Both species oviposit at different sites in the apple tree and both produce eggs of different size and number. The OBLR egg masses were more frequently visited than the CM eggs. However, CM eggs were more suitable in term of profitability for females *T. minutum* fitness.

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The importance of behavioural components in the estimation of fitness and fitness gain rate

To evaluate the contribution of physiological and behavioural components in the evaluation of fitness gain rate in parasitoids, we used the aphid parasitoid *Aphidius colemani* and its host *Myzus persicae*. We created a fitness index using different fitness proxies (size, developmental time, fecundity and handling time) of the offspring emerging from each host instar. While the physiological proxies suggested that the 4th instar was the most profitable to the female parasitoid, adding a behavioural component to our fitness index indicated that the 2nd instar was the instar giving the highest fitness gain rate. Preference tests confirmed that parasitoid females use the fitness gain rate to evaluate the host quality.

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Habitat distribution of predatory mites in Australian forests: arboreal specialists, suspended soil generalists, or rainforest floor avoiders?

We sampled a group of predatory mites in Australian rainforest and show that 'suspended soil' trapped in epiphytic ferns (1-21 m) is occupied by a relatively homogenous fauna of predatory mites, which is essentially distinct to the fauna on the rainforest ground. However, many of these arboreal specialists also occurred in 'low suspended soil', i.e. litter on log and boulder surfaces (<1m high). Moreover, several of these species are also found commonly on the ground of open forest – suggesting that canopy specialists may in fact be rare and that species distribution patterns are more complex than previously thought.

Nous avons échantillonné un groupe d'acariens prédateurs en forêt humide d'Australie. Nos résultats démontrent que les 'sols suspendus' dans des fougères épiphytiques (1-21 m) sont habités par une faune d'acariens relativement homogène

et essentiellement distincte de la faune du sol de la forêt pluviale. Toutefois, plusieurs de ces spécialistes arboricoles sont aussi présents dans la litière accumulée sur les roches ou le bois mort. De plus, certaines de ces espèces se trouvent communément dans le sol des forêts claires – ce qui suggère que les spécialistes de la canopée sont en fait rare et que les patrons de distribution des espèces sont plus complexe que prédit.

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Phytophagous mites of Canada

There are approximately 1000 estimated species of plant-feeding mites in Canada. However, only a small fraction of species is described, and the species limits of some pests are still unclear. Our role at the CNC is to revise the families and genera of phytophagous mites such as spider mites (Tetranychidae), false-spider mites (Tenuipalpidae), and gall and rust mites (Eriophyoidea). This includes describing new species, elucidating species limits of significant pests using morphological and molecular tools, and preparing dichotomous keys and computer-based interactive keys to facilitate species identification by other researchers and extension officers.

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Characterisation and expression studies of two lepidopteran farnesyl diphosphate synthase homologs.

Farnesyl diphosphate synthase (FPPS) is a key enzyme in juvenile hormone (JH) biosynthesis. Most insects produce one form of JH, JH III, but the Lepidoptera produce four ethyl-branched derivatives that are expected to require FPPS active site adaptations. We cloned two *Choristoneura fumiferana* FPPS cDNAs for which we found *Bombyx mori* homologs in Genbank. The type-I protein possesses significant active site aa substitutions whereas type-II appears more “conventional”. q-RT-PCR analyses of mRNAs indicated that type-I FPPS transcripts are ubiquitous in *B. mori* tissues whereas those of type-II are confined to the JH-producing glands, with an abundance ~20x that of type-I.

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Effects on insect pests of treatments to induce systemic resistance in canola

Strains of the bacteria *Pseudomonas chlororaphis* and *Bacillus amyloliquifaciens* have been shown to control some fungal diseases of canola through multiple mechanisms. One mechanism is induced systemic resistance, which is initiated by the signalling compound jasmonic acid, and protects plants against multiple pest threats. In 2006, we performed field studies to determine the effects of the two bacteria and of jasmonic acid on insect pests of canola. Foliar applications of the three treatments were made at cotyledon and bloom

stage. Flea beetle damage, and numbers of lygus bugs, aphids, lepidopterous defoliators and root maggots were assessed.

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Landscape level association between trees and ground dwelling beetles

Each species of ground dwelling beetles in the boreal forest perform a specific ecological function and therefore occupy a particular niche in this ecosystem. For subsistence, a population needs to exploit certain habitat resources that are inconsistently available through time and space. Trees, being a major element of the boreal forest habitat, are inducing part of this spatial-temporal resources variation. Consequently, the beetle fauna is expected to reflect at least in part the tree composition. In this study, we are using results obtained from simultaneous assessment of ground beetle and tree communities to extrapolate landscape level patterns in the beetle community.

Jay Biernaskie, Robert J Gegear, Dept. Ecology & Evolutionary Biology, University of Toronto

Bumble bee patch departure: learning the mean patch size

Why do pollinating insects visit so few flowers on mass flowering plants? We performed an experiment with bumble bees foraging in populations of artificial plants. Individual bees experienced either a mixed (M) population of large and small plants (many and few flowers) only; a small population followed by large (S – L); or a large population followed by small (L – S). The mean number of flowers probed on large plants was eventually smaller in the S – L treatment than in the M treatment. Bees' departure threshold on large plants in general, however, seems to depend on prior experience.

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Inhibition of Aphid Transmission of Plum Pox Virus with Foliar Applications of Horticultural Oils.

Laboratory trials with various concentrations of horticultural summer oils (Superior-70 Oil, Stylet Oil, and Spray-Oil 13E) applied to peach, *Prunus persicae*, seedlings demonstrated that foliar applications affected the transmission rates of plum pox virus (PPV) by green peach aphids, *Myzus persicae*. Utilization of a standardized protocol involving timed acquisition feeding periods and known numbers of adult apterous aphids allowed for comparisons across various treatments. Average infection rates from untreated PPV positive source plants to untreated peach seedlings can be as high as 55%. In comparison, infection rates for untreated source plants to treated peach seedlings ranged from 9.7% (1% Superior 70 oil) to as low as 0%. When both source plants and test plants were sprayed with oil, which is comparable to aphid spread within a treated orchard, the infection rate ranged from 0-4.8%. Implementation of various

management practices that reduce the spread of PPV, including the use of summer oil sprays, would contribute to efforts to successfully eradicate or manage PPV in Ontario.

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***Hippodamia convergens* used for biological control: more than meets the eye**

Convergent lady beetles, *Hippodamia convergens* Guérin-Méneville, are collected from overwintering sites in the Sierra Nevada Mountains of California and redistributed for aphid control in home gardens and agroecosystems throughout North America. Billions of beetles are collected and redistributed annually. An examination of beetles from three commercial insectaries revealed a diverse and hidden cargo. What is hitching a ride with these beetles and are there implications for other native and exotic coccinellids where *H. convergens* are released?

Genevieve Boisjoli, Elsa Étilé, Yves Mauffette; Université du Québec à Montréal

Impact de périodes de jeûne sur le fitness de la Livrée des forêts

Les facteurs abiotiques et la disponibilité de la nourriture contraignent les insectes phytophages à espacer leurs périodes d'alimentation. Ce projet a été entrepris afin de vérifier les effets de différentes périodes de jeûne pour *Malacosoma disstria* combinées avec différentes diètes. Les chenilles de stade 4 et 5 ont premièrement été élevées sur différentes diètes de feuillages d'érable et de peuplier. Elles ont ensuite subi différentes périodes de jeûne (12-72hrs) et ont été remis par la suite sur leur diète initiale. Les résultats ont révélé que, pour ce qui est du poids de la chrysalide, le jeûne subi au stade quatre a un impact significativement plus grand qu'au stade cinq.

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Reduced risk insecticides for the control of *Ostrinia nubilalis* Hubner on potato.

The increasing pest status of the European corn borer, *Ostrinia nubilalis* Hubner, on potatoes is generating interest in securing efficient and environmentally friendly control products. The efficacy of two reduced risk insecticides, indoxacarb and novaluron, at controlling eggs and larvae of the European corn borer was investigated and compared to that of spinosad in the laboratory. The project looked more specifically at the LC50, the ovicidal properties and the residual activity of the three insecticides.

Gilles Boiteau, J. Watmough, Y. Leclerc, J.D. Picka; Potato Research Center, Agriculture and Agri-Food Canada, 850 Lincoln Road, Fredericton, New Brunswick, E3B 4Z7, Canada

Renewed potential for the use of crop rotation in the management of the Colorado potato beetle.

The recommendation to rotate present year potato crop away from the previous year's crop is the core element of CPB management programs but its adoption rate has been low

because of the land area requirement. Field research conducted in 2004-2005 confirmed the need to rotate 1.5 km away to prevent colonization but also revealed the existence of a significant reduction and levelling in the number of colonizing beetles between 200 and 700 m from the nearest previous year's potato crop. The demonstration that logistically feasible 200 m rotations are as effective as less realistic 700 m rotations should renew interest in this key control method.

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Enemy-free space and food quality influence the foraging strategy of an insect herbivore.

Enemy-free space is often an important factor determining host use by phytophagous insects. Although this concept is generally applied to shifts among host plant species, enemy-free space can be applied to regions within host plants to describe herbivore feeding. Late-instar yellowheaded spruce sawfly larvae disperse acropetally, from lower to upper crown levels. A manipulative experiment that forced larvae to feed in different crown levels was conducted to determine the role of enemy-free space in the dispersal behaviour of *P. alaskensis*. The upper crown was enemy-free space as both early- and late-instar larvae had lower parasitism than larvae in the lower crown. The influence of enemy-free space, however, changed as larvae aged and moved within the tree crown.

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Pollination in the genus *Eulonchus* (Diptera: Acroceridae): Flower visiting behaviour, pollen loads, and mate detection.

The Diptera family Acroceridae (small-headed flies) is a rarely collected group of spider-parasitic flies, exhibiting highly specialized life histories. Adults are sometimes taken while visiting flowers, and many species have morphological characteristics that suggest a dependence on floral nectar, though little study has been made of their role in pollination. The floral visiting behaviour, abundance, and pollen loads of individuals in the genus *Eulonchus* were studied to determine their pollination abilities. This research revealed that *Eulonchus* individuals are good pollinators from both a behavioural and abundance standpoint, though there appear to be some differences between the sexes due to mating behaviour.

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The lily beetle: a threat to indigenous lilies?

The lily beetle (*Lilioceris lili*) was accidentally introduced into Canada at Montreal in the 1940s and is now an important pest of cultivated lilies. We undertaken a study to determine if this beetle is a threat to natural and managed populations of the indigenous lilies, *Lilium canadense* and *L. philadelphicum*, in Quebec and Ontario. The beetle was frequently found attacking *L. canadense* but never on *L. philadelphicum*. We are currently comparing the developmental times, from newly-emerged larva to adult, on *L. canadense* and *L. philadelphicum* with those on two cultivated Asian lilies, *L. vivaldi* et *L. delight*.

Philippe Boucher¹, Luc Sirois¹, France Dufresne¹, Christian Hébert²; ¹Université du Québec à Rimouski, 300 allée des Ursulines, Rimouski, G5L 3A1; ²Service canadien des forêts, Centre de foresterie des Laurentides, 1055, rue du P.E.P.S., C. P. 10380, succ. Sainte-Foy, Québec (Québec) G1V 4C7

Stratégies de dispersion d'une fourmi en forêt boréale

La stratégie de colonisation des débris ligneux par la fourmi *Leptothorax canadensis* a été caractérisée dans une chronoséquence de feux de 60 ans en forêt boréale. La structure génétique de 62 colonies provenant de 5 populations (494 individus) a été déterminée au moyen de sept locus microsatellites. Les résultats préliminaires indiquent que les nouveaux habitats créés sont colonisés par des fourmis de multiples provenances. Environ 30 ans après feu, les populations sont davantage polygynes, suggérant une saturation de l'habitat et une dispersion par bourgeonnement. Cette fourmi recourt à deux stratégies de dispersion dans un milieu hautement influencé par les incendies.

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Ants' colonisation of woody debris after wildfires

In the boreal forest, wildfires transform living trees in a tremendous amount of woody necromass. Woody debris contributes to habitat heterogeneity and ecosystem diversity. The goal of our project was to investigate ant's colonization of woody debris along a 60-years post-fire chronosequence. Our results indicate that inside 6 years after a fire, woody debris will be colonised by ants. Longhorn holes seem to facilitate early colonization of the small *Leptothorax canadensis*. When enlarging their nest, ant contribute to the fragmentation of woody debris. These results are particularly relevant in the establishment of the role of ants in the wood decomposition.

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Insects and fire-killed trees : an "ignited" couple!

Saproxylic diversity and succession in fire-killed black spruce (*Picea mariana* [Mill.]) coarse woody debris (CWD) in northern Quebec are estimated in this study using a 29-yr postfire chronosequence. Sampling was performed using both trunk-window traps and rearing from snag and log sections. 37 312 arthropods (>220 taxa) were collected from both sampling methods. Abundance and diversity of most initial

colonizing species decline with time since fire with the disappearance of subcortical habitat. No substantial species turnover was noted in snags thereafter. Lack of succession in snags is related to very low decomposition rates for postfire CWD as this substrate is unsuitable for species associated with highly decayed wood.

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A comparison of ground beetle assemblages (Coleoptera: Carabidae) in fields grown under sustainable and conventional farming practices.

Carabid beetles prey on many agricultural pests and play important roles in pest management. The application of compost and the reduction of tillage are sustainable cropping practices that can potentially increase the abundance of these beneficial insects. Carabid beetles were sampled for three years in rotation plots of potato, bean and wheat grown under sustainable and conventional farming practices. Sustainable treatments increased the abundance of carabids but did not influence their diversity or species composition. Crop type played an important role in species composition and interacted with treatments to influence the distribution of certain dominant species.

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Biological control success - holding hands for public good

AAFC has long history of research in biological control. The first weed biocontrol agent released in Canada was against St Johns' Wort in 1951. Since this time there have been more than 70 insects released against over 21 weeds with approx 2/3 establishment rate. Leafy spurge was early target for biocontrol, with the first insect released in 1965 and a total of 14 insects released in Canada. The most successful of these insects has been the root flea beetles in the genus *Aphthona*. Taking an agent from discovery to success is a staged process that includes research on basic biology and species interactions, foreign exploration and host-range screening, efficacy testing, and rearing studies, field release methodologies followed by short and long-term impact assessments. This can be a time consuming process requiring funding and cooperation of multiple stakeholders and governments for a minimum of 10 years. Even after a successful agent is identified, the ultimate success of a biocontrol agent lies with its implementation and integration by users. This area has been the focus of a recent release program for weed biocontrol in Southern Alberta. Factors contributing to the success of the program have been involvement of stakeholders in release site selection, consistency of release methods and the release team, 1 generation follow-up to releases with users, geographic databasing of release information, and feedback from the release program to ongoing research.

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The effects of latitude on spider species diversity north of 60

Spiders (Arachnida: Araneae) are ecologically important arthropods that exhibit high global diversity and are well-represented in northern ecosystems. Areas such as north-western North America, which possess some of the highest rates of endemism, remain largely understudied compared to temperate zones. Spiders were collected in pit-fall traps from early June to mid August 2005 along 500 km of the Dempster Highway in the Yukon to examine effects of this latitudinal gradient on diversity. Over 80 species have been identified, and preliminary results show high diversity along this gradient, with wolf spiders (Lycosidae) well represented at all latitudes. This work will provide a benchmark for biodiversity in the north and can eventually be linked to climate change models.

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Monitoring and modeling terrestrial arthropod biodiversity on the Kenai National Wildlife Refuge, Alaska

Comprising 800,000ha of boreal forest, wetlands, and alpine tundra, the Kenai National Wildlife Refuge has a legislative mandate "to conserve fish and wildlife populations and habitats in their natural diversity," yet, as with Alaska in general, for terrestrial arthropods only scattered checklists are available and data on species distributions exist only as scattered records. To begin to understand terrestrial arthropod diversity on the KENWR and the spatial characteristics of that diversity, we collected 255 sweep net samples as part of a Long Term Ecological Monitoring Program (LTEMP) which inventories and monitors biota on a systematic grid of ~350 permanent points spaced at 5km intervals over the KENWR. By cooperating with the USDA Forest Inventory & Analysis program (FIA) and sampling multiple taxa quickly at each point, We initiated LTEMP in 2004 by sampling breeding landbirds, vegetation, arthropods, and sound on every other point (n = 152) and we sampled the remaining points (n = 103) in 2006. The 2004 sweep net samples yielded over 7,000 invertebrate specimens in 16 orders, at this point mostly sorted to families and genera. The number of orders collected at each point, a crude metric of diversity, has been modeled geostatistically (geoRglm), exhibiting a negative relationship with elevation. As material is sorted to the species level, geostatistical hierarchical models (WinBUGS) will be used to model individual species distributions and species richness in relation to vegetation, disturbance history, and elevation.

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Effet toxicologique du tau-fluvalinate sur le Doryphore, *Leptinotarsa decemlineata* (Say) dans le nord de la France / Toxicological effect of tau-fluvalinate on the Colorado potato beetle, *Leptinotarsa decemlineata* (Say) in the North of France

Le doryphore, *Leptinotarsa decemlineata* (Say), ravageur majeur des cultures de pomme de terre est essentiellement contrôlé par des insecticides. Cependant des phénomènes de résistance aux insecticides sont apparus, notamment en Amérique du Nord. L'objectif du travail a été d'étudier les variations de sensibilité vis-à-vis du tau-fluvalinate (1) entre trois populations de Picardie, première région française productrice de pomme de terre, (2) au sein d'une population en fonction du sexe, du poids et du jeûne. Les résultats montrent que la sensibilité à cet insecticide varie entre les populations et dépend du poids et du jeûne au sein de la population étudiée.

Colorado Potato Beetle (CPB), *Leptinotarsa decemlineata* (Say), a significant defoliator of potato crop, is mainly managed by the use of chemical pesticides. A rapid development of resistance to near all insecticides used against this pest occurred, particularly in North America. The aim of our toxicological study was to examine the relative susceptibility to tau-fluvalinate (1) between three populations of CPB from Picardie, the main french potato producing region, and (2) within one population for the effect of sex, weight and starvation. Results showed susceptibility to this insecticide varied between populations and depended on insect weight and starvation within the population.

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A Protocol for Estimating the Cost-Effectiveness of Exhibit Butterflies Based on Mark-Recapture Lifespan Estimates, Behaviour and Cost

Most live butterfly exhibitors purchase pupae of various species based only on colour patterns and prices. Exhibitors would benefit from knowing which species are more cost-effective. We developed cost-effectiveness estimates for 29 commonly imported species based on longevity (from mark-recapture analyses), suitable behaviour, and pupal cost. These indices provide a tool that enables exhibitors to customize their butterfly imports and purchase species that give them better returns on their investment.

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Impact of Predators on Soybean Aphid in Ontario

The soybean aphid, *Aphis glycines* Matsumura, a native of eastern Asia, has become an important pest of soybean in central and eastern North America. To assess the role of existing natural enemy communities in Ontario, field cage trials were undertaken. Results to date indicate that multicoloured Asian ladybird beetle (ALB) appears to be the most effective of the predators tested, including other

ladybird beetle species. There is a buildup phase in which ALB populations increase to a threshold after which they dramatically reduce aphid populations and thereafter suppress these. Reduction of aphids by ALB results in significantly higher yields.

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Conservation and genetics of the Peace River grassland butterflies

The Peace River grasslands of northern Alberta and British Columbia contain a number of butterfly species that have been isolated by historic climate change. Unfortunately, these populations may be at risk, as much of their native habitat has agriculturally converted. Mitochondrial DNA was analysed to assess overall divergence in these isolated populations. In addition, MtDNA was examined in a number of butterfly species with continuous (i.e. non-disjunct) ranges in to ensure that variation in Peace River endemics is the result of isolation, and not purely distance. This technique may prove useful in assessing genetic endemism in other disjunct animals.

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Changes in the feeding behavior of *Myzus persicae* and *Macrosiphum euphorbiae* on previously infested potato plants / Changement du comportement de prise alimentaire de *Myzus persicae* et *Macrosiphum euphorbiae* sur des plantes de pommes de terre pré-infestées

Sixteen parameters related to the feeding behavior of the aphids *Myzus persicae* and *Macrosiphum euphorbiae* were measured with Electrical Penetration Graph technique on conspecific or heterospecific preinfested plants (*Solanum tuberosum*). For both aphid species, preinfestation by *M. euphorbiae* led to the modification of parameters related to phloem sap ingestion. A 50% reduction of total phloem sap ingestion time was observed. Preinfestation by *M. persicae* led only to a reduction of sap ingestion for conspecific individuals, but had no effects on *M. euphorbiae*'s feeding behavior.

Nous avons mesuré par électropénétrographie seize paramètres du comportement de prise alimentaire des aphides *M. persicae* et *M. euphorbiae* sur des plantes (*Solanum tuberosum*) préalablement infestées par des individus conspécifiques ou hétérospécifiques. Pour les deux espèces étudiées, la pré-infestation par *M. euphorbiae* a entraîné une altération de trois paramètres en rapport avec les phases d'ingestion de sève phloémienne. Ainsi, une réduction de 50% du temps total d'ingestion a été enregistrée. La pré-infestation par *M. persicae* a entraîné également cette réduction d'ingestion de sève pour les individus conspécifiques, mais n'a pas eu de conséquence sur *M. euphorbiae*.

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Monitoring spider diversity in SW Quebec forests: field techniques, taxonomy and three years of data

Long-term biodiversity monitoring requires detailed protocols for collection, accurate species identification, long-term data management and motivated and qualified field assistants. Our laboratory has been monitoring spiders in a series of 10 x 10 m plots located three of McGill University's research forests in SW Quebec. After three years, and with the help of many volunteers, we have documented 14 families and 74 species. To date, Linyphiids are the most diverse family, whereas Dictynids and Lycosids are dominant numerically. Although the data are not immediately suitable for publication, the benefits of long-term arthropod fauna monitoring are numerous, perhaps more importantly for fostering arachnological enthusiasm and expertise.

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Fatal attraction – Trap plants against western flower thrips in greenhouse ornamentals

Flowering chrysanthemums can be used as trap plants (i.e. plants that are more attractive to a pest than the crop) in an IPM program for the control of western flower thrips, *Frankliniella occidentalis*, in potted chrysanthemum in greenhouses. In this study we investigated the influence of trap plants on thrips host plant and oviposition site choice and evaluated the efficacy of trap plants to regulate thrips populations in cage trials and in a commercial greenhouse. In all experiments we compared a control (no trap plants) with untreated trap plants and trap plants that were treated with an insecticide (Spinosad).

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Sample size required to estimate *Cephus cinctus* (Hymenoptera: Cephidae) egg infestation, larval damage and parasitism by *Bracon cephi* (Hymenoptera: Braconidae).

The wheat stem sawfly (*Cephus cinctus*) is the most important insect pest of wheat in the prairies. SAS was used to randomly select from 2 to 50 stems 1000 times from all available sampled stems to estimate egg infestation levels, proportions of stems cut by sawfly, and parasitism rates. The required sample size was strongly and negatively correlated with the population trait. Unlike parasitism levels, the proportion of stems infested with sawfly eggs and larval damage at a given sampling point can be estimated with fewer than 50 stems, particularly at high levels of sawfly populations.

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Electrophysiological and Behavioural Responses of the Spruce Budworm (*Choristoneura fumiferana* (Clem.)) to Various Concentrations of Tannins Observed in Sylvicultural Thinning

The spruce budworm *Choristoneura fumiferana* is an important defoliator of evergreen forests of North America and primarily attacks balsam fir and white spruce. Sylvicultural thinning techniques have been shown to directly affect the success of the spruce budworm by disturbing foliar biochemistry. More specifically, the first year after a selective cut, the remaining trees grow vigorously but experience a decrease in certain defensive compounds, such as monoterpenes and tannins, resulting in trees that are more susceptible to spruce budworm attack. I am combining behavioural and electrophysiological techniques to better understand the relationship between sylvicultural thinning, tannins, and the spruce budworm.

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AAFC's Pest Management Centre: Update on Pesticide Risk Reduction Program and Biopesticide Initiative Activities

The Government of Canada has established the Pest Management Centre (PMC) within the federal agriculture department to house the new Pesticide Risk Reduction and Minor Use Programs. Both programs work jointly with research colleagues within AAFC, and with personnel at the Pest Management Regulatory Agency (PMRA) to facilitate access by Canadian growers to new and enhanced tools for sustainable pest management. The Pesticide Risk Reduction program aims to reduce the risks from pesticides used in agricultural production by working with growers to develop and implement risk reduction strategies. A key element in the implementation of these strategies is increasing the availability of alternative pest management tools and practices which reduce reliance on traditional chemical pesticides. Consultations with growers, researchers, regulators, and other stakeholders has resulted in the development of a "Biopesticides Initiative" to help improve access to novel, low risk pest control products for Canadian growers. Since the fall of 2005, the PMC has been providing support for biopesticides through strategic work with growers, the provision of support in the submission process, and data generation through research trials. Progress in various activities underway within the Pesticide Risk Reduction Program and the Biopesticide Initiative which are of relevance to the Canadian Forum for Biological Control will be discussed.

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Influence of the egg laying period of *Pissodes strobi* on the new brood emergence: Evaluating the consequences of being late.

The white pine weevil feeds and lays eggs in the bark of the terminal shoots of their host conifer trees. It can kill the terminal leader of numerous species but in the eastern part of North America their preferred hosts are the Norway spruce (*Picea abies*) and the white pine (*Pinus strobus*). In this study we ask if the weevil's spring activity match an optimal egg laying period associated with a consecutive optimal larval development. In a Norway spruce plantation and an adjacent white pine plantation, we caged adult weevils on the terminal leaders of the hosts, at three discrete periods: mid-May, mid-June and mid-July. The first period match the usual activity period of the insects. To document host insect relationship, for each caging period we used three types of leaders. First, we caged insect on intact terminal leaders. This allows a complete larval development on a natural growing shoot. Also weevils are caged on cut leaders of two types. One has been harvested in the winter, and the other is cut from healthy trees at the caging period. The winter leader is used as control to evaluate the relative adult performances. The cut leader is equivalent to the natural healthy leader at this period without any active induced defense against the weevil. The total number of oviposition punctures and also the emerging date, the number of emerged adults and their mean weight were evaluated. Bark samples were harvested at each caging period to evaluate the nitrogen content and the relative water content of the natural shoots over the three periods. Preliminary results will be presented.

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Biology of the Bronze Birch Borer (*Agrilus anxius*) (Coleoptera: Buprestidae) in a gradient of industrially disturbed lands near Sudbury, Ontario

Bronze birch borer (*Agrilus anxius*) is a destructive endemic pest of white birch (*Betula papyrifera*). Larvae produce galleries in the sapwood disrupting the transport of water and nutrients. Large populations occur in the stressed trees of the Sudbury area as a result smelter damage. Five hillside sites in a gradient away from the INCO smelter were established. Nine trees were harvested from the top and bottom of each site to survey the abundance of larvae and parasites. Seasonal activity of flying adults and their associated parasites were monitored using sticky band traps.

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Toxic effects of azadirachtin and of simpler epoxy-alcohols on *Galleria mellonella* (Lepidoptera) larvae and on three insect cell lines.

In order to determine the molecular structure in azadirachtin essential for insecticidal activity, we synthesized one epoxy-alcohol and tested it together with two other commercial similar molecules, azadirachtin and a neem formulation first in vivo on *Galleria mellonella* L. larvae. Following the results of these experiments showing a similar anti-insect activity of these molecules which contains these two functional groups and azadirachtin, we tested them in vitro on three insect cell lines. The results allowed us to compare the

in vitro effects of our molecules with those of azadirachtin described in literature. The cytotoxicity of our molecules emphasizes the importance of the structure between the two half moieties of azadirachtin for biological activity. Further studies need to be done especially the synthesis of ramified epoxy-alcohol molecules more complex and less toxic for nontarget organisms but more stable than azadirachtin.

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FACIN, a key player in a new class of essential oil based insecticides

FACIN offers an excellent IPM solution for several crop protection situations whether in the greenhouse, in turf management or with the home owner. FACIN is a biopesticide product based on an essential oil extract from a variety of *Chenopodium ambrosioides* and represents a new class of acaricides and insecticides. It is composed of several compounds with several modes of action thus giving the added bonus of potentially delaying development of resistance. The development and properties of FACIN will be discussed with particular focus on its modes of action, demonstrating how the product and botanical pesticides in general are unique pest management tools.

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Are Two Predators Better than One? Combining a Predatory Mite and a Predatory Bug for Control of Western Flower Thrips on Greenhouse Roses

Intensive insecticide use for western flower thrips (WFT), *Frankliniella occidentalis* (Pergande), is often necessary to meet consumer demands for floricultural crops. Despite the widespread use of insecticides, WFT are still difficult pests to control in part due to their ability to escape contact insecticides by hiding within plant parts and also in part due to widespread resistance. As an alternative to chemical control, we evaluated the use of the predatory bug, *Orius insidiosus* (Say), alone and together with the predatory mite, *Amblyseius degenerans* Berlese, for suppressing WFT on roses. In greenhouse studies simulating commercial production of cut roses, we found that plants protected by releases of predators had fewer WFT than unprotected plants. However, the abundance of WFT was lower among plants protected by predatory bugs alone than among plants protected by both predatory bugs and predatory mites. In laboratory studies, we found that predation of *A. degenerans* by *O. insidiosus* may detract from suppression of WFT within rose flowers. As a result, we do not recommend releases of both predator species for thrips control on cut roses.

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Reproduction, Feeding, and Changing Distribution of Brachycentrid and Hydropsychid Caddisflies (Trichoptera) in the Upper St. Lawrence River

The caddisfly, *Brachycentrus incanus*, forms large mating swarms along a 100-km stretch of the St. Lawrence River. After mating, females carry egg masses in an egg-mass receptacle formed from modified genital sclerites. Larvae feed primarily on diatoms as they develop throughout in deep waters in high-current areas of the main channel, with maximum densities of up to 17,000 per square meter in waters exceeding 10 m in depth. Since zebra mussels invaded the river in the early 1990s, *B. incanus* has decreased in abundance and range, while hydropsychid caddisflies downstream have remained stable or increased. Partially funded by PADI Foundation.

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Phylogenetic analysis of North American *Cybaeus* spp. (Araneae: Cybaeidae) utilizing morphological and molecular characteristics

Cybaeus is the largest genus in the family Cybaeidae and contains some of the most common spider species encountered in the forests of western North America. However, it has been surprisingly understudied from a phylogenetic perspective. Due to a lack of other distinguishing characteristics, identification of members of the genus *Cybaeus* is based almost exclusively on genitalic morphology, the established method used to differentiate spider species. Unpublished systematic work has placed sixty-one North American species of *Cybaeus* (including descriptions of thirty-three new species) into eight species groups. As an independent test of hypothesized *Cybaeus* species group designations and relationships, we will use molecular phylogenetic analysis of a portion of the mitochondrial cytochrome c oxidase I (COI) gene. Genetic data will be drawn from various members of the Holarctic "tetricus" (*C. tetricus*, *C. eutypus*, and *C. morosus*) and "angustiarum" species groups (*C. angustiarum*, *C. signifer*, *C. reticulatus*) as well as from some members of the Nearctic species groups ("adenes", "consocius", "aspenicolens", "septatus", "devius", "tardatus"). Morphological data will be gathered through specimen examinations and from existing data.

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Challenges and Opportunities Presented by An Invasive Alien Species Strategy for Canada

The invasive alien species (IAS) Strategy for Canada was developed under the leadership of Environment Canada, but is the work of many federal and provincial government agencies, with input and advice from a wide range of non-government, environmental and industry contributors.

Officially released in late 2004, the Strategy advocates a collaborative approach to protecting Canadian resources from IAS which focusses on prevention, early detection and rapid response, and increasing education and awareness. In early 2005, the Government of Canada endorsed the Strategy and provided funding to federal partners to initiate implementation of key elements of the Strategy. This support provides opportunities for new partnerships and new ways of approaching the age old problem of introduced species. It challenges government and non-government agencies to seek mutually supportive ways to work together, to be pro-active in preventing new introductions, to be strategic in response to established invaders, to identify priorities in a scientifically sound manner, and effectively reduce the impacts of IAS on natural and cultivated resources in Canada. Initiatives such as the IAS Partnership Program, the PlantProNet and others will be described.

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Investigating the translocation of xenobiotics: from spray droplet to insect target

Aphids are major pests of many agricultural crops, causing damage by transmission of viruses and direct feeding damage. Control of these pests is primarily through the application of insecticides. A desirable property of a novel insecticide is the ability to move systemically within the plant. Since aphids feed in the phloem, transport in this tissue is of major interest. However, the majority of systemic insecticides are xylem mobile. Using wheat (*Triticum aestivum*), the phloem feeding aphid (*Rhopalosiphum padi* L.) and the xylem feeding spittlebug (*Philaenus spumarius* L.) the translocation of several xenobiotics has been characterised, enabling a model to be built relating the physicochemical properties of a xenobiotic to its systemicity.

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Electrophysiological and behavioural responses of spruce budworm

The spruce budworm *Choristoneura fumiferana* (Clem.) (Lepidoptera: Tortricidae) is a major defoliator of coniferous forests in eastern North America. Two types of white spruce were discovered in a forest near the outskirts of Drummondville, Québec, Canada. Certain trees were shown to be completely defoliated by SBW larvae whereas others in close proximity were unaffected. The purpose of this study was to observe the responses of larvae to these two types of trees using both electrophysiological and behavioural techniques in an attempt to understand if the water-soluble components of the needles play a deterrent role.

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European Corn Borer (*Ostrinia nubilalis*) in Potatoes, the not so Final Frontier

The European corn borer (ECB) is an important pest in potatoes. The purpose of this project is to determine an action threshold which would accurately predict the potential for a reduction in tuber yields as a result of an ECB infestation. This work indicates that the action threshold could be raised to at least four egg masses/10 plants from the current two egg masses/10 plants

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Effects of alternative silvicultural practices on litter mite assemblages in Quebec's mixed-wood boreal forest

Alternatives to traditional silvicultural methods attempt to mimic natural forest dynamics and recreate structural complexity through such practices as the retention of live trees, snags and logs. Research has shown that mite assemblages are drastically altered by clearcut harvesting, and these changes may persist for many years; however, partial cut harvest may have less impact on mite assemblages. Litter was sampled for mites in uncut, clearcut, partial cut and prescribed burn sites 8 years after treatment application at the SAFE (sylviculture et aménagement forestiers écosystémique) research station in Quebec's northwestern boreal forest. Preliminary results will be presented.

Emma Despland, Biology Department, Concordia University

Scaling relationships and ontogenetic changes in caterpillar aggregation

Caterpillar growth spans two orders of magnitude and, in colonial species, is often associated with colony break-up. We show that younger caterpillars are less mobile and more responsive to social cues. Second, social cues improve food-finding ability and growth rate, but more so in younger caterpillars. Finally, interference competition occurs in groups of older, larger caterpillars and could provide part of the adaptive explanation for the decrease in aggregation during ontogeny. Simple scaling relationships generate size-dependent selection pressures with respect to aggregation, which imply that caterpillars benefit more from grouping when they are small than they do later in development.

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Ecological and economic impacts of the invasion of western Canada by the cabbage seedpod weevil (*Coleoptera: Curculionidae*)

The European weevil, *Ceutorhynchus obstrictus* (Marshall), recently invaded western Canada and has caused severe economic damage in vast areas of canola (*Brassica* spp.) cropland. Weevil populations were non parasitized for several years immediately following invasion, but at least 12 Chalcidoidea species have evidently switched from their natural hosts to parasitize *C. obstrictus*. Incidence of parasitism increased 50-fold in three years, accompanied by a shift in the dominant species that attack *C. obstrictus*. The

build-up of large parasitoid populations in canola agroecosystems poses risks for endemic weevil species that are native hosts of the parasitoids.

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The diversification of the cardiophorine clade of click beetles (Coleoptera: Elateridae)

Biogeographic evidence and phylogenetic analysis support a Jurassic origin of Cardiophorinae, despite rejection of putative fossil evidence for their origin during that period. Phylogenetic analyses suggest at least two periods of rapid diversification of Elateridae. Subfamilies Hypnoidinae Schwarz (or tribe Hypnoidini of Dendrometrinae) and Negastrinae Nakane and Kishii are both rendered paraphyletic by Cardiophorinae. The status of the two tribes and 35 genera and of higher Cardiophorinae are re-evaluated.

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The effect of flight on the mating behaviour and fecundity of female *Choristoneura conflictana* (Lepidoptera: Tortricidae)

In female insects, energy tradeoffs occur between adult dispersal and reproduction. These tradeoffs may affect female fitness through impacting mating behaviour, fecundity and fertility. The dispersal capability of female large aspen tortrix (*Choristoneura conflictana*) was assessed using computer-linked flight mills. The fecundity and fertility of females that did or did not fly were compared. Mating behaviour was observed to determine the effect of lowered energy reserves on reproduction. The findings from this study have implications for understanding the population dynamics of this important outbreaking forest defoliator.

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Monitoring changes in canopy arthropod populations through time in the western Amazon Basin, Yasuni area, Ecuador

The Amazon Basin contains the largest contiguous tropical rain forest on earth. Each hectare of unconverted rainforest contains up to 3.2×10^{10} individuals of terrestrial arthropods representing some 100,000+ species. Its usable natural resources are important to the peoples and economies of nine countries. Even so, human impact is having disastrous effects, as 15 million hectares of tropical forests are being converted each year to other land uses, mostly monoculture agriculture. Monitoring and mitigating this impact now is of paramount importance immediately to peoples of the Basin and to the rest of us into the future

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Food limitation of ground beetle (Coleoptera: Carabidae) communities in relation to activity, density, and insect mass

A two year study was carried out in 18 forest floor enclosures to examine food limitation in insect communities. Ground

beetles were sampled using pitfall traps in a mark-recapture experiment to determine the relationship between activity, density, and mass. The effects of temperature and habitat complexity on various carabid species was also examined in laboratory mesocosms to account for the varying probability beetles have of being caught in pitfall traps. Using carabids as model species allows for applied ecological questions concerning the relationship between pitfall trap sample and community to be answered along side general ones concerning insect populations.

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Feeding behaviour of a generalist lepidopteran larva on four of its hosts

Forest tent caterpillars (*Malacosoma disstria* Hbn.) can feed on several host plants. Few studies have addressed the behaviour of the insect when feeding on these hosts. The goal of this study was to compare behaviours of FTCs feeding on four plant species: trembling aspen (*Populus tremuloides*); sugar maple (*Acer saccharum*); paper birch (*Betula papyrifera*); red oak (*Quercus rubra* L.). Fifth instar larvae were filmed for 1 hour, in presence of a leaf of one of these hosts. Walking, feeding and resting activities were recorded. Insects in presence of paper birch and aspen behave similarly while those on red oak and sugar maple show a different allocation of time to the different activities.

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Plasticity of male moth response to sex pheromone in the ash leaf cone roller, *Caloptilia fraxinella* (Lepidoptera: Gracillariidae)

Plasticity in male moth response to sex pheromone is dependent on physiological state in *Caloptilia fraxinella*. Pheromone response was tested in wind tunnel and field bioassays when males were reproductively active and in reproductive diapause. Active males had a more fine-tuned response to the most attractive pheromone blend and males in diapause showed a broader response to the wide range of blends tested. Active males responded in a dose-dependent manner but males in diapause did not respond to the lowest pheromone doses tested and showed no difference in attraction to higher doses.

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Les tannins influencent-ils le développement de la tordeuse?

La Tordeuse de la vigne (*Endopiza viteana* Clemens) est un important ravageur des vignobles Nord américains. Les stades larvaires de la deuxième génération se nourrissent des baies et réduisent les récoltes. Des élevages de l'insecte sur des raisins rouges et blancs nous a permis de vérifier l'effet des tannins sur le développement de l'insecte. Des observations préliminaires démontrent que les larves élevées

sur des raisins rouges versus des raisins blancs montrent une différence dans le temps de développement.

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Biodiversity of parasitic wasps (Hymenoptera: Ichneumonidae) in the highest mountains of a tropical island and its Nearctic relatives: are they related?

The Sierra Maestra is the largest and highest Cuban mountain massif. A comprehensive study of the Ichneumonidae wasps (Hymenoptera) shows this is the nation “hotspot” with 161 species -75 % of Cuban figures recorded in just 7 % of the country area. The diversity, distribution -altitudinal range, ecosystem type- and relations with other faunas (Caribbean islands, Central and North America) are discussed. In the highest and coolest mountain tops have subsisted species which are probably Pleistocene relicts, and are evolutionarily related to Nearctic groups, showing a remarkable degree of isolation in these mountain tops which are actually functioning as islands.

Paul Fields, Agriculture and Agri-Food Canada, Cereal Research Centre, 195 Dafoe Rd., Winnipeg, MB, Canada R3T 2M9

Alternatives to methyl bromide fumigations in flour mills. Methyl bromide is a fumigant that is widely used in flour mills in Canada and throughout the world. It is being phased-out because it is an ozone depleting substance. The efficacy of heat, (+50 °C), sulfuryl fluoride, methyl bromide or phosphine combined with carbon dioxide and heat to control pest insects in flour mills was evaluated. All methods reduced red flour beetle (*Tribolium castaneum*) populations within the mill.

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The immune response of the coccinellid *Harmonia axyridis* to parasitism by *Dinocampus coccinellae*

We investigated the response of the immune system of the invasive species *Harmonia axyridis* to parasitism by *Dinocampus coccinellae* (Hymenoptera: Braconidae). Five hemocytes types were identified: plasmatocytes, granular hemocytes I, granular hemocytes II, oenocytoids and spherule cells. Only granular hemocytes II and plasmatocytes were involved in bacteria nodulation and parasitoid eggs encapsulation. After five days, complete encapsulation reached 81.1% of injected Sphadex® beads and 32.7% of parasitoid eggs in *H. axyridis* adults. We observed a decrease in the immune system efficiency when increasing number of parasitoid eggs were laid. The immune system of *H. axyridis* could have favored its escape from internal-developing natural enemies indigenous to North America.

Leah Flaherty, Faculty of Forestry and Environmental management, University of New Brunswick, Fredericton, New Brunswick, E3B 6C2

Opposite effects of plant module size and galler density on gall initiation success

Many studies have attempted to determine the cause of large variation in the distribution, abundance and performance of galls among and within host plants. Here, I evaluate two theories attempting to explain this variation, by conducting a field study in a clonal white spruce plantation. A shoot-galling adelgid was used to evaluate the influence of shoot size and dose of induction stimulus on gall initiation success.

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The residual toxicity of two insecticides on three field populations of *Lygus lineolaris* collected along the St-Lawrence valley in eastern Canada

In eastern Canada, the complex agricultural ecosystem which may be described as a mosaic of farmlands dispersed among natural habitats (i.e. forest, prairies) allow tarnished plant bug adults to fly and move from sprayed to non-sprayed areas. We collected three populations of *L. lineolaris* from three sites located along the St-Lawrence valley, i.e. the Niagara Peninsula (On), Dunham (Qc) and La Pocatière (Qc). Assays were done in the laboratory by confining adults in glass vials coated with dried residues. The LC50 values for the three populations varied from 0.069 to 0.103 g AI litre-1 for azinphos-methyl and from 0.062 to 0.112 g AI litre-1 for cypermethrin, i.e. no tolerance to insecticides.

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Sexual Size Dimorphism in Spiders: Patterns and Processes

We review the patterns of sexual size dimorphism (SSD) in spiders, the terrestrial animal taxon with the largest range of SSD. We show that both magnitude and direction of SSD often depend on the trait used (i.e. prosoma with or body length), and that spiders do not conform to Rensch's Rule, which states that males in related species diverge more in size over evolutionary time than females. We further evaluate current hypotheses for the adaptive significance of SSD in spiders and present new evidence for the gravity hypothesis. We conclude highlighting the difficulties testing the various hypotheses, and discussing research directions for the future.

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Nutrition-related stress carries over to spruce budworm, *Choristoneura fumiferana* (Lepidoptera : Tortricidae), progeny.

Larvae of Spruce budworm, *Choristoneura fumiferana* (Clem.), were reared over several successive generations on two different artificial diets. Laboratory rearing experiments were conducted using high and low quality artificial food to document whether food quality variations could affect budworm progeny. At each generation, offspring from high and low diet quality fed parents were split into two groups and reared using high and low quality food. The following parameters were recorded at each budworm generations: larval survival, pupal weights, development times, fertility and fecundity. Results will be discussed in the context of population dynamics issue.

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Data on the parasitoid complex of *Euproctis chrysorrhoea* (Linnaeus) in a Mediterranean environment.

The Brown-tail Moth, *Euproctis chrysorrhoea* (Linnaeus) (Lepidoptera, Lymantriidae), parasitoid complex was studied during 2003 and 2004 in four areas of the Valencian region (Spain) where the lepidopt fed on the strawberry tree (*Arbutus unedo*). According to the life cycle of the moth, four kinds of parasitoids were considered: egg, gregarious larvae, dispersal larvae and pupal parasitoids, all of them belonging to Hymenoptera. From egg-batches were obtained *Telenomus pinnatus* Kozlov et Kononova (Scelionidae) and *Trichogramma evanescens* Westwood (Trichogrammatidae). From larvae *Dolichogenidea lacteicolor* (Viereck) (Braconidae), *Meteorus versicolor* (Wesmael) (Braconidae), *Pediobius pyrgo* (Walker) (Eulophidae) and *Trichomalopsis peregrina* (Graham) (Pteromalidae). And from pupae emerged *Pimpla rufipes* (Miller) (Ichneumonidae).

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Determination of the population structure of the cabbage looper, *Trichoplusia ni* in greenhouse and field crops as a tool in reducing resistance to the microbial insecticide, *Bacillus thuringiensis*

The Lepidopteran pest, *Trichoplusia ni* shows significant spatiotemporal variation in the level of resistance to the widely used microbial insecticide Bt in fields and greenhouses. The objective of my research is to examine the patterns of genetic variation based on the molecular technique, amplified fragment length polymorphism in *T. ni*. Populations in greenhouses and broccoli fields have been monitored throughout the growing season and genetic patterns will be related to the levels of Bt resistance. Furthermore, I am examining how immigration and the persistence of greenhouse populations between growing

seasons effects the population structure of *T. ni*. Genetic analyses of *T. ni* populations is being conducted and preliminary results will be forthcoming. This study will provide further empirical evidence for processes affecting the population structure of natural populations and allow us to make recommendations to improve current pest management strategies for *T. ni*.

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Impact of aphidophagous predators on natural control of apple aphid populations

The impact of floral management on apple aphid population (*Aphis* spp.) and their predators was evaluated in a young apple orchard composed of apple scab resistant varieties (Liberty and Topaz). Two types of management were tested : (1) a border, and (2) a ground-cover composed of flowering plants. Moreover, the impact of predation was evaluated by comparing control trees with predator excluded trees. The observations were made during the summers of 2005 and 2006. The 2005 results indicate that Liberty trees are more susceptible to aphid infestation than Topaz. The position of the trees within the orchard also influenced aphid densities : trees located at the periphery were more infested than those in the center of the orchard. However, border and ground-cover had no influence on aphid densities. Finally, predators (mainly ladybirds, aphidophagous gall midges and hunting spiders) lower the rate of increase of aphid populations, but do not prevent them to peak at similar densities than when predators are excluded. The 2006 results are currently analysed.

Christopher Friesen¹, Richard Westwood², ¹University of Manitoba; ²University of Winnipeg

Community and Environmental Variables and the Relationship to Pollinator Visitation in the Endangered Western Prairie Fringed Orchid (*Platanthera praeclara*)

Many flowering plants are pollen limited, that is, they would produce more fruit and/or seed if they received more pollen. Causes of pollen limitation in animal-pollinated plants may occur at the community and ecosystem levels. This study examined the effect of plant-insect interactions that may influence the visitation rate of two nectar seeking sphinx moth species to the endangered, pollen-limited western prairie fringed orchid in Manitoba. The abundance of larval host plants and alternate nectar sources were not correlated to visitation rates. Weather conditions did not affect sphinx moth activity. These results suggest that sphinx moth nectar seeking activity is determined by factors which may require manipulative experiments to be understood.

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Pests, Parasitoids, and PCR: A Novel Approach to Evaluating the Host Specificity of Candidate Biocontrol Agents

Lygus plant bugs (Hemiptera: Miridae) are serious pests of many economically important crops. European parasitoids in the genus *Peristenus* (Hymenoptera: Braconidae) are being considered in a biological control program for *Lygus*, and several methods are being used to evaluate their host range prior to introduction into Canada. We provide a comparative assessment of conventional and molecular techniques for evaluating parasitism and parasitoid species composition in host populations. Our results suggest that molecular methods for detecting and identifying *Lygus* parasitoids provide an efficient and accurate alternative to conventional methods for conducting the necessary pre-release ecological host range studies.

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Étude moléculaire de la diversité génétique chez les simulies.

Nous avons étudié la diversité intraspécifique des séquences du gène COII et de l'espaceur 18S-5.8S ADNr chez 3 espèces du genre *Simulium*. Nonobstant de rares mutations individuelles, la séquence de COII ne varie pas chez *S. laciniatum* ; *S. longistylatum* présente par contre un polymorphisme localisé à une position unique; enfin, *S. vittatum* se caractérise par une plus grande diversité individuelle, avec une vingtaine de positions polymorphes, ce qui suggère la présence d'un complexe d'espèces. Excluant les séquences consensus de l'ensemble des simulies, l'espaceur 18S-5.8S possède une séquence (98-115 pb) particulière à chaque espèce, avec des régions à caractère d'ADN microsatellite identifiées dans au moins 2 cas sur 3; les données suggèrent que celui-ci origine de recombinaisons mitotiques intrachromosomiques.

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Notes on the life cycle of a fast growing arctic mayfly, *Baetis bundyae*, with an update of the mayflies of Nunavut

Through a series of northern collecting trips, we have nearly doubled the number of mayfly species known from Nunavut. One of these, *Baetis bundyae*, is one of the most common mayfly species in the eastern Canadian arctic, but can easily be missed in arctic surveys because of an extremely limited life history "window". Unlike most *Baetis*, it lives in both lakes and streams, and in habitats that freeze during winter and dry in late summer. It persists because it overwinters as an egg, then completes development in about 2 weeks, with timing in specific habitats varying with water temperature.

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A retrospective analysis of classical biological control release against cabbage seedpod weevil, *Ceutorhynchus obstrictus*.

Retrospective analyses of classical biological control releases are important tools for assessing the long-term impacts and consequences of deliberate introductions of exotic organisms. An assessment of a classical biological control release made against *C. obstrictus* in British Columbia in 1949 revealed that, despite previous reports to the contrary, 2 of the 3 parasitoids released did not establish. Surveys of sympatric, non-target, weevil hosts were conducted to test the fidelity of the one exotic parasitoid to the target weevil host. A few native parasitoids have adapted to this host, but their impact is usually negligible, and *C. obstrictus* continues to be a serious pest of Brassica seed production in North America.

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Parasite and parasitoid prevalence in wild bumblebees of Massachusetts

The conservation of pollinators is a growing concern, and parasites pose a potential threat to their populations. Bumblebees are important native pollinators, yet little is known about the prevalence and impacts of parasites and parasitoids in their populations. A survey of gut parasites and parasitoids of bumblebees in old-field habitats in Massachusetts showed considerable variation in parasitism rates. Parasitism by Conopid flies varied from 30% to 90%, while incidence of the gut parasite, *Crithidia bomibi* varied from zero to 40%. Such high parasitism rates will likely impact bee population dynamics, and could, in turn, have multitrophic effects on plant reproduction.

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Effets de trois pollinisateurs introduits, de la canneberge cultivée (*Vaccinium macrocarpon* Aiton), sur le poids, le volume, la mise à fruit et le taux de pollinisation des fruits, dans les cannebergères commerciales des Bois-Francs.

La pollinisation des fleurs de canneberge est principalement entomophile. L'introduction de l'Abeille domestique, du Bourdon fébrile et de la Mégachile de la Luzerne, dans cette culture, peut-elle influencer positivement la qualité de la pollinisation? Quel sera l'impact sur le taux de pollinisation, le poids et le volume des fruits, ainsi que sur la mise à fruit? Dans quelle mesure les variations des diverses conditions climatiques (température, radiation solaire, vent, humidité et précipitations) affectent-elles l'activité de butinage de ces trois pollinisateurs? Finalement, y a-t-il de la compétition ou de la complémentarité, entre les pollinisateurs introduits, pour cette ressource? Les résultats seront discutés lors de la présentation.

Marjolaine Giroux, Terry A. Wheeler; Department of Natural Resource Sciences, McGill University, Macdonald Campus, Ste-Anne-de-Bellevue, QC, H9X 3V9

Systematics and phylogeny of the subgenus *Sarcophaga* (*Neobellieria*) Blanchard (Diptera: Sarcophagidae)

Species of the subgenus *Sarcophaga* (*Neobellieria*) are exclusively Nearctic and Neotropical. Their habits are largely unknown but some species cause myiasis in mammals and are also used in forensic entomology. A recent phylogenetic analysis reveals that the subgenus *Neobellieria* is not a monophyletic group and that five of its ten species are more closely related to those of the subgenus *S. (Tolucamyia)* Dodge. With the aim of clarifying the relationships between these two subgenera, a systematic revision, including phylogenetic analysis, has been conducted. Data on biology and biogeography are also discussed.

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Culture-independent characterisation of microbiota isolated from natural populations of sawflies

Sawflies (Hymenoptera: Symphyta) are phytophagous in their larval stages, and a number of species have recently gained attention due to severe defoliation of commercially important tree plantations. Little is presently known about the microbial interactions that occur within sawfly hosts, and an increased knowledge will possibly give a greater understanding of host population dynamics and ecology. In this study, six species of sawfly were collected from locations across Canada and a survey of their associated microbiota undertaken. Total DNA was extracted from individual insects, and PCR used to amplify the conserved 16S ribosomal DNA gene from microbiota. Denaturing gradient gel electrophoresis was undertaken to separate bacterial isolates associated with the host insect. Sequencing of the PCR products revealed a dominance of Alpha- and Gamma-proteobacteria, with the majority of isolates showing high similarity to bacteria previously isolated from other insect species. Interestingly, a species of the endosymbiont *Wolbachia* sp. was isolated from the Mountain Ash Sawfly (*Pristiphora geniculata*). The presence of such influential microbiota species may have substantial impacts on host dynamics and ecology.

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Influence of peat mining and restoration on diversity of Brachycera (Diptera) in ombrotrophic peatlands in southeastern Quebec, Canada

In the St. Lawrence Lowland peatlands, peat extraction is responsible for 63% of disturbance. The effects of restoration or disturbances on terrestrial arthropods are largely unknown. The objectives were to: 1) Compare the species and trophic diversity, and community structure of Brachycera (Diptera) in three sites (restored, natural and abandoned) of three bogs. 2) Establish the relationship between Diptera diversity and environmental variables within the three treatments. The bogs were sampled from June to July 2006 using sweep net, pan traps and a Malaise trap. Brachycera will be identified to species or morphospecies and classified to a trophic group.

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Symbiotes bactériens, stress thermiques et résistance aux parasitoïdes chez le puceron du pois / Symbiotic bacteria, heat stress and pea aphid resistance to parasitoids

Chez le puceron *Acyrtosiphon pisum*, la résistance aux parasitoïdes (incluant son principal agent de lutte biologique *Aphidius ervi*) est une caractéristique clonale impliquant des entérobactéries symbiotiques facultatives, en particulier *Hamiltonella defensa*. Nous examinons l'hypothèse que la thermosensibilité de la résistance aux parasitoïdes, récemment démontrée dans notre laboratoire, dépend de symbiose simple ou multiple ou avec des symbiotes particuliers. Les expériences en cours impliquent la manipulation de la température chez diverses lignées clonales de *A. pisum* et la détermination de leur résistance à *A. ervi* en rapport avec les symbiotes bactériens associés.

Resistance to parasitoids (including its main biological control agent, *Aphidius ervi*) is a clonal characteristic of pea aphid *Acyrtosiphon pisum* that implicates facultative symbiotic bacteria, specifically *Hamiltonella defensa*. We examine the hypothesis that the thermosensibility of parasitoid resistance in pea aphid, recently discovered in our laboratory, depends on simple vs. multiple symbionts. Experiments involve the manipulation of temperature in several *A. pisum* clonal lineages and characterization of their resistance level to *A. ervi* in relation to their associated bacterial symbionts.

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The efficacy of *Tribolium* pheromone traps in flour mills

Insecticide use to control stored-product insects is declining, creating a need for alternative control methods. As part of an integrated pest management program, 30 *Tribolium* pheromone traps were placed in a flour mill. Both *Tribolium confusum* and *Tribolium castaneum* were captured in the traps over a 6-day period. However, these traps have low efficacy. One thousand marked insects were released into the mill but only 1 *T. confusum* was recovered. Few insects released within 60 cm of a trap touched the trap. Behavioural differences between laboratory and mill strains of these two species will also be discussed.

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Mortality factors of the cabbage seedpod weevil, *Ceutorhynchus obstrictus*, in its area of origin

The cabbage seedpod weevil, *Ceutorhynchus obstrictus*, is native to Europe and a serious pest of canola in Canada. There is a critical need to more effectively utilize biological control, as the future availability of insecticides is uncertain. Several hymenopteran parasitoids of cabbage seedpod weevil

are known from Europe. These European parasitoids show the greatest potential for incorporation into an integrated pest management system for cabbage seedpod weevil in North America. To estimate this potential, the actual impact of parasitoids, predators or other mortality factors on cabbage seedpod weevil populations has been analysed in the area of origin.

Allison Henderson, Grasslands National Park, Box 150 Val Marie, SK S0N 2T0

Sexual communication of *Exophthalmus jekelianus* (Coleoptera: Curculionidae) (White) on coffee in Costa Rica.

The Costa Rican weevil, *Exophthalmus jekelianus* is an economically important defoliator of the coffee plant, *Coffea arabica*, in the Turrialba region of Costa Rica. In 2002, strong interest from coffee growers for non-chemical management alternatives prompted pheromone research for *E. jekelianus*. I will present results that provide strong behavioural evidence of a female-produced pheromone. My results also suggest that the *C. arabica* plant itself may play a role in *E. jekelianus* sexual communication.

Allison Henderson, Pat Fargey, Grasslands National Park, Box 150 Val Marie, SK S0N 2T0

Arthropod Conservation in Canada: Recovery Strategy Development for the Mormon Metalmark, *Apodemia mormo*

The Mormon Metalmark, *Apodemia mormo*, is a rare butterfly of arid regions in western North America. It can be found at the northern extent of its range in south-central British Columbia and in Grasslands National Park (GNP) of southwestern Saskatchewan. In 2003, the BC and prairie populations of *A. mormo* were listed as endangered and threatened, respectively, under the Canadian Species at Risk Act. Recovery strategies for both populations are currently being developed. This process requires results of comprehensive research. I will present Parks Canada's approach to monitoring *A. mormo* in GNP and highlight research applicable to recovery strategy development.

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Challenges to Invertebrate Conservation in BC

Invertebrate conservation poses a significant challenge to governments, resource managers and biologists. With examples from British Columbia, this paper identifies ten challenges to invertebrate conservation: 1) lack of proper legislation to effectively protect invertebrate species at risk; 2) forester training and continuing education; 3) knowledge gaps in invertebrate ecology in BC; 4) taxonomic expertise; 5) lack of a centralized information sharing venue in BC; 6) single species versus multi-species and ecosystem approaches to invertebrate conservation; 7) narrow habitat specialists and coextinction; 8) captive rearing; 9) illegal collecting and 10) rapidly changing systems. The paper makes some recommendations to address these challenges in the short term (10 years).

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Diversity and abundance of saproxylic Diptera emerging from coarse woody debris in Abitibi-Témiscamingue, Québec

Diptera comprise the largest proportion of insects reared from decaying wood, yet this group has been largely understudied. In order to assess the diversity and abundance of saproxylic diptera in Quebec's boreal forest, we collected adults from 48 fallen logs using specially constructed emergence tents. Tree species and stage of decomposition were used to evaluate how the quality of wood affects dipteran community composition. We present initial comparisons of Diptera from early and late stages of decay from both White spruce and Aspen.

Pamela Horsley, Natural Resource Sciences, McGill University, Ste Anne de Bellevue, QC, H9X 3V9

Revision of the Mexican and Central American Genus *Trachyphloeomimus* (Coleoptera: Curculionidae, Entiminae)

The genus *Trachyphloeomimus* Champion presently contains 8 species from Mexico and Guatemala. Increased collecting throughout Central America has resulted in the discovery of more than 25 new species extending the distribution of the genus south into El Salvador, Honduras, Nicaragua and northern Costa Rica. Their center of diversity appears to be in the mountains of Mexico. A key to species, along with formal descriptions and photographs, illustrations and line drawings of important characters are presented. A phylogenetic analysis provides insight into the relationships of *Trachyphloeomimus* species and middle-American biogeography. *Trachyphloeomimus* specimens are rare in collections due to their cryptic habits and occurrence in high elevation forests.

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Ground beetle (Coleoptera: Carabidae) abundance and diversity in canola:wheat intercrops.

Increases in the diversity of plant species or cultivars in agroecosystems can limit insect pest pressure, and may also promote beneficial insects such as carabid beetles by providing more diverse microhabitats and more varied prey species. In a field study of the ecology and economics of canola:wheat intercrops, we investigated the response of carabid beetle populations to vegetational diversity. The carabid species assemblage and its response to different intercropping regimes will be discussed.

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Molecular identification of West Nile virus vectors and possibility of cross contamination among sorted mosquito samples

Culex species-specific primers targeting the Internal Transcribed Spacer (ITS) region were designed and used to identify mixed pools of *Culex* mosquitoes and determine the frequency of trap-level cross-contamination. DNA extracts from 118 *Culex* and 51 non-*Culex* mosquito pools, previously positive for West Nile virus, were screened and *Culex* DNA was detected in 5.9% of the non-*Culex* mosquito pools.

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Recovery of Carabid communities to variable retention harvesting.

Ecological stability measures have become common in disturbance ecology. Here we examined the resistance and resilience of Carabid communities 1, 2 and 5 years post-harvest to 5 levels of variable retention harvesting (75%, 50%, 20%, 10% and 2% residual structure) in 4 canopy cover types (deciduous dominated, deciduous dominated with coniferous understory, mixedwood and coniferous dominated) in the boreal mixed wood forest of Northern Alberta. Overall, higher retention treatments (75% and 50%) showed a greater recovery following disturbance. Furthermore, 5 years following disturbance some species showed no signs of recovery and appear to be extirpated in the lower retention treatments.

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Application de *Beauveria bassiana* contre la punaise terne *Lygus lineolaris* dans les vignobles

Des bioessais de deux isolats de *B. bassiana* ont été effectués en laboratoire par la méthode d'immersion contre la punaise terne, *Lygus lineolaris* (Hémiptères: Miridés), un des ravageurs les plus importants en Amérique du Nord.. Les résultats ont montré que les concentrations les plus élevées de ces deux isolats ont causé 100% de mortalité des nymphes et des adultes au 6^e et au 7^e jour suivant le traitement. En vignoble, l'efficacité des deux isolats de *B. bassiana* est maintenue jusqu'au 6^eme jour post-traitement. Le dépistage des plants traités montre qu'il y a une diminution significative du nombre de nymphes vivantes en fonction du temps.

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The evolution of some heteropteran true land bugs

Embryogenesis, characteristics of eggs, morphology of reproductive systems in 65 species from five families in infraorders of Cimicomorpha, and 11 Pentatomomorpha are compared. Embryonic development was monitored by dissection of fresh eggs in isotonic NaCl solution.

Reproductive systems of both sexes were observed in 50% alcohol. Materials were collected in Canada and several palaearctic regions. Phylogram and distribution in several genera like *Elasmucha* and *Sehirus* were found to be primitive and probable outgroups. Various egg shapes in 45 genera were considered to be evolved independently, and along different evolutionary pathways from an ovoid ancestral egg.

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Natural field mortality of the invasive leek moth

A life table study on leek moth, *Acrolepiopsis assectella* (Lepidoptera: Acrolepiidae), in its native European range was conducted over three consecutive summers. Mortality in the leaf-mining larval stages was relatively low whereas the exposed eggs and pupae suffered high mortality due to both biotic and abiotic factors. The point of greatest mortality appeared to be the crucial phase following egg hatch when neonate larvae must first penetrate the leaf surface. A comparison of mortality in caged and uncaged plants revealed a consistent significant impact of natural enemies on leek moth pupae. These results are discussed in light of leek moth control options.

Rob Johns, Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick, E3B 6C2

Intrastree heterogeneity drives the sex-biased foraging behavior of a specialist herbivore

Female eggs of yellowheaded spruce sawfly are oviposited higher in the crown than male eggs and female larvae are almost twice as likely to disperse acropetally, from lower to upper apical shoots, within the crown of black spruce. This is only the second study to demonstrate sex-biased oviposition site selection for a herbivorous insect, and is the first to unambiguously demonstrate the existence and adaptive value of sex-biased larval dispersal.

Rob Johns, Faculty of Forestry and Environmental Management, University of New Brunswick, Fredericton, New Brunswick, E3B 6C2

Ecological processes shaping the foraging behaviors and associated performance of herbivorous insects within tree crowns

Foraging behavior of herbivorous insects is shaped by spatial and temporal heterogeneity in the distribution of suitable resources, microclimate, and enemy-free space. Most studies have focused on heterogeneity among conspecific plants or plant species and do not address increasing evidence that variability within plants, particularly large plants such as trees, can be almost as high as that among plants. I will discuss how such high levels of architectural complexity within host plants, which may be similar to that present in canopies, can influence the suitability of feeding sites and associated foraging behaviors of various insect herbivores.

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Do larvae of Oriental fruit moth and Indianmeal moth produce an aggregation pheromone?

Cocoon-spinning larvae of the codling moth (CM) emit pheromone that provokes aggregation of conspecific larvae seeking a pupation site. We tested the hypothesis that larvae of Oriental fruit moth (OFM) and Indianmeal moth (IMM) exhibit analogous behaviour. In laboratory bioassays, fifth-instar OFM and IMM larvae did not aggregate in response to the presence of cocoon-spinning conspecifics. On the contrary, IMM larvae were repelled by semiochemicals emitted by cocoon-spinning conspecific larvae. Our data do not support the hypothesis that OFM or IMM larvae aggregate prior to pupation, emphasizing that pheromone-mediated aggregation by CM larvae is a rather unique phenomenon.

Jean Pierre Kapongo, Environmental Biology, University of Guelph

Using bumble bees to deliver multiple biocontrol agents for insect pest and disease control

The inoculum (*Beauveria bassiana* + *Clonostachys rosea*) was placed in a dispenser affixed at the exit/entry hole of bumblebee hive. Bees leaving the hive carried the inoculum powder on their body and delivered it on plant parts. 6.24x10¹⁰ conidia of *Beauveria*/g of inoculum was found to be optimal in controlling ca 70% of pests and harmless to pollinator (mortality < 20%). The same concentration added to 1.38x10⁷ conidia of *Clonostachys*/g provided the same control of insect pests and suppressed 56.84 and 46.28% of grey mold respectively on flowers and leaves of tomato, and 58.85 and 46.84% of pepper.

Michael M. Kasumovic, Maydianne C. B. Andrade; Integrative Neuroscience and Behaviour Group, University of Toronto at Scarborough

Male development tracks rapidly shifting sexual versus natural selection pressures

Examining any species with a unimodal distribution of phenotypes demonstrates an astonishing amount of diversity. This phenotypic variation is surprising since strong stabilizing selection should eliminate inferior phenotypes, leading to a decline in overall variation. The maintenance of this variation is usually explained by condition dependence and gene by environment interactions-sub-optimal phenotypes arise due to differences in resource acquisition in variable environments. However, these theories perpetuate the ideal of a single optimal phenotype. Here we challenge this conclusion by showing that various competitive contexts favour different phenotypes. Male Australian redback spiders (*Latrodectus hasselti*) have evolved to assess local pheromonal cues of conspecific density, allowing males to determine the intensity of direct versus scramble competition and to respond by developing the appropriate phenotype. Males matured significantly smaller and faster when reared in high female density when scramble competition was important, and matured larger and in better condition in low female and high male density when the potential for competition was greater. When testing phenotypes within

their developmental context, each phenotype performed optimally in the selective environment in which it was reared. Linear selection gradients confirm the reversal from positive selection on size and body condition under direct competition to positive selection on development time, and thus, negative selection on size under scramble competition. This highlights the importance of context-specific tests of fitness and calls into question the assumed global fitness value of size and other competitive male traits. Our results contradict the common emphasis on the importance of heritable variation in the ability of individuals to acquire resources sufficient to reach some optimum trait value. We therefore propose that male phenotypes alone are not good indicators of male fitness, and quality should instead be measured as the ability to develop tactically in response to cues of environmental and selective heterogeneity.

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The performance of herbivorous insect species on a cadmium-tolerant crucifer.

Phytoremediation has been proposed for the elimination of toxic metals in soil, yet little attention has been given to the performance of insects that feed on plants tolerant of these contaminants. Using cadmium-tolerant *Brassica juncea* and the green peach aphid and the cabbage looper as herbivores we tested the hypotheses that (i) neither herbivore would differentiate between control and cadmium-containing plants with respect to oviposition/larviposition, and (ii) due to the localisation of cadmium, chewing insects would be negatively affected while sucking insects would not. The results of the experiments and the implications of these findings for bioremediation will be discussed.

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Aleocharine rove beetles of Canada and Alaska – rapid progress in our knowledge (Coleoptera, Staphylinidae)

The rapidly evolving knowledge on the poorly known aleocharine rove beetles of Canada and Alaska is presented. Methods of studying these beetles are discussed and illustrated. Aleocharines represent one of the largest and taxonomically the most difficult lineages of staphylinid beetles. In the world fauna, it includes some 52 tribes, over 1,000 nominal genera and over 12,000 described species. In Canada and Alaska, we report 387 valid species (351 synonyms), classified in 92 genera and 14 tribes. We suspect that there are more species in Canada and Alaska to be discovered. Currently, some genera and species still need revision, particularly those in the large tribe Athetini.

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Community structure of Nearctic treehole and container breeding mosquitoes (Diptera: Culicidae)

Since *Ochlerotatus japonicus* was discovered in Niagara in 2001, this mosquito has expanded its range into most of Southern Ontario and is spreading northward. This invasive, diurnal mosquito is capable of vectoring West Nile virus and other diseases, which make studying its habitat and interactions with other species of importance. Sampling eggs and larvae in artificial containers and phytotelmata will provide confirmation of its distribution as well as associated species with which competition may be occurring. Invasive potential (and possibly disease transmission) could largely depend on competition with native mosquitoes. Experiments to determine if competitive displacement is possible are planned.

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A Taxonomic Revision of the New World Fauna of *Mesembrina* Meigen (Diptera: Muscidae) with Description of the first Neotropical Species

Little is known of the muscid genus *Mesembrina* and taxonomic information on the New World fauna is especially scarce. Consequently, the Nearctic species have been revised and the first Neotropical species described. The Nearctic *Mesembrina solitaria* (Knab) was found to be a new junior synonym of the Palaearctic *Mesembrina decipiens* Loew, resulting in the first confirmed Holarctic distribution for a species of the genus. Additional evidence supporting the synonymy of *Mesembrina alascensis* (Townsend) with *Mesembrina latreillii* R.-D. is also presented. To place the New World fauna in context, a key to the twelve world species of *Mesembrina* has been written.

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Bt corn and seed-applied insecticides in the management of the black cutworm (*Agrotis ipsilon* (Hufnagel))

Transgenic corn hybrids expressing the Cry1F Bt toxin and seeds treated with the neonicotinoid insecticide clothianidin were evaluated for efficacy in black cutworm management. Clothianidin applied to Cry1F Bt corn reduced larval weight gain and seedling injury due to cutworms. In contrast, weight of black cutworm larvae increased when they were fed on non-Bt corn seedlings treated with clothianidin, suggesting phagostimulation, compensatory overconsumption or a hormetic response in the insect.

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***Wolbachia* in wasps parasitic on filth flies (Diptera: Muscidae) with emphasis on *Spalangia cameroni* (Hymenoptera: Pteromalidae)**

Wolbachia bacteria were detected in 15 of 21 species of wasps parasitic on house fly, *Musca domestica*. Lab studies showed infections in the wasp, *Spalangia cameroni* (Pteromalidae), to cause female-mortality type cytoplasmic incompatibility. Further, developmental times of progeny were increased when the paternal parent was infected with *Wolbachia*, regardless of whether the maternal parent was infected or whether offspring developed from fertilized eggs. We speculate that *Wolbachia* may alter components of the male host's seminal fluid, which then affects the development of offspring from inseminated females. If so, this would identify a previously unsuspected effect of *Wolbachia* on host populations.

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La prédation intraguilde par la coccinelle asiatique *Harmonia axyridis* peut-elle expliquer son succès d'invasion? / Is invasive success of the multicolored Asian ladybeetle *Harmonia axyridis* explained by intraguilde predation?

La coccinelle asiatique *Harmonia axyridis* est une espèce envahissante au Québec depuis 1994. Depuis son introduction aux États-Unis, elle a eu un impact sur la présence et l'abondance d'autres insectes. L'objectif de cette étude était de mesurer les interactions de cette coccinelle envahissante avec une coccinelle indigène *Coleomegilla maculata* et une coccinelle exotique, *Propylea quatuordecimpunctata*. La coccinelle asiatique s'est montrée un grand prédateur de ces deux espèces.

Some negative impacts on abundance and presence of other insects have been observed since the introduction of the multicolored Asian ladybeetle *Harmonia axyridis* as a biological control agent in United States. The objective of this study was to measure strength of intraguilde predation of this species on all stages of the indigenous ladybeetle *Coleomegilla maculata* and another invasive ladybeetle, *Propylea quatuordecimpunctata* in order to explain its invasive success in Quebec province (Canada). The multicolored Asian ladybeetle has shown to be a great predator of these two species, while it was also vulnerable to some extent to predation.

David Lagacé, Department of Biology, University of Western Ontario, London, ON, Canada

Ecophysiology of monarch butterfly spring migration

Migratory insects emigrate as sexually immature adults when habitat quality is unsuitable for reproduction. However, both reproduction and migration require juvenile hormone (JH), with high titers resulting in sexual maturation while low ones cause migratory flight. The fall migration of the monarch conforms to this general model but little is known about the spring flight. I investigated JH biosynthesis and reproductive physiology of field collected monarchs throughout the summer, as well those reared under long (16L:8D) and short (12L:12D) day conditions. Regardless of daylength there is a pre-reproductive period of at least a week. The importance of this period in the stepwise northward migration will be discussed.

Robert Laird, Department of Biological Sciences, University of Calgary, Calgary, AB T2N 1N4

The diversity of indirect effects between soil fungi and insects

Mycorrhizal fungi form mutualistic relationships with the roots of most plants, exchanging soil nutrients for photosynthates. As a result, these fungi can change their host plant's quality from the perspective of insect herbivores and mutualists. I will discuss the diversity of mycorrhizal fungi-insect indirect interactions, focusing on the effects of mycorrhizal fungi on a specialist-feeding leaf beetle, a generalist-feeding moth and a mutualistic ant.

Robert Lamb and Patricia A. MacKay, Department of Entomology, University of Manitoba

Persistence and stability, at four spatial scales, for populations of an aphid on its native host plant

Over 6 to 11 years, five natural populations of an aphid failed to persist at the levels of colony or plant patch, but persisted at the level of population and region. Like crop aphids, its population density fluctuated markedly from year to year, but with regionally coordinated fluctuations and consistent differences among local populations. Neither persistence nor stability varied consistently with the average density of populations.

David Langor, James Hammond, Greg Pohl; Natural Resources Canada, Canadian Forest Service, 5320 - 122 Street, Edmonton, Canada, T6H 3S5

Ecological land classification as a surrogate for arthropod biodiversity

Utilization of arthropods as ecological indicators, and their incorporation in biomonitoring, is hampered by limited ecological knowledge for detecting human-caused changes in abundance and distribution of taxa. This poses a challenge for 'fine-filter' approaches to arthropod conservation in managed forests. Arthropod conservation objectives may be better incorporated into operational forest planning using a 'coarse-filter' approach. We examined the utility of the Canadian Forest Ecosystem Classification (FEC) as an ecological surrogate for epigeic arthropod assemblages. Assemblages were characterized in 15 ecosites in Upper Cordilleran forests. Congruence of ecosite classification with arthropod assemblage structure suggests that the FEC may be used as a biodiversity conservation tool.

David Langor and Laura DeHaas; Natural Resources Canada, Canadian Forest Service, 5320 - 122 Street, Edmonton, Canada, T6H 3S5

Diversity of non-native terrestrial arthropods in Canada

Through examination of literature records and in discussion with taxonomists we have compiled a list of over 1850 species of non-native terrestrial arthropod species in Canada. Most species are Coleoptera (607 spp.), Hemiptera (405) and Hymenoptera (338), and phytophagy is the dominant trophic role represented. Europe is the source of the vast majority of species, and British Columbia, Ontario, Quebec and Nova Scotia are the major ports of entry. We examine in detail the ca. 350 species on trees in terms of host affiliations, geographic distribution and spread, and rate and mode of entry.

Maxim Larrivée, Christopher Buddle, Department of Natural Resource Sciences, McGill University, Macdonald Campus, 21,111 Lakeshore Rd, Ste Anne de Bellevue, QC, H9X 3V9

Diversity patterns at multiple spatial scales of canopy spiders found on sugar maple and American beech in hardwood forests.

Canopy arthropods play many functional roles as predators, pollinators, detritivores, defoliators, and wood borers in forest ecosystems, and they are recognized as essential components of ecosystems. Understanding how arthropod diversity is distributed in space within ecosystems is essential to infer on the processes that govern their diversity. As such, we set out to characterize and compare the diversity patterns of canopy and spiders on sugar maple (*Acer saccharum* Marsh) and *Fagus grandifolia* Ehrh. Following a hierarchically nested design in space, spiders were sampled in the canopy of 45 sugar maple and 45 American beech. Sampling in the canopies was done with a mobile aerial lift platform. The canopy of 3 individuals (1st scale) of each tree species were sampled by beating the foliage in maple-beech stands (2nd scale) replicated 5 times in 3 sugar maple forests (3rd scale) found within the greater Montréal region (4th scale). Preliminary results and future analyses of the diversity (richness and relative abundance) of canopy spiders are discussed.

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Blackfly phylogeny through DNA sequencing? A critical study.

We have evaluated the usefulness of the COII gene and of the 18S-5.8S rDNA spacer (ITS-1) as phylogenetic markers within 3 genera of blackflies (*Twinnia*, *Cnephia* and *Simulium*). The COII protein sequence varies too little to allow unambiguous phylogenetic inferences, while, at the DNA level, the 3rd codon position undergoes mutation saturation. This leaves too little usable information and, accordingly, much more protein sequence data will be required to construct a convincing phylogeny. ITS-1 sequencing has revealed 8 consensus blocks, possibly pre-rRNA maturation signals, interspersed among species-variable sequences; for some species, those sequences appear as microsatellite DNA, which explains the length variability reported by a few authors. The total length of ITS-1, 98-115 bp for most species, occasionally reaches > 400 bp due to the central insertion of highly repetitive DNA.

Tanya Latty, Department of Biological Sciences, University of Calgary, 2500 University Drive, NW, Calgary, AB, T2N 1N4

Changes in mate choice with age and mating history in *Tenebrio molitor*

An experiment was conducted to examine changes in female and male mate choice and assessment time with age and mating history. Individuals were given a choice between high and low quality partners at ages 10, 20 and 30 days. Individuals were also exposed to one of three mating treatments: no mating, medium mating and high mating frequency. Young females spent greater amounts of time examining prospective mates than did older females. Males

were choosy when virgin, but became less choosy once mated. The amount of time males spent assessing females was influenced by an interaction between mating history and age.

Tanya Latty, Mary Reid, Department of Biological Sciences, University of Calgary, 2500 University Drive, NW, Calgary, AB

Aggregation in the Mountain pine beetle: does it pay to be first?

The mountain pine beetle (*Dendroctonus ponderosae* Hopkins) relies on mass attack to overcome the defences of host trees. The first beetle to attack a tree is known as the pioneer and suffers higher mortality than individuals that join established aggregations. Field experiments were conducted to determine if the order in which individuals joined aggregations affected reproductive success and beetle survivorship. Pioneers were found to produce less offspring than later arriving beetles. However, beetles that colonised trees early in the season (regardless of order on the tree) produced more offspring than those that arrived late in the season.

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Species diversity, distribution and abundance of xylem fluid feeding Hemiptera in Texas vineyards

Pierce's disease of grapevine is caused by the bacterium *Xylella fastidiosa*. This disease has become the most limiting factor to grape production in most counties across Texas. During the past decade and a half, California experienced severe epidemics of the same disease. Pierce's disease of grapevine is transmitted by insects in the Hemiptera. These acquire the bacterium when feeding on xylem fluid of infected plants. The disease and some of its most common vectors are native to the southeastern United States. Their identity, biology and behavior are not yet well understood. A multi-disciplinary, multi-institutional research program was initiated to study the disease and develop management alternatives. Intensive studies are taking place in Texas to identify the vectors, their vectoring capacity, reproductive habits, interactions with host plants and mobility through time, among others. Results of 3 years of sampling characterizing species diversity, distribution and seasonal abundance are to be presented.

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Kaolin Clay, a New Approach to Control the Striped Cucumber Beetle (*Acalymma vittatum*). / Le kaolin, un nouvel outil de lutte contre la chrysomèle rayée du concombre (*Acalymma vittatum*).

The striped cucumber beetle (*Acalymma vittatum*) is the main pest of cucurbits in eastern Canada. Beetles attack the plant's foliage, flowers and fruit and transmit bacterial wilt (*Erwinia tracheiphila*). Kaolin clay (Surround@WP) was tested as an alternative control measure to synthetic insecticides. The clay forms a white coating on the leaves which acts as repellent and prevents feeding damage and bacteria transmission. Our study shows that kaolin treated plants had a reduction in beetle density, foliage damage and bacterial wilt during the earliest stages of cucumber growth compared with untreated plants. In addition, marketable yield was higher in the kaolin treatment than in the control. Kaolin clay may be suitable for inclusion in an Integrated Pest Management program for cucurbit crops.

Jonathan Leggo, Faculty of Forestry and Environmental Management University of New Brunswick

Tradeoffs in allocation of resources to foliage or wood growth following defoliation of black spruce, white spruce, and balsam fir

Defoliation of conifers by insect pests affects resource distribution within the tree the following year. For example, trade-offs often exist between allocation of resources to foliage versus wood growth following defoliation. The extent of this trade-off may vary among conifer species, depending on their evolutionary association with insect pests. In 2005, gypsy moth and spruce budworm were caged independently on mid-crown branches of young, open-grown black spruce, white spruce, and balsam fir to assess the impact of defoliating insects on foliage versus wood growth in 2006. Results will be presented and compared to predictions based on contemporary plant – herbivore theory.

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Vegetation structure and invertebrate diversity in agriculture: a look at ground beetles (Family: Carabidae) in hayfields.

Realization of the negative impact industrialized agriculture imposes on global biodiversity has resulted in increased research on species diversity in agro-ecosystems. However, such research conducted at a small scale (within or between fields) tends to compare invertebrate and vegetation diversity without accounting for the influence of vegetation structure. As part of a larger study in Annapolis County, Nova Scotia, the influence of hayfield vegetation on ground beetles (Family: Carabidae) was examined in 2006. Ground beetle diversity was compared to both vegetation structure and plant species diversity.

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Determining the supercooling point of the blueberry maggot (*Rhagoletis mendax* Curran) from Quebec and Nova Scotia.

The blueberry maggot is actually expanding his geographical distribution northward. To determine the ability of pupae to survive at low temperatures, the supercooling points of pupae from Québec and Nova Scotia were assessed. Soil

temperatures at 3 cm deep were monitored for 3 years in several regions of Québec. The supercooling points were much lower than the mean soil temperatures experienced throughout winter. *Rhagoletis mendax* pupae should be able to overwinter successfully in most areas where lowbush blueberries are found in Québec. A contributing factor to their survival is snow cover.

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Pommes de terres sauvages résistantes aux pucerons : antixénose ou antibiose?

Resistance against the aphids *Myzus persicae* and *Macrosiphum euphorbiae* was characterized for two wild potato species, *Solanum chomatophilum* and *S. stoloniferum*, with behavioural (olfactometry and electrical penetration graph) and physiological studies. *S. stoloniferum* expresses antixenosis against both aphid species unrelated to leaf age. *S. chomatophilum* shows antixenosis against *M. persicae*. In contrast, resistance against *M. euphorbiae* is related to antibiosis and is only expressed in mature leaves.

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Ecological impact of invasive insects on forest ecosystems.

Alien pests are expected to be a dominant future influence in the world's forest ecosystems. The likely impacts of these invaders must include their role in altering long-term forest succession processes. Although some invaders cause spectacular short-term impacts (e.g., high tree mortality), if these effects mimic disturbances caused by pre-existing, natural disturbances then their effect on long-term patterns of forest dynamics may be minimal. In contrast, other alien species may induce unprecedented changes to forest ecosystems, and these impacts may destabilize natural cycles of forest dynamics, ultimately leading to drastic changes in ecosystem properties and services. The varying roles played by alien invaders, using examples from eastern North America, are illustrated.

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Parental conflict over kin recognition in *Aleochara bilineata* larvae

Female *Aleochara bilineata* lays their eggs in aggregates in the soil and the solitary larva has to search for and parasitize a Diptera pupa. Competition between sibs thus occurs. When larvae have a choice between hosts parasitized either by a kin or a non-related larva, they superparasitize preferentially the host containing the non-related larva. Although *A. bilineata* larvae are able to recognise their full sibs, paternal half siblings and paternal cousins, they fail to recognize their maternal cousins. We propose that the genes allowing kin recognition between *A. bilineata* larvae are silenced when maternally inherited, whereas they are expressed through paternally inherited genes.

Owen Lonsdale, Stephen A. Marshall, Insect Systematics Lab, Department of Environmental Biology University of Guelph, Guelph, ON, N1G 2W1

Deciphering the Past: Reconstructing the Phylogeny of the Clusiidae (Diptera) Using Multiple (and Sometimes Conflicting) Data Sets

The Clusiidae is a diverse family with many unusual and rare representatives, demanding multiple data sets for evolutionary reconstruction. Traditional techniques have been very useful, but because the family includes so many externally similar species, it has been necessary to employ evidence from genitalic, behavioural, and molecular (including COI, COII, 28S and CAD sequences) data sets. This talk will outline our efforts to use various methods of analysis to reconstruct the evolutionary history of the family from these disjunct sources.

Judy Loo, Natural Resources Canada, Canadian Forest Service, P.O. Box 4000, Fredericton, NB, Canada, E3B 5P7

Ecological impact of invasive fungi on forest ecosystems.

Invasive alien fungi have affected North American forests significantly, although little research has focused on the ecological effects of such invasions. Invasive alien fungi are responsible for the functional loss of several tree species from natural ecosystems. American chestnut, which commonly comprised ca. 25% of mixed stands throughout its natural range, was devastated by the introduction of the pathogen *Cryphonectria parasitica* from Asia. White elm, American beech, butternut, and several soft pines continue to decline across their native ranges due to invasive alien fungi. I review the ecological effects of fungal invasions on trees, illustrated by two case studies on hardwood species in eastern Canada.

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Host Plant Associations for *Anagrus* Parasitoids of leafhoppers in the Okanagan Valley, BC.

The Virginia creeper leafhopper, *Erythroneura ziczac*, and the western grape leafhopper, *E. elegantula*, are major pests of grapes in the interior of BC. The most important biological control agents of leafhoppers are *Anagrus* egg parasitoids (Hymenoptera: Mymaridae). While the leafhoppers overwinter as adults, *Anagrus* overwinter as partly grown larvae within the eggs of alternate leafhopper hosts on woody plants. The availability of suitable winter and spring hosts plays an important role in the biology of *Anagrus* parasitoids and their ability to control leafhopper populations. Mainly

four species of *Anagrus*, including *A. atomus* (L.), *A. avalae* Soyka, *A. daanei* Triapitsyn, and *A. erythroneurae* Triapitsyn and Chiappini, were collected from dormant host plants and from summer hosts in the Okanagan Valley. Largest numbers were collected from roses, blackberry, and other members of the Family Rosaceae. Plants in the mint family (Labiatae) were important hosts for several species, with lavender and garden sage acting as both summer and overwintering host plant for some species. Methods to enhance parasitism and the possibility of introducing other *Anagrus* species that do not presently occur in BC are discussed. This study contributes to our knowledge of the biology of these important natural regulators of leafhoppers infesting grapes, tree fruits, and other crops in south central BC.

Brian O. Ma, Bernard D. Roitberg. Department of Biological Sciences, Simon Fraser University, Burnaby, B.C. V5C 2Y5

The impact of sugar availability on the foraging behaviour of *Anopheles gambiae* s.s. (Diptera: Culicidae) mosquitoes of different energetic condition and bloodmeal status

We use an olfactometer to offer females of differing energetic condition and varying bloodmeal sizes a choice between proxies of floral nectaries and humans. Results thus far indicate that newly emerged females will choose sugar over blood when available, but as their energetic condition improves their preference may shift from sugar to human stimuli. We speculate on the role sugar may have on the vectorial capacity of these mosquitoes.

Kenna MacKenzie, Beata Lees, Debra Moreau; Agriculture and Agri-Food Canada, 32 Main Street, Kentville, NS B4N 1J5

Managing root weevils in strawberry with entomophagous nematodes

Management options for root weevils, a serious problem for strawberry growers in Eastern Canada, are limited. This study was set up to examine the usefulness of entomophagous nematodes which have been used successfully to control root weevils in other cropping systems. Three mature strawberry fields with root weevil infestations in Nova Scotia were used. *Heterorhabditis bacteriophora* (Larvanem, Koppert Biologicals) were applied to part of the fields by the cooperating growers in September 2005. The nematodes, determined using wax moth larvae as baits, survived the winter. Root weevil numbers were reduced in all three fields from pre-spray to spring 2005 samples. This suggests entomophagous nematodes could have a role in preventing root weevil damage in strawberry fields.

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Impact of mountain pine beetle, *Dendroctonus ponderosae* Hopkins, in young stands

Of the 14.9 million ha of pine in British Columbia, there are 1.96 million ha of young pine between the ages 20-55 years. Young or small diameter pine is often a "sink" for mountain pine beetles, *Dendroctonus ponderosae* Hopkins, during the decline of outbreaks. As the current outbreak in B.C. peaks

an unprecedented number of young stands are impacted by the beetle. The highest levels of attack are in stands over age 40, yet stands as young as 20 years are sustaining high mortality. Stands at the core of the outbreak and within mixed species stands seem equally at risk.

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Release and possible establishment of *Lathrolestes luteolator* as a biological control agent of Ambermarked birch leafminer (*Profenusa thomsoni*) in Alaska

We report on efforts to import the parasitoid, *Lathrolestes luteolator* to control an outbreak of *Profenusa thomsoni* impacting birch in SE Alaska. Six-hundred thirty-three (246F:387M) adult parasitoids have been released at two sites in Anchorage, AK since 2004. Parasitoids were obtained by rearing parasitized sawfly larvae and live collecting adults from sites in the Northwest Territories and Alberta. In early August 2006 we observed adults morphologically similar to *L. luteolator* and collected parasitized *P. thomsoni* larvae at the first release site, suggesting *L. luteolator* has successfully established. This project marks the first attempt at arthropod biological control in Alaska.

Chris MacQuarrie¹, D Langor², J Spence¹, ¹University of Alberta, Department of Renewable Resources, Edmonton, AB, Canada; ²Canadian Forest Service, Northern Forestry Centre, Edmonton, AB, Canada

Mortality factors influencing a newly established invasive species – *Profenusa thomsoni* in Alaska

Life tables are commonly used to determine stage-specific factors influencing insect populations. When applied to invasive species, these data can help predict ecosystem effects, influence management, and suggest tactics for dealing with new invasions. We determined most mortality of recently established populations of *Profenusa thomsoni* occurs to eggs and early instars from parasitism, intra-specific competition and undetermined causes. However, starvation was associated with most late instar mortality as larvae become trapped in mined-out leaves. A decreased incidence of parasitism and inter-specific competition compared to other populations may explain the rapid expansion of this species since its introduction to Alaska in the late 1990's

Brian Mader, Concordia University, 7141 Sherbrooke St W., Montréal, QC, H4B 1R6

Electrophysiological and behavioural responses of spruce budworm larvae *Choristoneura fumiferana* (Clem.) to the hydrophobic components of white spruce (*Picea glauca*).

In a recent study of the feeding behaviour of sixth-instar spruce budworm *Choristoneura fumiferana* (Clem.) (Lepidoptera: Tortricidae), it was suggested that surface chemicals might play a role in the initial feeding responses of larvae. The purpose of the present study is to examine whether stimulants and deterrents are indeed present in the

epicuticular waxes of white spruce needles using both electrophysiological and behavioural techniques.

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Diversity in male parasitoids' reproductive strategies

To maximize their fitness, male insects should not necessarily inseminate as many females as possible but rather should optimize both the number of females inseminated and the quantity of sperm transferred by female. Several life-history traits influence the reproductive strategies available to males. In *Trichogramma turkestanica*, a hymenoptera egg parasitoid, males are prospermatogenic and can become sperm depleted. Their reproductive strategies is then adapted to that specific situation.

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Avoiding conflicts between insect and weed biological control: selecting non-target species for host specificity testing of cabbage seedpod weevil parasitoids

Potential conflicts between classical insect and weed biocontrol may arise when insect pests are closely related to agents used for weed biocontrol. The cabbage seedpod weevil, *Ceutorhynchus obstrictus* (Marsham) belongs to the same subfamily, Ceutorhynchinae, as a number of agents introduced or proposed for introduction for weed biocontrol. To avoid conflict, a step-by-step approach can be used to develop a species test list that would simultaneously evaluate non-target potential on weed biological control agents and other non-target species. Using this procedure tests lists were developed for evaluations in the area of origin (Europe) and the area of introduction (North America).

Sean McCann, C.C. Lord. Florida Medical Entomology Laboratory, University of Florida, 200 9th Street S.E., Vero Beach, Florida 32962, USA

Senescence and physiological parameters influence fecundity of *Culex quinquefasciatus* Say

Understanding factors which govern reproductive output of disease vectors is crucial to predicting vector populations and disease transmission potential. Nutritional inputs from larval growth and adult bloodfeeding are known to affect fecundity of mosquitoes, but the interplay of these factors and age is not well understood. In this study, we examined these factors in a captive population of *Culex quinquefasciatus*, an important vector of arboviruses. A significant interaction

between body size and age predicting fecundity indicates that the influence of larval nutrition on fecundity is modified by aging in this species.

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Pillow-talk: Mating signals confer reproductive isolation in *Aphidius ervi* and *Aphidius nigripes*

Aphidius nigripes is an indigenous parasitoid of the potato aphid while *Aphidius ervi* was introduced for biological control of the pea aphid. Both species use long and short distance female sex pheromones for mating and as they now occur sympatrically, there is a potential for hybridisation. To determine to what degree, if any, there was cross attraction, we examined the behaviour of intra and interspecific pairs, and the response of males to cuticular extracts from conspecific and heterospecific females. Behavioural results, together with chemical analyses of cuticular extracts indicate that the short range cuticular pheromones are sufficiently species specific to ensure reproductive isolation.

David McCorquodale, Department of Biology, Cape Breton University, Sydney, NS B1P 6L2

The legacy of lady beetles (Coleoptera: Coccinellidae): the unintended effects of (un)intentional introductions

For insects, lady beetles receive very good press. They are perceived as beneficial because they eat pests and are useful in biocontrol. However there are costs. Unintended results of burgeoning populations of introduced lady beetles include declines in populations of native species of coccinellids, and extirpations (e.g. *Coccinella novemnotata*). One non-native species, *Harmonia axyridis*, has become a nuisance for homeowners and a problem for the Ontario wine industry. The interactions of native and non-native species, in both disturbed and more natural habitats, and the spread of non-native species in Canada will be addressed.

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Evaluation of the Efficacy of Imidacloprid Trunk Injections for Control of the Emerald Ash Borer

The Emerald Ash Borer (*Agrilus planipennis*, Fairmaire; EAB) is an invasive wood-boring beetle that originated from northeastern Asia. Since the summer of 2002, it has caused the death and decline of over 15 million trees in North America. I evaluated the efficacy of imidacloprid trunk-injections for control of the EAB. Imidacloprid has recently been granted an emergency registration as a trunk injection for control of EAB under the tradename Confidor™.

Alida Mercado, Christopher M. Buddle, Department of Natural Resource Sciences, Macdonald Campus, McGill University, 21,111 Lakeshore Road, Ste-Anne-de-Bellevue, QC, H9X 3V9

Seven introduced ground beetles (Coleoptera: Carabidae) in Québec: their distribution and potential range expansion since 1975.

Seven introduced species of ground beetles were selected for a distribution study in Québec, which was determined with specimens at: the Lyman Entomological Museum, the Ouellet-Robert Collection at the Université de Montréal and the Canadian National Collection in Ottawa. The distribution was compared to that reported by Laroche (1975). *Harpalus affinis* (Schrank), *Agonum muelleri* (Herbst), *Clivina fossor* L., *Pterostichus melanarius* (Illiger) and *Carabus nemoralis* Müller have a similar distribution to that reported by Laroche (1975). *Harpalus rufipes* DeGeer potentially has expanded its range to the south and *Bembidion obtusum* Audinet-Serville has probably expanded its range from Ontario into southern Québec

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Nutritional regulation in the beet armyworm caterpillar, *Spodoptera exigua*

Many generalist insects attain good performance on heterogeneous food sources by regulating the ratio of protein to carbohydrate intake. Given choices, beet armyworm, *Spodoptera exigua*, caterpillars selected a diet with a P:C ratio of 22p:20c and regulated nutrient intake to this target when faced with dietary variability. Caterpillars showed reduced performance on extreme C-biased but not P-biased diets. Our findings suggest that the beet armyworm possess more sophisticated post-ingestive physiological mechanisms for coping with unbalanced diets than previously studied *Spodoptera* species. These presumably include deamination of excess protein for use as an energy source and post-absorption elimination of excess sugars.

Dominique Michaud, Département de phytologie Pavillon Paul-Comtois, local 3423, Université Laval

Transgenic potato lines for pest control – Current advances and future trends

Major concerns about the possible negative impacts of transgenic crops on the environment, while dramatically compromising the commercial use of transgenic potato lines over the last ten years, have at the same time significantly catalyzed research advances in the field. This talk will summarize approaches currently devised for the development of pest-resistant transgenic potato lines, including new approaches relying on hybrid pesticidal proteins or on the host plant's own natural defenses. Empirical data available on the environmental impacts of transgenic potatoes will also be discussed, as well as the molecular strategies considered to minimize such effects.

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Pests of concern for CFIA in horticulture: an overview

One of the consequences of the increase in global trade is the raise in the frequency of introduction of exotic pests. To protect our plant resources, phytosanitary measures are then

needed for commodities at risk, e.g. nursery stock, wood or fruits and vegetables. The Canadian Food Inspection Agency (CFIA) is in charge of preventing the entry and spread of various pests of concern in agriculture and forestry, such as the Japanese Beetle, the Swede Midge and the Sirex Wasp. Distribution and regulatory measures taken by CFIA against some pests of concerns for the horticulture sector in Canada will be discussed.

Craig Milewski¹, Stacy McNulty², **Janet Mihuc¹**; ¹Paul Smith's College, Route's 86 & 30, Paul Smiths, NY 12970-0265; ²Adirondack Ecological Center, 6312 State Route 28N, Newcomb, NY, 12852

The Adirondack All-Taxa Biodiversity Inventory: full of possibilities

Conservation of biodiversity in the Adirondacks is becoming increasingly relevant in the face of multiple environmental threats. An All-Taxa Biodiversity Inventory (ATBI) is essential to increase biological knowledge and citizen support for sustained conservation of Adirondack biodiversity. A diverse community of public, private, academic, and governmental individuals and groups has come together to initiate an Adirondack ATBI. This undertaking will focus on all taxonomic groups, encourage citizen participation, create multi-faceted educational opportunities, and seek public/private collaboration. This poster will include more detail about the Adirondack ATBI and the potential for scientific research.

Julia Mlynarek, Terry Wheeler, Department of Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, QC, H9X 3V9

Systematics of *Goniaspis* and implications for higher classification of Chloropidae (Diptera)

The chloropid fly genus *Goniaspis* Duda is revised based on morphological characters of adult specimens. The genus contains nine described species restricted to the Neotropical Region from Mexico to Brazil. Although species within the genus are distinguished mainly on colour characters, other characters are shared, in various combinations, with other chloropid genera. This has led to confusion about the placement of *Goniaspis* within the family. *Goniaspis* is removed from the tribe Hippelatinini and transferred to the tribe Elachipterini. Some undescribed species related to *Goniaspis* raise questions as to generic limits within the Elachipterini.

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Use of the F1 Sterile Insect Technique (F1SIT) as a Tool for Host Range Testing in Weed Biological Control.

Brazilian Peppertree, *Schinus terebinthifolius* Raddi (Anacardiaceae), is an invasive exotic species distributed

widely throughout central and southern Florida. A leaf-rolling moth, *Episimus utilis* Zimmerman (Lepidoptera: Tortricidae) is a potential biocontrol agent. Traditional no-choice and multiple choice tests produced ambiguous results. Using the F1 Sterile Insect Technique (FISIT), the leafrollers could be safely released temporarily for field host range testing. Results of exposure of *E. utilis* adults to increasing doses of gamma radiation are presented.

Amy Moores¹, Terry Wheeler¹; Jade Savage²; ¹Natural Resource Sciences, McGill University, Ste-Anne-de-Bellevue, QC, H9X 3V9; ²Biology Department, Bishop's University, Lennoxville, QC, J1M 1Z7

The effects of habitat size and surrounding land-use on selected families of bog-dwelling Schizophora (Diptera: Cyclorrhapha: Schizophora) in the southeastern Quebec and northern Vermont region

While it is known that peatlands play many significant environmental and ecological roles, little is known of the higher fly fauna found in these specific habitats. Using peatlands of various sizes as island fragments, the main objectives of this study are to examine the effects of habitat size and surrounding land-use on the biodiversity of Schizophora fly assemblages. All selected sites are from southern Quebec and northern Vermont and were sampled over a six week period in the summer of 2006 using a combination of pan traps, Malaise traps and sweeping.

Lisane Morcos, Emma Despland, Concordia Biology department, 7141 Sherbrooke W., Montreal, Quebec, H4B 1R6

Are we there yet? Collective locomotion in a social caterpillar

Forest Tent Caterpillars (*Malacosoma disstria*) live in colonies and perform better in groups. These caterpillars travel in groups, following pheromone trails. This study examined the foraging efficiency of forest tent caterpillars in different group sizes. Caterpillars in large groups are less likely to turn back and can thus cover greater distance at a time. Also, caterpillars in large groups are much more likely to leave a pre-established trail and explore new territory. They are therefore more successful at finding new food sources. This study demonstrates mechanisms by which caterpillar collective foraging operates.

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Effet du virus de la granulose sur le carpocapse de la pomme (*Cydia pomonella*)

Le carpocapse de la pomme cause des dégâts considérables dans les vergers commerciaux. L'utilisation conjointe du virus de la granulose du carpocapse et de trichogrammes pour contrôler les populations du ravageur est une alternative intéressante en lutte biologique. Des épreuves biologiques ont été effectuées afin de déterminer l'effet du virus sur les œufs et les larves du carpocapse, ainsi que sur les trichogrammes

adultes. Ces expériences seront suivies d'essais dans les vergers qui viseront à évaluer l'efficacité du contrôle des carpocapses, ainsi qu'à étudier les interactions qui existent entre les différents agents de lutte biologique utilisés.

Ayman Mostafa, Neil J. Holliday, Department of Entomology, University of Manitoba, Winnipeg, Manitoba R3T 2N2

Effect of lygus bugs (Hemiptera, Miridae) on buckwheat crops in Manitoba

Large numbers of adult *Lygus lineolaris* have been observed in buckwheat fields near the end of the growing season; smaller numbers of nymphs occur earlier in the season. In field trials, insecticide applications in late July reduced the developing generation of nymphs, and prevented yield losses ranging from 12-78%. There was no benefit from controlling adults late in the growing season. Caged plants were more vulnerable to nymphs than adults, and the flowering stage was more vulnerable than later growth stages; yield loss was primarily the result of fewer seeds, resulting from flower abortion, and secondarily from seed malformation.

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Phylogeography of *Nicrophorus nepalensis* Hope 1831 (Coleoptera: Silphidae).

Understanding the processes governing the geographic distribution of genealogical lineages is essential for understanding how biodiversity evolves. Populations of *Nicrophorus nepalensis* Hope 1831 (Coleoptera: Silphidae) are used here as a model to show how interactions between historical events can lead to population divergence in mountainous ecosystems of Asia. Seven populations of *N. nepalensis* throughout Asia were sampled for mitochondrial (COI & COII) DNA. Phylogenetic analyses using mixture model Markov chain Monte Carlo methods show three separate lineages associated with distinct geographical areas: mainland Asia, the Malay Peninsula, and the Philippines.

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Foraging risks for western spruce budworm

Western spruce budworms emerge from hibernation in early spring and forage for needles and current-year buds on their host trees. This movement results in significant losses to the population. The magnitude of this stage-specific mortality is dependent on weather-mediated synchrony with bud development of the host tree and on density-related levels of defoliation by the previous generation of budworms.

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Response of herbivore insects to biotic and abiotic stress: global functional approach using proteomics

Réponse des insectes herbivores au stress biotique et abiotique: approche multifonctionnelle par la protéomique

In natural ecosystems, sap-sucking specialists such as aphids are exposed to a wide array of environmental stresses. These stresses can occur indirectly through the aphids' host plant or directly by exposure to intense solar radiations, temperature changes or attacks by natural enemies. My study examined the response of the aphid *Macrosiphum euphorbiae* to stress caused by: i) severe water stress to its host plant (potato, *Solanum tuberosum* L.); ii) the response of the host plant to the simultaneous feeding of a defoliating insect (Colorado potato beetle, *Leptinotarsa decemlineata*); and iii) direct attack by generalist and specialist endoparasitoids (*Aphidius* spp.) My results confirmed that growth, reproduction and survival of *M. euphorbiae* are highly affected by water stress of its host plant. There was no observable decrease in performance however, due to the defoliation of the host plant by the Colorado potato beetle, which may suggest that *M. euphorbiae* adapts easily to this type of stress. *Macrosiphum euphorbiae* was very resistant to attack by *Aphidius ervi* (generally associated to pea aphids), but was very vulnerable to attack by *A. nigripes* (specialist of aphids associated with potatoes). The study of *M. euphorbiae*'s proteome under the above stress conditions allowed a quantitative analysis of a large number of proteins (~520) without prior selection of model proteins. The observed patterns of expression and repression differed among stress conditions. Certain groups of proteins revealed specific responses to different stress conditions, while others, especially those involved in the energetic metabolism of the aphid, showed a more generalized response to stresses. Moreover, many aphid proteins were associated to proteins of symbiotic bacteria that seem to be important for the metabolic adaptation of the aphid following stresses. This study is one of the first to address the effects of environmental stress on herbivore insects using proteomics.

Mes études examinent les réponses d'un insecte herbivore suceur (puceron de pomme de terre, *Macrosiphum euphorbiae*) au stress indirect via sa plante-hôte et au stress direct via l'infection par des endoparasitoïdes aphidiines plus ou moins spécialistes (Hymenoptera: Braconidae). Combinée à des réponses 'classiques' au niveau organisationnel, l'approche fonctionnelle 'globale' de la protéomique permet de mieux comprendre l'adaptation métabolique complexe de ces insectes suceurs suite à divers traitements de stress. Certaines protéines sont modulées de façons spécifiques selon le stress exercé, d'autres sont plutôt associées au métabolisme énergétique ou à la symbiose des pucerons avec des bactéries.

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Mechanical Control of the European Corn Borer, *Ostrinia nubilalis* (Hubner) (Lepidoptera: Pyralidae) in Potatoes

The European corn borer is controlled by a precisely timed insecticide application aimed at the hatching larvae. Inclement weather often restricts insecticide application resulting in poor control. ECB larvae overwinter within the discarded stalks of potato plants. A device "the ECB larva crusher" was developed which allows growers to harvest and control simultaneously. The device is attached to the back of a potato harvester and as the potatoes are harvested, the

stalks, before being discarded, are passed through the device which crushes the stalks and larvae within them. An eighty percent larval mortality was achieved in efficacy trials. Details of the device will be presented.

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Carabid response to natural disturbance-based silviculture across three boreal forest ecosystems in western Québec

Modeling silviculture after natural disturbances has potential to maintain native species and their ecological functions while providing a sustainable supply of fibre. The SAFE project (Silviculture et aménagement forestier écosystémiques) is a fully replicated landscape experiment designed to monitor the effects of "conservation management" on boreal aspen, mixed forest, and conifer stands. Over the summers of 2004 and 2005, pitfall traps were installed in each forest type and respective partial cuts, clear-cut, and uncut stands. NMS comparisons by forest and harvest type on 4975 Carabids representing 40 species showed distinct differences between fire-related, open habitat, and old-growth specialist communities.

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Aquatic insects in boreal streams of the Cape Breton Highlands, Nova Scotia: relationships with physical habitat and forest history

The Cape Breton Highlands, reaching elevations of 300-500 metres, represent the only true boreal forest region in Nova Scotia. Most streams in the highlands are spring-dominated, but can be quite "flashy" because of high slopes and frequent and extreme rainfall events. The area has also been logged for many years, so watersheds experience a range of cutting practises. The focus of this project was to examine the highland stream communities relative to physical habitat and forestry history. Sampled were collected monthly in 12 mid-sized highland streams in the summers of 2005 and 2006. Preliminary findings on the aquatic insects will be summarized.

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Effect of time of tree removal on potential of *Hylurgopinus rufipes* to transmit Dutch elm disease pathogens from newly-symptomatic American elm trees in Manitoba

In Manitoba, *Hylurgopinus rufipes* is the main vector of Dutch elm disease pathogens. Diseased trees first exhibit symptoms in June, and some jurisdictions remove newly-symptomatic trees immediately; others practise winter removal. In June, July and August 2006, newly-symptomatic American elm trees were felled and debarked; number of brood galleries, number and stage of beetles in galleries, and proportion of beetles carrying spores of Dutch elm disease pathogens (*Ophiostoma ulmi* or *O. novo ulmi*) were recorded.

The results will be discussed in relation to potential for disease transmission in the season of diagnosis, and implications for disease management.

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Ecological impact of invasive insects on agricultural ecosystems - Wheat Midge Case Study

Wheat midge, *Sitodiplosis mosellana* (Géhin) (Diptera: Cecidomyiidae), was first detected in western Canada by Norman Criddle as early as 1901. The first major outbreak of wheat midge in Saskatchewan was recorded in 1983. Today wheat midge infests all of the wheat-growing area of Manitoba, much of Saskatchewan and is beginning to invade Alberta. Although predation by carabids is not a major factor in control of wheat midge, the larvae provide a source of food for some carabid species. In Saskatchewan, wheat midge populations were found to be parasitized by *Macroglenes penetrans* in 1984. Since the initial outbreak, conservation efforts have maintained average parasitism levels at 21-43%.

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Epidemiology of Aster Yellow disease in oilseed and cereal crops in Saskatchewan, 2001 – 2006

Incidence of Aster Yellow disease and populations of leafhoppers were surveyed in canola and cereal crops from 2001 to 2006. Nested PCR testing was used to estimate the % of phytoplasma-infected leafhoppers and plants. The incidences of the diseases in oilseed and cereal crops as well as in leafhopper populations are presented. Distribution of the phytoplasma in the plants is discussed.

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Phytoplasma diseases on grapevine

Grapevine yellows (GY) are diseases of *Vitis vinifera* caused by phytoplasma. Typical GY symptoms include leaf chlorosis and rolling, flower abortion or berry withering, uneven or total lack of lignification of canes, as well as reduced plant vitality and wine quality. The Canadian wine industry imports a large number of vines from France and Germany, where phytoplasma diseases are spreading despite strong compulsory control measures. Results about phytoplasma diseases survey in grapevines of Canada are presented. Risks to the Canadian wine industry related to the introduction of non indigenous grapevine phytoplasmas are discussed.

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Clover insect pests - an European flare for damage?

Severe yield losses occurred in red clover seed in 2005 within the Peace River region. In 2006, field surveying of red and alsike clover seed fields was undertaken to identify the insect pest(s) attacking flowers and developing seeds. Results from surveying confirmed that *Coleophora deauratella*

(Lepidoptera: Coleophoridae), the red clover casebearer, was present in Peace River region fields in 2006 and responsible for severe feeding damage in red clover. Field surveying and plant plus yield loss data will be presented for this new Albertan forage seed pest of red clover.

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How cold is too cold for *Lygus keltoni*?

Canadian winters can have an ameliorating effect on insect pest populations since overwintering stages can succumb to adverse cold temperatures. The effect of winter's cold temperatures on *Lygus keltoni* was examined using field collected adults and small microcosm cages deployed from late fall to early spring. The overwintering survival and reproductive status of adults will be described from these field studies conducted between 2002 and 2006 within the Peace River region of Alberta.

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Systematics and biogeography of the *Cicurina brevis* group (Araneae: Dictynidae)

Morphological and mtDNA data provide support for the monophyly of the *Cicurina* subgenus. New morphological studies suggest new synonyms and led to the discovery of an unknown structure in the female spermathecae that appear species specific. *Cicurina brevis* and its European sister species *Cicurina cicur*, show a population structure highly influenced by the last glaciation. A new eyeless *Cicurina* recently discovered in the Appalachians, shows that troglomorphy evolved at least twice, once with the *Cicurella* radiation in Texas and a second time in the *C. brevis* group in the Appalachians.

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Does the Pandora's Box paradigm apply to parasitoids in classic biological control?

"Classical biological control: panacea or Pandora's box?" ignited a contentious debate over the environmental costs of biological control. Since that paper, recognition that biological control agents have insinuated themselves into a variety of ecosystems, and in some cases, have inflicted considerable harm to non-target species, has increased. Exotic parasitoids may affect biodiversity through attacks on unintended native species or may out-compete native parasitoids. Specific harmful effects of parasitoids on non-target hosts or competing species have been difficult to quantify. However, there are good examples of both polyphagous and oligophagous parasitoids dramatically affected biodiversity and we may be underestimating the true effect of this guild.

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Assessing bee-o-diversity in mixed-grass prairie habitats

Given the decline of wild bees in certain areas worldwide, obtaining baseline data on diversity and community composition in representative habitats is critical for their conservation. Information regarding the bee fauna of mixed-grass prairie habitats is scarce. To overcome this deficiency, a novel passive collection method - the bee bowl- was used to investigate wild bee diversity in a large, managed prairie surrounded by agricultural land and smaller prairie sites within a forested park. We will present preliminary data, and consider the implications of collection methods and possible factors contributing to bee diversity to the findings.

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Compatibilité du virus de la granulose et des trichogrammes pour lutter contre le carpocapse de la pomme / Compatibility of granulosis virus and trichogrammatid wasps for the control of codling moth in apple orchards

L'utilisation du virus de la granulose (CpGV) pour lutter contre le carpocapse de la pomme, *Cydia pomonella* (L.) requiert des applications répétées durant la période d'émergence des larves. Le recours à des lâchers inondatifs de *Trichogramma minutum* qui s'attaque aux œufs pourraient permettre une diminution du nombre de traitements au virus. Afin de vérifier la complémentarité des deux agents de lutte biologique, nous avons testé en verger leur compatibilité par des lâchers inondatifs de trichogrammes simultanément avec des applications du virus CpGV. L'utilisation conjointe de ces deux agents de lutte sera discutée à la lumière des résultats de cette étude.

Effective use of the granulosis virus CpGV against codling moth, *Cydia pomonella* (L.), populations requires multiple applications at the larval stage of the pest. Inundative releases of *Trichogramma minutum* egg parasitoids could allow for a reduced number of virus applications to be effective. This hypothesis was verified in an apple orchard where inundative releases of wasps were made simultaneously with applications of CpGV. Joint use of both methods will be discussed with regard to the results obtained.

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Wild tuber-bearing *Solanum* species; A source of insect resistance.

Breeding potato varieties resistant to insects offer several challenges including finding a source of resistance. Wild tuber-bearing *Solanum* species are available from different plant collections around the world. They are the main source of resistance to insects. However, identifying resistant species and the development of high throughput screening methods is often complicated by the biology and the behaviour of the target insect. Data on the selection of resistant species, the

development of screening methods and finding of mode of resistance of *Solanum* species used for the development of potato resistant to insects will be presented.

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Eating the spermatophore and female reproduction in a ladybird beetle (Coleoptera: Coccinellidae)

In *Drosophila* spp., male seminal proteins influence female reproductive behaviour, causing increased egg-laying and decreased mating receptivity. Some ladybird beetles (Coleoptera: Coccinellidae) engage in an unusual postcopulatory behaviour: following mating, females eject the empty spermatophore and eat it. We test the hypothesis that male seminal proteins have similar effects in the two-spot ladybird (*Adalia bipunctata*) as observed in *Drosophila* - i.e., whether the proteins are absorbed through the reproductive tract or ingested with the spermatophore. Results suggest that spermatophore feeding does not affect mating receptivity, but promotes faster oviposition. Spermatophore feeding may cue females that mating has occurred.

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Influence of intraplant heterogeneity on feeding patterns of the pale-winged gray moth, *Iridopsis ephyraria*

The pale-winged gray moth, *Iridopsis ephyraria*, is a new outbreak pest of eastern hemlock forest in southern Nova Scotia. Defoliation estimates demonstrated that the upper crown of hemlock is less defoliated than the lower crown levels. This is likely due, at least in part, to increased light incidence, as larvae in a full shade treatment had higher survival rates than those in partial shade and full sun treatments. Although current-year foliage is more severely defoliated, caged larvae had higher survival when offered a mixed diet of foliage ages.

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Effet de la maturité des habitats urbains sur le succès d'invasion du carabe exotique *Carabus nemoralis* Müller

Mature community could be more resistant to biological invasion as they have more time to accumulate species adapted to local environmental conditions. Following this idea, we predicted that mature urban habitats have a stronger biological resistance to exotic carabid species invasion, as *Carabus nemoralis* Müller, than juvenile habitats. Our results show that *C. nemoralis* invasion success was weaker in disturbed open habitats but negatively influenced by forest level maturity. Since *C. nemoralis* show this same habitat preference in its native land, we cannot generalize on the effect of perturbation and maturity as controlling factors to habitat invincibility. Nevertheless, our data suggest also an appreciable biotic resistance of native communities to exotic carabid invasions and support that the maturity concept is an interesting way to understand urban habitat characteristics which reduce success of invasive species.

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Essais du Virosoft CP4 en verger biologique

Le carpocapse de la pomme, *Cydia pomonella* L (Tortricidae), est un ravageur important des vergers sur la scène mondiale. En réponse à des demandes nombreuses et croissantes pour des méthodes alternatives aux insecticides de synthèse, différentes méthodes de lutte ont été développées, incluant des insecticides à base de baculovirus. Dans ce contexte, le Virosoft CP4 a été mis à l'essai pendant trois ans dans un verger biologique de Saint-Hilaire, Qc, en conditions de populations de carpocapse très élevées. Le protocole expérimental a varié (nombre de traitements et types de mélanges) au cours de ces années pour répondre à des questions différentes. En dépit de conditions difficiles, le Virosoft a causé des réductions importantes du pourcentage de dommages de carpocapse à la récolte.

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An inventory of predacious mites in Quebec commercial apple orchards where IPM programs are implemented

The commercial apple orchard ecosystem in Quebec has now a diverse fauna of predacious mites. A systematic two year survey showed *Amblyseius fallacis* (Garman), *Typhlodromus caudiglans* Schuster (Acari: Phytoseiidae), and *Agistemus fleschmeri* Summers (Acari: Stigmaeidae) to be the most abundant species. Other phytoseiids, *Typhlodromus herbertae* Chant, *Typhlodromus longipilus* Nesbitt, *Typhlodromus bakeri* (Garman), *Typhlodromus pyri* Scheuten, *Amblyseius okanagensis* (Chant), *Typhlodromus conspicuosus* (Garman), and *Amblyseius finlandicus* (Oudemans) were found in low numbers. The two latter species were identified for the first time in Quebec. Seasonal totals for *A. fleschmeri* and *A. fallacis* decreased 7-fold and 42-fold, respectively, whereas *T. caudiglans* increased 9-fold from 1999 to 2000. Possible mechanisms for these changes are discussed.

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Predicted vs expressed polydnavirus genes: the case of the *Tranosema rostrale* ichnovirus (TrIV) in its spruce budworm host

Polydnaviruses (PDV) are dsDNA viruses with segmented genomes. They are obligate symbionts of some endoparasitic wasps, with replication confined to ovarian calyx cells. Virions accumulate in the ovary and are injected into caterpillar hosts during oviposition; there, viral genes are expressed, causing physiological dysfunctions that benefit the wasp larva. Identification of viral gene functions is an

important goal of PDV research. 85 ORFs were predicted from the sequencing and annotation of the TrIV genome. We are now determining which of these are expressed in the lepidopteran host, by PCR amplification of cDNAs, using a library constructed from TrIV-injected caterpillars.

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Is Cranberry Tipworm (Diptera, Cecidomyiidae, *Dasineura oxycoccana*) a new pest of lowbush blueberry?

Lowbush blueberry fields in Yarmouth County, Nova Scotia have seen a steady decline in productivity over the past four crop cycles. Cranberry tipworm was discovered for the first time in these fields in late summer, 2004. This study was set up to examine the impact of cranberry tipworm on lowbush blueberry. Plant growth and insect stages were monitored on four vegetative fields over the growing season. Plant growth was abnormal with leaf buds continuing to break throughout the summer rather than switching to floral bud initiation midsummer. This provided habitat for cranberry tipworm which increased in abundance throughout the summer. It is likely that under normal growing conditions, cranberry tipworm has minor impact on lowbush blueberry crops.

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Modeling the spread and ecological impact of invasive species.

We focus on adaptive seasonality, the most basic of biological responses to weather, as an approach to predict the spread and impact of invasive species. Adaptive seasonality is defined as the ability of a species to complete its life cycle under a specific thermal regime in a manner that synchronizes adequately the various life stages with the availability of key resources. We use the Gypsy moth as an example of this approach, because it is invasive in Canada, known to be geographically limited by climate, and detailed models of the insect's developmental responses to temperature are available. Analyses of potential distribution and impact of Gypsy moth is discussed.

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Potential weevil biocontrol agent for *Miconia calvescens*, the "Purple Plague" of Hawaii.

Without natural enemies, *Miconia calvescens* poses a grave threat to Hawaii's native ecosystems and biodiversity. One potential candidate for classical biocontrol is *Cryptorhynchus melastomae*, a stem-boring weevil known to feed on *M.*

calvescens in its native Costa Rica. Adults feed on new stems, petioles, leaf veins and lamina, whereas larvae mine the stem until pupation. Adults and larvae can seriously damage and kill small *M. calvescens*. Preliminary host testing indicates *C. melastomae* is family-specific. Since Hawaii has no native melastomes, a family-specific insect is suitable for biocontrol. *Cryptorhynchus melastomae* will soon be sent to Hawaii to undergo further testing under quarantine conditions.

Tyler Reid, Mary Reid, University of Calgary

Dispersal of the mountain pine beetle (*Dendroctonus ponderosae*) in thinned and non-thinned forest habitats.

In the mountain pine beetle (*Dendroctonus ponderosae*), dispersal to living host trees is vital to successful colonization and reproduction. Current management practices involve thinning of host lodgepole pine (*Pinus contorta*) trees to reduce susceptibility of mountain pine beetle attack, yet empirical evidence of the effect of thinning on dispersal is lacking. Preliminary evidence obtained from mark recapture experiments suggest that although beetles are less likely to locate suitable host trees in a thinned forest, they are able to disperse further and at less of a cost compared to non-thinned forests.

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Soybean aphid in Québec: Vive la différence !

An extensive survey carried out since the beginning of the invasion of *Aphis glycines* in 2002, combined with field experiments evaluating its feeding impact, suggests that soybean aphid is a relatively benign (occasional) pest in the province of Québec, due to a late colonization of soybean and a high incidence of generalist predators. Ongoing studies quantify and incorporate variables across multiple trophic levels (phenological stage of soybean, abundance of aphids, incidence of predators) in order to develop an environmentally sound economic threshold for soybean aphid.

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Spruce Beetle in the Yukon

For approximately the last 12 years a major spruce beetle (*Dendroctonus rufipennis* (Kirby.)) outbreak has been impacting spruce leading forests in the Yukon. The mortality induced by this insect far exceeds commercial harvest and is far too large for successful control, having impacted more than 350,000 hectares. As a result, resource managers have been primarily concerned with potential movement and spread of the beetle and to try to anticipate possible impacts due to wildfire, as well as potential impacts on the tourism industry. To assist with this, a study has been carried out examining the spatial patterns and intensity of host susceptibility, historical movement of the insect and likely pathways for future outbreak expansion.

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Using mustard seed meal as a cultural control method to increase the abundance of natural enemies of *D. radicum*

Delia radicum (L.) (Diptera: Anthomyiidae), the cabbage root maggot, is a pest of Brassica crops in Europe and North America. Studies in Brassica crops in Sweden demonstrated the application of mustard meal as a mulch can attract *Aleochara* spp. (Coleoptera: Staphylinidae) to suppress *D. radicum*. Our study examined whether attraction of *Aleochara* spp. to mustard seed meal would occur in canola, and which species are attracted.

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Mating success driven by individuals isolation in space and time

Invading populations may go extinct due to failure of adults to assemble for mating. Since invading populations initially exist at low densities, males and females may become isolated either in space due to dispersal, or become isolated in time because of variability in developmental times. We developed two types of models of this phenomenon for the gypsy moth, *Lymantria dispar*: (1) a spatially explicit, stochastic model based upon absolute population densities and (2) a deterministic model based upon pheromone trap counts. These models were used to determine invasion thresholds (Allee effects) and geographic variation in the Allee effect.

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Species diversity and seasonal abundance of arthropods in turfgrass ecosystems / Diversité et abondance saisonnière des arthropodes des surfaces gazonnées

Over a three-year study, ground-dwelling and soil arthropod communities in two different turfgrass lawns in Québec City, Canada, were characterized. More than 34,000 arthropods per year were sampled in pitfall traps and soil cores in both lawns. We identified 21 and 17 species of Collembola and Carabidae, respectively. Patterns of seasonal abundance of Carabidae were similar for the most abundant species, while no clear patterns were observed for the whole Collembola populations.

Durant trois ans, les communautés d'arthropodes retrouvées à la surface et dans le sol ont été décrites dans deux pelouses de la région de Québec, Canada. Plus de 34 000 arthropodes par année furent échantillonnés aux deux sites. Respectivement, 21 et 17 espèces de collemboles et de carabes ont été identifiées. L'abondance saisonnière des carabes était

similaire entre les espèces alors que pour les collemboles, aucun patron spécifique ne fut observé pour l'ensemble des espèces.

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The effect of habitat and seasonal variability on blow fly species diversity

The effect of habitat (open field, deciduous forest) and season (spring, summer, fall) on successional patterns of carrion insects were investigated using the domestic pig, *Sus scrofa*. Two freshly killed pigs (approximately 23kg) were placed in each habitat type (during each season) in 6 test sites throughout Windsor/Essex County, Ontario (n=12 pigs/season). Insects were sampled using pitfalls, malaise traps and direct sampling. The effects of habitat and season vary with respect to the blow fly species considered. Fall collections included the invasive species, *Chrysomya rufifacies*, which could potentially alter blow fly diversity and food web dynamics of the carrion system.

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The influence of landscape structure on the aphids biological control in corn

Biological control was actually studied at small scale : plant, crop or farm. In this study, we estimate the influence of landscape structure on the aphids and their natural enemies. The objectives are to answer the following questions: Does landscape structure influence 1) the colonization of the corn crop by aphids and their natural enemies? 2) aphids biological control? We followed the abundance of the aphids and their natural enemies in 19 maize corn crop. At the same time, we cartographed the 19 circular sectors with a radius of 500 m. We tested the correlations between the entomological and landscape data.

Curtis Russell, Fiona F. Hunter; Brock University

Analysis of the possible attraction of *Culex pipiens* to humans in the Golden Horseshoe.

The mosquito *Culex pipiens* L. is believed to be the primary enzootic vector for West Nile Virus (WNV) in Ontario. However, there have been studies within the United States that suggest *Cx. pipiens* may also feed on mammals, including humans. If this is the case, *Cx. pipiens* could also be a contributing bridge vector of WNV. This study uses mosquito gravid traps to capture blood fed *Cx. pipiens* from Niagara Falls to Toronto. Any mosquitoes with a remnant blood meal will be analyzed using cytochrome b to determine the host of the blood. This study is attempting to determine the true feeding habits of *Cx. pipiens* within the province of Ontario.

Rachid Sabbahi, Claude Guertin, INRS-Institut Armand Frappier, 531, boul. des Prairies, Laval, QC, H7V 1B7

Efficacité du champignon entomopathogène *Beauveria bassiana* contre les populations de la punaise terne, *Lygus lineolaris*, dans la culture du fraiser.

La punaise terne, *Lygus lineolaris* (Palisot de Beauvois), est le principal ravageur des cultures de fraises. L'objectif de la recherche est d'évaluer le potentiel insecticide du champignon entomopathogène *Beauveria bassiana* pour lutter contre les populations de la punaise. Le titre insecticide (CL50 et TL50) de certains isolats du champignon a été déterminé. Les résultats ont montré que les isolats INRS-IP et INRS-CFL avaient un potentiel insecticide intéressant avec une CL50 respective de 7,8 x 10⁵ et de 5,3 x 10⁵ conidies/ml et une TL50 de 4,46 et 4,37 jours. De plus, des essais en champs de fraises ont été réalisés afin de faire un suivi de la persistance et de la pathogénicité de ces deux isolats. Les résultats démontrent que les formulations à base de *B. bassiana* conservent leur potentiel insecticide pendant plusieurs jours. Ainsi, après 6 jours, on observe la présence de conidies sur le feuillage et une activité insecticide de celles-ci. L'application de traitements multiples lors de la floraison est discutée dans une optique de protection des plants contre les attaques de la punaise.

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Spider colonization of apple orchards

The colonization of agroecosystems by natural enemies is an important demographic process, as regular disturbances may reduce their populations. We studied colonization of apple orchards by spiders, an abundant and diverse group of generalist predators in orchards. We planted twelve "mini" orchards (consisting of ten 1.7m apple trees) at two distances from deciduous forest, and spiders were collected from the trees from June to September. Spiders were identified to species, we determined the rate and phenology of colonization, and compared the relative abundance of species in the mini-orchards to those in older orchards to understand the effects of time on assemblage composition.

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Le MTI-2, est-elle une méthode fiable pour la lutte contre les pucerons ? / Is MTI2 a reliable method to manage potato aphids?

Les inhibiteurs de protéases sont des molécules de défenses produites par les plantes et qui agissent sur les enzymes digestives des insectes. Toutefois, les pucerons possèdent de faibles activités protéasiques digestives et semblent donc des espèces non cibles dans le cadre d'une stratégie de lutte basée sur l'utilisation d'inhibiteurs de protéases. Nous avons testé l'impact de plants de pommes de terre transformés avec un gène codant pour un inhibiteur trypsique de la moutarde (MTI-2). Nos résultats montrent des effets négligeables ou bénéfiques qui semblent remettre en cause l'utilisation des inhibiteurs trypsiques dans des programmes de lutte contre les insectes.

Protease inhibitors are defensive compounds synthesized by plants and which alter insect digestive enzymes. However, aphids present low digestive protease activities and could be thus considered as non-target pests in a protease inhibitors-based strategy. We tested the effects of potato plants transformed with a mustard trypsin inhibitor encoding gene (MTI-2). Our results showed negligible or beneficial effects, which question the relevance of trypsin inhibitors as insect control tools.

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Les inhibiteurs de chitinases : Une stratégie adaptée au contrôle des pucerons Chitinase inhibitors : An appropriate strategy to manage aphids

Le métabolisme de la chitine représente une cible d'intérêt pour le contrôle des insectes ravageurs puisque cette molécule est un constituant majeur des structures exosquelettiques, des trachées et de la membrane péritrophique. La croissance des insectes nécessite l'intervention d'enzymes qui permettent le remodelage de la chitine dont la dégradation est assurée par les chitinases. Les inhibiteurs de chitinases ont montré des effets antimicrobiens, antifongiques et insecticides. Pour la première fois, nous rapportons les effets aphicides de ces composés sur le puceron *Myzus persicae*. Nos résultats démontrent l'intérêt d'une telle stratégie pour contrôler les populations d'insectes.

Chitin metabolism is an interesting target to manage insect pests because it is a major component of the exoskeleton, trachea and the peritrophic membrane. Insect growth requires enzymes to remodel chitinous structures. During the molting process chitinases participate to chitin degradation. Chitinase inhibitors are known for their toxic effects against bacteria, fungi and insects. For the first time, we describe aphicidal effects of these compounds. Our results highlight the interest of such strategy to control insect populations.

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Substrate selection by larvae in highly variable hosts restricts the importance of oviposition site in saprophagous wood-boring beetles (Coleoptera: Cerambycidae).

In parasitic saproxylophagous beetles, oviposition site is assumed to be the most important determinant of offspring performance. We hypothesized that wood-boring larvae select specific substrate types in highly-variable hosts, a behavior that would violate this assumption. For 24 snags, we assessed within-host variability in wood density and collected larvae to which we attributed a density value by sampling

wood around their galleries. Larvae collected showed significant preference for mid-decay density classes, and avoided highly-decayed wood. Our results suggest that these larvae indeed actively select specific substrate types. This behavior could explain the weak selection observed at larger scales.

Chez les Coléoptères saproxylophages, le site d'oviposition est considéré comme le facteur principal déterminant la performance des larves. Nous avons émis l'hypothèse que les larves peuvent sélectionner certains types de substrat et ainsi influencer elles-même leur niveau de performance. Nous avons caractérisé la variabilité de décomposition de 24 chicots de peuplier et collecter des larves auxquelles une densité a été attribuée. Nous avons observé une préférence significative pour les classes de décomposition moyennes et un évitement du bois fortement décomposé. Ces résultats pourraient expliquer la faible sélection observée à échelles plus grandes au niveau des sites d'oviposition.

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Host-use patterns of adults and larvae of saproxylic wood-feeding Coleoptera in black spruce and aspen.

We used a novel approach, wood dissection, to investigate occurrence patterns of wood-feeding Coleoptera adults and larvae (Buprestidae, Cerambycidae, Scolytidae) in snags of black spruce and aspen along a wood decay gradient. We sampled 80 snags of both tree species in five different stands distributed over their ranges within the province of Quebec. In black spruce, host-use was mostly concentrated at the beginning of the decay gradient. Patterns observed in aspen were opposite, as few individuals were found in fresh snags, while most snags in middle to late stages of decay contained insects. Potential factors behind these differences are discussed.

Pour caractériser les patrons d'utilisation d'hôte des adultes et des larves de Coléoptères saproxylophages (Buprestidae, Cerambycidae, Scolytidae) utilisant les chicots d'épinette noire et de peuplier faux-tremble, nous avons disséqué 80 chicots de chaque essence d'arbre recueillis dans cinq peuplements répartis dans plusieurs régions du Québec. L'utilisation des chicots d'épinette noire était concentrée au début du gradient de décomposition, alors que la situation était inverse chez le peuplier. Des facteurs potentiels pouvant expliquer ces différences seront présentés.

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The Biocontrol Network: a Canadian example of the importance of networking

The Biocontrol Network's history, participants, R&D programmes and success highlights since 2001 will be described. To achieve research excellence in biocontrol of

contained ecosystems, the Network programs were multidisciplinary, emphasizing synergism among investigators. The Network provided multidisciplinary training, co-supervision, mobility between laboratories and summer schools. It delivered improved or new products, and its research expanded into economics, social sciences, ethics and health. It became an active partner of regulators and developed new outreach tools. It gained high visibility and international recognition at scientific meetings worldwide and by organising international events in Canada. The future of the initiative will be discussed.

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Ponte optimale, prédation intraguild et pucerons myrmécophiles, cocktail explosif pour la cécidomyie *Aphidoletes aphidimyza* (Rondani)

A.aphidimyza est un petit diptère dont les larves se nourrissent exclusivement de pucerons et adoptent un comportement de prédation furtive. La présente étude s'intéresse au comportement optimal de ponte de la femelle dans un contexte de prédation intraguilde, l'impact des fourmis y est aussi traité. Un modèle d'optimisation vise à prédire le nombre d'œufs optimal à pondre dans une colonie de pucerons donnée afin de maximiser l'aptitude de la femelle. Par la suite le modèle a été testé grâce à la réalisation d'étude empirique en verger de pommier. Modèle validé ou rejeté ? A vous de voir ...

Amy Sharp, Fiona F. Hunter, Department of Biological Sciences, Brock University, 500 Glenridge Avenue, St. Catharines, ON, L2S 3A1

Mermithid-infected black flies (Diptera: Simuliidae): an examination of sexual determination and developmental stage.

Mermithid nematodes (Nematoda: Mermithidae) parasitize larval, pupal and adult black flies (Diptera: Simuliidae). Such parasitic infections often result in feminization of sexually dimorphic traits. To determine the developmental stage at which feminization occurs, mermithid-infected simuliid larvae were classified as being either early or late in development; gonad morphology and meiotic chromosomal condition were examined. Results indicate that mermithid-infected black flies exhibit feminization prior to larval histoblast formation. Larvae can be morphologically male or female, with morphological males exhibiting either male or female meiotic chromosomes; morphological females can only be genetically female. Additionally, mermithid-infection inhibits simuliid gonad development.

Diana Sharpe¹, Jen Perry², Locke Rowe²; ¹McGill University; ²University of Toronto.

Female Resistance Behaviour in the 2-spot Ladybird, *Adalia bipunctata*: Ecological Determinants and Consequences for Male Mating Success

Sexual conflict, often manifested in pre-copulatory struggles, should occur when the relative costs and benefits of mating differ between the sexes. In the two-spot ladybird, *Adalia bipunctata*, mating may have significant energetic costs for females, and females display varied and often intense

resistance behaviour. We investigated a) external factors that may affect female resistance behaviour (short and long-term starvation); and b) whether sexual selection on male size occurs as a side effect of female resistance. We found that starved and poorly-fed females resisted males for longer, and rejected mates more frequently, likely because the energetic costs of mating are relatively greater when food is limiting. There was no evidence of indirect selection on male size as a result of female resistance.

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Is Trypsin Inhibitor a Plant Defence against the Forest Tent Caterpillar (*Malacosoma disstria*)?

Forest tent caterpillars are defoliating insects found in North America. Their host trees, aspen, contain trypsin inhibitors (TIs) that inhibit the digestion of protein within the caterpillar. By treating the caterpillars with diets differing in three levels of TI, as well as nutritional quality, we found that the caterpillars' growth was inhibited by the lack of protein, and we also found the caterpillars' digestion was inhibited by TI. However, the higher level of TI decreased their growth on balanced food but had not much effect on protein deficient food.

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Gelechiid moths, a major threat for potato cultivation in South-America

Tecia solanivora, a gelechiid moth described from Guatemala, invaded potato fields of Venezuela in 1983, Colombia in 1985, Ecuador in 1996 and Canary Islands in 2001. It is now one of the main pests of potatoes in Northern Andean countries. In that area, *T. solanivora* interacts with two other gelechiid species, the invasive *Phthorimaea operculella*, and the South-American *Symmetrischema tangolias*. Our goals are to trace the demographic and genetic history of *T. solanivora* in South America using molecular markers, characterize the ecological interactions among the three species and develop efficient biological control strategies using entomoviruses.

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Distribution, Abundance, and Seasonal Ecology of the Annual Bluegrass Weevil (Coleoptera: Curculionidae) on Golf Courses in Québec, Canada

To determine the distribution, abundance, and seasonal ecology of the annual bluegrass weevil (*Listronotus maculicollis*) (ABW), a turfgrass insect pest on golf courses in Québec, we sampled nineteen golf courses during four years. The ABW was found on all golf courses scouted, except one located in Chicoutimi. ABW complete two generations per year, except in Rimouski where only one generation was observed. Linear regression model revealed that ABW is more abundant in western Québec than in

eastern Québec. ABW sizes differed between locations and they were generally bigger on golf course where one generation per year was observed.

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We can eliminate invasions or live with them! – High tech and low tech success stories

The burgeoning publicity on impacts of biological invasions has led to fatalism – we can't seem to do much except slow this juggernaut slightly, so why bother? This pessimism is unwarranted! There are many success stories – often unpublicized – in which invaders are eradicated or managed for the long term at low densities. Some entail dramatic cutting-edge biology, but others are surprisingly simple, crude methods. There is no scientific or technical reason why these approaches cannot be adapted to most invaders. The biggest problem is marshalling the political and social support to organize an effective, comprehensive operational structure, including an early-warning/rapid-response system.

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Impact of Spinosad on an Endoparasitoid in Late Instar Obliquebanded Leafrollers

Spinosad, a natural insecticide, was applied to 4th instar obliquebanded leafrollers, *Choristoneura rosaceana* (Lepidoptera: Tortricidae), that were either parasitized or non-parasitized by the endoparasitoid *Apophua simplicipis* (Hymenoptera: Ichneumonidae). Following topical application, survival of host and parasitoid declined in a dose-dependent fashion, although the parasitoids were less affected than the hosts at lower doses, relative to controls. When larvae were fed Spinosad-treated leaves, LC50's were ca. 60-fold lower for the hosts, and 150-fold lower for the parasitoids, compared with topical applications. Treatment with lower doses of Spinosad resulted in higher parasitoid survival, relative to controls.

Greg Smith^{1,2}, Allan Carroll², Staffan Lindgren¹; ¹University of Northern British Columbia, Prince George BC; ²Canadian Forest Service, Pacific Forestry Centre, 506 West Burnside Road, Victoria BC V8Z 1M5

Interactions between endemic mountain pine beetles and a potential bark beetle competitor.

Endemic mountain pine beetles attack weakened pine trees in late summer, often after other bark beetles have done so, resulting in interspecific interactions and possibly competition for resources. This study examines the effect of the presence of *Pseudips mexicanus* in naturally infested trees on oviposition and brood characteristics of endemic mountain pine beetles. Results suggest that *P. mexicanus* contributes to longer mountain pine beetle egg galleries and has a negative effect on mountain pine beetle offspring size. These findings will be discussed in terms of co-evolution and mountain pine beetle population dynamics.

Sandy M. Smith, Faculty of Forestry, University of Toronto, Ontario

Canopy research on arthropods in temperate maple-dominated forests: From descriptions to mechanisms in 10 years

In 1998, studies in the canopies of eastern hardwood forests were initiated to determine the rigour of biodiversity monitoring for forest certification; i.e. whether understorey trap data adequately captured canopy arthropod biodiversity. Since then, we have used globally standardized aerial malaise traps to show that hymenopteran diversity and composition are strongly dependent on forest type and structure; i.e. communities differ between the understorey and canopy, between different tree species, and under current low-intensity single-tree selection harvesting. This, combined with the discovery of new and rare mymarid species in these canopies, suggests that hymenopterans are particularly vulnerable to forest management practices. Future research will examine hymenopteran sensitivity to forest structure at lower taxa levels, and explore the mechanisms by which arboreal eriophyid mites and their communities may lead to tree and stand decline.

Sandy M. Smith¹, Peter de Groot²; ¹Faculty of Forestry, University of Toronto; ²Canadian Forest Service, Ontario
“The Beetles Have Arrived”: Recent case studies on invasive alien insects in our forests

Several potentially destructive invasive beetles have been discovered in our North American forests over the past decade, highlighting the need and potential for biocontrol options and partners. We review five recent introductions in eastern Canada including: 1) the pine shoot beetle (*Tomicus piniperda*) in 1993; 2) the brown spruce beetle (*Tetropium fuscum*) in 2000; 3) the emerald ash borer (*Agrilus planipennis*) in 2002; 4) the Asian longhorned beetle (*Anoplophora glabripennis*) in 2003; and 5) the siren woodwasp (*Sirex noctilio*) in 2005. Case studies will compare the scientific approach taken to control or limit their spread after arrival, and the challenges and biological control opportunities common to each. Recommendation is made for increased biological control expertise and a more proactive position on biocontrol in light of increased invasions and the unknown legacy of past imports.

Sandy M. Smith, Nick Rudzik, Faculty of Forestry, University of Toronto, Ontario

Impact of an introduced scolytid, *Tomicus piniperda*, on native scolytids and natural enemy complexes.

In 1996 we initiated a long-term study to examine the pattern of establishment by the introduced pine shoot beetle, *Tomicus piniperda* (L.), (Coleoptera: Scolytidae) in pine forests of southeastern Ontario. Sites (up to 17) were monitored annually between 1996 and 2004 to assess changes in the native community, with particular emphasis on the first five years. In general, the abundance and diversity of native species has declined with increased *Tomicus* gallery density, apparently due to competition for preferred breeding sites. A large number of generalist natural enemies have also moved relatively quickly from the native community onto *Tomicus*. However, in contrast to *Tomicus* in its native Europe and to native scolytids in eastern Canada, not all parasitoids are present and specific predator populations remain low even after 5+ years at any given site.

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'Hairy' Canola Meets Flea Beetles (*Phyllotreta* spp.): Host Plant Resistance in Action

Host plant resistance can be a durable, environmentally-friendly means of pest management, well suited to the control of chronic insect pests. GL1(myb) and GL3(bHLH) genes which influence trichome development in Arabidopsis were introduced into canola, resulting in up to 1600 times greater numbers of trichomes on developing leaves of the mutant than on leaves of unaltered seedlings. The increased hairs led flea beetles, *Phyllotreta* spp., the most common insect pest in Canadian canola production, to feed less on the mutant lines than on regular ones, and in an abnormal manner. This is the first step in developing antixenotic host plant resistance to the insect.

John Spence, Department of Renewable Resources, GSB 751, University of Alberta, Edmonton, Alberta T6G 2E3

Invasive species under your nose and in your backyard: the secret wars of ground beetles

A surprising number of carabid species, mainly of western European origin, are now well established in North America ... and the list is growing. This invasion is having dramatic effects on the native carabid fauna that occurs in our Canadian cities and towns, and in some places on our farms and in our forests. This paper will synthesize two decades of work on this topic, especially that seeking to unravel the ecological processes involved in the 'great carabid displacement' occurring in central Alberta. I will focus on what makes a successful invasive and how landscape factors may be involved in the carabid wars being waged beneath our feet.

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L'arbre est-il toujours plus vert à coté –

La qualité nutritive et l'essence foliaire sur lesquels un insecte s'alimente peu grandement influencer ses performances biologiques (temps de développement larvaire, taux de survie, poids des pupes). Cette étude porte sur l'effet d'une alternance alimentaire de différentes essences foliaires sur la performance biologique de la livrée des forêts. L'alternance de quatre essences foliaires (chêne rouge, bouleau blanc, érable à sucre et peuplier faux-tremble) a été testée in vitro sur différents stades larvaires de la livrée. Quand l'alternance est effectuée à de jeunes stades larvaire sur du chêne rouge, la performance biologique de l'insecte est augmentée. Toutefois, lorsque l'alternance est effectuée à de jeunes stades vers l'érable à sucre, on observe le contraire.

Charles Stephen, C.M. Buddle. Department of Natural Resource Sciences, McGill University, Ste. Anne de Bellevue, Québec, H9X 3V9

First focused survey of harvestmen (Arachnida: Opiliones) in Québec beech-maple forests

Although the spider fauna of Québec is relatively well documented, to date little attention has been focused on non-araneid arachnid fauna. In particular, very little is known

about the province's Opiliones: only 15 species have been recorded, although 27 species are known to occur in New York. On a broader scale, no published quantitative data exists on harvestmen in forest canopies of North America, nor does there appear to be published data on the relative efficacy of different collection methods. Here a new faunal inventory for Québec is presented, including canopy data and a comparison of primary collection methods. All data came from two ongoing arthropod biodiversity surveys of beech-maple forests in Montérégie. Harvestmen were sampled primarily by foliage beating during daylight hours and sticky traps left in place for >48 hours. In all, 23 species (874 individuals) from 5 families were collected. New records were found for both Québec and Canada. Opiliones were collected from the canopy and understory: this likely represents the first harvestmen collection records from the forest canopy of eastern Canada. The understory held higher levels of abundance, but only slightly higher species richness. Rarefaction estimates predicted that increased collection effort would result in higher canopy species richness. Ordination analysis found distinct groups in the canopy and understory layers. No differences were found between the two primary sampling methods.

Anita Stjernberg, Roughley, R.E. Dept of Entomology, University of Manitoba

The Impact of Rotational Seasonal Grazing on the Invertebrates of Mixed-Grass Prairie, Using Ground Beetles (Carabidae) and Spiders (Araneae) as Bioindicators

Grasslands need disturbance (drought, grazing, fire, etc.) in order to be maintained as grasslands. The current management strategy of the Yellow Quill Mixed-Grass Prairie Preserve, owned by the Nature Conservancy of Canada, is twice-over rotational cattle grazing. My research involves the impact of this strategy on selected groups of invertebrates (Coleoptera: Carabidae, and Araneae). A secondary experiment involves the seasonality of this grazing impact (spring, vs. fall, vs. spring & fall) and what effect it has on bioindicator species diversity and abundance. Only the Carabid results are to be discussed.

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Identification moléculaire des mermithides (nématodes) parasites de mouches noires (Diptera : Simuliidae)

Les stades adultes des quatre espèces de mermithides parasites de mouches noires (*Mesomermis fluminalis*, *M. camdenensis*, *Gastromermis viridis* et *Isomermis wisconsinensis*) étaient jusqu'à maintenant identifiés par la morphologie. Nous avons développé une méthode de typage par PCR de COI et de l'ADNr 18S; dont les amorces étaient pour COI tirées de Hu et al. (2004) et pour le 18S, conçues par comparaison des séquences chez *Caenorhabditis elegans* et *Drosophila melanogaster*. Les séquences des amplicons nous ont mené dans un deuxième temps à la création de nouvelles amorces capables de distinguer entre les quatre espèces et ce pour tous les stades du parasite. Il sera donc possible de préciser par une approche moléculaire la relation hôte-parasite.

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A phylogeny of the large wolf spiders from North America; are we making progress?

Although, thanks to Charles Dondale and others, many genera of wolf spiders from North America have been revised in recent years, the most recent revisions of the large wolf spiders (members of Lycosinae) are Chamberlin 1908 (*Lycosa*), Wallace 1942 (*Geolycosa*) and Wallace 1942 (*Lycosa lenta* group). I will discuss recent efforts using both morphology and molecules in determining a phylogeny of the large wolf spiders from North America and will discuss the many notable contributions of Charles Dondale in making sense of this large and fascinating group.

Ward Strong¹, Gary Grant², Jocelyn Millar³; ¹BC Ministry of Forests; ²Natural Resources Canada; ³University of California-Riverside.

Pheromone and life history traits of *Dioryctria abietivorella*

A two-component pheromone for the Fir Coneworm, *Dioryctria abietivorella*, was identified and synthesized. A 200:2000 mix of Z9,E11-14:Ac and a C25 Pentaene resulted in the most catches. Stabilizers, UV inhibitors, and other potential attractants/antagonists did not change trap catches. The most effective traps tested were Phero Tech diamond traps. Area-wide surveys found males fly from May through October, with peaks in June and August. In hourly surveys, male flight was nocturnal with a peak at 1:00 a.m. Most males were caught in the upper crowns of trees. Future investigations include oviposition habits, larval feeding preferences, mating behaviour, and pheromone control techniques.

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Effect of harvesting on rove beetle species diversity in Acadian red spruce stands.

We examined the differences in rove beetle species composition, diversity, and abundance in Acadian red spruce stands subjected to various harvesting regimes. Pitfall trap samples were collected from uncut, clear-cut, strip-cut, and selective-cut stands in the first and fifth season after stand treatment at two sites in New Brunswick.

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Effects of Stand Type on Oribatid Mite Assemblages in Southern Quebec

Oribatid mites represent a hyperdiverse group playing an important role in decomposition within forest systems. While much work has been done investigating the effects of factors such as soil type and humidity on oribatid assemblages, little has been done to look at the effects of broader factors such as stand type on biodiversity and assemblage composition of

this group. Litter and soil were sampled from four stand types (maple, beech, mixed conifer and mixed deciduous) and three habitat types (abandoned pasture, meadow and agricultural field) for mites at the Morgan Arboretum of McGill University. Preliminary results will be discussed.

Aynsley Thielman, Fiona F. Hunter; Brock University.

***Anopheles* (Diptera: Culicidae) systematics in Ontario: cytogenetic methods and results**

Polytene chromosomes are found in certain tissues, such as the salivary glands, of dipteran insects. Analysis of the banding patterns can be used to identify sibling and isomorphic species, infer phylogenetic relationships among species, and even indicate incipient speciation processes. Many different protocols are available for the preparation of polytene chromosomes in *Anopheles* but achieving consistently good results remains difficult. From field-collect specimens to establishing colonies for lab-reared material, the advantages and disadvantages of cytogenetic studies of *Anopheles* will be discussed.

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Does gypsy moth invasion affect the natural mortality of native caterpillars?

Research on the detection and management of the gypsy moth has been extensive; however, very few studies have addressed the ecological implications of its introduction into North American forests. With a wide host range and a large assemblage of natural enemies, the gypsy moth has broad potential to both indirectly and directly affect native species. Gypsy moth and native caterpillars were reared from areas in Ontario where the gypsy moth had either been recorded at outbreak levels or had never been observed. Parasitoid species composition and abundance were assessed to understand how the presence of gypsy moth indirectly affects the natural mortality of native caterpillars.

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Beetles, Bovines and Biodiversity: An inventory of Coleoptera in an eastern Canadian dairy pasture

Documenting the insect fauna of agricultural habitats is an important step in understanding the effect of agricultural management on biodiversity. We present an inventory of Coleoptera for an experimentally managed Nova Scotia dairy pasture based on intensive collection of above ground adults over two growing seasons using pitfall traps and sweep netting. The pasture's beetle fauna comprises over 140 species from 25 families. Weevils (Curculionidae), leaf beetles (Chrysomelidae), ground beetles (Carabidae) and rove beetles (Staphylinidae) are well represented and the ratio of introduced to native species is high relative to the overall fauna of the Maritimes.

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Woodlands adjacent to apple orchards: is there a link between vegetal diversity and obliquebanded leafroller populations?

The vegetation diversity around an agricultural ecosystem is an important factor of the biodiversity inside this ecosystem. The obliquebanded leafroller, *Choristoneura rosaceana* (Harris), is a pest which can develop on more than fifty plant species. Is the abundance of this tortrix related to the composition of the wooded one? Pheromone traps were laid out in 10 apple orchards of southern Quebec and their adjacent forest, and recorded weekly in 2005 and 2006. The results will be compared and discussed in relation to various parameters and indices drawn from the characterization of adjacent forests.

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Méthode de lutte potentielle contre le charançon du pin blanc à l'aide de *Beauveria bassiana*

Le charançon du pin blanc est un insecte qui occasionne beaucoup de dommages dans les plantations de pin blanc et d'épinette de Norvège dans l'Est du Canada et dans les plantations d'épinette de Sitka dans l'Ouest Canadien. Des études en laboratoire ont démontré la vulnérabilité de ce ravageur au champignon entomopathogène *Beauveria bassiana*. Une stratégie de lutte a été testée par application au sol lors de la diapause de l'insecte. Des applications automnale et printanière ont été réalisées afin de comparer leur efficacité. Les résultats de cette approche fort prometteuse seront présentés lors de cette présentation

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Identification of a new aphid isoprenyl diphosphate synthase

We cloned the cDNAs of five putative aphid farnesyl diphosphate synthases (FPPS), a key enzyme involved in juvenile hormone and E-β-farnesene (alarm pheromone component) biosynthesis. The predicted translated products have the conserved domains present in all short-chain E-isoprenyl diphosphate synthases, including the two aspartate-rich motifs. However, the aphid sequences display an

apparently rare substitution (Phe/Tyr→Gln; Q281) at position -4 relative to the first aspartate-rich motif. Surprisingly, a recombinant *Myzus persicae* isoform of the presumed FPPS produced geranyl diphosphate (as opposed to FPP) as principal product when supplied DMAPP and IPP as substrates, indicating this enzyme has geranyl diphosphate synthase activity.

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Effects of site and crown level in density-defoliation relationships of the eastern blackheaded budworm (*Acleris variana*) in a cultured balsam fir (*Abies balsamica*) forest.

Acleris variana is an endemic pest that periodically causes severe defoliation on balsam fir in eastern Canada. For effective monitoring/control measures to be implemented, relationships between insect density and defoliation need to be established. To do this, we conducted a field survey which destructively removed branches from three different crown levels in both pre-commercially thinned and commercially thinned stands of trees during different stages of the insect's development. The influence of crown level, site type and insect density on defoliation will be presented and discussed.

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Wireworm control in potato crops: Will efficacy trials used for organophosphates work for neonicotinoids?

The last remaining effective insecticide registered for wireworm control in potatoes is phorate (Thimet 15G). Attempts to replace this highly toxic OP with various neonicotinoid (i.e. thiamethoxam, clothianidin and imidacloprid), phenyl pyrazol (e.g. fipronil) and synthetic pyrethroid (e.g. tefluthrin) insecticides have met with varied success worldwide. Our studies have determined that the efficacy of specific insecticides in controlling wireworms will vary according to: a) the species involved; b) the application method used (i.e. broadcast, in-furrow, seed treatment); c) land preparation before planting, and; d) species-specific repellency. This paper discusses the difficulties and misunderstandings often associated with wireworm efficacy research, and suggests that efficacy trials should be structured to accommodate the toxicological peculiarities associated with many of the novel lower-risk insecticides.

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Aphid Transmission Efficiencies for the Ontario Isolate of Plum Pox Virus

Factors affecting the spread of plum pox virus (PPV), such as aphid transmission efficiency and host range, differ between virus strains. Studies relating to the transmission and host range of the Canadian isolate of PPV were conducted at SCPFRC, Vineland, based on a standardized protocol involving timed acquisition feeding periods and known numbers of aphids. Our results have shown that the

predominant isolate of the Ontario PPV 'D' strain is readily transmitted from peach, *Prunus persica*, or dwarf flowering almond, *P. glandulosa*, to peach 'Bailey' seedlings. Additionally, of eight species of *Prunus* tested so far, seven are susceptible to PPV. Species of aphids known to be important vectors of PPV in Europe, such as the green peach aphid, *Myzus persicae*, and spirea aphid, *Aphis spiraecola*, are also common and efficient vectors in Ontario. Information obtained in this study will contribute to attempts to eradicate or manage this important disease of *Prunus* tree fruits and ornamentals.

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Influence du site d'établissement d'une colonie de pucerons sur la prédation intraguilde

À l'aide d'un dispositif expérimental clos sur plant de pommes de terre, nous avons vérifié l'influence de l'emplacement d'une colonie de *Macrosiphum euphorbiae* (Aphididae) – surface foliaire abaxiale ou bourgeon foliaire apical – sur la prédation intraguilde (IGP) entre et *Aphidoletes aphidimyza* (Cécidomyiidae; prédateur furtif) et *Harmonia axyridis* (Coccinellidae; prédateur actif) ainsi qu'entre *H. axyridis* et *Chrysoperla rufilabris* (Chrysopidae; deux prédateurs actifs). L'intensité ainsi que les effets indirects des interactions intraguildes (IG) sur la proie IG ont été évaluées à intervalles réguliers. Les résultats obtenus permettent de mieux comprendre les relations prédateur-prédateur au sein des méthodes de lutte biologique.

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The effect of remnant boreal forest habitats on saproxylic beetle assemblages in landscapes subjected to harvesting

Saproxylic beetles were sampled in harvested landscapes in eastern mixedwood boreal forest of Québec. The objective was to explore habitat-use and aspen host-use of saproxylic beetles in clearcuts and remnant habitats, which are believed to mimic post-fire residual trees and snags. Remnant habitats collected significantly higher species richness and abundance of saproxylic beetles in addition to higher larval densities, compared to forest interiors. Overall, saproxylic beetles appear to readily use remnant habitats in clearcut landscapes, supporting the hypothesis that biodiversity is best preserved when harvesting mimics more closely natural disturbance.

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Islands in the sky: The beast, the impediment, and whirlpools in the pattern of arboreal community ecology.

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 ecology and conservation biology. The prevalent patterns of habitat specialization, low vagility, and restricted distribution displayed by a large percentage of resident canopy microarthropods are features often associated

with ecosystems that have enjoyed relatively stable conditions for long periods of time, as have ancient coniferous forest canopies. Several processes act to shape communities but it is clear that challenges to ascertain the relative importance of these mechanisms still remain. This presentation will summarize the spatial and temporal patterns of diversity in arboreal arthropods with emphasis on Oribatida and discuss future research directions and opportunities related to exploration of the last biotic frontier.

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Insect associated with nests of the American Kestrels, Northern Saw-whet and Boreal owls

Raptor nests represent a unique habitat where allochthonous resources, such as carrion, animal excrement and host animals themselves form the base for complex and diverse communities of detrital consumers, predators and parasites. Here we report on the insect fauna associated with nests of Northern Saw-whet (n=3) and Boreal Owls (n=12) and American Kestrels (n=3). Fleas, larval Diptera and adult Staphylinids, Histerids and Dermestids were the most abundant insect groups collected in berlese extractions. Our results build on preliminary findings of Majka et al. 2006 for a more generalized view of the insect fauna associated with environmentally sensitive vertebrate species.

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Morphology and behavioural interactions between aphids and their parasitoids: a comparative study.

Behavioural interactions between hosts and their parasitoids are central to the understanding of their population dynamics and evolution. While many studies have shown associations between either host or parasitoid morphology and their behavioural interactions, the generality of these results and their evolutionary importance is unknown. We present a comparative study that addresses these issues in aphid (Homoptera: Aphididae) and parasitoids (Hymenoptera: Aphidiidae) systems. Phylogenies, behavioural, and morphological data were gathered from the literature. Additional morphological data was also obtained from specimens in the Canadian National Collection of Insects (Ottawa). We discuss the evolutionary significance of our findings.

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A low density reverse Northern array used to study gene expression in *Leptinotarsa decemlineata* (Say) under environmental stresses

A low density reverse Northern array was developed to study gene expression in *Leptinotarsa decemlineata* (Say) in response to various environmental stresses. The array contained over 40 ESTs with the identities of cytochromes P450, glutathione S-transferases, esterases or glycine-rich proteins, which were generated by degenerate RACE. The hybridization with DIG-labeled cDNA from azinphosmethyl treated beetles showed that glycine-rich protein genes were strongly induced while CYP4G29 gene was suppressed by the insecticide treatment; the primary hybridization with DIG-labeled cDNA of the beetles from different plants showed alternative cytochrome P450 gene over expression. It indicated that the array method was useful to screen for the genes responding to different environmental stresses.

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Insecticide and water stress induced glycine-rich protein gene expression

Glycine-rich proteins (GRP) are known to be a cuticular component or related to insect defense mechanism. Three GRP transcripts were identified from *Leptinotarsa decemlineata* (Say) using a low density reverse Northern array and the deduced proteins were named Ld-GRPs. They contain 119 to 122 amino acids, a few GLG motifs, and were highly hydrophobic. The Ld-GRP genes were strongly induced by azinphosmethyl in adult beetles. Further, they were expressed more strongly in resistant beetles than in susceptible beetles. Ld-GRP1 and Ld-GRP2 genes were also induced by water stress in adults and the expression was restricted to epidermal cells. This is the first time to show that cuticular structural genes were expressed in adults. This response might be a strategy for the beetles to minimize the negative impact of environmental stress such as the presence of xenochemicals or dry conditions.